Examining the research-practice gap in Physical Therapy (PT) in the United States of America using knowledge translation interventions (KTIs): A comparative study

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Abstract

This research was undertaken to study the impact of single and multicomponent knowledge translation interventions (KTIs) on barriers to the integration of Clinical Practice Guidelines (CPG) into Clinical Decision Making (CDM) in the context of physical therapists (PTs) and find out which of the two KTIs was more effective. A literature review showed that research knowledge (e.g. CPG) in the field of PT (Physical Therapy) is not being integrated in to clinical practice (e.g. CDM), thus leading to a research-practice (R-P) gap in other words CPG-CDM gap. It is suggested in the literature that the management and behavioural aspects of PTs might be acting as barriers hindering the integration of the research knowledge into clinical practice consequently affecting the delivery of optimum patientcare. Remedial measures, namely KTIs, are suggested to address those barriers and to bridge the R-P gap. However, the phenomenon of the R-P gap, the causes of it and the possible interventions are not well understood concepts in the literature, particularly in the context of PTs.

CPG for Venous Thromboembolism (VTE) in PT was chosen as the example of research knowledge. It was argued that barriers have the potential to affect CDM which in turn can affect the CPG-CDM gap. Lack of knowledge about CPG-CDM gap is a major limitation in the literature that is affecting the integration of CPG into CDM. Other gaps found in the literature that have the potential to affect CPG-CDM gap include management and behavioural variables as probable causes of CPG-CDM gap (or barriers), use of KTIs to bridge the CPG-CDM gap and, KTIs. Furthermore, lack of knowledge about relationship between barriers and CPG-CDM gap, KTIs and barriers, KTIs and CPG-CDM gap and the impact of KTIs (effectiveness) in bridging CPG-CDM gap were the other gaps found in the literature that had potential implications to CPG-CDM gap. These gaps were addressed in this research to some extent.

Relationships between the independent variables (lack of knowledge of PTs in CPG, lack of favourable attitude of PTs towards CPG and lack of self-efficacy and motivation of PTs to integrate CPG into CDM) and the dependent variables (CDM and CPG-CDM gap) were defined and models were proposed. Further, it was posited that KTIs could impact barriers based on theories and models found in the literature that provided some basis to create the linkage between KTIs and management and behavioural barriers. Education material (EM) and virtual communities of practice (VCoP) were chosen as of the KTIs in this study. The models of Cabana et al. (1999) and Fischer et al. (2016), primarily, were used to ground the conceptual models represented by figures and equations. Methodologically, a positivist approach with an objective ontological stance was employed and a deductive approach and quantitative research method were used to address the research gaps. The research design included a longitudinal element and survey questionnaire. The target population was licensed PTs in the USA. Random sampling was used. Two groups of PTs were identified namely

EM-group and VCoP group. Data was collected from the groups before and after administering the KTIs. The results showed that single and multicomponent KTIs impacted barriers in different ways. EM impacted lack of favourable attitude of PTs towards CPG, and lack of self-efficacy and motivation of PTs to integrate CPG into CDM as barriers and narrow the CPG-CDM gap. VCoP was found to impact the combination of four barriers and narrow CPG-CDM gap. In addition, barriers in groups of two were also impacted by VCoP and narrowed the CPG-CDM gap. Furthermore, a CPG knowledge score card and a corresponding CDM score card developed by the researcher were used to test the change behaviour of PTs in integrating CPG into CDM. This experiment showed that barriers existed and caused CPG-CDM gap and KTIs could narrow the CPG-CDM gap.

The findings indicate that this research has contributed to knowledge in many ways, including unearthing the relationship between CPG-CDM gap and barriers, better understanding of KTIs, their relationship with CPG-CDM gap and barriers, gaining knowledge about the impact of single and multicomponent KTIs on single and multiple barriers and identification of methods to bridge the CPG-CDM gap.

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List of Abbreviations

APTA – American physical therapy association

CDM – Clinical decision making

CDC – Centers for Disease Control and Prevention

CDMB – Clinical decision-making behaviour

CIHR - Canadian Institute for Health Research

CoP - Communities of Practice

CPG – Clinical practice guidelines

CSP – Chartered society of Physiotherapy

DVT – Deep vein thrombosis

EBCDM – Evidence based clinical decision making

EBP – Evidence based practice

EM – Educational material

EPOC – Effective Practice and Organization of Care (EPOC)

IOM – Institute of medicine

KT – Knowledge translation

KTA – Knowledge to action cycle

KTI – Knowledge translation intervention

LE DVT – Lower extremity Deep vein thrombosis

NHS – National health services

OMRU - Ottawa model of research utilization

PE – Pulmonary embolism

PT – Physical therapy

PTs – Physical therapists

PTS -Post thrombotic syndrome

QED – Quasi experimental research design

RCT – Randomized controlled trial

VCoP – virtual Communities of Practice

VTE – Venous thromboembolism

WCPT – World confederation of physical therapy

WHO – World health organization

CFA – Confirmatory factor analysis

SEM – Structural equation modeling

SMC -Squared Multiple Correlations

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List of Operational Definitions

Clinical Practice Guideline (CPG) - CPG is defined as "evidence based recommendations developed based on synthesized form of research knowledge and that have the potential to improve patientcare when integrated into clinical decision making" (Author, 2018).

Clinical Decision Making (CDM)- CDM is defined as "a process of decision making by which healthcare practitioners plan, direct, perform and reflect on aspects related to patientcare by integrating the latest research knowledge" (Author, 2018).

Barrier – A barrier is regarded as an obstacle that hinders the integration of research knowledge into clinical practice (Author, 2018).

Knowledge Translation (KT) - KT as "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically-sound application of knowledge to improve health, provides more effective health services" (Canadian Institute for Health Research (CIHR), 2016).

Knowledge Translation interventions (KTIs) - KTIs are intended to facilitate the use of research knowledge in clinical practice (Author, 2018).

Single component Knowledge Translation interventions (Single component KTIs) - Single component KTIs can address only one of the many barriers to KT and help to overcome that specific barrier (Squires et al. 2014)

Multicomponent Knowledge Translation interventions (Multicomponent KTIs)- Multicomponent KTIs are combination of two or more single KTIs that could help to overcome multiple barriers simultaneously (Squires et al. 2014).

Chapter 1

Introduction

1.1 Introduction

Research knowledge produced in every field is important to both practitioners and researchers. There is widespread recognition amongst researchers about the need to integrate the latest research knowledge into clinical practice to enhance patient care. Physical therapy (PT) is no exception. Ironically, the literature shows that research knowledge produced in the field of PT is not extensively being integrated into clinical practice (Stander et al. 2018; Graham et al. 2018; Fristedt et al. 2016; Scott et al. 2012). Many have highlighted that integration of research knowledge in to clinical practice is a challenge. Although inconclusive, available research outcomes indicate that clinical practice behaviour and barriers to change in the practice behaviour of the practitioners are two main causes that is affecting the integration of research knowledge into clinical practice (Bérubé et al. 2018; Stander et al. 2018; Curtis et al. 2017; Sheringham et al. 2017; Nilsen. 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Rice et al. 2012; Scott et al. 2012; Gagliardi, 2012). Many have argued that changing the clinical practice behaviour of the practitioner is a topic frequently referred to anecdotally, but research outcomes are inconclusive, not generalizable and have serious limitations (e.g. Curtis et al. 2017; Suman et al. 2015; Baker et al. 2015; Fischer et al. 2016; Cooper et al. 2015). In this context, clinical practice behaviour of the practitioner assumes significance, especially in the field of PT, where integration of research knowledge in practice is of paramount importance. Accordingly, further research is imperative. Lack of integration of research knowledge into clinical practice has led to the emergence of a research knowledge-clinical practice (R-P) gap which is affecting the PTs and in turn affecting patient care. Research efforts that have addressed the R-P gap are far and few, making the current level of knowledge about the R-P gap inadequate, inconclusive and lacking depth (e.g. Stander et al. 2018; Nilsen. 2015; Bernhardsson et al. 2014; Campbell et al. 2013). This research addresses these two issues; namely the challenges involved in changing the behaviour of physical therapists (PTs) and addressing the R-P gap.

In addition to the two issues mentioned above, literature shows that some management and behavioural attributes or aspects are argued to be the cause of the R-P gap, that is to say, barriers hindering the integration of research knowledge into clinical practice. Further, current knowledge about those management and behavioural barriers is not conclusive and lacks clarity (Bérubé et al. 2018; Stander et al. 2018; Ladeira et al. 2017; De Souza et al. 2017; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Scott et al. 2012; Schreiber et al. 2009; Salbach et al. 2007; Jette et al. 2003). Again, it has been argued in the literature that if the R-P gap is caused by management and behavioural barriers, then it is possible to use interventions to address those barriers, either to narrow or to eliminate the R-P gap (Fischer et al. 2016; Sibley & Salbach, 2015;

Bernhardsson et al. 2014; Squires et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013; Scott et al. 2012; Bhattacharyya, 2009). Research on interventions to address those management and behavioural barriers in the context of PTs is not well established and available research outcomes do not adequately explain the barrier phenomenon (Stander et al. 2018; Ladeira et al. 2017; De Souza et al. 2017; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Squires et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013). Lack of in-depth knowledge about management and behavioural barriers and the role of possible interventions to address the barriers, has resulted in the continued presence of barriers. Further, lack of knowledge on the linkage between the barriers to the integration of research knowledge into clinical practice and R-P gap is preventing the reduction or elimination of the R-P gap. Four aspects emerged from this scenario that requires investigation:

1. the R-P gap;
2. management and behavioural challenges creating R-P gap;
3. concept of management and behavioural barriers causing R-P gap; and
4. use of interventions to narrow R-P gap by impacting the barriers causing the gap.

This study investigates these four aspects. It has developed models using theory and relevant literature, tested them empirically and explained how these aspects could be addressed by taking specific examples of research knowledge, clinical practice, barriers to integration of research knowledge into clinical practice, KTIs and R-P gap. To begin with, it was necessary to gain knowledge on the background of the research.

1.2 Background

Physical therapy or physiotherapy is an allied healthcare discipline which plays a vital role in multidisciplinary healthcare services delivered to clients or patients. The World Confederation for Physical Therapy (WCPT, 2017) defines physical therapy as "services provided by physical therapists to individuals and populations to develop, maintain and restore maximum movement and functional ability throughout the lifespan. The service is provided in circumstances where movement and function are threatened by ageing, injury, pain, diseases, disorders, conditions or environmental factors and with the understanding that functional movement is central to what it means to be healthy". The Chartered Society of Physiotherapy in the UK (CSP, 2018) states that PTs assume the roles of clinical leaders and multi-professional team members in the field of healthcare, thereby supporting the patients at home, work, hospital, community and leisure environments. Similarly, the WCPT (2017) posits that PTs are concerned with "identifying and maximizing the quality of life and movement potential within the spheres of promotion, prevention, treatment/intervention, habilitation and rehabilitation. These spheres encompass physical, psychological, emotional, and social wellbeing" According to the American Physical Therapy Association (APTA, 2011) PTs are involved

with maintenance, restoration and improvement of movement, activity and health in order to achieve the optimal functioning, well-being and quality of life of people of all age groups. PTs identify risk factors that could affect the people's health and implement services to mitigate risk and contain the progression of or prevent functional decline and disability resulting in enhancement of participation in different chosen life situations. Further, PTs deliver services that include; examination, evaluation, diagnosis, prognosis, intervention, and outcome assessment of specific conditions within the scope of their practice; and device clear treatment and follow up plans that are appropriate for specific clients in collaboration with the patient or client or caregiver. PT is an autonomous profession already in the UK wherein the physiotherapists can independently assess, diagnose and even prescribe medicines (CSP, 2018). Similarly, APTA (2018a) envisages PT to be an autonomous profession by 2020 in the USA; with clients having direct access to PT services. These three prominent organisations have outlined the importance of PTs to the modern-day living including the areas of health promotion, wellness and fitness of people. In addition, all the three organisations reiterate the need for PTs to employ Evidence based practice (EBP) to ensure efficient and effective patient care with adequate emphasis to safety. EBP is being acknowledged and promoted by even governments globally to narrow the gap between research and clinical practice (McEvoy et al. 2010b).

PT as a profession is well established and the importance of EBP is paramount in the PT profession. However, studies reveal that integration of evidence into clinical practice of PTs is not happening readily (Stander et al. 2018; Graham et al. 2018; Bérubé et al. 2018; Fristedt et al. 2016; Scott et al. 2012; Nilsen. 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Rice et al.2012; Scott et al. 2012; Gagliardi, 2012). There are growing concerns among experts and prominent PT organisations who have highlighted the problem of lack of integration of the latest research knowledge into clinical practice. For instance, Scurlock-Evans et al. (2014) argue that there is a gap between what is done and what should be done with regard to applying and use of EBP by PTs. Citing different studies, Bostrom et al. (2018) argue that knowledge, attitudes and skills to apply EBP and the use of evidence in practice in the field of PT is not routine. While there appears to be no survey or data regarding the use of or non-use of EBP by PTs (Cantero-Téllez et al. 2018) one of the studies commonly cited by researchers regarding statistics related to use of EBP in healthcare professionals including PTs is that of Grol and Grimshaw (2003) which showed that 30 to 40% of patients do not receive EB treatments, and that 20 to 25% receive treatments that may be unnecessary or even harmful. A more recent study by Cantero-Téllez et al. (2018) showed that still a significant gap exists in the use of EBP by PTs. Taking the example of clinical practice guideline (CPG) implementation with regard to carpal tunnel release (CTR) which is a medical condition affecting the wrist, Cantero-Téllez et al (2018) reported that among the PTs, use of guidelines to treat CTR is low; reasons for which is the lack of consensus regarding the techniques and interventions used by PTs and occupational therapists worldwide after

CTR. This example shows that there is a lack of clarity on the results of implementing the research knowledge itself and the outcomes of using the research knowledge.

Thus, use of EBP by PTs in clinical practice is not common and problems exist. The result of not using research knowledge in clinical practice is argued to be affecting the delivery of optimum patient care (Traeger et al. 2017; Ladeira et al. 2017; De Souza et al. 2017; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Scott et al. 2012; Rice et al. 2012; Van Tassel, 2012; Schreiber et al. 2009; Salbach et al. 2007; Jette et al. 2003;). Another result is the direct contradiction of the recommendation by prominent organisations like WCPT, CSP and APTA which advocate the use of EBP. While some studies have been conducted by researchers (e.g. Bernhardsson et al. 2014; Campbell et al. 2013) to understand what contributes to the lack of use of research knowledge in clinical practice, some consensus was seen to have evolved in the literature which showed that barriers to managing patientcare and behavioural aspects could be the reasons why PTs are not embedding research knowledge into clinical practice (Stander et al. 2018; Curtis et al.2017; Fischer et al. 2016; Argyriou et al. 2015; Silva et al. 2015; Sibley & Salbach, 2015; Campbell, 2013; Rainbard et al. 2006; Grol & Grimshaw, 2003; Jette et al. 2003). This research investigated the management and behavioural barriers affecting the integration of research knowledge into clinical practice in order to find out; to what extent those barriers affected the integration of research knowledge into clinical practice, how the R-P gap was created and how to bridge the R-P gap. In investigating this problem this research identified the gaps in the current knowledge in the context of PT, which included the following:

1. Lack of conclusive studies on management and behavioural barriers to integrating research knowledge into clinical practice.
2. Lack of appropriate knowledge on defining and addressing barriers to integration of research knowledge into clinical practice.
3. Lack of conclusive knowledge on defining and explaining the use of mechanisms to address the barriers including interventions and types of interventions.
4. Lack of clear knowledge on how barriers create R-P gap and to what extent those barriers affect R-P gap.
5. Lack of knowledge on how and to what extent one particular type of interventions namely knowledge translation interventions (KTIs) impact barriers to integration of research knowledge into clinical practice.
6. Lack of clear explanation of how to apply existing theories, concepts and models in addressing the issues of barriers to integration of research knowledge in clinical practice, relationship between barrier to integration of research knowledge into clinical practice and R-P gap, impact of interventions on barriers causing R-P gap, use of KTIs to bridge the R-P gap.

In this context it was argued that attitude and behavioural aspects of health professionals need to be evaluated (e.g. Stander et al. 2018; Grol et al. 2013). Hence, it is clear that management and behavioural aspects of health professionals, for instance PTs who are the focus of this research, need to be understood and evaluated as barriers to integration of research knowledge into clinical practice. While there are many aspects of management and behaviour of PTs (e.g. adherence/ behaviour, knowledge, skills, attitudes and beliefs, awareness, attainment of goals and reflective practice (Stander et al. 2018) this research examined the aspects identified by Fisher et al. (2016) and Cabana et al. (1999) which included knowledge, attitude, self-efficacy and motivation. Limiting the focus only to four of those aspects brought more clarity into the investigation, reduced complexity and made the research parsimonious. These four aspects were investigated separately as well as in combination of groups in this research. How barriers work independently and in groups with regard to R-P gap is an area, not addressed and compared in one single research studies, although examples of single and multiple barriers research conducted separately are found in the literature (e.g. Russell et al. 2010 (on single barrier) and Bernhardsson et al. 2014; Campbell et al. 2013 (on multiple barriers)).

However, there was a dilemma on which aspect of research knowledge and clinical practice should be chosen as examples for the research. Literature showed that research knowledge is generally considered as comprehensive CPGs (Curtis et al. 2017; Keiffer, 2015; Van Dulmen et al. 2014; Nilsen & Bernhardsson, 2013; Treweek et al. 2013; Graham et al. 2011; Bridges et al. 2007). Thus, CPGs were chosen for examination in this research. Hardly any study has been conducted to show how knowledge about CPGs is translated into EBP, particularly in the field of PT and prior researchers have pointed out that knowledge translation of CPGs into EBP does not happen in reality (Stander et al. 2018; De Souza et al. 2017). This was a major gap in the literature and lack of knowledge on why CPGs are not translated into EBP has clearly led to a situation that PTs, like many other health care professionals, are not able to provide the best patient care based on latest research knowledge.

In addition, while linking CPG to EBP, it was necessary to identify a particular example of EBP in the context of PTs. Clinical decision making (CDM) was chosen as the representation of EBP because CDM is argued to be an important aspect of clinical practice (Jewell et al. 2018; APTA, 2018d; Rousseau and Gunia, 2015; Thompson et al. 2013; Straub-Morarend et al. 2011; Roshanov et al. 2011). CDM is simple in cases of decisions taken by PTs that are routine and frequent, but becomes complex in cases where decision making is uncertain and complex and, in such situations, CPG is expected to aid the CDM process of the practitioner (Fischer et al. 2016). Integration of CPG into CDM in the field of PT is not taking place readily (Bérubé et al. 2018; Stander et al. 2018; Ladeira et al. 2017; De Souza et al. 2017; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Scott et al. 2012; Schreiber et al. 2009; Salbach et al. 2007; Jette et al. 2003). Other than the

general reference to indicate lack of integration of research knowledge into clinical practice, conceptualization of R-P gap is not available in the extant literature. The literature review showed that there was no specific research available that conceptualized CPG as research knowledge and CDM as a clinical practice aspect, and thus CPG-CDM gap is not well addressed in the literature especially in the context of PTs. If, in-depth knowledge about CPG, CDM and the CPG-CDM linkage can be gained, then it is possible to address the concerns expressed above.

As far as knowledge transfer interventions (KTIs) are concerned, recently researchers have started to pay greater attention to their utility in addressing behavioural and management attributes as barriers (e.g. Stander et al. 2018; Fischer et al. 2016; Grimshaw et al. 2012). This research relied upon the framework of Fischer et al. (2016) which is built on the original model by Cabana et al. (1999) to address the concepts of KTIs, barriers affecting knowledge translation into clinical practice and clinical practice. While the model developed by Fischer et al. (2016) supported this investigation, it did not specify any particular type of KTI that could be used to remove barriers. In addition, the framework of Fischer et al. (2016) does not comprehensively address the important concept of R-P gap or CPG-CDM gap. Furthermore, the model is not validated by empirical investigation. Particularly in the context of PTs, this limitation is obvious as the model could not be applied without modification. As far as the examples of KTIs were concerned, this research relied upon the EPOC classification of KTIs (EPOC, 2015) and used single and multicomponent KTIs. While classification and examples of KTIs to remove the barriers causing CPG-CDM gap is not well researched, this research aimed to use both the types of KTIs to understand how barriers causing the CPG-CDM gap could be addressed, which is new knowledge. Education material (EM) was chosen as the single component KTI to address individual management and behavioural barriers affecting PTs whereas Virtual communities of practice (VCoP) in combination with educational material (EM) and knowledge broker (KB) was chosen as the multicomponent KTI to address the same barriers but in groups. However, only VCoP as a term is used throughout this thesis to represent multicomponent KTIs for ease of understanding. EM and VCoP were chosen based on the recommendation of other researchers (e.g. Russell et al. 2010 (KB); Giguere et al. 2012 (EM); McLoughlin et al. 2018 (VCoP)).

1.3 Research problem

From the discussions set out above, it is possible to identify the main research problem. The problem is research knowledge (either produced as new or updated) in the field of PT is not being integrated in the clinical practice, more specifically; CPGs are not being integrated into CDM leading to a CPG-CDM gap. Why many PTs do not integrate CPG into CDM is not well understood although, some researchers point out that this could happen due to management and behavioural barriers (knowledge of PTs in CPG, attitude of PTs towards CPG, and self-efficacy and motivation of PTs to integrate CPG into CDM). Research on management and behavioural barriers that hinder PTs from integrating

latest research knowledge is in the early stages of development and no conclusive evidence is available to prove that those barriers are the cause for the non-integration of research knowledge into clinical practice and hence the R-P gap (CPG-CDM gap). This requires investigation. Further, if barriers were the reasons for CPG-CDM gap, then how to reduce or eliminate those barriers to benefit patients was another issue not addressed well in the literature. Here again, some guidance was available in the literature which indicated that KTIs could be useful in addressing the barriers but KTIs and their impact on barriers was an under investigated area. Lack of knowledge about CPG-CDM gap, barriers causing CPG-CDM gap, impact of KTIs on barriers causing CPG-CDM gap and bridging CPG-CDM gap is eventually affecting the quality of patientcare. How to address these issues was the main problem. Prior to defining the consequent research questions, it was necessary to bring in some examples of research knowledge that could be part of CPG-CDM, clinical practice that could be part of CPG-CDM linkage, barriers that could cause CPG-CDM gap and KTIs that could impact the barriers causing CPG-CDM gap. This enabled the researcher to define the research questions succinctly and clearly.

1.4 Research questions

The stated research problem translates into the following research questions:

RQ1: To what extent do the identified barriers lack of knowledge, attitude, self-efficacy and motivation affect the behaviour of PTs in integrating CPG to CDM?
RQ2: In order to address the identified barriers, can single and multicomponent KTIs be used to change the practice behaviour of PTs in integrating CPG to CDM?
RQ3 If single and multicomponent KTIs be used to change the practice behaviour of PTs in integrating CPG to CDM, which one of the two KTIs is more effective?

1.5 Aim

The research aims to conduct a comparative study of the effectiveness of single and multi-component knowledge translation interventions (KTIs) in bridging the research-practice gap (CPG-CDM gap) that affects Physical Therapists (PTs) by addressing barriers to change their practice behaviour.

1.5.1 Objectives

The following objectives supported the achievement of the aim of the research:

- Objective 1: To gain knowledge about barriers causing R-P gap and interventions that reduce the impact of barriers through literature review.

- Objective 2. To identify specific research knowledge, clinical practice, R-P gap, barriers and interventions through a study of relevant literature to develop a basis to address the identified gaps in the literature.
- Objective 3. To study models, framework and theories and establish the relationships between research knowledge, clinical practice, barriers to integration of research knowledge into clinical practice, R-P gap and interventions in addressing the R-P gap.
- Objective 4: To develop a theoretical framework, conceptualize the relationships mentioned above and test the hypothesised relationships.
- Objective 5. To develop a suitable research methodology to test the relationships empirically
- Objective 6. To verify the hypotheses using the outcomes of the empirical study.

1.6 Brief summary of the context and methodology of study

The research was conducted to understand the barriers causing CPG-CDM gap amongst the PTs. The target population was practicing PTs in the United States of America (USA). PT as a profession is well advanced and organised in the USA. Licensed PTs with a wide-ranging experience, qualification, age and knowledge are available for conducting the research. Such PTs are also members of prominent organisations involved in PT (e.g. APTA). Some of the licensed PTs were non-practicing members of prominent organisations and only practicing PTs were targeted. It was possible to target PTs with multiple specialisations. In addition, the population of PTs was large and sampling process could be implemented. That means any PT could be randomly selected to be part of the research. It must be noted here that organisations like APTA have developed CPGs in the field of PT and PTs who are members of APTA have in theory an opportunity to integrate CPG into CDM. Access to PTs in USA was possible through technological tools that promised to enhance the quality of data collection and collected data. Use of online tools improved the probability of conducting an accurate and credible online survey and online forum was comparatively high. In addition, voluntary support from some APTA members was available which was ideal for conducting the research. Another important point was that it was the change in behaviour of PTs that was studied as a barrier causing the CPG-CDM gap. Initial discussions with some of the PTs and a preliminary study of current status of CPG adherence in the USA showed that PTs encountered barrier and hardly any study had been conducted to understand how those barriers cause CPG-CDM gap. Furthermore, KTI studies conducted were limited in the USA. Any research conducted in the USA promised to produce reliable and valid results. Thus, the stage was set to conduct the research the results of which provided the basis to determine the significance of this study. The detailed of the study conducted for this research is provided under Chapter 4.

The data collection approach involved collection of objective data from a sample of the PTs chosen using random sampling method. Two groups of PTs were identified. One group was assigned to be administered a single component KTI (e.g. EM) and another group was assigned to be administered the multicomponent KTI (e.g. VCoP). The two groups were provided with a survey questionnaire before and after the administration of the KTIs. Data was collected using a Likert scale questionnaire and a knowledge and CDM scorecard. Details of the data collection instruments are provided in sections 4.9 to 4.11. The collected data was analysed using statistical techniques described in Chapters 4 and 5.

1.7 Significance and contributions of the study

This study primarily contributed to the growing body of knowledge in the field of PT related to barriers causing CPG-CDM gap (R-P) gap. The research examined CPG for VTE in PT and its relationship with CDM (clinical practice) and found that CPG-CDM gap exists and was caused by management and behavioural barriers, namely knowledge, attitude, and self-efficacy and motivation of PTs. Changing the behaviour of PTs was found to be a major challenge. In addition, the definition and identification of barriers causing CPG-CDM gap was difficult and had to be measured in different ways. Behavioural barriers coexisted and isolating and measuring single and groups of barriers was a challenge. Single barriers could be seen to manifest as dominant behavioural variables that could be statistically measured. Multiple barriers were seen to exist in combination of four and two and results showed that some barriers in the combinations were more dominant than others. Knowledge turned to be the most significant barrier in investigations related to the groups, which indicated that regardless of the combination or clustering of behavioural barriers, if knowledge is low, then CPG-CDM gap could be high. Self-efficacy turned out to be more dominant in the single barrier investigation meaning if it is low then CPG-CDM gap could be high. The results showed that if specific barrier or group of barriers were targeted then motivation as a barrier showed a negative trend. This implied that motivation could be a major barrier that could challenge in changing the behaviour of PTs. KTIs were found to be useful in reducing CPG-CDM gap. Both single and multiple component interventions were found to be useful for specific situations. The effectiveness of the two interventions were compared. These findings related to CPG-CDM gap appear to be first of their kind in the context of PTs not investigated so far.

As far as the theoretical contribution was concerned, the identified relationships showed how existing theories, models and concepts could be extended to the identification of the relationship between barriers causing CPG-CDM gap, KTIs, CDM and CPG-CDM gap. This is a major contribution to theory as these models could be used to study PTs and their change behaviour in other contexts. No similar study has established in such detail the relationships identified and established as the ones discovered in this research. In fact, it is shown in the literature that seldom theory has been used by

researchers to establish concepts in CPG or barrier studies. To that extent this study is significant that it has used a variety of theories, models and concepts to establish the results.

As far as methodological contribution was concerned this study is significant in many ways. Use of multiple strategies helped in making the research less complicated, parsimonious and easy to repeat. Statistically significant models were established that were reliable and valid, thereby making the probability of generalising the outcomes of this research high. Two independent samples were used in pre and post intervention stages. This enabled the researcher to validate the use of random sampling in the research. Variance and covariance methods provided knowledge on how to group different barriers and identify their direct and indirect relationship to CDM and CPG-CDM gap. Correlation and regression methods enabled the researcher to find statistically significant relationship between the barriers causing CPG-CDM gap, KTIs, CDM and CPG-CDM gap. Establishment of such relationships enabled the researcher to adopt Structural Equation Modelling (SEM) leading to establishment of the extent to which barriers could affect CDM and CPG-CDM gap, KTIs could affect the barriers and the extent to which CPG-CDM gap could be narrowed. Two different methods were used to assess the impact of KTIs and the two outcomes were compared to find out which one of the two KTIs namely single and multi-component KTIs was more effective. Two different samples from the same population were tested which enabled the researcher to conclude that the results could be applied to the wider population of PTs. Similar research conducted on PTs with such rigour is hard to come by in the literature. It is possible to predict the operation of barriers causing CPG-CDM gap using the method established in this research and manipulate the behaviour and management variables of PTs by applying appropriate KTIs and bridge the CPG-CDM gap. This is a significant contribution of this research to methodology.

In the practical side the contribution of this research is significant. It is now possible for PTs to identify barriers causing the CPG-CDM gap and use appropriate KTIs to address knowledge and behaviour barriers. This knowledge in turn promises to enhance patientcare and provide optimum patientcare benefiting the patients. Organisations involved in PT could be benefitted by improving the competence and performance of the PTs who are challenged by barriers to the integration of CPG into CDM. Policy makers could insist on the integration CPG into CDM by using the outcomes of this research.

1.8 Thesis structure

The remainder of this thesis is laid out as follows.

- Chapter 2 reviews the relevant literature and identifies significant gaps in the literature and how those gaps could be addressed.

- Chapter 3 details the theoretical framework developed for this research.
- Chapter 4 describes the methodology adopted in this research.
- Chapter 5 provides the analysis of the data collected using the methodology described in Chapter 4. Chapter 6 discusses the findings of the data analysis provided in Chapter 5.
- Chapter 7 concludes the research by highlighting the contributions of this research.

1.9 Summary

This chapter has provided an overview of the research with key concepts presented with the rationale for those concepts being selected for investigation. A summary of the extant knowledge available is presented, highlighting the key areas that require further investigation. The research questions, aim and objectives of this research have been defined, and the context of the study. This research addresses an important knowledge gap in the literature and thereby adds to the growing body of KT literature as well as PT literature by the unique contributions highlighted in the forthcoming chapters.

Chapter 2

Literature Review

2.1 Introduction

In the field of healthcare including Physical therapy (PT) there is an essential requirement for practitioners or clinicians to integrate research knowledge into clinical practice as it is expected to enhance patient care. Although not a new idea, there is ongoing attempts to integrate research knowledge into clinical practice that is generally referred as Evidence based practice or EBP (Sackett D. 1996) and is gaining momentum in the field of PT (APTA, 2018d; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Jones et al. 2014; Nilsen & Bernhardsson, 2013; Campbell et al. 2013; Scott et al. 2012; Sangosen et al. 2013). At the conceptual level, EBP is an endeavour to integrate research knowledge into clinical practice (Sackett D. 1996). However, it is widely recognized that embedding research knowledge in clinical practice does not happen extensively due to barriers that hinder the change in practitioner's clinical practice behaviour resulting in a research-practice gap or R-P gap (Stander et al. 2018; Graham et al. 2018; Bérubé et al. 2018; Curtis et al. 2017; Sheringham et al. 2017; Nilsen. 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Rice et al. 2012; Gagliardi, 2012; Scott et al. 2012). A type of research knowledge could be Clinical Practice Guideline (CPG) and that of clinical practice could be Clinical Decision Making (CDM). An example of change in practice behaviour could be the integration of CPG in CDM of the PTs and this research addresses the specific research practice gap termed as CPG-CDM gap and the behaviour change of PTs in regard to this. It must be noted here that when research knowledge integrated into CDM, it could be termed as evidence based clinical decision making (EBCDM). While on the surface it may appear that the lack of integration of research knowledge into CDM is due to straightforward reasons, an in-depth review of the literature shows that there are significant barriers to such integration and lack of knowledge about those barriers has led only to perpetuating the problem of CPG-CDM gap and not bridging the gap. In addition, it must be recognized that the CPG-CDM gap could also be created due to other reasons, for instance, perceived barriers which in reality may not be barriers, a review about which has been provided in the sections that follow. Thus, the focus of this review is concerned with clinical practice behaviour of PTs related to CPG, CDM, CPG-CDM gap, integration of CPG into CDM, barriers to the integration of CPG into CDM and interventions that impact the barriers and reduce the effect of barriers on the integration of CPG into CDM.

In light of the discussions above, this review focuses on four barriers that have been argued to obstruct the integration of research knowledge into CDM, although such a claim has not been empirically tested completely (Nilsen, 2015). The four barriers chosen for investigation and review are knowledge barrier, attitude barrier, self-efficacy barrier and motivation barrier. Further, It is generally recommended to use some strategies to bridge the CPG-CDM gap, and the current literature

encourages the use of knowledge translation (KT) to bridge the research-practice gap (Graham et al. 2018; Stander et al. 2018; APTA, 2018d; Bérubé et al. 2018; Bernhardsson et al. 2014; Jones et al. 2014; Campbell et al. 2013) and KT is expected to aid healthcare professionals in their quest to enrich their clinical practice and thereby enhancing the patientcare (Hudon et al. 2015; Jones et al. 2014; Bernhardsson et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013), but such a claim seems to anecdotal with some arguing it does not happen readily and calling for further studies to be conducted to validate the claim (Vander Schaaf et al. 2015; Scott et al. 2012). In addition to that KT as a concept is regarded as complex and less understood and this could be due to dearth of research in this area particularly in the field of PT (Stander et al. 2018; Nilsen, 2015).

Despite these arguments, the available evidence provides some basis to explain the KT process of CPG and its integration to CDM and the barriers that prevent such a translation related to the practice behaviour of healthcare professionals in specific contexts, for instance PT. It is recommended in the literature that interventions, for instance, knowledge translation interventions (KTIs) can play a role in overcoming the effect of barriers to change the practice behaviour and thus help to bridge the R-P gap. In the absence of evidence to support those recommendations there is a need to gain knowledge on how to change practice behaviour of practitioners (Curtis et al. 2017; Suman et al. 2015; Baker et al. 2015; Fischer et al. 2016; Cooper et al. 2015). Although interventions including KTIs are purported to play a role in addressing barriers to behavioural change of practitioners and hence bridge the R-P gap, it is not known how the process of change in practitioners could occur due to interventions that can address barriers to change. In addition, which intervention or strategy can impact a specific barrier to change and hence bridge the CPG-CDM gap is not clear. Keeping these arguments in the backdrop, this research critically reviews two types of KT interventions namely educational material (EM) and virtual communities of practice (VCoP) and their role in reducing the effect of barriers on the integration of CPG into CDM. It must be mentioned here that KT interventions differ completely with regard to medical interventions and a clear distinction needs to be made to avoid any confusion. While KT interventions are considered as constructs that could be used to empirically study their impact on clinical practice behaviour as a management concept, medical interventions are related to diagnosis and treatment of medical conditions. Since this research is not concerned with any medical condition and solely related to management and behavioural aspects, the concept of KT interventions must be treated as factors concerning management and behavioural aspects of healthcare professionals.

To facilitate critical review of the above it was required to use a type of CPG. Thus, this research relies upon CPG for Venous Thromboembolism (VTE) in PT (Hillegass et al. 2015) rationale for the choice is explained under section 2.3.1.1. Additionally, CDM was chosen to represent the clinical practice behaviour of the practitioner and the rationale for the choice is provided under section 2.4. In

addition, the different concepts have been grounded in established theories which provide the guidance to understand, conceptualize, operationalize and relate those concepts.

2.2 Research context

Multiple contexts need to be considered including patients, practitioners, organizations and professional bodies as factors while investigating the KT process of CPG to CDM, as there is a complex interplay of those factors in the KT process (Chaudoir et al. 2013; Nilsen & Bernhardsson, 2013). Physical Therapy (PT) which is an allied healthcare profession is unique with distinguishable characteristics and hence focused research in PT is likely to produce different research outcomes (Hudon et al. 2015; Jones et al. 2014). This research focuses only on the PTs practitioners, who are involved in critical CDM with reference to patientcare and are expected to incorporate the recent and relevant research knowledge into their clinical practice although, it appears to be not happening extensively (Stander et al. 2018; Hoesing, 2016; Jones et al. 2014; Hudon et al. 2015) and it is not clear in the literature, why such lack of integration continues to challenge the PT practitioners (Salbach et al. 2010). Furthermore, this researcher was not able to find studies about the KT process of CPG into CDM in the context of PTs and is unaware of any empirical and experimental research that has been conducted to understand this problem; an argument that is supported by other researchers (e.g. Jones et al. 2014; Nilsen & Bernhardsson, 2013; Salbach et al. 2010).

Moreover, it is argued that individual attributes of the PTs are said to be affecting the KT process of CPG into CDM as barriers (Salbach et al. 2010). According to oxford dictionary a barrier is "something, circumstance or obstacle that keep people or things apart or hinder or obstruct communication or progress" (oxford dictionary online, 2018). In the context of KT in healthcare a barrier is defined "as any factor that hindered physicians and/or health care providers from implementing scientific evidence in clinical practice or weakening their attitude towards adherence to a clinical guideline" (Argyriou et al. 2015). In this study, a barrier is regarded as an obstacle that hinders the integration of research knowledge into clinical practice. Literature reported that interventions that are targeting the healthcare practitioner appears to be more effective compared to interventions that are targeting the organisations or the patient and thus the focus of this research on the individual PT practitioner is supported (Grol & Grimshaw, 2003). Human behaviour is an area that cannot be easily understood, explained or manipulated. There is a general agreement among researchers that inducing a change in human behaviour is challenging even if for a temporary situation and sustaining such a behaviour change can be even more difficult (e.g. Adams et al. 2015). Hardly any conclusive evidence has been provided in the literature on how the issue of change in practice behaviour could be brought about among the practitioners (Stander et al. 2018; Curtis et al. 2017) by addressing the barriers. Research focusing on this issue is expected to contribute to the growing body of knowledge in supporting the PTs to integrate CPG into CDM (Fristedt et al. 2016; Tilson et al.

2014; Salbach et al. 2010). Thus, this research is investigating the role of KT interventions to address the barriers to change the practice behaviour of PTs to narrow or even eliminate the CPG-CDM gap. Further, this research focuses on impact of single and multicomponent KT interventions on four types of barriers (including management and behaviour barriers) of PTs practitioners and the effect of such KT intervention on the reduction or elimination of CPG-CDM gap. Hence the review is inclined towards the direction of KT interventions throughout.

Although the focus of this research is KTIs, it was essential to discuss about CDM, CPG, and CPG-CDM gap (referred to as research-practice gap), barriers to change in practice behaviour of PTs and impact or effect of the interventions because the main challenge that needs to be addressed is the impact of KTIs on the barriers to change behaviour of PTs in the KT of CPG to CDM. Thus, the following sections critically review the literature about the mentioned concepts.

2.3 Clinical practice guidelines (CPG)

In the field of healthcare including PT, ongoing and rigorous research is conducted that produces new knowledge that supersedes or enhances the current knowledge. CPGs are being produced using the knowledge generated through the scientific research and CPGs are generally considered as simplified form of research knowledge (Curtis et al. 2017; Nilsen & Bernhardsson, 2013; Treweek et al. 2013; Bridges et al. 2007) and help the practitioners to make appropriate decisions regarding patient care in specific circumstances (Rice et al. 2012; Lohr & Field, 1992). CPGs commonly deal with specific clinical conditions or diseases (Vander Schaaf et al. 2015; Nilsen & Bernhardsson, 2013; Bridges et al. 2007) and are intended to assist the CDM of the practitioner and can be used by patients for informed decision making (Graham et al. 2011). CPGs are regarded as tools that contribute to standardization of patient care (Kredo et al. 2016; Hoesing, 2016; Gundersen, 2000); mechanism to improve quality of patientcare, (Rao & Tandon, 2017; Keiffer, 2015; Van Dulmen et al. 2014; Siering et al. 2013) way to ensure patient safety (Hoesing, 2016; Rice et al. 2012) and help to enhance the delivery of optimum patient care (Hoesing, 2016; Franke et al. 2008; Woolf et al. 1999). These aspects become critically important in the current scenario, where there are astonishing numbers of patients being either harmed or even killed by medical errors; a situation that needs immediate attention. According to Van Tassel, (2012) the medical errors should not be attributed solely to the incompetency of the physicians, but to a faulty medical care system that fails to integrate the latest research knowledge into the clinical practice. Further Van Tassel, (2012) argues that CPGs should be considered as the “gold standard” of clinical practice or as the “default treatment choice” to reduce the medical errors. The above arguments show that CPG is regarded as an important mechanism to ensure optimum patient care and thereby reducing the medical errors.

Generally, integration of CPGs into clinical practice does not appear to be taking place extensively among the healthcare practitioners (Sehl et al. 2017; Plackett et al. 2017; Munteanu & Jordan, 2017; Curtis et al. 2017; Sheringham et al. 2017; Harvey et al. 2016; Fischer et al. 2016; Vander Schaaf et al. 2015; Rice et al. 2012; Cabana et al. 1999) in comparison with very limited number of success stories of CPG integration that is reported in the literature (Montero, 2015). CPGs are recognized by well-known professional bodies in the field of PT, including World Confederation for Physical Therapy (WCPT), American Physical Therapy Association (APTA, USA), Chartered Society of Physiotherapy (CSP, UK) and these organizations are strongly recommending the integration of the CPGs in clinical practice. Despite such acknowledgement, it is argued that PTs fail to regularly update their practice using the latest CPGs (Bérubé et al. 2018; Stander et al. 2018; Ladeira et al. 2017; De Souza et al. 2017; Hanney et al. 2016; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Scott et al. 2012; Schreiber et al. 2009; Salbach et al. 2007; Jette et al. 2003), reasons for which is unclear. Some PTs might be critical of CPGs while some others might be finding barriers hindering the use of CPGs in routine clinical practice. Lack of a mandatory requirement from the licensing or regulating authorities could be another reason for the CPG-CDM gap (Salbach et al. 2010). It can also be argued that PTs might be finding their existing methods of practice as satisfactory and might not depart from the current practices if a change in practice is required to comply with the CPG recommendations. Some PTs might be having concerns related to the applicability of the CPGs on varying patient population. Besides that, the behavioural attributes of PTs including: interest to acquire latest research knowledge; motivation to integrate CPG; self-efficacy to do so; attitude and commitment might be affecting the integration of CPGs in practice. While, it is certain that CPGs provide updated knowledge that is expected to be beneficial to patients, in actual clinical practice, many barriers are hindering such integration of CPG in practice and certain management and behavioural aspects could be the reasons for the CPG-CDM gap. It is also not clear whether interventions can be linked to managerial and behavioural concepts of the practitioners in the process of eliminating or narrowing the CPG-CDM gap.

Based on the above discussions, it can be inferred that literature in particular is not clear about:

1. Investigations on specific CPGs (for instance, Venous Thromboembolism (VTE) in PT)
2. CDM using specific CPGs
3. CPG-CDM gap
4. The nature of relationship that exists between the CPG and CDM, barriers leading to CPG-CDM gap and the role of KTIs in bridging the gap.

The next section reviews the literature with regard to the above-mentioned aspects.

2.3.1 Examples of CPGs

Research knowledge has the potential to significantly influence clinical practice (Curtis et al. 2017; Chan et al. 2017). Some examples of CPGs in the field of PT are enumerated in Table 2.1.

Table 2.1 Examples of CPGs endorsed by World confederation of Physical therapists (WCPT)

No.	Medical condition	Publisher	Country	Initial publication	Revision
1	CPG for Neck pain	APTA	USA	September 2008	July 2017
2	CPG for VTE	APTA	USA	October 2015	Nil
2	CPG for heel pain – Plantar fasciitis	APTA	USA	April 2008	November 2014
3	CPG for Hip Osteoarthritis	APTA	USA	April 2009	June 2017
4	CPG for frozen shoulder	CSP	UK	June 2011	Nil
5	CPG for Cystic fibrosis	TSANZ	Australia & New Zealand	April 2016	Nil
6	CPG for stress urinary incontinence	KNGF	Denmark	February 2014	Nil

It can be seen from Table 2.1 that new research knowledge or CPGs are being produced or updated version of the existing CPG is being released with an intention to enhance patient care. For instance, CPG for VTE in PT is new and has been brought out in the year 2015 for the first time and CPG for PT management of neck pain was first published in the year 2008 and a revised version of the same is published in the year 2017. However, many a time, practitioners are not aware of a new CPG or an update of an earlier CPG and those practitioners fail to follow the recommendations of the CPG. Sometimes even if practitioners have knowledge about the CPG, they perhaps would not like to depart from their current practice (inertia of previous practice) as the current practice is producing satisfactory results in patient care. This contradiction poses several questions. For instance, why CPGs are not being integrated by PTs in their clinical practice? Do the practitioners agree that those CPGs have enough potential to improve patient care or have no effect on patient care? Are there barriers that prevent them from integrating the latest research knowledge into CDM? Are those barriers real or perceived ones? Is there a need for facilitators or is it the lack of facilitators creating the problem of non-integration? Are there interventions that could help to overcome the barriers or reduce the influence of barriers? Are those barriers related to behaviour or knowledge or other aspects? Have there been studies that successfully addressed the situation of barriers leading to the concept of CPG-CDM gap? These questions need to be answered. While patient care is the most important concern of every healthcare practitioner, it is hard to explain how CPGs which are the products of rigorous, time consuming and costly process of synthesizing the research knowledge (Curtis et al. 2017; Hoesing, 2016) does not find its way into CDM. When many questions arise with regard to CPGs and their integration being operationalized as CDM then it is worthwhile to review the literature to understand what actually is happening in clinical practice, taking the example of a CPG namely CPG for VTE in PT (see Appendices 2.2 and 2.3 for CPG on neck pain).

2.3.1.1 CPG for Venous Thromboembolism (VTE)

CPG for VTE in PT is provided in Appendix 2.1. VTE is considered as one of the clinical conditions with high risk of mortality and morbidity worldwide (Jain & Cifu, 2017) and can affect people of all races and ethnicities, age groups, and genders (Beckman et al. 2010). VTE is the formation of a blood clot in a deep vein that can lead to life threatening complications and term VTE refers to the conditions: Deep vein thrombosis (DVT), pulmonary embolism (PE) and Post thrombotic syndrome (PTS). VTE is a serious preventable clinical condition, with an incidence of 10% to 30% of patients dying within 1 month of diagnosis, and about 50% of those diagnosed with a DVT developing long-term complications including PTS (CDC, 2018). About 10 million cases of VTE are diagnosed every year; and 900,000 cases per year are reported in the United States (Roberts et al. 2017). In the U.K., about 1,000 adults believed to be affected by DVT and about 86.3 in 100,000 affected by PE in 2013. Further the report predicts that "the number of cases of PE is expected to increase to over 50,000 cases per year by 2021, or a rate of 93.6 per 100,000 adults in the U.K. (CDC, 2018). In the USA, about 60,000-100,000 people die due to VTE (CDC, 2018). Even in the survivors of a PE, quality of life is reduced significantly due to use of long term anticoagulant medication for preventive care. VTE cause significant global economic burden on the limited healthcare resources as it requires several diagnostic tests and medications, prolonged hospital stays and lifelong follow-up care. But by focusing on VTE prevention, healthcare systems can save money, improve outcomes and ultimately save several lives. The healthcare expenditure related to the condition of VTE is estimated to be between $7 billion and $10 billion annually in the USA (Roberts et al. 2017). In the U.K., VTE costs around €640 million annually to the National Health Service or NHS.

Prevention, early diagnosis, proper management and diligent follow up are critical to the management of VTE and it is important that the PTs are aware of the best practices to deal with this condition as members of multidisciplinary healthcare team. PTs in most of the practice settings encounter with patients at risk for VTE, suspected of VTE, diagnosed with VTE, history of VTE and as well PTs are routinely being asked to mobilize patients already diagnosed with VTE. CPG for VTE in PT was published by Hillegass et al. in 2015. It was developed through a rigorous process and it was also appraised using standard procedure. This CPG comprehensively addresses the critical aspects of dealing with VTE and is endorsed and recommended by APTA to assist the PT practitioners in their clinical practice as PTs play a major role in prevention and management of VTE (PTNow, 2018a). In addition, this CPG is appraised using the most validated tool (Murad, 2017) known as The AGREE II (Appraisal of Guidelines, Research, and Evaluation) by AGREE Collaboration. CPG for VTE in PT is found to be particularly important amongst the several other CPGs, and it is relevant and applicable to most of the PTs practicing in variety of clinical settings including orthopedic, cardiopulmonary, acute care, geriatric care and several others. It must be mentioned here that CPG for VTE in PT has been very recently developed and statistical data about its integration into CDM by PTs is not yet available.

In this regard what is known is that CPGs do not always get integrated into CDM despite their purported benefit to patients. There are arguments in the literature that the practitioner's behaviour attributes can be determinants or factors or barriers (e.g. resistance to change the habits in clinical practice) as well as some external factors (e.g. lack of resources) can be the reasons (Hoesing, 2016; Fischer et al. 2016) for lack of CPG integration. This lack of integration of CPG into CDM can be argued to have created a virtual gap between research knowledge and clinical practice; termed as know-do gap or research –practice gap. A review about this gap could provide better idea on what causes this gap and how this gap could be addressed. The review on research-practice gap is provided next.

2.3.2 Research-practice gap or the CPG-CDM gap

Generally, CPGs provide recommendations and algorithms that are evidence based for the decision making and thereby guide the practitioner to provide optimum patientcare (Hoesing, 2016; Franke et al. 2008; Woolf et al. 1999). Although there is a requirement to incorporate CPG in clinical practice, lack of CPG integration is creating a gulf between scientific research knowledge and the actual clinical practice that is generally termed as research-practice gap (Stander et al. 2018; Graham et al. 2018; Fristedt et al. 2016; Scott et al. 2012; Squires et al. 2011a; Squires et al. 2011b) and as mentioned earlier, it is termed specifically as CPG-CDM gap in this research. The CPG-CDM gap is evident across healthcare professions (Curtis et al. 2017; Sheringham et al. 2017; Gagliardi et al. 2011). Gabbay and le May (2004; p. 1013) reports that "*Family doctors and nurses are far from critical of the scientific basis of CPG. Nonetheless, they do not use CPG as their only support tool in clinical practice, rather as reliable sources of information to validate their already existing "midlines" and decision shortcuts used in patient care*". This can be interpreted as a barrier at the practitioner level indicating the existence of a CPG-CDM gap. A recent study shows that significant gap exists between CPG recommendation and actual prescription of antibiotics for lower respiratory tract infection amongst the German physicians (Kraus et al. 2017). As mentioned earlier, Grol and Grimshaw, (2003) reported citing the studies conducted in the Netherlands and the USA (Schuster et al. 1998; Grol, 2001) showed that at least 30-40% of patients were not receiving treatments that are evidence based and 20% of the treatment delivered to the patients was harmful to them.

Nichol et al. (2010) reported that nonadherence to CPGs can be blamed for the sub optimal patientcare being delivered in some multiple chronic conditions. Supporting this argument, Otterman et al. (2012) reported that CPG non-adherence resulted in variation of patient care and the patient care was not optimal. CPGs are also considered as mechanisms that could reduce overuse, underuse and misuse of the therapeutic choices (Jha et al. 2005). However, in the USA, underuse of the therapeutic choices continued to be a challenge, although clear recommendations are given in the CPGs, regarding the care that is expected to be provided (Kale et al. 2013). This study reported that only

71.9% of Physicians showed compliance with the CPG recommendation of antithrombotic drugs for atrial fibrillation and prescribed those drugs to the patients. Similarly, only 64.5% of Physicians prescribed Aspirin for patients with cardiovascular disease while scientific evidence supports the use of Aspirin, in reducing heart attack and even death in patients with cardiovascular disease. This essentially means that the CPG non-adherence behaviour of the practitioner is a major medical error and might lead to complications and death in those patients. Further, Beta-blockers are drugs that are proven to reduce hospitalization, therapeutic revascularization procedures and even death in a medical condition called congestive heart failure. However, only 59.7% of Physicians showed adherence to the CPG recommendation and prescribed beta blockers for patients with congestive heart failure (Kale et al. 2013) leaving 40.3 % of patients denied with the provision for optimal care. The above-mentioned arguments show that failure of integration of CPG into CDM could result in significant harm or even death of the patient, indicating the real existence of a CPG-CDM gap which need to be addressed urgently.

While CPG-CDM gap is a reality, it is important to understand how the CPG-CDM gap is created and mechanisms to bridge the gap. Although there are factors that are argued to be responsible for CPG-CDM gap, knowledge about those factors and their influence remains incomplete (Stander et al. 2018; Fischer et al. 2016; Argyriou et al. 2015; Salbach et al. 2010; Cabana et al. 1999). However, there are two factors commonly identified are the barriers and facilitators. Limited research publications available in this field have discussed about barriers that leads to CPG-CDM gap while not many researches have investigated the facilitators and the research outcomes produced so far are not consistent. Distinction of the factors clearly into categories as barriers or facilitators itself is not clear. An excellent example is that while CPG itself is considered as a barrier by some (Fischer et al. 2016; Cabana et al. 1999) and as facilitator by some others (Curtis et al. 2017; Nilsen & Bernhardsson, 2013; Salbach et al. 2010). Thus, there is a need to know more about factors that could affect the CPG-CDM gap to gain more knowledge about it and to find ways to how to address it. Research on facilitators is not very common as usually those facilitators are agents that narrow the CPG-CDM gap and generally are not considered to be a challenge. However, this is not the case with barriers that create the CPG-CDM gap and hence need investigation. Prior to examining the barriers, the nature of CPG needs to be understood. CPG seems to be a complex phenomenon with several aspects that are related to CPGs, for instance, integration of CPG into CDM, barrier, interventions to address the barriers to bridge the CPG-CDM gap. The next section describes the concept of CPG.

2.3.3 Definitions and theoretical underpinning of CPG

At this point, it was considered necessary that some of the definitions, benefits and limitations of CPG and the theoretical underpinning of the concept of CPG which are discussed next.

2.3.3.1 Definitions of CPG

Although, CPGs are not 'one-size-fits-all' approach to patient care; they describe and appraise the scientific evidence by clinical reasoning (the likely benefits and harms) behind the recommendations and thus, making it applicable to the individual patient situation (Graham et al. 2011). Table.2.2 provides summary of commonly used definitions of CPGs.

Table 2.2 Definitions of CPG

Author	Definition
Hoesing (2016)	CPGs are "defined as documents that support clinical decision-making and contain systematically developed recommendations, processes, and timeframes for managing specific medical conditions or interventions, based on a search and review of available credible literature".
Fischer et al. (2016)	"CPGs are systematically developed statements to assist practitioners' decisions about appropriate healthcare for specific clinical circumstances".
Kredo et al. (2016)	CPGs provide recommendations and best-practice statements about the various aspects of patient care including screening, diagnosis, management or monitoring aspects of a specific medical condition or disease
Treweek et al. (2013)	"Guidelines are a convenient way of packaging evidence and presenting recommendations to healthcare decision makers".
Graham et al. (2011)	"Statements that include recommendations, intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options.
Gagliardi et al. (2011)	"Guidelines are syntheses of best available evidence that support decision making by clinicians, managers and policy makers about the organization and delivery of healthcare".
Ladiera (2011)	"CPGs are systematically developed statements to assist practitioners' decisions about appropriate healthcare for specific clinical circumstances. Their purpose is to make explicit recommendations with a definite intent to influence what clinicians do".
Ceccato et al. (2007)	"CPGs were originally developed to synthesize research with evidence-based practice and assist healthcare providers in medical decision making".

Although there are variations in the definitions, there is some consensus among researchers that CPGs are generally regarded as synthesized form of research knowledge (Curtis et al. 2017; Barth et al. 2016) particularly in uncertain clinical situations, CPGs could be a useful tool that support CDM of the practitioner (Liang et al. 2017; Fisher et al. 2016; Argyriou et al. 2015; Graham et al. 2011; Cabana et al. 1999; Davis et al. 1997) by providing recommendations in specific clinical situations (Ladiera, 2011). Accordingly, for the purposes of this research CPG is defined as "evidence based recommendations developed based on synthesized form of research knowledge and that have the potential to improve patientcare when integrated into clinical decision making".

2.3.3.2 Theoretical underpinning of CPG

According Nilsen, (2015) theory is considered to be a collection of analytical principles or statements including defined variables, a domain to which the theory can be applied to explain the relationships between the variable and particular predictions. Davies et al. (2010) explain that a theory could be a model or a framework, for instance, theory of planned behaviour (TPB by Ajzen, 1991). In regard to the medical context, theory is considered to have the capability to guide the clinical practice and philosophy of healthcare practitioners (McEwen & Wills, 2011). Likewise, number of other theories

also can be applied to the concept of CPG and its integration in practice (Liang et al. 2017). Babatunde et al. (2017) pointed out that models or frameworks like Promoting Action on Research Implementation in Health Services framework (PARiHS by Kitson et al. 1998), Consolidated Framework for Implementation Research (CIFR by Damschroder et al. 2009), Theoretical Domains Framework (TDF by Michie et al. 2011), Self-determination theory (Deci & Ryan, 1985), Self-efficacy theory (Bandura, 1994 & 1977) and Theory of planned behaviour (TPB by Ajzen, 1991) could be used to explain the concept of CPG . Good and Moore (1996) argue that CPGs themselves are "useful source of middle-range prescriptive theory because of their empirical support and specific recommendations for practice". Van Tassel, (2012) argues that a 'libertarian paternalism' theory proposed by Sunstein and Thaler (2003) should be considered in healthcare context that regard CPGs as the "gold standard" of clinical practice or as the "default treatment choice" and need to be implemented in the healthcare system to reduce the incidence of medical errors. While many of these theories could be useful in explaining CPG integration and the behavioural aspects of the practitioner; the empirical models that explain the concept of CPG and its integration into practice are very few. Empirical studies have the advantage of providing support to understand changes or modifications to behavioural factors in an objective manner. Thus, lack of empirical studies in regard to CPG-CDM gap in the field of PT is a major gap. CPG as research knowledge and its relationship to the clinical practice behaviour of the healthcare practitioner is supported by the knowledge-attitude-behaviour framework (KABF) of Cabana et al. (1999) and the updated KABF by Fischer et al. (2016), and these frameworks are discussed in the forthcoming sections (see section 2.5.1). While CPGs are purported to have several benefits (Fischer et al. 2016; Argyriou et al. 2015; Graham et al. 2011; Cabana et al.1999; Davis et al. 1997), it is also criticized for their drawbacks or limitations. The advantage and limitations of CPGs are provided in Appendices 2.4 and 2.5 respectively.

2.3.4 Summary

The foregoing discussion showed that CPG is a complex concept. Although there are criticisms, it is widely seen to be beneficial to the patients when CPGs are integrated into CDM. However, there is lack of integration of CPGs into CDM in actual clinical practice. An investigation into this aspect could provide deeper knowledge about the problems affecting PTs in integrating CPG into CDM.

2.4 Clinical decision making (CDM)

CDM is an important aspect of clinical practice behaviour (APTA, 2018d; Thompson et al. 2013; Straub-Morarend et al. 2011; Roshanov et al. 2011) and even referred as the 'essence' of daily clinical practice (Hajjaj et al. 2010). CDM encompasses the screening, diagnosis, management and follow up aspects of patientcare and is influenced by the clinical practice behaviour of the practitioner (Roshanov et al. 2011; Thomson et al. 2004; Soumerai & Avorn, 1990). As a process CDM involves the complex interaction between perceived confidence, cognitive abilities and the information seeking

behaviour of the physician (Uy et al. 2014) and application of medical and biomedical knowledge, skills of problem-solving, analysis of the probable options alongside the outcomes. Further, CDM requires an ability to select the best option for the patient with minimum risk with maximum benefit (Hajjaj et al. 2010). The concept of CDM in the healthcare sector has come under criticism for making unscrupulous decisions that are not either supported by evidence or considered to be low-value (Traeger et al. 2017). Further, the tendency to intentionally implement clinical decisions that are related to medical tests, diagnostic and therapeutic procedures which can provide patients with little-to-no benefit or cause harm (defined as low-value patientcare) are on the rise (Elshaug et al. 2012). That means, lack of integration of research knowledge in CDM could be a reason leading to a situation of 'medical errors' that are avoidable. Van Tassel, (2012) pointed out that about the current state of medical errors by citing a consumer report investigation as "more than 2.25 million Americans will probably die from medical harm this decade . . .. 'That's like wiping out the entire populations of North Dakota, Rhode Island, and Vermont. It's a man-made disaster'.

A study conducted across 26 countries reported that major deviation from the CPG recommendations in regard to management of trauma patients resulted in significant higher mortality rate among the patients (Rice et al. 2012). Similarly, the guideline adherence resulted in less risk of hospitalization for cardiac patients in some countries of Europe (Komajda et al. 2005). Another study showed that CPG non-adherence resulted in lower survival among patients who are newly diagnosed with breast cancer (Wöckel et al. 2010). Considering, the above arguments, it could be seen that CPGs can aid the practitioner's CDM, resulting in enhancement of patientcare or at the least, reduction in medical errors. Traeger et al. (2017) reported that, low-value patientcare is prevailing amongst the PT practitioners. In this situation, recommendation to educate PTs about the low-value healthcare problems is yet not widely used by PTs in their practice although developed according to individual country specifics (Traeger et al. 2017). This shows that while CDM requires the integration of CPG, practitioners either hesitate to integrate research knowledge into practice or use decision shortcuts in patientcare which could be related to the management and behavioural aspects that hinder such integration (Straub-Morarend et al. 2011). Thus, it can be argued that CDM is possibly affected by the behavioural aspects of PTs and thus in this research CDM is chosen to represent the clinical practice behaviour aspect of the PTs. Under this circumstance predictability of the CDM behaviour of PTs become a significant aspect. The above arguments clearly point out that CDM of professionals in the healthcare sector including PTs is fraught with lack of adherence to CPG, reasons for which are not clear leading to a CPG-CDM gap. While CDM is the general term used to refer to clinical decision making (a type of clinical practice), in this research CDM is linked to evidence-based research knowledge and hence has been identified as EBCDM (evidence based clinical decision making). The next section discusses EBCDM as a concept.

2.4.1 Evidence Based Clinical Decision Making (EBCDM)

EBP is a contemporary clinical practice method that focuses on scientific research evidence with sufficient quality to assist CDM (Rousseau and Gunia, 2015). Vision 2020 statement of APTA identified EBP as one of the core elements of the PT practice (APTA, 2018b). EBP employs scientific evidence (e.g. Melnyk & Fineout-Overholt 2011; Miller 2004; Wells & Miranda, 2006) in conjunction with the expertise and judgement of the practitioner as well as the preference, values and the circumstances of the patients while making clinical decisions (APTA, 2018d). EBP emphasizes on evidence based clinical decisions that are expected to facilitate achievement of desired clinical outcomes and avoid dysfunctional practices (Rousseau & Gunia, 2015). In the wider context of EBP, when research knowledge (e.g. CPGs) is integrated to CDM, it can be referred as Evidence Based Clinical Decision Making (EBCDM) and it requires skills for identification and interpretation of the best scientific evidence. EBCDM is a complex process of integration of a practitioner's knowledge and expertise that are accrued through the practice, patient's preference and the latest research knowledge. In this research (and throughout this thesis), the term CDM will be referred to as EBCDM when CPG is integrated into CDM. Use of the abbreviation CDM therefore implies EBCDM. However, EBCDM in itself is a complicated concept and linking it to CPG appears to be a complex process not well explained in the literature or understood which is demonstrated in the following discussions.

An important aspect of CDM is the clinical reasoning of the practitioner which is considered to be complex and mostly associated with uncertainty (Fischer et al. 2016; Thistle et al. 2016; Smith et al. 2007; NHS, 2011). Wulff and Getzsche (2000; p. 6) explain the CDM process as "It is not so simple; however, all positive decisions are beneficial and that all negative decisions-omissions-are harmful. Many treatments may produce serious unwanted effects and many diagnostic procedures (e.g., liver biopsies and endoscopic examinations) are unpleasant and may cause complications. The clinician must carefully consider the consequences of his or her actions, both for the individual patient, and, as we shall discuss later, for the health service as a whole". This suggestion of Wulff and Getzsche (2000; p. 6) amply demonstrates the complexity of CDM process and further argued that clinical reasoning could take place either due to deduction or empirical method or both. Sometimes the decision of the practitioner might range from doing nothing or a wait and see strategy to aggressive management of the condition (Thompson et al. 2004). Thus, it is not certain that CDM as a concept when linked to CPG could lead to a situation of better or optimum patientcare. There is some uncertainty, concern, barriers and gap between the clinical practice and integration of CPG particularly when new research knowledge is to be integrated into practice. This aspect is a major area of concern for researchers as no specific solutions are suggested by the researching community to address this issue regarding the CDM process especially when CPGs are to be integrated into CDM in

the context of PTs to know how clinical decisions are influenced by the CPGs. This is an important gap that needs to be addressed.

CPG for VTE in PT that is produced through an exhaustive scientific process under the guidance of APTA (PTNow, 2018a) and the extent of integration of this CPG into CDM is not known. There is a possibility that PTs are not aware of the CPG, having some doubts about its validity and might not be familiar to apply the recommendations in practice. Further, lack of comparable data or results from any studies that investigated the effect of this CPG might cause doubts about the extent of benefit that would accrue to the patient if integrated in practice. Thus, there is a need to investigate the integration of CPG for VTE in PT to achieve a better understanding of the situation. An example is required to understand the role of CPG in CDM and there was no such example available in the literature. This researcher created a hypothetical scenario based on the recommendations of CPG for VTE in PT (see Appendix 2.1) that can help to understand the contribution of CPG in CDM and it is possible to foresee some problems that may arise due to failure to integrate CPG for VTE in practice. The hypothetical scenario is explained next.

Anticoagulation therapy is widely used to treat lower extremity Deep vein thrombosis (LE DVT). However, studies reported that there are about 7-10 times increased likelihood of a major bleeding in the brain in the event of a fall when patient is on anticoagulants (Hillegass et al. 2015). However, anticoagulants are recommended as the benefits of preventing complications outweigh the risk of bleeding. However, when an older patient with LE DVT is on anticoagulants, there is no clear yes or no answer in regard to mobilizing the patient versus keeping the patient on bed. However, CPG for VTE recommends (Recommendation number 12) a fall risk assessment by PTs prior to the CDM of mobilizing the patient or continuing the bed rest. The fall risk assessment can be conducted using a specific toolkit known as 'The Centers for Disease Control and Prevention's Stopping Elderly Accidents, Deaths and Injuries (STEADI). Such an assessment is expected to reduce mortality and morbidity among elder patients who are on anticoagulants. Thus, PT's CDM of mobility versus bed rest has significant implications on patient care. Hence, the specific recommendation of fall assessment and the recommended tool could guide the PT in CDM, only if the PT is aware of, familiar with, have a favourable attitude towards and motivated enough to integrate the recommendations given in the CPG into CDM. From this example, it can be inferred that integration of CPG into CDM is important and can be affected by several reasons leading to CPG-CDM gap, although knowledge about how barriers could affect the integration of CPG into CDM is limited (Fristedt et al. 2016; Tilson et al. 2014; Salbach et al. 2010). In order to gain deeper understanding, the next sections review the definitions to understand CDM and the theoretical support of CDM.

2.4.2 Definition and theories concerning CDM

In order to gain deeper understanding of the CPG-CDM gap, concept of CDM, definitions about CDM, theories and models based on which CDM can be explained.

2.4.2.1 Definitions of CDM

Definitions of CDM vary. Examples of various definitions and concepts of CDM found in the literature are provided in Table 2.3.

Table 2.3 Definitions of Clinical decision making

Authors	Definition
Schell, B. A. (2009)	CDM can be regarded as a process that the practitioners use to plan, direct, perform, and reflect on aspects related to patient care.
Smith et al. (2008)	"Clinical reasoning is a complex and multiphasic phenomenon wherein PTs develop an understanding of the problems of their patients as the basis for action"
Chapman, (2004)	CDM generally involves a decision-making process in which health practitioners' act on behalf of patients or it is called as surrogate decisions.
Edwards et al. (2004)	CDM is a result of a collaboration process involving patient and professional teams in health sectors

While the definitions provide some understanding of CDM, what happens to that CDM or how that CDM changes due to the necessity to integrate new research knowledge (new CPG) or updated version of the CPG is not known. Since none of the definitions include the usefulness of CPGs in CDM, it can be concluded that the currently available definitions fall short of fully explaining the concept of CDM as far as the field of healthcare is concerned. Accordingly, for the purpose of this research CDM is defined as "a process of decision making by which healthcare practitioners plan, direct, perform and reflect on aspects related to patientcare by integrating the latest research knowledge". However, as explained earlier, integrating research knowledge in CDM has been found to be a major challenge (Salbach et al. 2010; Schreiber et al. 2009). For instance, a study by Silva et al. (2015) reported that only 31.3% of PTs strongly agreed and 41% partially agreed that research knowledge as a factor which contributes to their CDM. Thus, in this research EBCDM is regarded as an important aspect that could enhance the optimum patient care.

2.4.2.2 Theoretical support for CDM

Literature review shows that models or frameworks that have related research knowledge to CDM are only few (Salbach et al. 2010). Grounding the concept of CDM and explaining how it can be linked to CPG and CPG-CDM gap, requires the use of theories and models concerning CDM. An important aspect of CDM is decision making and it appears that decision making theories are shown to be applicable to explain CDM (Williams & Brown, 2014). For instance, some decisions could be covered under rational decision making when comparison between costs and measurable outcomes are involved, whereas some others could be grounded under irrational factors including cognitive biases,

environmental pressures, and politics and engagement (Shepherd & Rudd, 2013). In addition, decision theories have been shown to be applicable to CDM by a few (Elwyn et al. 2011). Similarly, Kahneman and Tversky's (1979) postulated the prospect theory which says that decision making can be divided into stages namely editing phase in which the options available are analysed, framed and perceived and the evaluation phase which involves the choice of the option perceived to have the highest value. Again Gigerenzer (1996) (as cited by Williams & Brown, 2014) developed the ecological rationality model through which it was explained that people make decisions under constraints (e.g. time, knowledge, or analytical ability). This theory suggests that decision making could use heuristics – experience-based techniques for problem solving or knowing by trying.

Taking the suggestion of Gigerenzer (1996) (as cited by Williams & Brown, 2014) and linking it to the problem of research knowledge integration into CDM, it is possible to bring in the angle of knowledge constraint into focus because research knowledge can be discussed under the category of knowledge translation theory (Curtis et al. 2017; Hudon et al. 2015; Jones et al. 2014; Straus et al. 2011). For instance, Luker and Kenrick [(1992) cited by Muir, 2004)] argue that knowledge based on research as well as some tested theories could be useful in explaining the concept of CDM and knowledge derived from practice and emanating out of experience, knowledge that is regarded as common sense are useful in CDM. Thus, it is possible to propose that theories concerning knowledge and knowledge translation could be applied to explain CDM; an argument supported by many (e.g. Hudon et al. 2015; Jones et al. 2014). KT theories could provide ways to address the hindering factors or enhance the supporting factors that affect the integration of research knowledge in CDM. In addition, behavioural aspects related to CDM of the PTs with regard to integration of CPG into CDM could also be considered to play a role in understanding the barriers encountered by PTs and using OMRU can be helpful as it has integrated the theory of planned behaviour in explaining the knowledge translation process of CPG into CDM. It must be noted here that there is no single and specific theory that could be used to address the above problems. This is a major gap in the literature especially when one takes into account the various constraints that individual PTs face in integrating research knowledge in CDM.

2.4.3 Summary

The foregoing discussions show that CDM, more specifically EBCDM is the prime concept that is affected by some aspects as research knowledge (CPG), barriers and interventions as well as behavioural and managerial aspects concerning the PTs. Some definitions and theories are found to be useful in understanding and explaining the concept of CDM and its relationship to CPG. The review showed that knowledge about CPG-CDM gap in the context of PTs is very limited. After reviewing the concept of CDM the review proceeds to address the barriers that affect PTs in their effort to integrate CPG into CDM.

2.5 Barriers leading to CPG – CDM gap

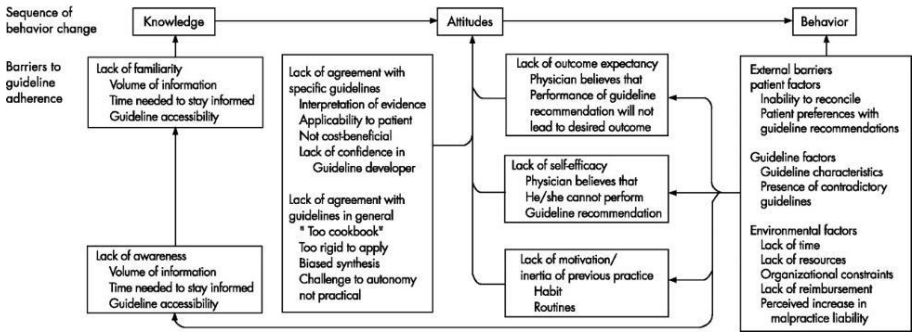
The literature review shows that, investigations specific to CPG integration are very few and most of the barrier studies are conducted in the wider context of EBP in the field of PT. For instance, Cochrane et al. (2007) identified different categories of barriers to EBP, as support/resource, cognitive/ behavioural, attitudinal/rational, clinical practice guidelines/evidence, client, healthcare professional /physician and system/process barriers to EBP and other classifications of barriers to EBP are also available (e.g. Campbell, 2013). Although some studies have been conducted in regard to the barrier analysis pertaining to CPG adherence, but those studies have been criticized as affected by limitations for instance problems in comprehensive assessment of barriers due to the use of questionnaires that are not standardized, reliable and valid (Willson et al. 2017). While Cabana et al. (1999) and Fischer et al. (2016) have investigated the barriers to the integration of CPG into clinical practice in the field of medicine, similar publications are hard to find in the PT literature that have specifically investigated the barriers to the integration of CPG into CDM which is a major gap in the literature. Nevertheless, the application of the concepts of barriers to the integration of CPG into CDM conceptualized in the field of medicine and in other healthcare professions including PT, finds some support in the literature (e.g. Van der Wees et al. 2013; Van Bodegom-Vos et al. 2012). Thus, the concepts of Cabana et al. (1999) and Fischer et al. (2016) can arguably be extended to the context of PTs. In order to gain knowledge about this, a brief description of the frameworks developed by Cabana et al. (1999) and Fischer et al. (2016) is provided in the next section.

2.5.1 Knowledge-Attitude-Behaviour Framework by Cabana et al. (1999) and Fischer et al. (2016)

One of the earliest conceptual models addressing CPG compliance or adherence was the "Knowledge-Attitude- Behaviour Framework" (KABF) by Cabana et al. (1999) (see Figure 2.1) that explain he interaction amongst the three components namely CPG, barriers to integration of CPG and clinical practice behaviour of the practitioner. This model identifies various factors that are related to compliance with CPGs and places substantial emphasis on the clinician characteristics including knowledge and attitude as major factors affecting the clinical practice behaviour of the practitioner. KABF is widely used to understand the operation of barriers, in the integration of CPG into clinical practice, in the context of medicine. According to KABF, barriers to CPG adherence are categorized into internal and external barriers. Physician related factors are categorized as internal factors, which are knowledge of CPG and attitude towards CPG. Further, lack of awareness or familiarity with CPGs as variables could lead to lack of knowledge about the CPG. Lack of agreement with a CPG, lack of self-efficacy (i.e., physician's belief that he/she cannot integrate CPG recommendations), lack of outcome expectancy (i.e., physician's disbelief that CPG compliance will lead to desired outcome), and inertia from habits and routine, influences the physician's attitudes about CPGs. According to

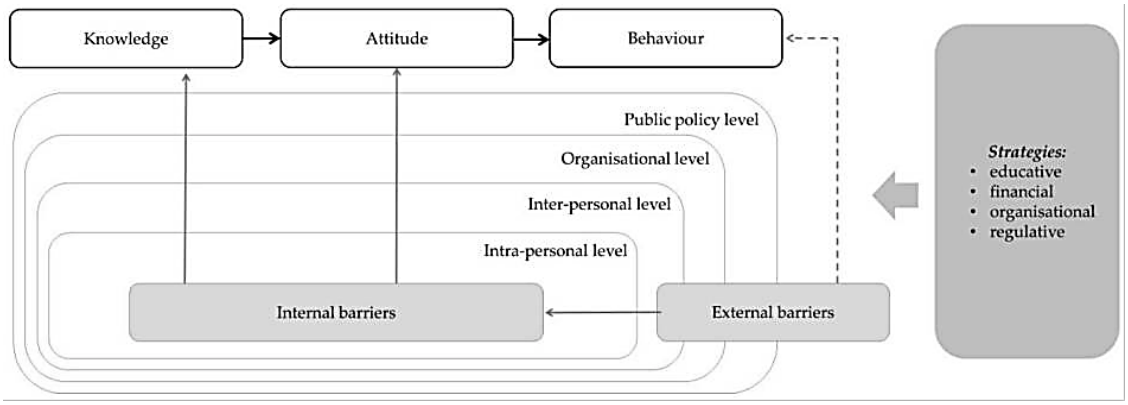
KABF, knowledge influences attitude which in turn affects the CPG adherence behaviour of the practitioner. Several other factors related to the patient, the CPG itself, and environmental variables are considered as external factors that can also influence the CPG adherence behaviour of the practitioner.

Figure.2.1 "Knowledge-Attitude- Behaviour Framework" (KABF) by Cabana et al. 1999



Recently, KABF was updated by Fischer et al. (2016) (see Figure 2.2). Although the determinants of the model remain the same, Fischer et al. (2016) added a new dimension in to the model as 'interventions' to overcome the barriers to CPG adherence. Modification of Cabana's model by Fischer et al. (2016) also refers to barriers as internal (practitioner level) and external and the barriers were further organized into different levels including intra personal, inter personal, organizational and public policy level. The updated model of Fischer et al. has the element of interventions in it and the interventions are regarded as strategies to overcome the barriers to CPG nonadherence. Thus, Fischer et al.'s model can be regarded as a KT model to understand the phenomenon of integration of CPG into CDM.

Figure.2.2 "Knowledge-Attitude- Behaviour Framework" (KABF) by Fischer et al. 2016



In fact, there is evidence to the expanded and empirical application of the KABF, as a predictive model in the context of medicine (e.g. Roelens et al. 2006). The predictive model, developed by Roelens et al. (2006) based on KABF, examines the behavioural aspects of practitioners, in relation to adherence to CPG in clinical practice. The literature review on barriers is broadly grounded on the original KABF by Cabana et al. (1999) and the modified one by Fischer et al. (2016), with regard to

the concepts related to barriers leading to CPG – CDM gap, the impact of those barriers on the integration of CPGs into CDM, that is the CPG-CDM gap and the interventions that could be used to remove or minimize the impact of those barriers on CPG-CDM gap. Hence the term KABF used in this entire thesis essentially refers to the frameworks developed by Cabana et al (1999), Fischer et al. (2016). Thus, KABF and the predictive model developed by Roelens et al. (2006) are used as theories, underpinning the barrier analysis, in this research. An important feature of the three frameworks (Cabana et al. 1999; Fischer et al. 2016; Roelens et al. 2006) is that all the three frameworks examine the knowledge (knowledge management concept) and attitude (behavioural aspects) of the practitioners that act as barriers to the integration of research knowledge into clinical practice. The next section discusses the barriers leading to CPG-CDM gap in the field of PT.

2.5.2 Barriers attributed to CPG-CDM gap in the context of PT

From the preceding discussion, it can be seen that there could be factors considered as barriers to integration of CPG in in the field of PT, and only limited research is published in the literature in the field of PT concerning the barriers to integration of CPG in clinical practice or the CPG-CDM gap (e.g. Bernhardsson et al. 2014). Further, not much is known about the barriers that have implications on changing the clinical practice behaviour of the practitioner linked to EBCDM. Although not many studies are available in regard to barriers leading to CPG-CDM gap in the context of PT; it can be argued that the concept of the barriers to EBP can be applied to the concept of barriers to the CPG-CDM gap too and this argument is supported in the literature (Stander et al. 2018). This is possible, due to the fact that essential feature of EBP concept is the integration of research knowledge in clinical practice and hence making it possible to extend the concepts of barriers to EBP to the concept of barriers affecting the CPG-CDM gap. The identified barriers to EBP exist at various levels including individual, organisational and system levels across the healthcare professions (Curtis et al.2017; Fischer et al. 2016; Argyriou et al. 2015; Silva et al. 2015; Rainbard et al. 2006; Grol & Grimshaw, 2003; Jette et al. 2003; Cabana et al. 1999) and various attempts were made to categorize them in the context of PT (Silva et al. 2015; Sibley & Salbach, 2015; Campbell, 2013; Jette et al. 2003). Thus, in this research, EBP barriers are viewed as barriers to CPG integration in clinical practice. Table 1 under Appendix 2.6 shows a list of barriers to EBP at various levels in the context of PT from which the practitioner level barriers were extracted according to KABF by Cabana et al. (1999) shown in Table 1 under Appendix 2.7.

Researchers have identified barriers that can affect EBP, at various levels including the individual, organizational and at the system levels. For instance, a practitioner might be encountering barriers at individual as well as at organizational level as the organizations do not have a policy to use of CPG in clinical practice. Many a times, an individual practitioner might integrate CPG into CDM, regardless of the organizational barriers. In other words, overcoming the barrier at practitioner level is much

more feasible to achieve compared to addressing the organizational barriers that might even require policy and procedural changes. It is recommended that attempts made to influence or change the clinical practice behaviour is more amenable as opposed to an attempt to change the organizational context (Scott-Findlay& Estabrooks, 2006). Table 2.6 shows barriers to EBP, in the context of PT, at the practitioner level were extracted according to KABF, by Cabana et al. (1999).

2.5.3 Discussion on selected barriers affecting CPG-CDM Gap

Table 2.6 categorized the barriers, at the practitioner level, according to KABF by Cabana et al. (1999) and shows that the existence of many barriers at the practitioner level is relatively common, when compared to other barriers. Barriers at all levels, seems to be important, focus of this research is only on barriers, at the PT practitioner level, with regard to integration of CPG into CDM. Although, barriers exist at organizational and system levels, those have not been studied in this research because studying all the contexts in one research will be complicated, time consuming and may lead to difficulties in conclusively addressing the research objectives. In addition, limited studies addressing the barriers existing at the individual PT practitioner level in integrating CPG into CDM could be a major reason CPG-CDM gap, a reason that supports the rationale behind the focus of this research on barriers at PT practitioner level exclusively. In order to ensure that focus of the research is maintained on, how to minimize the CPG-CDM gap, this research focuses only on widely discussed barriers, hindering the integration of CPG into CDM and considered to be significant in the context of individual PT practitioners (Ramirez –Velez et al. 2015; Silva et al. 2015; Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Gorgon, 2012; Nilsagard and Lohse, (2010); Buchard, 2009; Salbach et al. 2007; Iles and Davidson, 2006; Jette et al. 2003) extracted from Table 2.6. For instance, lack of awareness and familiarity to CPG leads to lack of knowledge, as a barrier to EBP (Stander et al. 2018; Chan et al. 2017; Barth et al. 2016; Hoesing, 2016; Southern et al. 2014; Bernhardsson et al. 2014). Insufficient skill and self-efficacy are reported to have been observed among PTs, related to CPG (Salbach et al. 2010; Jette et al. 2003). Similarly, interpretation and implementation of research knowledge requires skills and judgment; attributes referred to as self-efficacy of the PTs (Ramirez –Velez et al. 2015; Silva et al. 2015). Thus, the four barriers chosen for investigation were knowledge of CPG, motivation to adopt CPG, attitude towards CPG and self-efficacy to adopt CPG and the next sections review critically those four barriers.

2.5.4 Knowledge as a barrier affecting CPG-CDM gap

Knowledge of CPG could influence the practitioner behaviour, either to integrate or not to integrate the CPG in the clinical practice. Thus, lack of knowledge could lead to lack of integration of CPG into CDM and hence could become a barrier. According to the KABF (Cabana et al. 1999; Fischer et al. 2016), lack of awareness and familiarity are two important aspects that are related to knowledge. CPG for VTE in PT is recently published and the PT practitioner might not be aware and familiar with

CPG for VTE. That means if there is lack of awareness of the CPG as well as familiarity with the recommendations in the CPG, then the PTs will not be able to incorporate the latest research knowledge in the management of patients. That means that while the practitioner is capable of enhancing patient care, in reality the practitioner may not be doing so due to lack of awareness and familiarity of the CPG for VTE. Here the knowledge component of CPG for VTE could be a considered as a factor affecting the clinical practice and delivery of patient care. In order to understand how knowledge can act as a barrier, the following sections review the literature and critically examine knowledge as a concept and lack of knowledge or incomplete knowledge can act as barrier affecting integration of CPG into CDM.

Knowledge can be considered as, knowing about certain aspects including those that can be understood using facts or concepts or laws or judgements or feelings or principles or insights or causal relationships (Ahmad & Daghfous, 2010). For instance, some classifications or typology of knowledge are considered as concepts. Classification of knowledge could be general and specific or explicit and tacit or individual and organizational or routine and procedural knowledge (Alhalhouli et al. 2014). In contrast another typology of knowledge in the specific clinical practice context, categorizes clinical knowledge into three dimensions namely propositional, professional, and personal dimensions (Higgs &Titchen, 1995). While it is possible that the many ways in which the concept of knowledge could be understood, this multiple way of defining knowledge makes it difficult to operationalize it precisely. At the same time multiple ways also provide linkage with the concept to a particular form of knowledge; for instance, research knowledge by which it is possible to have a better perspective of the concept. It is important to understand the basic concept of knowledge to explain how such knowledge could be translated into practice. For instance, Bernhardsson et al. (2015) claims that although research knowledge is more accessible, explicit and generalizable, rendering it suitable to be applied widely, it is unlikely to provide tried-and-tested answers that could be applied directly to clinical practice. These arguments show that knowledge even if derived through research, can be a challenge or a barrier to implementation in clinical practice (Murad, 2017). That is sometimes other forms of knowledge for instance practice-based knowledge or experiential knowledge could be useful, as it is based on experience and is an integral part of understanding the individual patient to provide patient centred care (Lee, 2011), although such knowledge is not generalizable and easily accessible (Bernhardsson et al. 2015). In both the situations it is seen that knowledge and its translation into practice is barrier ridden.

Several theories provide support to establish the relationship between knowledge and behaviour. For instance, Theoretical Domains Framework (TDF) is a behaviour change theory proposed by Michie et al. (2011) that is widely used by researchers to understand the behavioural aspect of intervention studies. TDF integrates several theories including 12 behaviour change theories, reflecting 14

motivational theories, 11 action theories and 8 organizational theories in single framework to understand the human behavioural change. TDF discusses about 12 domains that could affect the behaviour change and relate the domain of knowledge directly to the domain of behaviour, providing support to the conceptualization of a direct linkage between knowledge in CPG and CDM as a behavioural construct, in this research. Further, the KABF by Cabana et al. (1999) and Fischer et al. (2016) proposed that, knowledge affects the clinical practice behaviour of the practitioner and considered lack of awareness as well as lack of familiarity as subset of factors under the construct of knowledge. Likewise, specific KT theories including OMRU framework (Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b; Hogan, & Logan, 2004) provides support to the argument that lack of knowledge could acts as a barrier hindering the integration of research knowledge into clinical practice. Further, the model developed by Graham et al. (2006) known as Knowledge to Action (KTA) model, knowledge as a component has been described to have some effect on the clinical practice behaviour.

Detailed literature review was conducted to identify some examples showing relationship between CPG recommendations along with the consequences arising from non- adherence to the recommendations and there were no such examples available in regard to CPG for VTE in PT. Thus, this researcher created hypothetical scenarios that could explain a specific recommendation given in CPG for VTE in PT, with its relationship to CDM and the expected complication arising from non-adherence to the recommendation. The following sections that discuss each of the four selected barriers will have a table depicting the hypothetical scenario with a specific CPG recommendation that is most appropriate to explain the relationship between the four selected barriers and the consequence of non- adherence to that recommendation. An illustration of the concept of research knowledge concerning CPG for VTE in PT and the barriers to its integration to CDM and the consequence is provided in Table 2.4.

Table 2.4 Illustration of a recommendation in CPG for VTE in PT, knowledge as possible barrier and the effect on CDM

CPG for VTE Recommendation	**Key concepts**	**Barrier at the practitioner leve**	**Examples of studies supporting the presence of barrier**	**Affected CDM component**
"PTs should recommend mechanical compression (e.g., IPC, GCS) when individuals are at high risk for LE DVT. (Recommendation 4.) (Hillegass et al. 2015)	Recommending mechanical compression as a preventive measure for LE DVT	Lack of Knowledge about the risk factors for LE DVT due to lack of awareness or familiarity	Ramirez –Velez et al. 2015; Silva et al.2015; Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Nilsagard and Lohse, 2010; Buchard, 2009; Salbach et al. 2007; Iles and Davidson, 2006; Jette et al. 2003	Failure to integrate Preventive measures for LE DVT in clinical practice

Table 2.4 shows that recommendation number 4 of the CPG for VTE in PT emphasizes on integrating preventive measures for LE DVT in clinical practice. Although the PT might be aware that LE DVT

is preventable, this recommendation in the CPG is strongly supported by research evidence and hence could be highly useful to PTs. In addition, Hillegass et al. (2015) reported that several studies show that use of mechanical compression alone was beneficial to the patient and decreased the incidence of LE DVT or PE considerably giving contrasting opinion. However, when mechanical compression if combined with other preventive measures then such a treatment is shown to have provided additional benefit to patients. Hence, if the PT is not aware and familiar with this CPG, then there is a probability that PT might not give adequate importance to the preventive measures for LE DVT. In this situation, lack of awareness and familiarity with CPG recommendations could act as barriers leading to the CPG-CDM gap. If behavioural aspects become barriers, then, CPG as research knowledge cannot be translated. On the other hand, if the knowledge component is not understood properly, then the complexity of CPG knowledge itself will become a barrier. This will be the case if only one component of CPG for VTE in PT is considered as research knowledge in isolation. In contrast if the entire set of fourteen recommendations of the CPG for VTE in PT is analysed together to understand whether the research knowledge is a barrier by itself or due to behavioural aspect while being integrated in practice, then also research knowledge could become complex and difficult to understand. Either way the research knowledge could become very complex and hence a barrier.

An important inference that could be arrived at this point is that knowledge particularly research knowledge, could be a major barrier if accessibility, familiarity, awareness, understanding, practicability, applicability and any other aspect, for instance, behavioural ones are not addressed, and some research is already conducted supporting such an inference. For instance, Sehl et al. (2017) concluded that the current level of CPG adherence is affected by lack of awareness and lack of familiarity with reference to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines. Likewise, Southern et al. (2014) reported that knowledge and attitudinal barriers were responsible for the non-adherence of a CPG for Hepatitis C screening program among the physicians and these factors are critical particularly in cases where the specific CPG is complex. Based on the study by Southern et al. (2014), one can argue that the problem will be even more pronounced if there is complexity involved in recommendations of a CPG, that need to be integrated into CDM.

While some studies have investigated knowledge as barrier to integration of CPG in practice, such studies are not conclusive and generalizable. For instance, a study by Aftab et al. (2014) reported a weak but significant relationship between knowledge of the CPGs for Asthma and CPG compliance among emergency doctors. The sample size of this study was low (n=27) and the mean age of the doctors was 27.3 years, restricting its application to young physicians only. Chan et al. (2017) identified knowledge and attitude as practitioner level factors that affect CPG implementation in the context of Physicians, making it contextual. While on the one hand, researchers argue that practitioner may not adhere to a CPG, due to lack of awareness of as well as familiarity with a CPG's existence

(Asonganyi et al. 2013), on the other, there are contradicting opinions that show lack of awareness is not a major factor in determining the CPG compliance. For instance, Sanchez et al (2014) argue that, lack of familiarity with the CPG recommendation is not a factor that is correlated with inappropriate prescription of antibiotics among the primary care providers in the USA. While CPGs are useful in EBP, evidence is rarely unequivocal in regard to the current level of such integration of research-based knowledge in practice-based knowledge to make appropriate judgments in specific clinical situations (Bernhardsson et al. 2015). Further, Bernhardsson et al. (2015) reports that the integration of both research-based as well as practice-based knowledge has been identified as 'a core challenge' in the EBP literature making it necessary to investigate CPG integration into CDM. Any study that brings out a more meaningful outcome could be highly beneficial to the patients as well as the practitioner.

2.5.4.1 Operationalization of knowledge as a barrier affecting the CPG-CDM gap

Knowledge has been operationalized in different ways but as a barrier its operationalization is not clear in the literature. For instance, KABF by Cabana et al. (1999), consider knowledge as a barrier and clearly shows that knowledge as a barrier affects clinical practice behaviour. Similarly, knowledge as a concept has been described as an independent variable that determines clinical practice by Roelens et al. (2006). Another study by Zwerver et al. (2013), about CPG adherence related to depression among insurance physicians, it was seen that knowledge and skills were the determinants that were directly related to CPG adherence. Contradictory to the above finding, Baiardini et al. (2009) argue that changes in knowledge or attitude, not necessarily lead to changes in behaviour. In another representation knowledge is associated with interventions to remove barriers and is termed as knowledge translation interventions or KTIs. In another instance, knowledge is identified as professional knowledge, propositional knowledge and personal knowledge which are related to the CPG-CDM gap. It is important to note that the concept of knowledge in this research indicates the knowledge of the PT in CPG and not research knowledge itself. This has to be clearly understood as the review of the concept of knowledge in the literature has been shown to represent as familiarity and awareness (Roelens et al. 2006; Cabana et al. 1999) with regard to CPG and evidence based clinical practice which signify knowledge of the PT in CPG. Thus, it can be seen that there are different representations of knowledge as affecting CPG, CDM and the CPG-CDM gap. However empirical evidence that has related knowledge as a component (not research knowledge) that has the potential to determine clinical practice behaviour is hard to find in the literature although it could be represented as a construct and quantitatively measured in empirical studies. Studies by Silva and Costa, (2015) and Garland, (2013) showed that knowledge could be measured using a research instrument. In addition, knowledge management theories can also support the conceptualization of knowledge barrier in integration of CPG into CDM. The ongoing discussions also point out that knowledge as a barrier needs to be addressed using appropriate interventions. While the use of

interventions is an established method to address barriers (see section 2.7.3) it is not clear in the literature which intervention could address this barrier and to what extent. A detailed review on interventions is provided under section 2.7.3.

2.5.4.2 Summary

While knowledge in general could be considered as a major factor affecting integration of research into clinical practice, it is evident from the foregoing discussions that it also can act as a barrier to the integration of CPG into CDM. As demonstrated by the example of CPG for VTE in PT, knowledge as a barrier can be a serious issue that widens the CPG-CDM gap if not addressed. Supporting the above argument, various studies conducted both in the field of medicine and PT could not provide conclusive evidence to identify and address knowledge as a barrier. Thus, there is a need to examine knowledge as a barrier to the integration of CPG in clinical practice with regard to PT and specific contexts involving CPGs, for instance, CPG for VTE in PT. The next section addresses the behavioural barriers that affect CPG – CDM gap, beginning with PTs attitude toward to CPGs.

2.5.5 Attitude as a barrier affecting CPG-CDM gap

Literature is replete with contradictory arguments about attitude of practitioners, in particular PTs, towards CPGs and its integration in clinical practice. Birrenbach et al. (2016) reported that not much is known about attitudes and perceived barriers to use of CPGs among Physicians in Switzerland. Echoing similar sentiments Koes et al. (2010) argue that the extent to which currently available CPGs are implemented and followed in different countries is largely unknown especially with regard to change behaviour of health care practitioners. In order to examine, how attitude of practitioners towards CPG as a concept affects its integration into CDM in PT, the following sections review the concept of attitude, definitions, models and theories concerning the attitude, operationalization of attitude as a barrier and impact of interventions on the CPG-CDM gap. As mentioned earlier, concepts related to attitude towards CPG integration in clinical practice is grounded on the KABF developed by Cabana et al. (1999) and Fisher et al. (2016) (see section 2.5.1.).

2.5.5.1 Attitude

Attitude as a concept is widely discussed in the management, behavioural, social sciences and healthcare literature (Gardener, 2017; Tilson et al. 2016). However, literature on attitude as a concept with regard to CPG and its integration into CDM, in the field of healthcare is limited and particularly in the field of PT, there are not many studies are available that investigated the attitude. The literature points out that attitude of healthcare professionals towards the adoption of a new CPG or an updated CPG in general is not observed to be uniform (Curtis et al. 2017) due to a variety of reasons including those concerning the characteristics of CPG itself (e.g. complexity) (Graham & Logan, 2004a: Graham & Logan, 2004b; Grol and Wensing, 2004; Cabana et al. 2000; Davis et al. 1997; Logan &

Graham, 1998), practitioner's change behaviour (e.g. lack of outcome expectancy: not willing to adopt a CPG due to the assumption that the outcome of adoption of CPG in practice is not useful) (Wisnivesky et al. 2008; Roelens et al. 2006), environment (lack of peer support leading the questions the credibility of the CPG) (Ramirez –Velez et al. 2015; Bernhardsson et al. 2014; Gorgon, 2012) and patients related reasons (non-adherence of the patient and patient preferences) (Jack et al. 2010). Some studies have linked attitude and change in practice behaviour of PTs (Tilson et al. 2016; Sibley& Salbach, 2015; Gurses et al. 2010: Van der Wees et al. 2008) and some arguments in the literature consider unfavourable attitude to be a major barrier to the adoption of CPG although inconclusively (Curtis et al. 2017; Gardener, 2017). If attitude towards CPG of PTs can be understood better, then, there is a greater chance that a coordinated effort could be thought of amongst PTs that would enable some sort of a predictability of the PTs behaviour towards the integration of CPG into CDM. Example of how attitude can be understood is given in Table 2.5 related to CPG for VTE in PT.

Table 2.5 Illustration of a recommendation in CPG for VTE in PT, attitude as possible barrier and the effect on CDM

CPG for VTE Recommendation	**Key concepts**	**Barrier at the practitioner level**	**Examples of studies supporting the presence of barrier**	**Affected CDM component**
"PTs should screen for risk of VTE during the initial patient interview and physical examination" (Recommendation 3) (Hillegass et al. 2015).	Screen for risk of VTE	Attitude of PTs towards conducting an initial interview and physical examination as part of screening process, with careful consideration to the risk factors for DVT.	Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Gorgon, 2012; Nilsagard and Lohse, (2010); Buchard, 2009; Salbach et al. 2007; Jette et al. 2003.	Screening for the risk of VTE will not be implemented

From Table 2.5 it can be seen that CPG for VTE in PT recommendation no.3 suggests that PTs should examine the patients for risk of VTE during the initial patient interview as well as the physical examination. At this stage, some PTs might conduct a detailed initial screening of the patient that could enable the early detection of LE DVT. Some others might not conduct a detailed initial screening of the patient due to their busy schedule thus overlooking certain details that could lead to non-detection of LE DVT leading to complications later. Similarly, some PTs would be examining the patient considering several risk factors (e.g. age, history of cancer, recent surgery and or immobilization, contraceptive use) which could help in early detection. For example, advancing age is considered as a risk factor while treating patients for VTE as patientcare given by PTs to address VTE varies with age. There are situations where this risk factors are completely overlooked by some PTs because they do not feel those are important aspects, leading to non-detection of LE DVT and thereby failure of early detection suggested by the CPG. The hypothetical example given above points out that the behavioural aspect of attitude has a bearing on integration of CPG into CDM. Perhaps if one

understands and defines attitude as barrier then it is possible to find a solution to tackle attitude as a barrier to the integration of CPG to CDM. This is discussed in the next section.

2.5.5.2 Conceptualization of attitude

Attitude as a concept in the healthcare discipline, in particular PT has been explained with support of various theories and models. For instance, theory of planned behaviour (TPB) explains that attitude is a multiplicative function of beliefs because of which behaviour of people leads to some outcomes and assessment of those outcomes. Further, changing attitude is based on changing behavioural beliefs (Fishbein & Ajzen 2010). If a person believes that the result of certain behaviour is favourable, then it is expected that the attitude of that person will be favourable. That is to say, if a practitioner believes that integration of CPG into CDM can lead to better patientcare, then the attitude of the healthcare practitioner will be favourable towards this integration. In another instance, diffusion of innovation (DoI) theory argues that innovation is affected by the positive or negative attitude formed in a person that occurs at the persuasion stage of the diffusion of an innovation (Rogers, 2003). This implies that attitude as a behavioural aspect, affects a person either to adopt or reject an innovation, depending on whether the innovation, persuades the person to have favourable or unfavourable attitude. This implies that CPG as an innovation, if it persuades the PTs to develop a favourable attitude, then the PTs will adopt the CPG and integrate it in their practice and the vice versa. According to the transtheoretical model of behaviour change, behavioural change is a continuous process and can be considered to comprise five stages of precontemplation, contemplation, preparation, action and maintenance (DiClemente & Prochaska.1983; Prochaska & Velicer, 1997). Known as the readiness to change model, it is considered to be a very reliable and effective one that can be used to improve the healthcare professional's practice. The first transition from precontemplation stage to contemplation stage takes place when professional's knowledge and attitude changes. This implies that if a healthcare professional is presented with an innovation that can improve the clinical practice, then the professional's attitude needs to be favourable to enable him or her to transit from the first stage of precontemplation to the second stage of contemplation of using the innovation in practice. This means that if only the professional's attitude is positive, he or she will contemplate on adopting the innovation. What causes this behavioural change is still not clear and is not explained clearly in any of the aforementioned theories. But it is clear that the behavioural belief is certainly not easy to predict and could in many instances act as a barrier for integration of innovation into clinical practice. From the above discussions, it can be seen that there are theories that provide support to conceptualize attitude as a behavioural construct, in the management of clinical practice.

According to Eagly and Chaiken, (1993, p. 1) attitude could be defined as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour". However, Hogg and Vaughan (2005, p. 150) define attitude as "a relatively enduring organization of beliefs,

feelings, and behavioural tendencies towards socially significant objects, groups, events or symbols". According to KABF by Cabana et al. (1999), the attitude as a construct is affected by a subset of variables or factors including lack of agreement, skill or self-efficacy, motivation, outcome expectancy with reference to CPG adherence. Further, there are arguments that 'decision making' is influenced by knowledge and attitudes (Hogg, &Vaughan, 2018). These arguments indicate the complexity of attitude as a behavioural aspect that could be used for explaining the diverse behavioural aspects of people including healthcare professionals in regard to the CPG-CDM gap. Despite this, the extent to which attitude affects a practitioner to change his or her practice behaviour is not well understood. Thus, there is a need to understand how attitude as a construct can be operationalized, taking into account the context of PT grounding it on appropriate theories. The next section addresses this aspect.

2.5.5.3 Operationalization of attitude as a barrier affecting CPG-CDM gap

There are two aspects concerning the operationalization of attitude as a barrier affecting CPG-CDM gap. The first one is its relationship to CDM as change in behaviour construct using quantitative studies. The second one is, the study of attitude of healthcare professionals towards patientcare, using qualitative studies. From the quantitative studies' point of view attitude as a construct has been operationalized by researchers as a behavioural change construct. According to Campbell et al. (2013) attitude as a barrier can be linked to EBP in the context of allied healthcare professionals. Similar studies are conducted by Bernhardsson et al. (2014) and Salbach et al. (2010) in the context of PT. A study by Bernhardsson and Larsson, (2013) showed that attitude could be measured quantitatively using a research instrument. Studies by Quiros et al. (2007) measured the construct 'Attitude' of ICU staff, toward CPG quantitatively and Rubin and Parrish (2010) measured the attitude towards EBP using another instrument. Thus, it is possible to represent the construct 'attitude' in empirical studies and measure it objectively and quantitatively. Operationalizing attitude towards CPG as a construct and relating that to clinical practice behaviour of PTs, from the point of view of behavioural aspects concerning management science will help to understand the predictability of clinical practice behaviour of PTs when their attitude towards CPG changes.

According to Gardener, (2017) whether a healthcare practitioner's attitude and beliefs influence the approaches adopted by the practitioner to treat chronic low back pain is not clear. Attitude of PTs that disagrees with recommendations of the CPG can potentially lead to noncompliance or nonadherence of CPGs causing the CPG-CDM gap. While PTs in general have a favourable attitude and belief regarding CPGs for low back pain, PTs with biomedical treatment orientation could have high fear avoidance belief and hence do not adhere to CPGs (Gardener, 2017). Scurlock-Evans et al. (2014) argued that even PTs with positive attitude towards EBP and hence CPGs, may not be implementing EBP. However, when viewed from a qualitative healthcare research perspective, attitude of healthcare

professionals has been operationalized in some studies as purely a barrier. For instance, a study by Harting et al. (2009) reported the unfavourable attitudes. Some reasons were also conjectured including national or cultural differences and opinions of participants in the study being highly critical of the CPGs. Similarly, Lizarondo et al. (2011 examined the individual characteristics of the allied health professionals and pointed out that attitudes and beliefs about research are significant predictors of self-reported research knowledge use amongst them. From the discussions given above it is possible to infer the following with regard to operationalizing attitude of PTs towards integrating CPG into CDM:

- Positive attitude of PTs towards CPG favours integration into clinical practice.
- Positive attitude of PTs towards CPG does not favour integration into clinical practice.
- Positive attitude of PTs towards CPG favours integration into clinical practice and translates into high quality and consistent EBP.
- Positive attitude of PTs towards CPG favours integration into clinical practice and does not translate into high quality and consistent EBP.
- Negative attitude of PTs towards CPG does not favour integration into clinical practice.
- Negative attitude of PTs towards CPG does not favour integration into clinical practice but yields satisfactory results in patientcare that uses current practices not in line with CPG recommendations.

The above inference is supported by extant literature (Tilson et al. 2016; Scurlock-Evans et al. 2014). An example of the operationalization of attitude as a barrier to the integration of CPG into CDM can be demonstrated by the previous example. After critically reviewing the literature and analysing how and to what extent attitude could be used as a predictor of CPG-CDM gap it is important to gain knowledge about a possible way to remove the barrier or minimize its impact on the integration of CPG into CDM. This is discussed in section 2.7.3 related to interventions which are argued to be useful in removing attitudinal barriers.

2.5.5.4 Summary

The foregoing discussions have shown that both favourable and unfavourable attitude of healthcare practitioners including PTs affect the integration of CPG into CDM as behavioural barriers. The review reveals that hardly any study has been conducted in the context of PTs about understanding how attitude of PTs could be understood in relation to CPG- CDM gap and used as predictors of the CPG-CDM gap. Different theories, models and definitions have been examined to gain knowledge about attitude as a construct and how it can be operationalized as a predictor of CPG-CDM gap. The review indicates the possible use of interventions to remove attitude as a barrier. The next section discusses self-efficacy of practitioners as a barrier and the aspects related to CPG-CDM gap.

2.5.6. Self-efficacy as a barrier affecting CPG – CDM gap

CPGs are expected to improve CDM (see Appendix 2.4). However, those CPGs are not self-implementing. Practitioners must make efforts to integrate those CPGs into clinical practice including decision making. But literature shows that barriers exist to integrating CPGs into practice. For instance, Tilson et al. (2016) argued that PT's use of research knowledge in clinical practice are influenced by different aspects including self-efficacy; EBP-related attitudes, knowledge and skills, and self-reported behaviours indicating that lack of self-efficacy could affect PTs in adopting CPGs in EBP. Similarly, Rea et al. (2004) argued that PTs' practice is related to their self-efficacy and outcome expectations implying that lack of self-efficacy could be a barrier to providing better patientcare. While it is argued that self-efficacy of a PT helps in integrating CPG into CDM, it is not clear when lack of self-efficacy act as a barrier then how does it affect the CPG-CDM gap. Preliminary examination of the literature in the field of healthcare in general and PT in particular indicated that the gap created by self-efficacy or the lack of it is witnessed in different ways although it is not clear whether there are levels of self-efficacy or the lack of it that cause the gap or affect the level of the gap. Further as a component affecting the behavioural aspect (e.g. CPG adherence behaviour or EBCDM) self-efficacy is found to be a changing phenomenon with some researchers arguing that varying frequency of self-efficacy can affect the extent of integration of CPG into CDM, in other words the CPG-CDM gap. For instance, one of the inconclusive arguments found in the literature is that higher the self-efficacy of PTs more likely is their engagement in CDM (CPG adherence behaviour) (Salbach et al. 2010).

To know more about this phenomenon called self-efficacy it was necessary to review the relevant literature and gain knowledge about its influence on the CPG-CDM gap. Thus, this section reviews the concept of self-efficacy of PTs with regard to integration of CPG into CDM, definitions, models and theories concerning the self-efficacy of PTs as a clinical practice behavioural component, its operationalization as a barrier to integration of CPG into CDM as part of knowledge management of health science, its impact on the CPG-CDM gap and interventions that could influence its impact. Here again the concept of the relationship between self-efficacy of PTs and CPG-CDM gap is grounded on the models developed by Cabana et al. (1999) and Fischer et al. (2016). In addition, the concept of self-efficacy is established from the theoretical explanations given by Bandura (1994 & 1977). The forthcoming sections deal with these aspects.

2.5.6.1 Self-efficacy of PTs towards CPG

Self-efficacy as a concept is shown to affect PTs in their patientcare process. The argument of Bandura (1977) that self-efficacy can explain a person's ability to succeed in specific situations or accomplish a task provided the support to link self-efficacy to the behavioural aspects using the social cognitive theory. Bandura (1977) explained that in the presence of barriers and repugnance (aversion),

expectations of personal self-efficacy determine: (a) whether the coping behaviour will be triggered; (b) the quantum of effort that will be put in and (c) the extent of time over which it will be sustained. It is further argued that expectations of personal efficacy originate from the sources of information namely vicarious experience, verbal persuasion, performance accomplishments and psychological states. According to Bandura's theory, individuals with high self-efficacy would have a tendency to consider difficult tasks as a challenge and attempt to master it rather than avoiding it. While literature shows that self-efficacy is firmly grounded on Bandura's theory, some have criticized Bandura's model as pseudo empirical and baseless (Smedslund, 1978). In fact, Smedslund (1978) says Bandura's theory of self-efficacy that is based on psychology is simply common-sense observation about life and behaviour. Further Smedslund (1978) argued that most empirical studies involving relationships concerning the field of psychology are analytic in nature and correlation found in those relationships is more or less automatic, making the investigations pointless. Smedslund (1991:331) says "Studies that show that people who do not believe that they can do something do not try to do it are pseudo empirical". Despite strong criticism, Bandura's model offers a strong ground to investigate the concept of self-efficacy as part of an empirical study in the management discipline; an argument that finds resonance in the literature.

This research focuses on explaining self-efficacy as a barrier to the integration of CPG into CDM in PT and how such a barrier can be overcome using interventions which is part of the practice behaviour of the PTs and hence falls under the management science discipline. To gain a deeper understanding of this phenomenon this review use an example of a recommendation from CPG for VTE in PT (see Table 2.6) and examines the concept of self-efficacy as a barrier.

Table 2.6 Illustration of a recommendation in CPG for VTE in PT, self- efficacy as possible barrier and the effect on CDM

CPG for VTE Recommendation	**Key concepts**	**Barrier at the practitioner level**	**Examples of studies supporting the presence of barrier**	**Affected CDM component**
"PTs should establish the likelihood of an LE DVT when the patient has pain, tenderness, swelling, warmth, or discoloration in the lower extremity". (Recommendation 5.) (Hillegass et al. 2015).	Assessing the risk of LE DVT using standardized tools.	Self-efficacy to identify the clinical features of LE DVT and assess the risk of LEDVT using tools like Wells Score.	Ramirez –Velez et al. 2015; Silva et al. 2015; Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Buchard, 2009; Salbach et al. 2007; Iles and Davidson, 2006; Jette et al. 2003	Risk assessment for LE DVT

From Table 2.6 it can be seen that there is a certain skill needed to identify the clinical features and assess the risk of LE DVT using tools like Wells Score to make confident clinical decisions. However, this could be a challenging situation to some practitioners. Improper assessment of the risk of LE DVT could lead to improper diagnosis which could affect the patientcare. In such situations, the clinician's self-efficacy plays a leading role. For instance, if the clinician is well versed in identifying

the features properly and assesses the risk of LE DVT properly despite complex situations, then the CDM of the clinician using the CPG concerning LE DVT could be considered as appropriate. Here the self-efficacy supports the clinician to make a complex clinical decision appropriately and is not seen as a barrier. On the contrary despite having a sound knowledge of the CPG for LE DVT and the clinician is not able to arrive at an appropriate decision, then it may be due to a lack of ability or lack of confidence on the part of the clinician to deal with the situation appropriately. Decision making in this situation involves the clinician's ability to understand the CPG recommendation properly and integrate it in the patientcare process leading to better patientcare.

If one considers the above example, then the possible situations that emerge and point to self-efficacy as a barrier to the integration of CPG into CDM are that PTs can or cannot address:

- the issue of integration of CPG into CDM with self-efficacy but the CDM is not optimum.
- the issue of integration of CPG into CDM with self-efficacy but the CDM is acceptable.
- the issue of integration of CPG into CDM due to lack of self-efficacy.
- the issue of integration of CPG into CDM with self-efficacy and make optimum CDM but may not address the issue.

Here if one applies the theory of Bandura, it can help to explain PT's ability to succeed or not succeed in specific situations where CPG needs to be integrated into CDM to accomplish better patientcare by linking self-efficacy to the integration of CPG into CDM behaviour of PTs using social cognitive theory. However, it must be borne in mind it may not be the social cognitive aspect alone that affects the PTs in using their self-efficacy in integrating the CPG into CDM. If the conceptualization and operationalization of self-efficacy is not well understood, then it may not be easy to manipulate this construct when viewed as a barrier to achieve better CDM behaviour of PTs.

2.5.6.2 Conceptualization and operationalization of self-efficacy as a barrier

Conceptualization of self-efficacy of PTs as a barrier in regard to CPG-CDM gap is not well investigated and it is not known how and to what extent self-efficacy can act as a barrier. If one used the KABF by Cabana et al. (1999) and Fischer et al. (2016), then self-efficacy is treated as part of the attitudinal construct which is conceptualized as a barrier to integrate knowledge into clinician practice behaviour. Contrary to that, Babatunde et al. (2017) and Zwerver et al. (2013) argued that attitude is an independent construct that affects the clinical practice behaviour of PTs. Thus, there is a contradiction in conceptualizing and operationalizing the concept of self-efficacy. Posnanski (2002) argued that self-efficacy can be visualized as made of two attributes namely the expectancy of a person that it is feasible to develop and implement a behaviour that is desired and the belief that the behaviour could bring the desired outcome. While the conceptualization of self-efficacy is not uniform each one of the different conceptualization of self-efficacy varies. For instance, the model developed by Cabana et al. (1999), self-efficacy was identified as a barrier CPG adherence behaviour of the practitioners. The model developed by Posnanski, (2002) called professional development

model explained self-efficacy as an enabler and barrier of professional development. Fischer et al. (2016) expanded the model of Cabana et al. (1999) to include interventions that would explain how to remove unfavourable attitude towards CPG as a barrier. Zwerver et al. (2013) developed the Attitude, Social Norm, Self-Efficacy model (ASE model) which explained the physicians' behaviour about CPG adherence. These are some of the important theories that are widely used in the literature in explaining self-efficacy as a concept.

As far as the operationalization of the concept of self-efficacy is concerned literature shows contradictory findings. For instance, using the theoretical arguments of Bandura, (1977) and the model by Cabana et al. (1999), self-efficacy as well as motivation were considered as the subset of attitude along with lack of agreement, non-adherence to leading to a CPG-CDM gap. It is also important to note the contradictory views exist regarding empirical measurement of the construct self-efficacy. Although conceptualization and operationalization of self-efficacy in the literature is somewhat well established, some have cautioned about the possibility of self-efficacy beliefs in one context indirectly affecting those in another context. This gives rise to the possibility of error in judging the proper application of the concept of self-efficacy. Bandura, (2006) cautions that if perceived self-efficacy is not tailored properly to measure a particular object of interest, and then there is a possibility that the results obtained could be contentious. Considering the arguments of Van der Bijl and Shortridge-Baggett (2001) that in many instances it is possible that self-efficacy is considered as a temporary characteristic that is easy to influence and very specific to the happening and task on hand. These critical aspects must be considered while conceptualizing self-efficacy. Despite such tensions in conceptualizing self-efficacy, a statement of Bandura, (2006, p.319) which says, "The value of a psychological theory is judged not only by its explanatory and predictive power, but by its operational power to effect change" was very useful in many empirical studies in conceptualizing and operationalizing the concept of self-efficacy. Theories and models reviewed above provide a strong ground required to understand and operationalize self-efficacy as a concept in varying situations that involve the behavioural aspects of healthcare practitioners. Further, it can be seen that self-efficacy when operationalized as a barrier causing CPG-CDM gap then interventions could be used to tackle the barrier in reducing the gap. This aspect is discussed in detail under section 2.7.3.

2.5.6.3 Summary

In summary it can be seen that self-efficacy of PTs as a concept can act as a barrier in the integration process of CPG into CDM. It is also argued that this barrier could be dealt with interventions. In arriving at this inference, important theories, concepts and models have been reviewed and discussed critically. In addition, conceptualization and operationalization of self-efficacy as a barrier to CPG adherence or integration of CPG into CDM were critically reviewed. Thus, this section has provided a comprehensive review of self-efficacy as a concept that affects the CPG-CDM gap and proceeds to

the next section, review of motivation as an important construct that acts as a barrier to the integration of CPG into CDM.

2.5.7 Motivation as a barrier affecting CPG-CDM gap

Motivation is widely considered to be an important behavioural attribute of human beings. Motivation as a concept has been linked to the performance of people and the level of motivation vary amongst people as also their performance. In addition, motivation induces change in behaviour in human beings. An example of motivation affecting performance of PT can be taken as CPG adherence to improve patientcare; that might be perceived as a performance indicator and hence that could be considered as motivator inducing PTs to change their behaviour. While this example is somewhat simplistic, a hidden aspect in these examples is that the level of achievement of the result with regard to each PT could be different and the motivation levels also could be different. Such a variation may occur due to many reasons including factors affecting motivation (e.g. satisfaction) and motivation acting as a barrier (e.g. motivated to maintain existing clinical practice and not interested to introduce new CPGs). While it is commonly believed that motivation is a behavioural attribute that would enable human beings to perform, the same cannot be agreed as a general rule, because it is not clear why human beings behave differently due to changing motivation (NHS,2007). Especially when one deals with healthcare practitioners where there are a number of aspects that could affect motivation, interpretation of motivation and its conceptualization might be tricky. These arguments are applicable to even the integration of CPG into CDM of PTs as integration of CPG into CDM is considered to be affected by motivation of PTs. This aspect would be discussed in the next section.

2.5.7.1 Motivation of PTs to integrate CPG into CDM

Motivation as a factor could act as a barrier in translating CPG into CDM an argument that finds resonance in the literature (Ramirez –Velez et al. 2015; Silva et al. 2015; Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Gorgon, 2012; Salbach et al. 2007; Jette et al. 2003) and is not investigated well. For instance, it is known in practice and found in the literature that some PTs do not implement new CPGs or adopt improved versions of existing CPGs because they are motivated to adhere to the existing CPG and current clinical practice, due in part, the level of success they might have achieved and introducing a new CPG, might be considered to have the potential to disturb their well-settled practice. For instance, a recent qualitative study reports a quote from a physician as follows *"…we don't have to follow these guidelines. There may be many other issues to consider. We might be satisfied with the treatment that we already have, and not find the new treatment much better. It might even be more expensive. So, we don't have to put it into practice"* (Kristensen et al. 2016). In another instance, Hisham et al. (2016) reported that Physicians were 'comfortable' with their current practice and did not see a valid reason to change their current practice. The reason for this could be their motivation to retain existing patients and gain new patients

through the partial or complete success they have achieved through the current practices. In this situation motivation of healthcare practitioners to adhere to the current clinical practices could be a barrier to integrate new CPGs or updated version of CPGs into practice. The question that could be raised is that whether the motivation of PTs to adhere to current clinical practices should be considered as a barrier and allowed to change using interventions or not? Similar dilemma could be witnessed in the case of a PT who is well experienced and interested to integrate the latest CPG into CDM but fails to do so because the PT is guided by his or her experience and motivated to conclude that the latest CPG is not good enough to be integrated into CDM. Here again it may be appropriate to ask whether there is a need to use interventions to change the behaviour of the PT. It is also not known about the most appropriate intervention that could help to remove the motivation barriers. These are important gaps in the literature as literature is silent on these aspects. In order to gain knowledge on these issues it was necessary to understand the concept of motivation and review how this concept has been operationalized in the literature as a barrier.

2.5.7.2 Conceptualization and operationalization of motivation as a barrier to integration of CPG into CDM

Conceptualization and operationalization of motivation as a barrier in the literature vary. Some have conceptualized motivation as a barrier at healthcare professionals level hindering CPG integration in clinical practice (e.g. Clark et al. 2017) while some others have identified motivation as a barrier to the integration of CPGs from the patient's perspective (Urias-Bodnar, 2017). Outside the healthcare domain, motivation has been conceptualized as a predictor of performance of human beings working in organizations (Ferreira, 2017) while some others have argued that it is determined by such factors as individual characteristics, cultural factors and organizational and work contexts (Franco et al. 2002). Furthermore, motivation has been described in several ways including intrinsic motivation, extrinsic motivation, reflective motivation and automatic motivation (Ferreira 2017; Clark et al. 2014, Guay et al. 2000). For instance, Wilson and Cleary, (1995) argued that personal motivation is a personal characteristic of a practitioner that affects the functional status which in turn affects the overall quality of patient management. Echoing similar sentiments, TDF as the behaviour change framework proposed by Michie et al. (2011) suggests that motivation of the practitioner is essential to generate a clinical practice behaviour change.

While empirical studies that have operationalized the concept of motivation as a barrier are limited, some definitions of motivation were considered useful to conceptualize and operationalize motivation as a barrier. Motivation is considered to be representing the reasons for a specific behaviour (Guay et al. 2010, p. 712) that moves the person either to engage in or not to engage in something. Further, intrinsic motivation is defined by Lai, (2011) (also see Deci et al. 1999) as something that is animated by someone's personal interest, enjoyment, or pleasure. In contrast extrinsic motivation is defined as

motivation governed by reinforcement contingencies. Lai, (2011) further argues that motivation could involve such aspects as a set of perceptions, beliefs, interests, values, and actions that are closely related because of which those aspects that lead to motivation could concentrate on cognitive behaviour (such as monitoring and strategy use), non-cognitive aspects (such as perceptions, beliefs, and attitudes), or both. The various definitions of motivation point that it is a behavioural aspect and is concerned with a variety of aspects including the attribute of a person to do or not to do something, as perception, belief and attitude and as a phenomenon that is driven by personal enjoyment, interest, or pleasure. NHS, (2007) argues that motivation is the basic aspect that affects nearly everything a person does. In addition, it is argued that motivation can be driven by external factors (e.g. incentives or penalties) and internal factors (e.g. self-motivation, drive and ambition to improve). It is also argued that intentions, goals, priorities of people and commitments may motivate people or act as barriers to motivation resulting in change in behaviour or lack of it (NHS, 2007).

Many of these definitions could be used to understand the concept of motivation as a barrier for PTs to integrate CPG into CDM. For instance, in Table 2.7 it can be seen that the recommendation 11 of the CPG for VTE of PT, lack of collaborative decision making could be a barrier to motivation which is supported by the definition of motivation which indicates that it is a behavioural aspect related to perception or belief or attitude. An example of a possible situation that could occur is expected to demonstrate how lack of collaborative decision making, a behavioural and management factor, could be a motivation barrier. In the example that follows it must be highlighted that there is interplay of management, behaviour and medical aspects. While the intention of the researcher is to demonstrate how patientcare management and PT behavioural aspects are acting as motivation barriers affecting the CPG-CDM gap with respect to the integration of CPG for VTE in PT, medical knowledge intertwined with the explanation should not be misconstrued as essential to the demonstration. Table 2.7 is an example of a recommendation in CPG for VTE in PT, motivation as possible barrier and the effect on CDM.

Table 2.7 Illustration of a recommendation in CPG for VTE in PT, motivation as possible barrier and the effect on CDM

CPG for VTE Recommendation	Key concepts	Barrier at the practitioner level	Examples of studies supporting the presence of barrier	Affected CDM component
"When a patient with a documented LE DVT below the knee is not treated with anticoagulation and does not have an IVC filter and is prescribed out of bed mobility by the physician, the PT should consult with the medical team regarding mobilizing versus keeping the patient on bed rest". (Recommendation 11) (Hillegass et al. 2015).	Consulting with the medical team when a patient is not on anticoagulants and without an IVC filter	Motivation to provide the best patient care Motivation to be part of collaborative decision making	Ramirez –Velez et al. 2015; Silva et al. 2015; Bernhardsson et al. 2014; Salbach et al. 2007; Jette et al. 2003.	Collaborative decision making

Analysis of the recommendation number 11 of the CPG in Table 2.7 shows that, when LE DVT is already diagnosed, then there could be some specific aspects of patient care other than the one usually adopted in practice. That is, the usual practice for treating LE DVT in patientcare management is using anticoagulants and inferior vena cava filter. If the patient is not managed in this way, then the PT will have dilemma in choosing the option of mobilization versus bed rest considering the complications that could arise from either choice. But there is no consensus in the healthcare management literature on how to manage this situation by employing either mobilization or bed rest. In fact, the decision making by PTs is found to vary in practice with some opting for patient mobilization while some others opting for bed rest. This variation in decision making could occur due to specific clinical situations. When encountered with such uncertainty the patientcare management team is expected to engage in a collaborative decision making, the unique clinical situation and the patient characteristics. In this situation, PTs as members of the interdisciplinary patientcare team are expected to engage in discussions with the team members to decide whether to encourage mobility or to keep the patient confined to bed in order reduce further the complications. If collaborative decision-making support is not availed by the PT, then it could be argued that the PT is facing a motivation barrier in integrating the CPG into CDM. In this case the CPG-CDM gap will be wider due to the motivation barrier for instance lack of initiative on the part of the PT to reach out to the rest of the team who could help in decision making through collaboration. This example implies that motivation barriers can stop PTs from changing their behaviour in integrating CPG for VTE in PT in CDM. In addition, there is an argument that the practitioner has the prerogative to decide whether to integrate or not to integrate research knowledge including CPG in their clinical practice if such integration is not mandated by the profession (Salbach et al. 2010). In the absence of a mandatory requirement for practitioners to integrate CPG into practice, the question that arises is that what factors act as motivators or motivation barriers for the practitioners to integrate CPG in their practice.

Empirical investigations quantitatively measuring motivation as a construct in the context of CPG integration are only few. Jette et al. (2003) measured motivation in the context of EBP, although that instrument does not measure CPG integration comprehensively. Similarly, Quiros et al. (2007) measured motivation of ICU Personnel towards CPG using a 5-point Likert scale. Generally, instruments measuring motivation are adopted for healthcare research. For instance, Guay et al. (2000) developed an inventory called 'Situational Motivational scale' that can be used to measure the construct 'motivation'. The foregoing arguments lead to the inference that it is worth investigating the role of motivation or the lack of it as a barrier affecting the CPG – CDM gap and find out how the gap could be narrowed by suitably operationalizing motivation as a concept. In doing so it is essential to take the help of theories. There are different theories found in the literature that could help in grounding the concept of motivation barrier of PTs and operationalize it.

2.5.7.3 Theories, models and concepts that support the operationalization of motivation as a barrier

Generally, it is believed that motivation is not easy to explain and difficult to quantify. But there are a host of theories that can be used to ground motivation as a concept and explain how it can be operationalized as a barrier. For instance, motivation has been explained in contrasting ways for instance positive versus negative motivation, intrinsic versus extrinsic motivation and basic versus learned (Ball, 2012). Examples of the contrasting or polarized nature of motivation are provided in Table 2.8.

Table 2.8 Polarised nature of motivation (Source: Ball, 2012)

No.	Type of motivation	Explanation
1	Positive	Impelling one to reach a certain goal.
2	Negative	Driving one away from an unwanted situation.
3	Intrinsic	There is internal motivation, or push. It's an internal state that impels one to act towards achieving a certain goal.
4	Extrinsic	There is external motivation or pull. It's when an external goal influences one's behaviour towards them. Behaviour is a complex blend of internal pushes and external pulls.
5	Basic	Basic or primary motives are unlearned and common to both animals and humans. We're talking hunger, thirst, sex, avoidance of pain, and perhaps aggression and fear.
6	Learned	The learned or secondary motives include achievement, power, recognition and love.

While Table 2.8 shows that the concept of motivation can be viewed as a polarized phenomenon, many other theories that have been postulated in the literature explain the concept differently. For instance, self-determination theory argues that motivation is a concept made of multiple dimensions and different behaviours are driven by different types of motivation (Gagné & Deci, 2005). On the other hand, Vroom's Expectancy theory states that there is a mathematical relationship that indicates motivation of a person can be related to performance in a particular situation, but it depends on expectancy, instrumentality and valence (Vroom, 1964). Here expectancy indicates perceived probability of achieving a certain performance depends on exertion of certain amount of effort, instrumentality refers to the assumption that a certain level of performance will lead to a preferred outcome and valence indicates probability that others will value such an outcome (Vroom, 1964).

One of the widely used theories to explain CPG adherence include Theory of planned behaviour (Kortteisto et al. 2010; Ceccato et al. 2007). It appears application of a theory or more than one theory to explain motivation barriers may depend upon a given situation and researchers have to understand the situation carefully before choosing a particular theory or specific theories to explain the phenomenon. However, what is clear is that motivation or the lack of it or motivation barriers can be related to performance outcomes of PTs. For instance, integration of CPG for VTE in CDM indicating an influence on the performance outcomes that may either be positively or negatively influenced by what dimension of motivation affects the PT. Further, it is worth investigating the role of motivation

in the CPG- CDM gap and what interventions could be of use in achieving the integration of CPG into CDM to bridge the gap. A more detailed discussion on the interventions is provided under section 2.7.3.

2.5.7.4 Summary

The previous section has provided a comprehensive review of the literature on motivation as a concept that could be a barrier or other aspects that act as barriers to motivation of healthcare professionals in integrating CPG into CDM and affecting the CPG-CDM gap. The review shows that motivation as a barrier, the lack of it and demotivation have been reported in the literature as contributing to the CPG-CDM gap. Conceptualization and operationalization of the concept of motivation and motivation barriers were not well established particularly in the context of the integration of CPG into CDM and there is a strong requirement to conduct further investigations to determine how and to what extent motivation and motivation barriers affect the CPG-CDM gap. After discussing the concept of motivation and motivation barriers, the review proceeds to the next section of review of interventions that could be used to remove barriers to the integration of CPG into CDM and narrow the CPG-CDM gap.

2.6 Bridging the research-practice gap or CPG-CDM Gap

One of the strategies suggested in the literature is the usefulness of knowledge translation (KT) to address the R-P gap although not much is known about role of KT in bridging the CPG-CDM gap. Despite the existence of the R-P gap, the number of empirical and experimental studies that addressed this gap in the field of PTs is far and few (Nilsen, 2015). For instance, a systematic review by Jones et al. (2014) shows that the number of high quality studies conducted nearly for a decade, (2005 - 2014) in the context of PT were limited, indicating the dearth of research outcomes in this area. The World Health Organization (WHO) recommends that ‘‘stronger emphasis should be placed on translating knowledge into action to improve public health by bridging the gap of what is known and what is actually done’’ (WHO, 2004, p. V cited by Wallin, 2009). Van Tassel, (2012) argues that CPGs need to be considered as gold standard in clinical practice, to reduce medical errors and reduction of healthcare cost. In this situation it can be seen that some researchers KT appears to be promising in bridging the R-P gap and could act as the foundation for conducting further study (Curtis et al. 2017; Fischer et al. 2016; Vander Schaaf et al. 2015). One mechanism by which KT have been argued to affect the barriers (e.g. knowledge of PTs about CPG, attitude, self-efficacy of PTs, motivation of PTs to integrate CPG in CDM) leading to CPG-CDM gap and those arguments provide some support for using KT as a mechanism to bridge the CPG-CDM gap in this research. KT as an emerging concept attracted the attention of researchers and many research papers have called for conducting further studies in this area with a focus on PTs. Any new knowledge gained in this area has the potential to identify a mechanism to minimize or bridge the CPG-CDM gap. In order to understand this aspect this

research focusses on KT as a concept to determine how the barriers could be understood and to recommend ways to remove them or reduce their effect to bridge the CPG-CDM gap. Taking into the above arguments the next section provides critical discussions on KT as a mechanism by which R-P gap could be addressed.

2.7 Knowledge Translation (KT)

Knowledge translation is identified as a process that facilitates the integration of research knowledge into clinical practice (Curtis et al. 2017). Several mechanisms are traditionally being used, across healthcare disciplines to facilitate the uptake and utilization of research knowledge in clinical practice including: continuing medical education (CME) activities; conferences; seminars; online courses and many others to upgrade their knowledge and professional competence. Generally, several opportunities are offered to the practitioner and each one is competing to capture the attention of the practitioners (Koutsavlis & Bergeron, P. 2001). Although widely used, several of these activities are criticized for their ability to improve the competence of the practitioner and to bring out behaviour changes in the practitioner. Further, many of these activities have not been successful in achieving integration of research knowledge including CPGs into actual clinical practice (Stander et al. 2018; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013; Scott et al. 2012). It is a challenging situation for the practitioner to select the activities that could actually contribute to professional development and thereby improvement of patient outcome, as no guidance or a specific criterion for selecting this activity are available currently. However, one area that is promising to deal with the problem of lack of integration of research knowledge appears to be the use of Knowledge translation (KT) which has wider dimensions than attendance traditional CME activities. KT intervention studies in the field of PT were first reported in 1999 (Stander et al. 2018) and thus there are only limited studies available in the literature. However, KT as an emerging concept has promising potential to support the integration of CPG into CDM and any new knowledge achieved through further study of KT process of CPG into CDM could help the PTs, in their professional practice and thereby enhancing the patientcare.

2.7.1 Knowledge Translation in healthcare

The term Knowledge translation or KT was introduced by the Canadian Institute for Health Research (CIHR) and according to CIHR, (2016), KT as "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically-sound application of knowledge to improve health, provides more effective health services". The use of KT is gaining momentum across healthcare disciplines and is synonymously being used with terms like research utilization, research dissemination, research uptake, knowledge to action etc. in different parts of the world (Curtis et al. 2017; Shea, 2011). KT is viewed as an important concept that could help to understand, how patient care could be enhanced yet, its application in many areas of healthcare is beset with problems. Even

though it has been posited in the literature that KT can help to improve integration of research knowledge to clinical practice, how this happens in actual practice is not clear. However, several KT models that are emerging seem to have the potential to explain and support KT of research knowledge. For instance, Promoting Action on Research Implementation in Health Services (PARiHS) framework (Kitson et al. 1998), Ottawa Model of Research Use (OMRU) framework (Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b; Hogan, & Logan, 2004), The Knowledge to Action (KTA) framework (Graham et al. 2006), Framework for Research Dissemination and Utilization (RD&U) (Dobbins et al. 2002) and Consolidated Framework For Implementation Research (CFIR) (Damschroder et al. 2009), are some of the available frameworks or models in the field of KT that promise to provide a way to understand KT process of integration of research knowledge into clinical practice. However, researchers argue that it is not clear and conclusive how KT as a mechanism could be used to address the CPG-CDM gap and there is a need to know how the concept of KT could be successfully employed in overcoming the barriers responsible for CPG-CDM gap.

2.7.2 KT – is it a potential solution to bridge CPG-CDM gap?

Different KT models and frameworks have several components that need to be understood if the concept of KT is to be studied. For instance, Ottawa model of research utilization or OMRU (Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b; Hogan, & Logan, 2004) view KT as a process and show promise to support the integration of research knowledge into clinical practice. OMRU model has several components integrated in the model including innovation (e.g. CPG), potential adopters (e.g. characteristics of the practitioner), interventions (e.g. dissemination, implementation) and outcomes (e.g. improved knowledge, change in practice behaviour, compliance). Amongst these components, knowledge translation interventions (KTIs) and their impact on the process of KT is not clear and knowledge about the operationalization of KTIs is limited and lack clarity (Stander et al. 2018; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Squires et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013; Scott et al. 2012; Grimshaw, 2012; Bhattacharyya, 2009; Menon et al. 2009; Forsetlund, 2009; Farmer, 2008). Similarly, three other factors that need to be considered in the KT process are CPG as research knowledge that needs to be translated, potential adopters (e.g. practitioner level factors termed as barriers) and the outcome of the KT process (e.g. change in clinical practice behaviour or CDM behaviour). When KT process is considered in the context of PT, there is a complex interaction amongst these four components namely CPG, barriers, interventions (KTIs) and outcomes (CDM). For instance, if one takes the example of CPG as the research knowledge component that needs to be translated to clinical practice, then the very concept of CPG is shown to be a complex phenomenon as it is difficult to be conceptualized. The complexity arises because of the characteristics built into CPG which are by nature complex. For instance, CPGs have been characterized by such aspects as compatibility, complexity, trialability,

observability and relative advantage (Chaudoir et al. 2013; Atkinson, 2007; Davis et al. 1997; Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b). These are complex aspects that cannot be easily explained or understood in the KT process of CPG. These aspects affect the barriers that exist at the practitioner level and could hinder the change in practice behaviour of those practitioners in the process of integrating the CPG in CDM which is the KT process.

Finally, as a process KT involves some factors, already identified as barriers in the preceding sections, that comes into play during the integration of research knowledge into clinical practice which has the potential to affect the process by hindering the translation of knowledge, reasons for which are yet to be conclusively established. In addition, when the concept of Knowledge translation interventions (KTIs) is brought in as part of the process to enable translation of knowledge through the process, then the interaction between the KTIs and the KT process in presence of those barriers leads to a complex phenomenon not easy to explain. Thus, there is a need to understand how CPG as research knowledge component, CDM behaviour of the practitioner as KT outcome component, and the barriers that come into play during the translation phase of the knowledge and the role of KTIs in the KT process are related. Any investigation that undertakes a holistic study of how these aspects function together in the KT process of CPG into CDM is expected provide knowledge on how to simplify the complex process to enable an effective integration of the CPG in clinical practice to bridge the CPG-CDM gap. While the CPG-CDM gap has been discussed above (see section2.3.3.) and the barriers that could come to play during the KT process have already been reviewed in section 2.5.3. The other components of KT process namely KTIs and KT outcomes are discussed in next sections.

2.7.3 Knowledge translation interventions (KTIs)

Definition of interventions varies, and such a variation is attributed to contexts (see Table 2.9).

Table 2.9 Definitions of Knowledge translation of interventions (KTIs)

No.	Definition of intervention	Authors
1.	"Interventions designed to bring about changes in healthcare organizations, the behaviour of healthcare professionals or the use of health services by healthcare recipients"	EPOC (2015) p, 9
2.	Educational intervention is "any strategy, program or manoeuvre intended to persuade physicians to change their performance and maintain their competence"	Davis et al. (1997) p. 410)
3	"A KT intervention is one which facilitates the uptake of research into practice and/or policy and can also be referred to as research utilization".	Tricco et al. (2015), p.2
4	"KT intervention" as the process of intervening on people, groups, entities or objects in an experimental study in order to translate evidence about improved healthcare knowledge, behaviour change or patient wellbeing, i.e., KT interventions that were relevant to improving decision making processes.	Légaré et al. (2016), p.4

The definitions vary and lack uniformity. However, the common feature that could be seen in all of them is the emphasis on a change in behaviour of the practitioner or performance of the practitioner influenced by the interventions. Researchers (Stander et al. 2018; Curtis et al. 2017; Scurlock-Evans

et al. 2014; Hudon et al. 2015; Menon et al. 2009) claim that interventions that are intended to facilitate the use of research knowledge in clinical practice should consider the factors that can affect the change in practice behaviour of the clinician. Those factors that affect the behaviour change of the practitioners are already being identified (see section 2.5.3.) and this research focuses only four factors namely knowledge, attitude, self-efficacy and motivation of the practitioner. Taking the outcomes of KT studies found in the literature, the forthcoming section discusses the important aspects that concern KTIs including the types, their choice, theoretical underpinnings in relation to KT of CPG into CDM.

There is some consensus among researchers that interventions are essential part of translation of research knowledge into clinical practice (Stander et al. 2018; Curtis et al. 2017; Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b; Iles & Davidson, 2006; Jette et al. 2003; Salbach et al. 2007) in bridging the research-practice gap. Although there is some variation could be seen about KTI strategies; diffusion, dissemination and implementation are commonly being used in the KT studies particularly with reference to CPGs. Diffusion refers to a natural process of 'distributing the information' and the unaided adoption of those policies and practices by the practitioners (Davis & Taylor-Vaisey, 1997). Diffusion is intended for distributing the research knowledge to the recipients (Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b) and usually does not consider the impact of such information sharing on the practitioner behaviour or patient outcome. 'Dissemination' as a KT strategy refers to communicating the information to the practitioners to enhance their knowledge or skills; and is considered more active compared to 'diffusion' (Davis &Taylor-Vaisey, 1997). Further, dissemination strategy targets a specific clinical audience. The major difference between diffusion and dissemination is in the nature of the former being 'passive' and latter being an 'active' process and dissemination has clear targets such as specific clinician groups. Although some of the KT studies (e.g. Bekkering et al. 2005a, 2005b) used dissemination as a KT strategy in the context of PT, there are arguments that complex research outcomes including CPGs cannot be fully translated by diffusion and dissemination as intervention and may require active implementation intervention strategies (Bhattacharyya et al. 2011; Davis & Davis, 2010).

'Implementation' as KT strategy, is considered as putting a CPG in place, that is more active than dissemination and implementation requires effective communication strategies as well as techniques to overcome the barriers. The techniques can be administrative as well as educational ones that are already demonstrated to be effective in clinical practice setting (Davis & Taylor-Vaisey, 1997). There are several types of implementation intervention strategies to support the KT process, and different interventions can target different audience (Davis & Davis, 2010). For instance, use of educational materials, formal educational activities, reminders, use of local opinion leaders, audit and feedback as

well as outreach visits can be targeting the healthcare professional, (Grimshaw et al. 2012), whereas policy changes, incentives, leadership may be targeted towards the organizations (Davis & Davis, 2010). Due to the wide variation of terminologies used to represent intervention, there were efforts to provide classifications to bring in some clarity to the concept of interventions. Davis et al. (1997) classified KTIs into four types namely traditional Continuing medical education (CME), community-based interventions, and practice-based interventions and multiple intervention strategies. EPOC taxonomy (2015) is another classification of interventions into categories as provider-based intervention and patient mediated interventions. Examples of practitioner oriented EPOC interventions include educational meetings, educational materials, audit and feedback, educational outreach visits and opinion leaders. Although, some overlap could be seen amongst the widely followed classifications of interventions, that might lead to some confusion regarding what could be regarded as a KTI and the classification of KTIs. Despite such confusion and conflicting views, it can be seen that many types of KTIs have been varyingly deployed in the process of KT.

Although several mechanisms are suggested as implementation interventions to facilitate the integration of research knowledge in clinical practice, there are several inadequacies in the current knowledge and understanding of these KTIs as knowledge about KTIs is still emerging. Although KTIs are found to be useful in KT process but there is no clarity in the literature regarding the aspects how the KTIs operate, how to identify a KTI, what are the differences in the KTIs, to what extent those KTIs support translation of knowledge, do they remove barriers to KT, do they support facilitators of KT and above all in the field of PT what has been done to understand, identify and implement KTIs in the knowledge translation process of CPG to CDM. In addition, at the theoretical level, there is a lack of knowledge on what theories could be applied to understand and explain KTIs as concepts and how those KTIs could be operationalized. While there are studies that provide some answers to the questions raised above, much remains to be understood. Using the outcome of some of the studies, it was found that specific KTIs could be identified, described, operationalized and examined. Particularly in the field of PT there is confusion about the concept of KTIs and their role and purpose in the KT process of research knowledge into CDM behaviour of PTs. The next section is an attempt to understand KTIs in detail.

2.7.3.1 Single and multicomponent KTIs

At this point, it is necessary to introduce, the concept of classification of the KTIs under two categories namely, single component and multicomponent (also referred to as multifaceted) interventions. While, it is widely recognized that there is a need for interventions to change the behaviour of practitioners, including PTs, (Stander et al. 2018; Squires et al. 2014; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013; Scott et al. 2012); there are doubts raised in the literature, about what interventions are to be considered as single

or multicomponent (Eldh & Wallin, 2016). According to Squires et al. (2014) single component KTIs can address only one of the many barriers to KT and help to overcome that specific barrier. Examples of single component interventions include education material, education meeting and opinion leaders (EPOC, 2015; Davis et al. 1997). However, there is criticism that the concept of single and multicomponent KTIs itself is not clear and it is not easy to recognize interventions as single or multicomponent in most of the published studies. There are arguments that the classification itself, might have categorized the interventions without any basis (Squires et al. 2014). Further, there are questions that a single component KTI can indeed be a multicomponent one, and the distinction is not clear (Eldh & Wallin, 2016). Further, there are studies that have used single KTI to address multiple barriers, contradicting the view of Squires et al. (2014). There is no clarity in regard to the concept of single and multicomponent KTIs; more research is required to achieve better clarity to regarding the effect of a single component KTI. Further, the effect of a single component KTI on barrier and the impact on the changing the behaviour of the practitioner is a major area that is not understood well. Research on single component interventions is found to be sporadic and the component itself requires a deeper understanding to gain knowledge about its effectiveness in addressing the barriers.

On the contrary, multicomponent intervention is described as a combination of two or more single KTIs that could address multiple barriers simultaneously in changing the behaviour of the practitioners (Squires et al. 2014). The study by Bekkering et al. (2005a, 2005b) used dissemination of educational material and interactive educational meetings to achieve translation of CPG for back pain to clinical practice in the context of PTs in Netherlands. Likewise, Rebbeck et al. (2006) used interactive educational meetings, opinion leaders, audit and feedback in the KT process of CPG for acute whiplash injuries. Similarly, Campbell et al. (2013) used an evidence alert system, opportunities to receive financial incentives, organizational change, customized and personalized interventions are part of a multicomponent KTI strategy. While the research interests on multicomponent interventions are seen to be widespread, conceptually multicomponent interventions do not seem to be well understood. Another important point is that researchers are not clear about the effectiveness of multicomponent interventions (Stander et al. 2018; Hudon et al. 2015; Jones et al. 2014; Bernhardsson et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013). Adding to this is the confusion about what could be called multicomponent intervention because some have expressed the opinion that a single component intervention could also be considered multicomponent intervention under certain circumstances which makes it difficult to clearly conceptualize the multicomponent interventions.

2.7.3.2 Effectiveness of KTI strategy

There is an ongoing debate regarding the effectiveness of KTI strategies. One of the earliest systematic reviews by Grimshaw et al. (2004) pointed out that the effectiveness of KTIs namely,

educational materials (8.1%), educational outreach (6.0%) and audit and feedback (7%) were small to moderate when used as single component KTI or as part of a multicomponent KTI strategy. Similarly, Forsetlund et al. (2009) pointed out that KTIs have some effect on clinical practice, but that effect tends to be small to moderate in bridging the research-practice gap. Davis & Davis, (2010) reported that the overall effectiveness of several of KTIs seems to lie in a continuum ranging from small to moderate effect. Recent studies also agree that most of the interventions and strategies for KT have small to moderate effects (Stander et al. 2018; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013; Scott et al. 2012). Thus, these findings confirm that KTIs have some effect (Davies et al. 1997; Davis & Davis, 2010; Grol & Grimshaw, 2003), although there is a major issue regarding lack of conclusive evidence on the effectiveness of the interventions (Bhattacharyya, 2009; Jamtvedt. 2005; Farmer, 2008; Menon et al. 2009; Forsetlund, 2009; Grimshaw, 2006). Current knowledge and understanding about the effectiveness of the KTIs is limited and requires further study. Knowledge about single and multicomponent KTIs when compared could yield information about their effectiveness in dealing with barriers to change practice behaviour which in turn could be useful in addressing the barriers encountered by PTs. Thus, the next section discusses the effectiveness of the two types of KTIs.

2.7.3.3 Effectiveness of single Vs multicomponent KTI strategy

In earlier sections it was shown that there is lack of consensus regarding the effectiveness of single versus multicomponent KTIs. Squires et al. (2014) argue that a common assumption that is prevalent amongst researchers is that multicomponent KTI strategy would be better compared to single component KTI. However, Squires et al. (2014) argue that when multiple barriers are hindering the KT process, multicomponent KTI would be better to address those multiple barriers simultaneously; an argument supported by many researchers (Stander et al. 2018; Nilsen. 2015; Bernhardsson et al. 2014; Campbell et al. 2013). Bekkering et al. (2005a, 2005b) concluded that there were advantages of using a multicomponent active strategy compared to single component strategy (emailing the CPG) for PT management of back pain and passive strategies are generally not recommended for CPG implementation. In contradiction to the above argument, a systematic review by Grimshaw et al. (2004) that was one of the first studies that evaluated the effectiveness of multicomponent KTIs in changing healthcare professional's behaviour; concluded that multicomponent KTIs are not necessarily more effective than single-component interventions. Likewise, French et al. (2010, cited in Squires, 2014) argued that adding more components into a multicomponent intervention does not result in proportionate increase in effectiveness of KT. Thus, there is no sufficient and conclusive evidence to support a claim that multicomponent interventions are more effective than single component interventions.

Although, the last two decades witnessed the exponential increase in the KT studies; there is lack of conclusive evidence about the KTI effectiveness remains as a challenge. For instance, Squires et al. (2014) compared effectiveness of single-component KTIs and multicomponent KTIs and reported that there is no clear evidence that multicomponent interventions are more effective than single-component interventions. A review by Argyriou et al. (2015) reported that amongst the five randomized controlled trials (RCTs) included in the review, only one RCT by Kok et al. (2013) demonstrated that multicomponent KTIs improved the knowledge, skills and efficacy of the physicians. Likewise, Suman et al. (2015) argue that multicomponent KTI strategies for the implementation of CPGs for neck and/or back pain, did not significantly improve professional behaviour outcomes. Thus, there is no compelling evidence to support the argument that multicomponent strategies being superior to single component strategies in changing practitioner behaviour although multicomponent KTIs find favour. Interestingly, Squires et al. (2014) reported that one of the studies (Shojania et al. 2009) showed that single component KTIs was more effective than multicomponent KTIs among the physicians. Chan et al. (2017) emphasize on the need to conduct further investigation to evaluate the effectiveness of KTIs, specifically investigating the implementation of CPGs. Table 2.10 provides an overview of variety of KT studies using multicomponent KTI strategy in the context of PT.

Table 2.10 Studies in PT using multicomponent KTI strategy from 1999-2017 (Sources: Jones et al. (2014); Menon et al. (2009); Campbell et al. (2013); Bernhardsson et al. (2014); Dizon et al. (2014b); Tilson et al. (2014); Schreiber et al. (2014); Brennan et al. (2006); Cleland et al. (2016)

Studies using multicomponent KTIs in Physical therapy																															
Author/s	**Interventions based on EPOC (2015) taxonomy**																				**Interventions other than EPOC**										
	Educational Materials	**Educational Meetings**	**Opinion leaders**	**Audit & feedback**	**Clinical guidelines**	**Educational outreach**	**Reminders**	**Tailored intervention**	**Communities of Practice**	**Critical incident reporting**	**Monitoring Performance**	**Cont. Quality improvement**	**Educational games**	**Inter professional education**	**Local consensus**	**Managerial supervision**	**Patient mediated interventions**	**Performance data**	**Patient reported Outcomes**	**Knowledge broker**	**Website/ Online support**	**Mentoring**	**Leadership**	**Clinical decision support system**	**Newsletters**	**Teleconference**	**Clinical improvement project**	**Journal club**	**Peer assessment**	**Virtual reality**
Kerssens et al. (1999)		✓																													
Bekkering et al. (2005 b)	✓	✓			✓		✓																								
Brown et al. (2005)	✓		✓			✓																			✓						
Hoeijenbos et al. (2005)	✓	✓																													
Brennan et al. (2006)		✓																								✓					
Rebbek et al. (2006)	✓	✓	✓		✓	✓																									
Stevenson et al. (2006)	✓	✓	✓																												
Nikopoulou-Smyrni and Nikopoulos, (2007)		✓					✓																								
Ketelaar et al. (2008)	✓	✓																			✓										
Gross and Lowe, (2009)	✓	✓	✓																												
Schreiber et al. (2009)	✓	✓																													
Russell et al. (2010)	✓	✓																		✓											
Fruth et al. (2010)		✓																													
Willet et al. (2011)	✓	✓																			✓										
Demmelmaeir et al. (2012)	✓	✓		✓				✓																							
Schreiber and Dole, (2012)		✓																			✓										
Lizarondo et al. (2012)																												✓			
Rutten et al. (2013)												✓																			
Verhoef et al. (2004)	✓	✓													✓										✓						
Beggs et al. (1997)	✓	✓													✓											✓	✓				
Campbell et al. (2013)	✓	✓			✓		✓	✓												✓	✓	✓									
Rebbek et al. (2013)		✓	✓																												
Bernhardsson et al. (2014)	✓	✓			✓		✓	✓													✓										
Dizon et al. (2014b)	✓	✓																			✓										
Tilson et al. (2014)	✓	✓																			✓		✓								
Maas et al. (2015)		✓							✓		✓																		✓		
Schreiber et al. (2015)	✓	✓																		✓	✓			✓							
Swinkels et al. (2015)	✓	✓																													
Cleland et al. (2016)		✓				✓																									
Hurtubise et al. (2016)																				✓											
Levac et al. (2016)																															✓
Camden et al. (2017)		✓							✓																						
Babatunde et al. (2017)	✓	✓																			✓										
Ferreira, (2017)		✓		✓																											

Till date, the research outcomes produced regarding the role of KTIs in the KT process of CPG into CDM are far and few in the field of PT and are inconclusive (Stander et al. 2018; Vander Schaaf et al. 2015; Nilsen and Bernhardsson, 2013; Scott et al. 2012). While at the conceptual level, both single and multicomponent KTIs are under researched areas and the available researches focus more on multicomponent interventions. Furthermore, hardly any comparison between the two is easily available in the literature. Despite the lack of conclusive evidence regarding the effectiveness of a multicomponent KTI strategy, most of the KT studies in the context of PT were using multicomponent KT strategies.

The discussion up to now have sought to highlight the existence of the CPG-CDM gap, (schematically represented in figure 2.3) arguably caused by barriers to change in the behaviour of PTs for instance knowledge, attitude, motivation and self-efficacy (see discussions under section 2.5.3.) and some possible remedy to narrow the gap by the use of interventions (see discussions above). What is known is that the barriers could lead to a CPG-CDM gap (figure 2.4) as PTs are affected by those barriers, exhibited in their behaviour of not adapting CPG, but what is not known is how to reduce the effect of those barriers especially using interventions. There are possible ways by which this could be achieved that is reducing the effect of barriers on the CPG-CDM gap leading to behavioural change of PTs by using interventions is provided in Figures 2.5.

Figure 2.3 CPG-CDM gap

Figure 2.4 Barriers leading to CPG-CDM gap

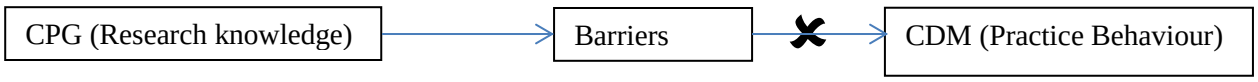


Figure 2.5 Intervention targeting the barriers to achieve KT to bridge the CPG-CDM gap

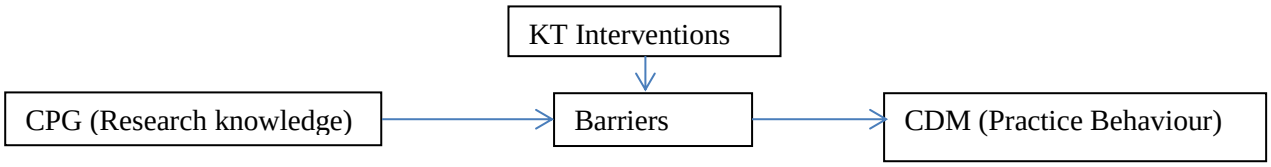


Figure 2.6 Representation of the effect of single component KT intervention targeting the barriers to bridge the CPG-CDM gap (for comparing the effectiveness)

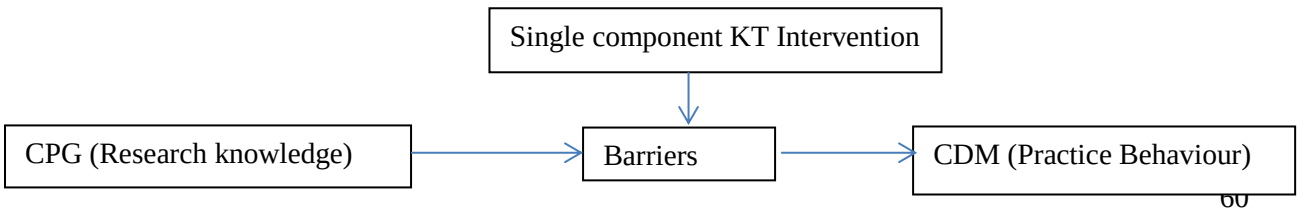
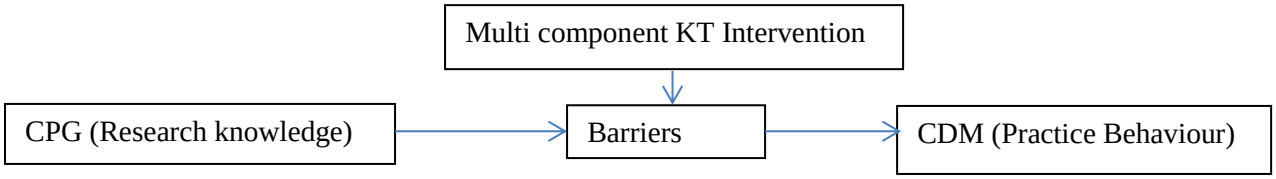


Figure 2.7 Representation of the effect of multi component KT intervention targeting the barriers to bridge the CPG-CDM gap (for comparing the effectiveness)



In Figure 2.6 and figure 2.7 it can be seen two interventions namely single component KT intervention and multicomponent KT intervention have been depicted to show how those interventions could act on the barriers. The effectiveness of the interventions if known could uncover knowledge about the impact of the interventions on the barriers and resulting change in behaviour of the PTs in CDM leading to reduction in CPG-CDM gap. This is a gap in the literature. Thus, the next section explain some KTIs that can be used in this research as single component and multicomponent KTIs with the rationale for the selection.

2.7.4 Discussion on some KTIs that could address barriers to bridge the CPG-CDM gap

Different KTI strategies might be required depending on the specific barriers that the KTIs are going to target, for instance KTIs that are capable of targeting the practitioner level barriers might not be useful to deal with barriers at other levels. Since, the focus of this research is individual practitioner; KTIs were chosen accordingly that are suitable to address the identified barriers namely, knowledge, attitude, self-efficacy and motivation (see section 2.5.3.) that affect the behaviour change of the practitioners. Although there could be many KTIs that could be used to address the barriers only Educational material (EM) and Virtual Communities of Practice (VCoP.) and Knowledge broker (KB) have been chosen for review in this research. The reason for this is that EM is found to be one of the most commonly used KTI (see Table 2.10) while VCoP has hardly been used to study the KT process in the context of PTs (see Table 2.10) and several studies support the role of KB in KT studies. In fact, the choice of EM, VCoP and KB provide a contrasting situation in which EM is seen to be widely used and KB is moderately effective and hence could be considered to have been reasonably established in understanding the KT process whereas VCoP is yet to be fully understood.

2.7.4.1 Educational material (EM) as a KTI strategy

The interventions used in the studies listed in Table 2.10 are generally multicomponent and some KTIs are frequently being used in many researches. For instance, educational material (EM) is consistently being used in almost all studies as a component of a multicomponent KTI strategy. The finding of a systematic review by Dawes et al. (2003) shows that that 50–80 % of physicians used printed EM for information. Use of printed EM as a KTI is expected to improve practitioner's 'awareness, knowledge, attitudes, skills, and finally leading to an improvement in clinical practice and

eventually patients' outcomes (Giguere et al. 2012). Further Grudniewicz et al. (2015) argue that EM is simple and relatively inexpensive KTI that could be used particularly for dissemination of CPGs. Perhaps the use of EM is one of the most commonly used KTI to address the lack of knowledge and attitude as barriers in the KT process could be due to the inherent characteristics of EM being a simple and inexpensive KTI. Further EM are claimed to allow a wider distribution and reach amongst the practitioners at relatively low cost (Giguere et al. 2012) particularly in dissemination of CPGs. A study by Bekkering et al. (2005a, 2005b) is regarded as one of the early KT studies in regard to CPG in the context of PT used dissemination of EM as a passive strategy in comparison with an active strategy including interactive educational meetings, reminders and feedback. The findings of the study by Bekkering et al. support the use of EM as part of a multicomponent KTIs, and also suggested that specific KTI strategies should be selected and examined in the context of PT.

Although healthcare practitioners would prefer to use EM as a source of information (Dawes et al. 2003) and EM appears to be a common factor in KT studies, there are contradictory arguments in the literature claiming that there is no demonstrated effectiveness of EM as KTI on knowledge, behaviour of the practitioner or patient outcomes. A Cochrane systematic review by Giguere et al. (2012) suggest that printed EM have a small beneficial effect on professional practice outcomes of the Physicians when used as single KTI or when compared to no intervention. Further, the effect of EM on patient outcomes was not evaluated in that review. Another systematic review by Grudniewicz et al. (2015) analysed the effect of printed EM as KTI on the knowledge, attitude and behaviour of the Physician and concluded that there is no significant effect of EM on the above-mentioned outcomes amongst Physicians. Further the researcher argues that EM is not useful as a KTI to achieve behaviour change among healthcare practitioners (Grudniewicz et al. 2015). However, it could be argued that, current knowledge and evidence is insufficient to reach a conclusion regarding the effectiveness of EM as a KTI strategy and several researchers are continuing to utilize EM as a component of the multicomponent KTI strategy despite all the claims of EM being ineffective in the KT process.

In reality there is limited evidence available about which barriers could be influenced by EM and how does it function within certain settings, and how to improve the effect of EM and the potential of EM as a KTI (Grudniewicz et al. 2015). In addition to that, there is no study available until date that has addressed the role of EM as a KTI to achieve integration of CPG in CDM. Supporting the above argument, a review by Giguere et al. (2012) concluded that printed EM had some impact on the professional practice as well as patient outcomes when used as a component of a multicomponent KTI strategy. Furthermore, some researchers argue that EM as a non-interactive and low-technology KTI, would continue to be used for dissemination of clinical information and new evidence (e.g. CPG) and most likely to be used as a component of a multicomponent KTI strategy (Grudniewicz et al. 2015). Studies evaluating effectiveness of EM in the KT process of CPG into CDM in the context of PT are

not available in the literature. Furthermore, the evidence on the impact of EM when used as strategy to bridge the CPG-CDM gap is also not known and need to be investigated.

2.7.4.2 Communities of Practice (CoP)

Communities of practice (CoP) had been used in the management sector over two decades and the same concept is not extensively explored in the healthcare sector. Wenger et al. (2002: p. 4) defined CoP for the first time as group of people "who share a concern, a set of problems, a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis". Recently, Wenger et al. (2011) updated the definition of CoP as a "learning partnership among people who find it useful to learn from and with each other about a particular domain. They use each other's experience of practice as a learning resource" (p. 9). CoP claimed to have several advantages including the ability to act as carriers for enhancement of intellectual capital as well as a mechanism to enhance individual, practice and organizational performance, enable organizations to gain competitive advantage (Blankenship & Ruona, 2007) and cited as most important and palpable example of knowledge management at the work place of a firm (Saint-Onge & Wallace 2003, p.50).

CoP can be of many forms size, location and composition within an organization collaboratively among several organizations and can exist physically or virtually. There are four types of communities of practice namely professional communities, task/craft-based communities, virtual communities of practice (VCoP), and expert or creative communities (Amin & Roberts, 2007). The recent growth in online technology has provided the opportunities for knowledge sharing globally and co-learning in an efficient manner and VCoP uses the internet and communication technologies (ICT) to exchange knowledge. Yahoo groups and LinkedIn groups are examples of VCoP that offer more flexible opportunities for professional learning by overcoming the barriers of travel, specified time and irregular work hours (Hanlis et al. 2009). It was proposed several years ago that Physicians should be able to explore the opportunities provided by the technological advancements including the internet for their CME activities in the 21st century (Curran &Fleet, 2005). Currently healthcare professionals are using wide range of VCoPs for various purposes including learning, education, continuing professional development, information sharing and knowledge management (McLoughlin et al. 2018). VCoPs are useful in knowledge creation, tacit knowledge exchange, and help to build the social capital in an efficient manner with cost effectiveness (Swift, 2014, Mairs, 2013). Thus, it can be argued that VCoP can also facilitate the knowledge translation process of integrating CPG into CDM. Literature review showed that VCoP as a KTI in the healthcare sector can be regarded as a social network in which several possible interactions could occur that can enhance the clinical practice. Further, VCoP enhance communication among colleagues as well as provide opportunity for mentors to share their knowledge (Parboosingh et al. 2011). It is argued that CoP can be regarded as a concept

to understand how people are learning in a social environment and can help healthcare practitioners to support better understanding of the CPGs and its integration in practice (Li et al. 2009).

CoP is acknowledged as one of the KTI in the EPOC (2015) taxonomy and has been investigated in the context of healthcare for a range of purposes including: knowledge exchange, mentoring novice professionals; learning; facilitate EBP and to improve clinical practice (Ranmuthugala et al. 2010). CoP has been recommended in the healthcare sector as intervention in regard to change management of practice behaviour (Travaglia et al. 2011). McLoughlin et al. (2018) argue that VCoPs offer the opportunity for professional, inter professional development for practitioners and can reduce professional and social isolation of the practitioners. However, investigations to understand the potential of VCoPs in facilitating KT to achieve CPG integration is an under researched area, particularly in the context of PT. Some studies argue that all the publications in regard to VCoP in the healthcare field is published in the year 2000 or later (Li et al. 2009), indicating that VCoP as an emerging area for research and further research is needed to gain knowledge about its potential in KT activities. From Table 2.10, it can be seen that studies that are examining VCoP in the context of PT are far and few and not much is known for their potential role in the KT process including CoP. Camden et al (2016) investigated the impact of a CoP as part of a multicomponent KTI strategy and found out that CoP had increased the PTs knowledge, skills and professional practice in regard to a developmental coordination disorder. Another study by Russell et al. (2010) showed that VCoP had an impact on self-reported knowledge and uptake of standardized measurement tools amongst the PTs. The role of VCoP as a KTI in changing practice behaviour of the PTs in the KT process of CPG into CDM is not examined until date. Although some of the VCoP exist for many years, little is known about the impact of VCoP as a KTI in the field of PT (Camden et al. 2017). For instance, cardiopt.org is a VCoP existing in the Yahoo groups since 2001 with 550 members of APTA with a focus on Cardiopulmonary Physical therapy. With the proliferation of technology, VCoPs, appear to offer unlimited opportunities for knowledge exchange.

2.7.4.3 Knowledge broker as a KTI

Translating research knowledge into clinical practice and policy making is regarded as a complex and messy task. It is difficult to achieve the coordination required between researchers and knowledge users (policy makers and practitioners) as they appear to occupy two different worlds; as researchers rely heavily of concepts, theories, policy makers and practitioner need easy and evidence based solutions (Ward et al. 2009). Thus, using a human interface between the researcher and practitioners could be a solution to facilitate the knowledge exchange. According to CHSRF (2003), Knowledge brokers (KB) are the human force or intermediary to facilitate communication and interpretation of research evidence to achieve better knowledge transfer between researchers on one side and practitioners and decision makers on the other. Russell et al (2010, p.3) defined KB as "someone who

is capable of 'bringing researchers and decision makers together, facilitating their interaction so that they are able to better understand each other's' goals and professional culture, influence each other's' work, forge new partnerships, and use research-based evidence". Although the dictionary meaning consider brokers are middleman who does not favour either side, but in terms of KT literature, in the context of knowledge management, KB essentially means, a person who facilitates research transfer. In addition, knowledge brokering as a concept is supported by various theories including knowledge management, transactional framework, social change framework, knowledge system framework (Ward et al. 2009).

Literature review shows that KB is expected to facilitate the research transfer in the context of PT. KB is argued to be enhancing communication and thereby bridging the research-practice gap. (Schleifer Taylor et al. 2014). In other words, KB can be the human link to bridge the CPG-CDM gap. A study by Schreiber et al. (2015) in the context of paediatric PT showed that KB as a part of a multicomponent KT strategy improved the knowledge and use of standardized outcome measures among PTs. Similarly, a study in the context of Paediatric PT, the role of KB appears to facilitate the KT process in a VCoP environment (Russell et al. 2010). Another study conducted by Hurtubise et al. (2016) investigated the role of KB in a VCoP, which was termed as virtual KB, in the context of PT with reference to Paediatric rehabilitation. However, there are arguments that other KTIs including targeted message to the practitioners are comparatively better than KB (Dobbins et al. 2009). Although KB has been argued to be an effective mechanism in knowledge transfer, there is inconclusive evidence regarding the role of KBs in the VCoP environment in facilitating KT (Ward et al. 2009). However, the number of studies available in the literature is not adequate to draw conclusions regarding how KB operates as a KTI in a VCoP environment. According to Ward et al. (2009) KBs play three important roles as 'knowledge manager', 'capacity builder' and 'linking agent' and among these roles this research proposes to investigate the linking agent role of the KB in bridging the CPG-CDM gap. It is reported in the literature that KB is an effective way to support EBCDM (Russell et al. 2010). An empirical KT study by Campbell et al. (2013) investigated the role of KB as a component of a multicomponent KT strategy in the context of the study and the results of the study was inconclusive due to clustering effect. Literature review showed that there are no studies that have addressed the impact of KB (as one component of a multicomponent intervention) specifically in the environment of VCoP, on the barriers hindering integration of CPG-CDM. This is a major gap in the literature. After discussing about some of the KTIs, it was important to identify the representation of the KTIs in empirical investigation. Thus, the next section discusses this aspect.

2.7.4.4 Representation of a KTI in an empirical investigation using 'Relative advantage'

As mentioned earlier not much is known about the role of intervention strategies in the integration process of CPG into CDM (see section 2.7.3.2) and there is inconclusive evidence in regard to the use of single or multicomponent KTIs regrading research integration in clinical practice. Considering the contradictory opinions, this research aims to compare the effect both the strategies empirically. There was a need to identify a characteristic or characteristics of the intervention to represent single and multicomponent KTIs in this empirical study. According to theory of DoI (1995), the attributes of innovation namely; relative advantage, trialability, compatibility, observability and complexity can affect the adoption of that innovation. There are some suggestions in the literature that these characteristics could be used to represent KTIs (Cranley et al.2017; Chaudoir et al. 2013; Atkinson, 2007; Davis et al. 1997; Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b). Some studies used these five characteristics together or taking attributes one or more at a time. A study by (Hsu et al. 2013) it was found that only complexity, observability and trialability affected the usage of IT by nurses, implying that all the five factors of the DoI model need not to be used in all circumstances. However, most of the KT studies have used either some or all of those five characteristics suggested in the DoI to represent an 'innovation' including CPG, limiting it to the use of medical interventions mainly (Cranley et al. 2017). That is to say that the five characteristics of CPGs are being investigated; not the characteristics of the 'intervention' as a KTI in the studies. Although, various KTIs have been used in the KT studies, there are no clear guidelines in regard to the representation of KTIs in empirical studies. The review of the literature shows that not many researchers have attempted to conceptualize the characteristic of an intervention as a measurable variable in the models or frameworks, although many KT models are intended to measure the effect of interventions in the KT process. In such situation; measuring 'intervention' as a construct empirically would be challenging although that is being part of most of the KT models. Further, the available models or frameworks that has an intervention characteristic as a variable or construct is not being tested empirically. In addition to that, tools or instruments to measure these constructs are also not available (e.g. intervention construct in OMRU).

Considering the fundamental assumption of the DoI, (Roger, 1995), 'relative advantage' (RA) is a perception of something (e.g. innovation) being more beneficial than the other, could be related to the concept of intervention. According to Cranley et al. (2017), RA of can be understood as anything that makes a process of change easier for others. KT of CPG into CDM involves the integration of the CPG recommendations into CDM, that might need a deviation from the previous practice essentially indicate the need for a behaviour change of the practitioner. One of the expected outcomes of using a KTI is to facilitate such a behaviour change. Thus, it could be argued that RA of the intervention can be chosen to represent the KT intervention strategies; an argument that finds some resonance with those of other researchers. For instance, Chaudoir et al. (2013) have suggested the use of relative

advantage as representing the variable evidence-based innovation in a systematic review. Again, researcher was unable to find any study that has investigated the 'relative advantage' (RA) of KTI as a measurable construct in empirical investigations, with reference to CPG-CDM gap in the literature. One of the KT models, which has representation of KTIs, using RA as a variable is the Consolidated Framework for Implementation Research (CIFR) by Damschroder et al. (2009). CIFR as a framework suggest the use of RA, as a variable to represent intervention. However, empirical investigation of the CIFR model is far and few. One such study by VanDevanter et al. (2017) used the CIFR framework to assess the factors that affect implementation of CPG in regard to tobacco use treatment in the context of public health care delivery system. This qualitative study conceptualized RA, as a characteristic of the intervention, although RA as was not measured quantitatively. Thus, in the absence of definite evidence that mandates the use of all the five characteristics of intervention, identified by DoI to be used in understanding the concept of intervention, it is possible to argue that one or more of those five factors could be used to represent innovation or intervention. Thus, in this research RA appears to be appropriate to measure the construct of KTI.

2.7.5 Theoretical support of KT

Considering PTs who are directly concerned with the patientcare, then many aspects related to their behaviour, learning, management of patients and health issues come to the fore, as changes take place with regard to those issues. To address these issues, it is necessary to involve theories, both management sciences particularly knowledge management (El Morr, &Subercaze, 2010) and behavioural sciences in addition to the medical sciences (PT), in understanding, the phenomenon of integration of CPG into clinical practice. Theories from other fields including management, knowledge management, social sciences, and behavioural psychology are used to support KT. For instance, Diffusion of innovation (DoI by Rogers, 2003), Theory of planned behaviour (TPB by Ajzen, 1991), and Theory of Reasoned Action (TRA by Fishbein & Ajzen, 1975; Ajzen &Fishbein 1980) are used as supporting theories in the KT models and frameworks. However, there are specific KT theories that are designed for guiding the KT process in the field of healthcare are available in the extant literature. The next section discusses the KT theories in the context of healthcare.

2.7.5.1 Review of KT theories in the context of healthcare

Detailed review of the literature shows that many theories could be used to support KT, in the context of healthcare (Nilsen, 2015; Hudon et al. 2015; Bernhardsson et al. 2014; Campbell et al. 2013). Table 2.11 shows a classification by Nilsen, (2015) in regard to the wide variety of theories that could be used to support KT as a concept as well as a process.

Table 2.11 Categories of theories supporting KT (Source: Nilsen, 2015)

Table 1 Five categories of theories, models and frameworks used in implementation science

Category	Description	Examples
Process models	Specify steps (stages, phases) in the process of translating research into practice, including the implementation and use of research. The aim of process models is to describe and/or guide the process of translating research into practice. An action model is a type of process model that provides practical guidance in the planning and execution of implementation endeavours and/or implementation strategies to facilitate implementation. Note that the terms "model" and "framework" are both used, but the former appears to be the most common	Model by Huberman [40], model by Landry et al. [41], model by Davies et al. [43], model by Majdzadeh et al. [44], the CIHR Model of Knowledge Translation [42], the K2A Framework [15], the Stetler Model [47], the ACE Star Model of Knowledge Transformation [48], the Knowledge-to-Action Model [13], the Iowa Model [49,50], the Ottawa Model [51,52], model by Grol and Wensing [53], model by Pronovost et al. [54], the Quality Implementation Framework [27]
Determinant frameworks	Specify types (also known as classes or domains) of determinants and individual determinants, which act as barriers and enablers (independent variables) that influence implementation outcomes (dependent variables). Some frameworks also specify relationships between some types of determinants. The overarching aim is to understand and/or explain influences on implementation outcomes, e.g. predicting outcomes or interpreting outcomes retrospectively	PARIHS [5,64], Active Implementation Frameworks [63,68], Understanding-User-Context Framework [62], Conceptual Model [17], framework by Grol et al. [22], framework by Cochrane et al. [59], framework by Nutley et al. [21], Ecological Framework by Durlak and DuPre [57], CFIR [60], framework by Gurses et al. [58], framework by Ferlie and Shortell [61], Theoretical Domains Framework [66]
Classic theories	Theories that originate from fields external to implementation science, e.g. psychology, sociology and organizational theory, which can be applied to provide understanding and/or explanation of aspects of implementation	Theory of Diffusion [107], social cognitive theories, theories concerning cognitive processes and decision making, social networks theories, social capital theories, communities of practice, professional theories, organizational theories
Implementation theories	Theories that have been developed by implementation researchers (from scratch or by adapting existing theories and concepts) to provide understanding and/or explanation of aspects of implementation	Implementation Climate [116], Absorptive Capacity [117], Organizational Readiness [118], COM-B [119], Normalization Process Theory [120]
Evaluation frameworks	Specify aspects of implementation that could be evaluated to determine implementation success	RE-AIM [124]; PRECEDE-PROCEED [125]; framework by Proctor et al. [126]

Some KT models or theories commonly used in healthcare includes the following; Promoting Action on Research Implementation in Health Services (PARiHS) framework (Kitson et al. 1998), Ottawa Model of Research Use (OMRU) framework (Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b; Hogan, & Logan, 2004), The Knowledge to Action (KTA) framework (Graham et al. 2006), Framework for Research Dissemination and Utilization (RD&U) (Dobbins et al. 2002) and Consolidated Framework For Implementation Research (CFIR) (Damschroder et al. 2009). The PARiHS framework is widely used in healthcare KT research due to the intuitive appeal and flexibility of the model that successfully integrated the main aspects of research evidence, context and facilitation. However, it is a complex model and relatively difficult to apply in everyday clinical practice settings and is mainly used for retrospective evaluation of KT process while its role to guide prospective KT studies are limited (Ellen, 2012). OMRU as a KT model is purported to be suitable to guide KT process to implement research knowledge in clinical practice. After some revisions, the most recent model encompasses six key elements as evidence-based innovation, potential adopters, the practice environment, implementation of interventions, adoption of the innovation, and the outcomes of implementation of the innovation at different levels including patient, practitioner, economic and system levels. Unlike PARiHS framework, OMRU as a KT model can be used prospectively to guide the KT process. Although shown as a linear model, in reality the model is complex due to the interactions between the various components in the model. Further, the model is not supported by validated instruments to measure several of the constructs (Ellen, 2012).

Many of the frameworks or models incorporate multiple theories to explain the process of KT. If one considers OMRU, although the entire framework as a whole cannot be explained by a single theory,

essentially all the constructs are being supported several theories. For instance, the construct of 'innovation' could be explained with help of Diffusion of innovation (DoI) theory by Rogers, (2003). Similarly, TDF by Michie et al. (2011) can support the practitioner level barriers termed as 'potential adopters' in the model. Another construct, the 'adoption' could be explained using Theory of planned behaviour (TPB by Ajzen, 1991), Theory of Reasoned Action (TRA by Fishbein & Ajzen, 1975; Ajzen &Fishbein 1980) and Theory of Interpersonal Behaviour (Triandis, 1989). The above arguments clearly show that there is no single theory available in the extant literature that could explain the phenomenon of KT comprehensively, leading to a situation of theoretical pluralism to understand KT. Theoretical Domains Framework (TDF) by Michie et al. (2011) combines several theories to explain the behaviour change interventions (see section 2.5.4). However, this framework has a serious limitation as it doesn't provide guidance on selection of intervention strategies to best address particular barriers. The KT theories reviewed in the previous sections namely; PARiHS, OMRU, KTA and CFIR already identified barriers and proposed certain interventions. However, most of the frameworks do not provide tools or instruments to measure the constructs. Even when a model proposed some tools, many are yet to be tested empirically. Further, some of these models appear to be more suitable to apply with a focus on clinical or organizational setting which require organizational, policy and system level strategies. However, the focus of this research is to target the barriers at the individual practitioner level and KTIs targeting the practitioner to achieve KT of CPG into CDM. Thus, it was necessary to identify, a KT theory that could support the process of integration of CPG into CDM, leading to change in practice behaviour of practitioners, with help of KTIs. The next section discusses this aspect.

2.7.5.2 Selecting a theory to explain the KT process to bridge the CPG – CDM gap

Table 2.11 shows that several theories are capable of supporting the process of KT. At the same time, several contradictory opinions exist in the KT literature, in regard to the selection of a specific theory to support KT. Currently, not much is known about the criteria that could guide the process of selecting, one theory from the plethora of tools, theories, models, and frameworks. For instance, there are variations in the recommendations of the researchers in selecting KT theories to understand how effectively research could be integrated to practice using KTIs (Stander et al. 2018; Curtis et al. 2017; Nilsen, 2015; Hudon et al. 2015). Further, there is no clarity in the literature on the application of any specific theory or set of theories to explain how effectively the research knowledge including CPG could be integrated into CDM with the aid of KTIs. In such situation, the researcher should rely upon a theory that is could explain the myriad of concepts that can influence the integration of CPG into CDM and support the integration process to achieve KT in the context of a PT practitioner. Furthermore, a simple linear framework might be more appealing to the researcher to guide the KT process in comparison with a complex multidirectional model. However, a simple linear KT model might be poor at reflecting real world events (Ellen, 2012). Contrary to that, a complex KT model

might be difficult to understand as well as apply in real situations. Thus, selecting one theory that encompasses all the concepts of this research has become a challenge.

The review of the literature was conducted to identify a theory that can explain the main concepts under investigation in this research. Although a few theories provide the theoretical support to the KT process and change in behaviour of the practitioner which include KT theories, behavioural theories, theory of innovation, motivation theory and process theory, the literature review showed that hardly any research outcome has been produced applying those theories to explain how the change in behaviour in PTs could be brought about and knowledge is translated to clinical practice. This is an area of study that is recommended in the literature (Stander et al. 2018; Curtis et al.2017; Suman et al. 2015; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Nilsen & Bernhardsson, 2013; Scott et al. 2012). Further, most of the models failed to support above mentioned concepts in an integrated manner. To some extent, the KABF developed Cabana et al. (1999 and the updated KABF by Fischer et al. (2016) can explain as well as support all the components under investigation in this research including CPGs as research knowledge, barriers, interventions and CDM as practice behaviour of the clinicians. Thus, KABF by Fischer et al. (2016) can be used to explain the phenomenon of CPG integration into CDM with help of KTIs and thus bridging the CPG-CDM gap. However, KABF by Fischer et al. (2016) is not yet tested empirically. The review indicates that there is a paucity of research outcomes indicating how the change in practice behaviour of PTs affected by barriers can be addressed using interventions with regard to the translation of CPG to CDM. This needs to be understood.

2.8 Research Gap

The literature review presented in this chapter has brought out a number of gaps that exist in the literature with regard to an understanding of the CPG, CDM behaviour of healthcare professionals including PTs, CPG-CDM gap, barriers that could cause CPG-CDM gap, KT process, KTIs that could impact the barriers as well as CDM and CPG-CDM gap, single component and multi-multicomponent KTIs and the theories that could be used to gain knowledge about the above. The gaps are

From section 2.3.2 it can be seen that two contradictory aspects are prevalent in the CDM behaviour of healthcare professionals and in particular PTs. While it may appear obvious that PTs must integrate CPGs into CDM such a claim is affected by contradictions. There is a lack of understanding of what causes those contradictions. Then while acknowledging the lack of widespread integration of CPG into CDM of PTs, it was found that the concept of CPG has limitations. Appendix 2.5 shows that it is not known what those limitations are and whether those limitations have a role to play in creating a CPG-CDM gap and how to overcome such a gap. Further, Section 2.4 showed that CDM needs to be understood clearly if one has to explain how the CPG-CDM gap is created. It is not known how the

management and behavioural aspects of PTs affect EBCDM and contributes to the CPG-CDM gap.While CPG-CDM gap appears to be a reality in the case of PTs, from section 2.4.1 it can be seen that the concept of CPG-CDM gap is not well understood in with reference to the nature of CPG-CDM gap, causes the CPG-CDM gap and what remedies are available to address the problem. Additionally, in section 2.5.2 it was argued that lack of empirical studies has left a gap in the literature in the current level of understanding of management and behavioural barriers and how they affect the EBCDM and CPG-CDM gap. Section 2.6 shows that some interventions could be used to either remove or limit the effect of barriers on EBCDM and CPG-CDM gap. However, very little knowledge appears to be available in the literature leading to lack of an understanding of how and to what extent those interventions could be useful in reducing the CPG-CDM gap or remove it totally. These are major gaps. In addition, the review in section 2.7.3 led to an assumption that the concept of knowledge translation interventions could be used to affect the barriers as well as CPG-CDM gap. However, it is not clear what KT interventions could affect which barrier and which intervention is more suitable to be deployed to affect barriers to the translation of CPG to CDM. This is a basic gap in the literature. Finally, it was not clear how an empirical relationship could be established to understand and address the management and behavioural aspects of PTs using the concepts of CPG, CDM, CPG-CDM gap, management and behavioural barriers encountered by PTs, and KTIs. A comprehensive model that has addressed the CPG-CDM gap using the above concepts is still not found in the literature, a major gap in the literature.

2.9 Chapter Summary

This chapter has provided a critical review of the literature related to CPG, CDM, EBCDM, CPG-CDM gap, management and behaviour barriers encountered by PTs and KTIs to gain knowledge on why there exists a CPG-CDM gap and what can be done about it. Evidence in the literature shows that empirical research could provide support to gain knowledge on why there exist a CPG-CDM gap and how CDM can be manipulated with the help of a research model. The review shows that no empirical model is found in the literature that has addressed the problem of CPG-CDM gap. But there exists some basis in the literature that shows that a research model developed based on prior research relating the components mentioned above could be useful with the support of established theories and models. Review also shows that testing such a model could enable unearth hitherto unknown knowledge and explain how to either remove or limit the impact of management and behaviour barriers encountered by PTs on CPG-CDM gap using KTIs. Furthermore, while literature shows that the model could focus on just the relationship amongst the components mentioned above to address the gap, at the same time an understanding of how the model functions with two different interventions could provide knowledge on how a specific intervention is providing a better control of CPG-CDM gap. Thus, a comparison of the impact two different interventions should provide a solid case to validate how the CPG-CDM gap can be addressed.

Chapter 3

Theoretical Framework

3.1 Introduction

This research concerns the integration of clinical practice guideline (CPG) as research knowledge into the clinical decision making (CDM) of the physical therapists (PTs). Experts agree that there is a need to integrate the latest research knowledge into clinical practice to benefit the patients. Literature shows that on the one hand research knowledge needs to be integrated into clinical practice, while on the other hand this integration does not appear to be taking place extensively amongst the PTs (see section 2.3.2). Although there could be many reasons for this contradiction, one of the reasons cited for this happening is the presence of barriers. Literature shows that there is a dearth of knowledge with regard to the identified barriers to the integration of research knowledge into clinical practice leading to the creation of what is termed a research knowledge–clinical practice gap: specifically referred as CPG-CDM gap in this research and denoted using the same terminology hereafter. The review of the literature showed that the current knowledge pertaining to CPG-CDM gap (see section 2.4) is limited. Limitations relate to various issues including: lack of complete understanding of elements that cause the CPG-CDM gap; lack of understanding on the ways and methods that can be used to address the gap; absence of empirical studies that could be used to predict how the CPG-CDM gap occurs and can be reduced or eliminated; and lack of established relationships that provide a cause and effect explanation of how certain phenomena contribute to the occurrence of CPG-CDM gap. While some researchers have tried to address these issues using various conceptual models (e.g. Fischer et al. 2016; Cabana et al. 1999), an important aspect that is observed in the literature is the lack of adequate theoretical underpinning of those concepts that have been researched. For instance, one of the concepts that have been discussed in the literature as a cause of the CPG-CDM gap is the behavioural aspects of PTs which include attitude and motivation. These aspects have been dealt with as barriers in the literature by some researchers (see section 2.5) but lack of proper application of theories to define and describe those barriers and their relationship to research knowledge–clinical practice gap has left the research outcomes unclear. There are many such aspects that require examination to understand how to narrow the CPG-CDM gap (or indeed eliminate it completely). Accordingly, drawing on the findings of the literature review, this chapter aims to address the concept of CPG-CDM gap and propose a conceptual model that can explain the phenomenon.

The research framework was developed in two steps. The first step was to identify the barriers to the integration of research knowledge into clinical practice and apply the intervention. The second step was to induce research knowledge translation into CDM and apply interventions to test whether barriers are present. In the first step, it was essential to identify the barriers and the interventions that affect the CPG-CDM gap. In the second step, it was essential to test the impact of interventions on the

CPG-CDM gap using single and multicomponent interventions. This would enable testing of whether barriers are present and to identify which of the two interventions is more effective in impacting the CPG-CDM and reducing the barriers. It must be noted that, in the second step, even if there is a lack of knowledge on the exact barriers that are impacted by the interventions, the effect of the interventions on CDM that is affected by translation of knowledge is expected to provide a clear indication of the existence of barriers and hence the impact of interventions on them. Thus, step one and step two together provide a framework to test the identified barriers and their relationship with CDM, the CPG-CDM gap, interventions, impact of interventions on the barriers identified for this research, interventions' relationship to translation of CPG to CDM and the effectiveness of interventions.

3.2 Choice of the research knowledge for study and its relationship to clinical practice

Foremost it is important to choose a particular type of research knowledge in order to study the phenomenon of research knowledge–clinical practice gap in the field of PT. The particular type of research knowledge provides the basis to understand whether it can be integrated into clinical practice and whether a research knowledge–clinical practice gap exists. While there are many different types of research knowledge (e.g. clinical practice guidelines (CPGs), clinical prediction rules (CPRs) (Plüddemann et al. 2014), clinical decision support systems (CDSS) (Sim et al. 2017) and clinical decision rules (CDRs) (Fuller et al. 2018). In this research clinical practical guideline (CPG) in PT was chosen as the type of research knowledge to study the research knowledge–clinical practice gap. CPGs either supersede current knowledge or improve or enhance it. In addition, CPGs are meant to enhance the consistency and efficiency in patientcare by reducing/removing the gap between what practitioners do and what scientific evidence supports (Woolf et al. 1999). Despite the advantages associated with the use of CPGs (see Appendix 2.4), still the integration of CPG in clinical practice appears to be a challenge. In fact, one argument says that more money and energy have been spent on the development of guidelines than activities that could increase the guideline use (Howard & Jenson, 1999). Encouraging healthcare practitioners (e.g. PTs) to use CPGs in clinical practice is identified as a major challenge in the literature (see section 2.3.2). These arguments point towards the existence of the CPG-CDM gap. In addition, this relationship between CPG and CPG-CDM gap can be supported by theories. For instance, the knowledge-attitude-behaviour framework (KABF) of Cabana et al. (1999) and the updated KABF model developed by Fischer et al. (2016) both of which argue that CPGs are not integrated into clinical practice leading to the CPG-CDM gap. Thus, the choice of CPG as the research knowledge for this study can be justified.

An important aspect that must be borne in mind at this point is that CPG as a concept needs to be studied as an overarching phenomenon that influences every aspect concerned with it, an argument supported by the literature (Cabana et al. 1999; Fischer et al. 2016). For instance, knowledge about

CPG, attitude, self-efficacy of PTs in integrating CPG with CDM and embedding CPG in clinical practice are examples of various aspects that are concerned with CPG and influenced by CPG. This indicates that CPG as a concept can be considered to be an umbrella term under which various aspects concerning CPG are studied. Hence, in this research, CPG has not been identified as a factor or a construct or a variable and hence no specific measurement of CPG was involved.

Next, several CPGs are available in the field of PT that address different medical conditions, for instance, CPG for VTE in PT and CPG for neck pain (see Table 2.1). CPG for VTE in PT is synthesized from research knowledge and was published (for the first time in the field of PT) in 2015. This research knowledge is expected to be integrated by PTs across specialities and is strongly recommended by the professional bodies. Investigating in detail about this CPG is expected to yield outcomes that could be beneficial to PT practitioners. As a newly developed CPG, there is lack of data about its integration into clinical practice and the challenges met by PTs in that process of integration is yet to be published. Hence, it can be argued that CPG for VTE in PT is recent and relevant research knowledge and yet can pose major challenges for PTs to integrate it in clinical practice leading to a situation of CPG-CDM gap. While the foregoing discussions have provided the basis for choosing CPG for VTE in PT as the type of research knowledge that will be used for study in this research, the discussions also highlight, how this CPG is linked to the CPG-CDM gap.

The foregoing discussion addressed one aspect of the CPG-CDM gap namely CPG, and then it was necessary to understand the other aspect of the CPG-CDM gap, namely clinical practice which is specifically identified as CDM. Thus, the link between clinical practice and CPG-CDM gap will be discussed in the next section, along with the basis for the choice of a particular clinical practice that will be studied in this research. In addition, it must be noted here that henceforth the term CPG will be used to signify research knowledge and CPG for VTE in PT throughout this thesis to simplify discussions.

3.3 Clinical Practice of PTs and its relationship to CPG-clinical practice gap

The concept of clinical practice is integral to the understanding of CPG-CDM gap. Review of the literature clearly showed that, PTs needs to integrate research knowledge in clinical practice of because of its purported benefits to patientcare. However, such integration of CPG in clinical practice is not taking place easily amongst PTs leading to CPG-CDM gap. What makes it difficult for PTs to integrate CPG into clinical practice and the consequent occurrence of CPG-CDM gap is not well understood in the literature (see section 2.5). In this situation it is important to understand the concept of clinical practice so that it is possible to gain knowledge the underlying problems that create the CPG-CDM gap. In order to do so, this research focuses on one important aspect of clinical practice, namely clinical decision making (CDM) that involves the complex interaction between certain aspects

including perceived confidence, cognitive abilities and the information seeking behaviour of the healthcare practitioner (Uy et al. 2014). CDM can be understood as clinical practice behaviour and could be termed clinical decision making behaviour (CDMB). As a concept CDMB is affected by a number of aspects including: the characteristics of CPG; complexity of the situation in which a decision is made; behavioural aspects of PTs; management principles; patient behaviour; integration of CPG into CDM; relationship between CPG and CDM; individual characteristics of PTs; barrier and interventions that could affect the barriers to the integration of CPG into CDM (see section 2.4.1). There is a lack of conclusive evidence in the literature that the various aspects that could affect CDM have been fully addressed to enhance patientcare, especially the ones related CPG, to the relationship between CPG and CDM, to the CPG-CDM gap, to barriers to the integration of CPG into CDM; impact of interventions on the barriers and specifically in the context of PT (see section 2.5.2).

One aspect that is intriguing researchers and practitioners alike is the non-integration of research knowledge in CDM by PTs resulting in the CPG-CDM gap. Although some reasons have been cited in the literature - including the claim that practitioners are not quick to adopt medical interventions of recognised effectiveness as those practitioners did not receive adequate training in empirically supported treatment methods, and practitioners do not read the latest research outcomes and feel that it is difficult to apply research results (Howard & Jenson, 1999), there is no conclusive evidence to show the specific reasons contributing to the CPG-CDM gap. However, based on the research work by Cabana et al. (1999) and Fischer et al. (2016), this research argues that one of the prime reasons for the CPG-CDM gap is presence of barriers to the integration of CPG into CDM. While the outcome of the research conducted by Cabana et al. (1999) and Fischer et al. (2016) are not conclusive, those outcomes nevertheless clearly indicate that barriers to the integration of CPG into CDM are strong reasons for practitioner's behaviour of not integrating research outcomes into clinical practice, an argument that could be extended to the field of PT. This infers therefore that barriers could be related to CDM and the integration of CPG into CDM empirically. In addition, the framework by Fischer et al. (2016) provide the basis to argue that knowledge translation interventions (KTIs) could be used to impact the barriers and to facilitate integration of CPG into CDM, although the claim made by Fischer et al. (2016) is not conclusive and requires empirical testing.

Thus, on the one hand, theory has shown that the CPG-CDM gap is a problem, while on the other hand studies that have tried to address this gap are found to be very few. More studies are required to understand and address the problem of the CPG-CDM gap. In particular a major problem is that barriers could be the reason for the CPG-CDM gap that has not been well studied and requires attention. However, taking the theoretical support provided by KABF (Cabana et al. 1999; Fischer et al. 2016), this research argues that, CDM as a concept could be studied to address the CPG-CDM gap taking into account, the effect of barriers to the integration of CPG into CDM as well as the impact of

interventions on the barriers, so that, the CPG-CDM gap could be narrowed or eliminated. Further, conducting the empirical studies could enable the development of models that could be used to predict the following: how the CPG-CDM gap could be narrowed or eliminated; explain the role of barriers that cause the CPG-CDM gap; and to understand how the KTIs influence the CPG-CDM gap by either potentially reducing or eliminating it.

As far as the operationalization of CDM is concerned, it could be linked to both the barriers and interventions empirically using published theories and models. It can be argued that, when barriers exist, those barriers make it difficult for practitioners to integrate CPG into CDM. This means that operationally, when barriers are directly linked to CDM, then it is possible to study, if there is an increase in the effect of barriers, then there can be a decrease in the level of integration of CPG into CDM and hence increase in the CPG-CDM gap. Alternatively, it can be argued that if the barrier effect is lowered, with the help of KTIs, then the CPG-CDM gap could be narrowed or eliminated leading to greater integration of CPG into CDM. In either case, linking CDM empirically to both the barriers and KTIs could provide help to the operationalization of CDM as well as the effect on the CPG-CDM gap.

In addition, if CDM must be empirically tested, then it must be visualized as a construct that could be measured, leading to an objective description of the concept of CDM and its functioning, when related to barriers and interventions. Hence a measurement method is needed to objectively assess the concept of CDM. One of the ways this could be done is through the use of survey questionnaires as scales to measure the concept empirically. For instance, from the literature review it could be seen that Silva and Costa (2015) measured CDM in the wider context of EBP, using a 5-point Likert scale. Although the original scale measured the construct as ‘skills and resources’, & ‘opinion’, the questions were found to be suitable to measure the construct of CDM. Further Weng et al. (2013) also measured CDM empirically and objectively, in another study using a different scale. Similar scales could be used to objectively measure and describe CDM. The next section discusses how the barriers and KTIs could be related to CDM.

3.4 Barriers causing CPG-CDM gap and their relationship to CDM

From the literature review, it can be seen that barriers contribute to the CPG-CDM gap although; it was not clear how those barriers affect the gap. Examples of barriers cited in the literature are numerous, for instance lack of knowledge of CPG, unfavourable attitude of practitioners, lack of motivation of practitioners towards integrating CPG into CDM and lack of self-efficacy of practitioners to implement CPG into CDM (see section 2.5). Studies of identification of the barriers that contribute to the CPG-CDM gap and mechanisms to address those barriers have been an area of interest to a small part of the research community and practitioners. Specifically, Cabana et al. (1999)

argued that barriers to integration of CPG in clinical practice exist and are responsible for the creation of the CPG-CDM gap and similar arguments were espoused by Fischer et al. (2016). However, studies that have dealt with such barriers as constructs and that have empirically related them to CDM and the CPG-CDM gap are largely notably absent in the literature. Recent studies have not been able to establish a clear empirical relationship between barriers and CDM or the CPG-CDM gap, leaving a lacuna in the body of knowledge. The lack of empirical studies has resulted in a situation wherein predicting the occurrence of the CPG-CDM gap using barriers has become extremely difficult. This study aimed to fill this gap in the literature.

From the review of the literature presented in section 2.4.1, it can be seen that barriers at the practitioner level are those which contribute to the CPG-CDM gap and hence act as constraints or obstacles that affect individual PTs' ability to integrate CPG into CDM. Although the very few studies that have identified some barriers have not been able to reach solid conclusions on what can be considered as the real barriers in practice, the arguments provided in those research studies do nevertheless provide some basis for this study to build on. For instance, according to Cochrane et al. (2007), barriers could arise due to individual PTs' cognitive-behaviour, attitude or rationale, emotion or professional aspects, or guidelines or patients. Although not tested empirically, Cochrane et al's (2007) work provides a basis to form assumptions about barriers and their relationship to CDM and the CPG-CDM gap using the support provided by other research publications found in the literature (see section 2.5). Furthermore, addressing this issue in this research, it was necessary to choose specific areas that have been identified as possible cause of barriers in the literature namely the individual PTs' behaviour and management aspects. Given the time and resource constraints, choosing specific areas to investigate is important that it is beyond the scope of any single investigation to examine all possible areas.

Four different types of barriers were therefore chosen for study based on the categorisation of Cabana et al. (1999) and Fischer et al. (2016) namely knowledge, attitude and motivation of PTs towards CPG and self-efficacy of PTs to integrate CPG into CDM. The reason for this choice is that the study of those researchers is related to CPG and its integration into practice concerning healthcare professionals and has investigated both barriers and interventions that affect healthcare practitioners in their effort to integrate CPG into practice. This context is also similar to the current study. Studying these four barriers was considered a realistic scope for the research, and moreover addresses both behavioural and managerial aspects of individual practitioners in the field of PT. This was deemed appropriate to ascertain in-depth knowledge about the relationship between the barriers that affect PTs clinical practice and the CPG-CDM gap. Considering the fact that in the field of PT, hardly any evidence could be found in the literature regarding the linkage between barriers that affect clinical practice and the CPG-CDM gap in the context of individual practitioners, the study of these four

barriers that have been broadly recommended in the literature (see section 2.5.4, 2.5.5, 2.5.6, and 2.5.7) and would provide a good starting point to conduct the investigations where none presently exist. Furthermore, since this study aimed to compare the impact of single and multi-component interventions, it was necessary to include at the least two barriers in the study as multi-component intervention studies require to examine the effect of the intervention on more than one barrier at a time (Eldh & Wallin, 2016; Squires et al. 2014). While at the minimum two barriers could be thought of as adequate for a study about the impact of single and multi-component interventions, it was deemed important to include the widely discussed barriers in the literature, not least because the exclusion of one the four barriers in favour of others may not provide a comprehensive picture.

While partly relying upon the study of Cabana et al. (1999) and Fischer et al. (2016), the present study takes into account the limitations of Fischer et al.'s study which includes that it was not empirical in nature and has only argued that some relationship between the barriers, interventions and the integration of CPG into clinical practice as a concept exist. Hardly any theoretical support for explaining the different barriers and their influence on the CPG-CDM gap in the context of individual practitioners could be found in the extant literature. In this situation, the present research relies on the above mentioned research models of Cabana et al. (1999) and Fischer et al. (2016) that have tried to establish a relationship between barriers that hinder the integration of CPG in clinical practice and the impact of interventions on these barriers in bridging the CPG-CDM gap (see section 2.5.1). Although the two models are not generalizable, it appears that these models together could be used effectively to inform this research, and hence to build a new conceptual model that relates the barriers to integration of research knowledge in clinical practice, role of interventions and clinical practice.

Furthermore, this research is about the barriers that create the R-P gap in the field of healthcare including PT and how interventions could be used to reduce the impact of barriers. There is a dearth of KT theories in the literature that can be used to link barriers to CPG integration, CDM, CPG-CDM gap and interventions in the field of PT. The nearest and latest theoretical proposition that shows how barriers could be linked to clinical practice behaviour was the KABF model developed by Cabana et. al (1999). However, this model falls short of explaining how the barriers could be addressed to enable greater integration of CPG into clinical practice in the field of healthcare. This limitation was overcome by Fischer et al. (2016) who proposed a modification to the KABF model developed by Cabana et al. (1999) and introduced the concept of intervention strategies that could be used to reduce the impact of the barriers. In addition, the KABF model proposed by Cabana et al. (1999) and the one proposed by Fischer et al. (2016) are identified in the literature are a type of KT theoretical representation and are supported by established theories including theory of planned behaviour (TPB by Ajzen, 1991) and the theory of diffusion of innovation (DoI) by Rogers (2003).In a nutshell it can be argued that the KABF developed by Fischer et al provides a strong basis to ground the theoretical

framework to be developed for this research although a transformation of the framework from a prescriptive one to a predictive one was needed. Thus, the KABF developed by Fischer et al. (2016) was identified as the most recent and suitable theoretical representation in the literature that could be used in this research.

While applying the concepts of Fischer et al. (2016), which were built on the model of Cabana et al. (1999), a departure has been introduced in this research with regard to the categorization of barriers. That is, the knowledge is treated as a management barrier while motivation and self-efficacy of PTs have been used as individual behavioural barriers of PTs in this research. In the KABF (Cabana et al. 1999; Fischer et al. 2016), knowledge was argued to affect the attitude of the practitioner, which in turn, is shown to affect the practice behaviour. In addition, motivation and self-efficacy of practitioners have been shown to be as a subset of the attitudinal barrier. The reason for this is that, KABF suggest that motivation and self-efficacy needs to be considered as attitudinal factors and in turn attitude is determined by knowledge of the practitioner about the CPG. However, in the literature, acquiring knowledge from research outcomes for application in practice is considered as part of knowledge management (see section 2.5.6.2) as a concept which contradicts the conceptualisation of KABF. Knowledge as a construct has been identified to be a management construct, as integration of CPG into CDM has been considered as a knowledge management concept, instead of the argument put forth by KABF. Consideration of knowledge as a management construct has been supported by different theories and models (e.g. Liyanage et al. 2009). Similarly, it is argued in this research that, motivation and self-efficacy need to be considered as separate constructs and hence need to be treated as distinct individual barriers that might have an independent effect on the CDM behaviour and integration of CPG into CDM, rather than as attitudinal sub-constructs. The rationale for this is that, in the wider literature, attitude, motivation and self-efficacy have consistently been treated as separate and individual constructs that affect human behaviour with theoretical support. For instance, the inclusion of self-efficacy as a construct is supported by self-efficacy theory (Bandura, 1977) (see section 2.5.6.2) and the construct of motivation is supported by several theories including Theoretical Domains Framework (TDF by Michie et al. 2011), Self-determination theory (Deci & Ryan, 1985) and Theory of planned behaviour (TPB by Ajzen, 1991) (see section 2.5.7.3). The next section discusses each one of the barriers and their relationship to the CPG-CDM gap using the support of the theories found in the literature.

3.4.1 Relationship between knowledge and the CPG-CDM gap

While the operationalization of knowledge as a barrier affecting CPG and the CPG-CDM gap is being a challenge (see section 2.5.4), in this research, it was proposed that knowledge as a barrier could be operationalized as a construct that is directly related to CDM. Table 2.4 provides an illustration of how knowledge for VTE in PT can be thought of as a concept that could be related to the CDM of

PTs. Table 2.4 was developed by the researcher for this research based on the literature review and provides a practical basis that could be used to relate knowledge as a barrier to the integration of CPG into clinical practice in the absence of a conceptualization in the existing literature.

Table 2.4 Illustration of a recommendation in CPG for VTE in PT, knowledge as possible barrier and the effect on CDM

CPG for VTE Recommendation	**Key concepts**	**Barrier at the practitioner level**	**Examples of studies supporting the presence of barrier**	**Affected CDM component**
PTs should recommend mechanical compression (e.g., IPC, GCS) when individuals are at high risk for LE DVT. (Recommendation 4.)	Recommending mechanical compression as a preventive measure for LE DVT	Lack of Knowledge about the risk factors for LE DVT due to lack of awareness or familiarity	Ramirez –Velez et al. 2015; Silva et al.2014; Bernhardsson, 2014; Queiroz, 2013; Buchard, 2009; Salbach et al. 2007; Iles and Davidson, 2006; Jette et al.2003	Failure to integrate Preventive measures for LE DVT in clinical practice

From Table 2.4, the following inferences can be made:

- Lack of knowledge of CPG leads to failure in integrating CPG into CDM
- The higher the extent of lack of knowledge, the higher will be the extent of failure of PTs to integrate CPG in CDM that is higher the CPG-CDM gap.
- If the effect of lack of knowledge of CPG as a barrier is reduced by a corresponding increase in the knowledge of CPG, and then higher is the extent to which PTs will integrate CPG in CDM reducing the extent of failure and lowering the CPG-CDM gap.
- As such, the higher is the extent of knowledge, the lower would be the extent to which PTs' lack of knowledge in CPG will act as a barrier, and the smaller will be the CPG-CDM gap. These inferences are depicted as shown in Figure 3.1.

Figure 3.1 Relationship between knowledge and CDM

From the theoretical perspective, knowledge has been variously defined and described in the literature (see section 2.5.4). However, with regard to the current research, where integration of CPG into CDM is under investigation, the KABF (Cabana et al. 1999; Fischer et al. 2016) is the one that appears to provide a suitable basis to explain how PTs knowledge in research outcomes (like CPG) could be related to CDM as a clinical practice behaviour component. According to this framework, research knowledge (such as CPG) of healthcare professionals (represented as PTs in this research) could be linked to the clinical practice (represented in this research as CDM) behaviour with attitude being positioned between CPG and CDM. This implies that the higher the level of research knowledge of healthcare practitioners in CPG, then the higher could be the integration of research

knowledge into clinical practice, and hence producing a reduction in the CPG-CDM gap, taking into account the attitude of practitioners. However, in this research, a deviation was taken at this point that knowledge as a construct has been directly linked to CDM without bringing in attitude as a barrier between knowledge and CDM. The reason for this is that there are theoretical models that argue that knowledge affects behaviour directly, for instance, Michie et al.'s (2011) Theoretical Domains Framework (TDF) that relates the domain of knowledge directly to behaviour. This conceptualization provides a direct linkage between knowledge in CPG and CDM as a behavioural construct.

In addition, several KT theories including: Ottawa Model of Research Use (OMRU) framework (Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b); Promoting Action on Research Implementation in Health Services (PARiHS) framework (Kitson et al. 1998); The Knowledge to Action (KTA) framework (Graham et al. 2006); Framework for Research Dissemination and Utilization (RD&U) (Dobbins et al. 2002) and Consolidated Framework For Implementation Research (CFIR) (Damschroder et al. 2009), support the argument that lack of knowledge acts as a barrier in integration of research knowledge into practice (see section 2.7.2). That is, when knowledge is represented as a construct that affects CDM directly (see Figure 3.1 above), then it is possible to argue that the same representation could be used to bring in the concept of lack of knowledge as affecting CDM through that relationship. In such a case lack of knowledge acts as the barrier in the reverse direction to that of having knowledge, reducing the extent of integration of CPG into CDM and increasing the CPG-CDM gap. Thus, the direct relationship between knowledge of healthcare professionals in CPG and CDM could be used to test knowledge as a construct to know whether it enables or hinders the integration of CPG into CDM and to know whether it is a facilitator or barrier; in other words, whether it decreases or increases the CPG-CDM gap.

It is further proposed with the support of the theories cited above, that when knowledge translation takes place, it is possible to represent, knowledge as a construct in empirical studies that could be measured objectively, for instance the arguments of Silva and Costa (2015) which show that knowledge could be measured using a research instrument (see section 2.5.4.1). That is to say, if knowledge can be measured and linked to CDM then there is a possible way to explain and understand the operation of the knowledge → CDM relationship especially when knowledge is considered as a barrier. For instance, if it is assumed that knowledge changes by one standard deviation in the positive direction, then CDM could change correspondingly in the positive direction, although it is not known at this stage, to what extent CDM will change. In contrast, it can also be proposed that, a one standard deviation change in knowledge in the positive direction reduces the lack of knowledge as a barrier, by one standard deviation meaning that, there is an inverse relationship between knowledge as a barrier and CDM which can be implied by measuring, the change occurring

in knowledge as a construct. Finally, literature shows that establishing a relationship in this manner is expected to provide a way by which PTs, healthcare organisations and patients can be benefitted by appropriately utilizing the relationship developed in this research. Any mechanism developed to address the CPG –CDM gap has the potential to narrow the CPG-CDM gap by indicating the level of knowledge of PTs in regard to a particular CPG and to what extent their knowledge is acting as a barrier.

Lastly, since the aim of this research was to provide an understanding that could help to reduce the impact of lack of knowledge as a barrier leading to CPG-CDM gap, the relationship developed above should be able to support the operationalization of interventions which are required to overcome the barrier to bridge the CPG-CDM gap (see section 2.7.3). Considering the fact that any impact of intervention on barriers is expected to directly affect the barrier, the relationship established in this section, between knowledge and CDM, does not come in the way in developing, any other conceptualisation that links the intervention to the barrier directly and separately. That is to say that the linkage between interventions and barriers could be dealt with independently without bringing in the concept of CDM into the picture, because the result of such a linkage will imply that any change in the level of lack of knowledge as a barrier due to the impact of interventions will inform, how CDM could change through the relationship depicted in Figure 3.1. This aspect is discussed later. From the foregoing discussions and based on Figure 3.1 the following hypothesis could be formulated.

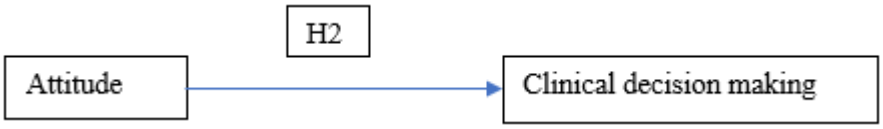
H1: The lesser the extent of knowledge of PTs about CPG, the lesser will be the integration of CPG in CDM.

3.4.2 Relationship between attitude of PTs in CPG and CPG-CDM gap

The literature review has shown that the attitude of PTs is a behaviour component of PTs that affects CDM and the CPG-CDM gap and is considered to be a challenge for PTs to overcome while integrating CPG into CDM (see section 2.5.5). Lack of favourable attitude has been described as a barrier in the literature and has been identified as directly affecting clinical practice behaviour (see section 2.5.5.3). Table 2.5 given in the previous chapter, provides an illustration of the direct relationship between lack of favourable attitude as a barrier to integrate CPG into CDM and CDM. This conceptualisation of a direct relationship between lack of favourable attitude of PTs in CPG and CDM, based on the actual clinical practice reported in the literature is nevertheless not well understood in the field of PT. As described in the case of knowledge as a barrier (see section 3.4.1 above), it is possible to derive the following inferences from Table 2.5.

- Unfavourable attitude (lack of favourable attitude) of PTs towards CPG, leads to a failure in integrating CPG into CDM
- The higher the extent of unfavourable attitude, the higher will be the extent of failure of PTs to integrate CPG in CDM that means the higher will be the CPG-CDM gap.
- As a corollary, if the effect of unfavourable attitude as a barrier is reduced by a corresponding increase in a favourable attitude, and then higher is the extent to which PTs will integrate CPG in CDM reducing the extent of failure and lowering the CPG-CDM gap.
- That is to say, that the higher is the favourable attitude, the lower will be the extent to which PTs' unfavourable attitude towards CPG will act as a barrier and the lower will be the CPG-CDM gap. These inferences can be depicted as in Figure 3.2

Figure 3.2 Relationship between attitude and CDM



From the theoretical perspective, attitude towards CPG of PTs has been defined and described in the literature (see section 2.5.5.2) in various ways. However, as already explained in section 2.5.5, attitude as a barrier and in the current research, KABF (Cabana et al. 1999; Fischer et al. 2016), was used to explain, how PTs attitude towards CPG could be related to CDM, representing the clinical practice behaviour component. According to this framework, knowledge of the healthcare professionals including PTs, could be linked to CDM, with attitude being positioned between CPG and CDM. This implies that, the higher the level of favourable attitude of healthcare practitioners in CPG, then the higher will be the integration of research knowledge into clinical practice, and hence the possibility of a reduction in the CPG-CDM gap. Further, as discussed in the case of knowledge as a barrier, the support of KT theories (see section 3.4.1 above) can be used to explain, how unfavourable attitude, acts as a barrier hindering the integration of research knowledge into clinical practice (see section 2.5.5). That is, when attitude is represented as a construct that affects the CDM directly (see Figure 3.2 above), then it is possible to argue that the same representation could be used to bring in the concept of unfavourable attitude, as affecting CDM through that relationship. In such a case, it is possible to visualize, how unfavourable attitude towards CPG acts as the barrier, in the reverse direction to that of favourable attitude towards CPG, reducing the extent of integration of CPG into CDM and thus increasing the CPG-CDM gap. Hence, the direct relationship between attitude of healthcare professionals towards CPG and CDM could be used to test, attitude as a construct, in order to ascertain, whether it enables or hinders the integration of CPG into CDM, or to

ascertain whether it is a facilitator or barrier; in other words, whether it decreases or increases the CPG-CDM gap.

Also, with the support of the theories cited above, it is proposed that when knowledge translation takes place, it is possible to represent attitude as a construct in empirical studies that could be measured objectively. For instance, this is supported by Rubin and Parrish (2010) (also see Bernhardsson & Larsson, 2013), who argued that attitude can be measured using an instrument in empirical research (see section 2.5.5.3). That is to say, if attitude can be measured and linked to CDM (measurement of which has been already discussed in section 2.5.2) and then, there is a possible way to explain and understand the operation of the attitude → CDM relationship, especially when attitude is considered as a barrier. For instance, if it is assumed that favourable attitude changes by one standard deviation in the positive direction, then CDM could change correspondingly, in the positive direction, although it is not known at this stage to what extent CDM will change. In contrast, it can also be interpreted that a one standard deviation change in attitude in the positive direction, reduces the unfavourable attitude as a barrier, by one standard deviation. That means, there is an inverse relationship between attitude as a barrier and CDM, which can be implied by measuring, the change occurring in attitude as a construct. Finally, the literature review showed that establishing a relationship in this manner is expected to provide means by which PTs, healthcare organisations and patients can benefit by appropriately implementing the relationship developed in this research. Such an implementation has the potential to narrow the CPG-CDM gap by indicating the level of attitude PTs have towards a particular CPG and to what extent their attitude is acting as a barrier, eventually leading to better patientcare.

Lastly since a purpose of this research is primarily to help in reducing the impact of unfavourable attitude as a barrier on the CPG-CDM gap, the relationship developed above should be able to support the operationalization of interventions which are required to overcome the barrier as well as to bridge the CPG-CDM gap (see section 2.7.3). Taking the support of the arguments provided in section 3.4.2 and considering the fact that any impact of intervention on barriers is expected to directly affect the barrier, the relationship established in this section between attitude and CDM is seen not to hinder the development of any other conceptualisation that links the intervention to the barrier directly and in isolation. From the foregoing discussions and based on Figure 3.2 the following hypothesis could be formulated.

H2: The lesser the extent of favourable attitude of PTs towards CPG, the lesser will be the integration of CPG in CDM.

3.4.3 Relationship between (i) self-efficacy of PTs in CPG, and (ii) motivation of PTs to integrate CPG respectively, and CPG-CDM gap

The relationships as, self-efficacy of PTs in CPG and CPG-CDM gap on the one hand, and motivation of PTs to integrate CPG and the CPG-CDM gap on the other, are discussed here together. Discussing them together does not change their character of alter the result as their analysis is independent. Lack of self-efficacy and motivation have both been described as barriers in the literature and have both been identified as directly affecting clinical behaviour, for instance CDM (see section 2.5.6 & section 2.5.7). Tables 2.6 and 2.7 in the previous chapter provide an illustration of the direct relationship between lack of self-efficacy and motivation as barriers respectively to integrate CPG into CDM and CDM. As was the case with knowledge and attitude, this conceptualization of a direct relationship between lack of self-efficacy and motivation on the one hand and CDM on the other hand, based on actual practice, reported in the literature is not well understood in the field of PT. As such, it is possible to derive the following inferences using Tables 2.6 and 2.7.

- Lack of self-efficacy and motivation of PTs towards CPG leads to failure in integrating CPG into CDM
- It can also be stated that, higher the extent of lack of self-efficacy and motivation of PTs towards CPG, higher will be the extent of failure of PTs to integrate CPG in CDM that is higher the CPG-CDM gap.
- Furthermore, if the effect of lack of self-efficacy and motivation of PTs towards CPG as barriers is reduced by a corresponding increase in self-efficacy and motivation of PTs towards CPG, then higher is the extent to which PTs will integrate CPG in CDM reducing the extent of failure and lowering the CPG-CDM gap.
- That is to say, that higher is the self-efficacy and motivation of PTs towards CPG, lower will be the extent to which PTs' lack of self-efficacy and motivation of PTs towards CPG will act as barriers and lower will be the CPG-CDM gap. These inferences can be depicted pictorially as in Figures 3.3 and 3.4 respectively.

Figure 3.3 Relationship between self-efficacy and CDM

Figure 3.4 Relationship between motivation and CDM

Extending the similar arguments as given in sections 3.4.1 and 3.4.2, pertaining to knowledge and attitude as barriers leading to CPG-CDM gap, it is possible to say that lack of self-efficacy and motivation as barriers, identified in the current research can also be explained, using the KABF (Cabana et al. 1999; Fischer et al. 2016) and could be related to CDM as clinical practice behaviour component. This implies that the higher the level of self-efficacy and motivation of PTs, the higher could be the integration of research knowledge into clinical practice and hence a reduction in the CPG-CDM gap. Again, as discussed in the case of knowledge as a barrier, KT theories (e.g. OMRU framework by Logan & Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b) can be used to explain how lack of self-efficacy and motivation of PTs towards CPG, acts as a barrier in integrating the research knowledge into practice (see section 2.5.5). If self-efficacy and motivation of PTs can be visualised as affecting CDM directly (see Figures 3.3 & 3.4 above), then it is possible to argue that the same representation could be used to bring in the concepts of lack of self-efficacy and motivation of PTs, as barriers to explain, how those concepts affect CDM through that relationship. In other words, it is possible to visualize how lack of self-efficacy and motivation in implementing CPG into practice act as barriers in the opposite direction to that of self-efficacy and motivation in implementing CPG into practice reducing the extent of integration of CPG into CDM and increasing the CPG-CDM gap. Thus, the direct relationship between lack of self-efficacy and motivation of PTs as barriers, towards integrating CPG into CDM and CDM, could be used to test self-efficacy and motivation of PTs as constructs to know, whether they enable or hinder the integration of CPG into CDM and to know, whether they are facilitators or barriers; in other words, whether self-efficacy and motivation of PTs decrease or increase the CPG-CDM gap.

Again, it can be proposed that when KT takes place, self-efficacy and motivation can be represented as constructs in empirical studies that can be measured objectively. The arguments of Rubin and Parrish (2010) (also see McEvoy et al. 2010a) show that self-efficacy could be measured, using an instrument (see section 2.5.2). Similarly, motivation can be measured; using another instrument developed by Guay et al. (2000) (also see Quiros et al. 2007). That is to say, if self-efficacy and motivation can be measured and linked to CDM, then there is a possible way to explain and understand, the operation of the self-efficacy → CDM and motivation → CDM relationships respectively, especially, when these two constructs are considered as barriers. For instance, if it is assumed that self-efficacy and motivation of PTs change by one standard deviation in the positive direction, then CDM could change correspondingly, in the positive direction, although it is not known at this stage to what extent CDM will change. In contrast, it can also be proposed that a one standard deviation change in self-efficacy and motivation of PTs, in the positive direction reduces the lack of self-efficacy and motivation of PTs as barriers by one standard deviation, meaning that there is an inverse relationship between self-efficacy and motivation of PTs as a barrier and CDM, which can be measured as the change occurring in self-efficacy and motivation of PTs as constructs. Finally,

literature shows that establishing a relationship in this manner is expected to provide a way by which PTs, healthcare organisations and patients can be benefitted by appropriately implementing the relationship developed in this research. Such an implementation has the potential to narrow the CPG-CDM gap by indicating the level of self-efficacy and motivation of PTs have in implementing a particular CPG into practice and to what extent their self-efficacy and motivation are acting as barriers, eventually leading to better patientcare. Finally, in a similar manner to the explanation given in the sections 3.4.1 and 3.4.2, it can be seen that self-efficacy and motivation of PTs, can be used independently without bringing in the concept of interventions. That is to say, that the relationship between intervention and barriers could be separately tested to gain knowledge on how the intervention affects the barriers and the CPG-CDM gap. Thus, the hypotheses that can be formulated are as follows:

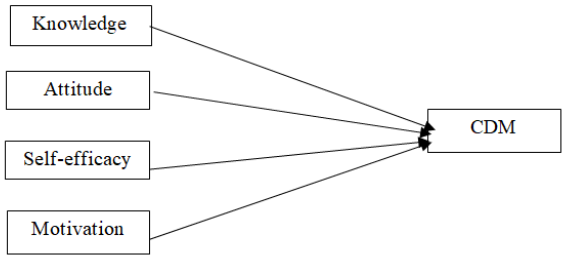
H3: The lesser the extent of self-efficacy of PTs towards CPG, the lesser will be the integration of CPG in CDM.

H4: The lesser the extent of motivation of PTs towards CPG, the lesser will be the integration of CPG in CDM.

3.5 Relationship between combination of barriers (knowledge, attitude, self-efficacy and motivation of PTs to integrate CPG) and CPG-CDM gap

While the foregoing discussions show that barriers can be linked to CDM and the CDM-CPG gap based on the support of knowledge management and behavioural theories, it is also necessary to highlight that barriers can coexist. It can be argued that a practitioner might encounter more than one barrier that could hinder the integration of CPG into CDM. Hence, it may be necessary to consider the situation where multiple barriers exist at the PT practitioner level. Thus, it is important to visualise the situation, wherein multiple barriers could act on CDM. While there is hardly any empirical evidence to show that multiple barriers can be linked to CDM in the context of PT, the foregoing discussions provide enough scope to argue that, if barriers can be linked individually to CDM, then a combination of barriers acting on CDM could be thought of as a corollary. This argument is depicted in Figure 3.5

Figure 3.5 Relationship between knowledge, attitude, self-efficacy, motivation as barriers acting in combination and CDM



While the relationships between each one of the barriers and CDM can be supported, by the same set of theoretical underpinning as discussed in sections 3.4.1 to 3.4.3 above, it is also important to support how the four barriers can be construed to act in association with each other. Theoretical support for understanding how the barriers can be associated in a manner as depicted in Figure 3.5 above is found in the literature. It can be seen from section 2.5.1 of the previous chapter that KABF (Cabana et al. 1999; Fischer et al. 2016) as a theory supports the underpinning of the association of knowledge and attitude as concepts that could be linked to clinical practice behaviour. Using this theory, it is possible to explain how knowledge and attitude can act together to change the behaviour of practitioners. Similarly, from section 2.7.5 of the previous chapter, it can be seen that the Theoretical Domains Framework (TDF by Michie et al. 2005) provides support to the argument that various constructs are responsible to change the behaviour of healthcare professionals which include: knowledge; attitude; self-efficacy and motivation. These four constructs were also included in the category of 12 constructs that were brought together in TDF as variables affecting the behaviour change of the healthcare practitioners by Michie et al. (2005). Hence, it is possible to infer that grouping of the barriers in this research is supported by theoretical underpinning derived from TDF and that a set of those barriers could be considered or grouped together for analysis to examine, how they affect CDM in combination with each other. While the discussions above provide the basis to define the hypotheses for testing the model in Figure 3.5, it is worthwhile to understand the practical aspects of grouping of the barriers, which is discussed next.

Some examples of real occurrences of multiple barriers in combination are provided here support the conceptualisation in Figure 3.5. The literature is mostly silent on, examples of research studies that have identified the occurrence of multiple barriers, in the integration of research knowledge into clinical practice in the healthcare field. However, in this research an effort was made, through in-depth literature review to extract knowledge, from already published material to identify, the existence of multiple barriers, acting at the same instant of time to affect practitioners. The outcome of such a review was the taxonomy of various barriers, extracted from the literature review, but underpinned by the KABF (Cabana et al. 1999; Fischer et al. 2016) (see Table 2.5 in the previous chapter). This table was an attempt to classify the various barriers reported in the literature using generic terms. The contribution of this effort to the concept of barriers to EBP (in other words CDM) in the context of PT is that, it explains, how various barriers identified by different researchers, in varying conditions, with differing terminologies, can be brought under, specific barrier concepts with a focus on, individual practitioners and thereby providing easier and generic terms to identify the classified barriers. An extract from Table 2.5, as given in Table 3.1 below, explains this argument.

Table 3.1 Extract from Table 2.5 illustrating the occurrence of multiple barriers in PT practice

No.	Author/s	Context & Country	Barriers to EBP in the context of PT	Common factors identified as internal barriers at practitioner level					External barrier
				Knowledge		Attitude			
				Awareness/ familiarity	Agreement	Self -efficacy	Outcome expectancy	Motivation	
1	Ramirez –Velez et al. (2015)	EBP in Columbia	Lack of research skills, lack of understanding of statistical analysis, inability to apply research findings in patient care, poor ability to critically appraise the literature	---	---	✓	---	---	---
			Lack of information resources,	✓	---	---	---	---	---
			Lack of interest	---	---	---		✓	
			Lack of generalizability research findings to specific context	---	---	---	✓	---	---
			Insufficient time, lack of English language skills, lack of peer support	---	---	---	---	---	✓

From Table 3.1 above, it can be seen that Ramirez –Velez et al. (2015) identified multiple barriers in one research investigation about individual PTs, which could be classified under six different types of barriers using the KABF (Cabana et al. 1999; Fischer et al. 2016). These barriers include: awareness/familiarity (knowledge); agreement (attitude); self -efficacy (attitude); outcome expectancy (attitude); motivation (attitude) and extrinsic barriers. This example also shows that barriers could be brought under generic terms, for instance, four barriers namely agreement, self-efficacy, outcome expectancy and motivation, could be brought under the term attitude. It must be noted here that Table 2.5 in the previous chapter and the explanations about the table are provided to demonstrate the actual existence of multiple barriers in reality and to support the arguments that multiple barriers need to be linked to CDM. It must also be borne in mind that the representation of attitude in this section is strictly based on the KABF (Cabana et al. 1999; Fischer et al. 2016), whereas a deviation has already been introduced and explained under section 3.4. In this research, it has been highlighted that attitude needs to be treated as an independent behavioural construct alongside self-efficacy and motivation. In the literature, it appears that, no other research study that has investigated barriers encountered by PTs in integrating CPG into CDM, those barriers have been classified under generic terms and explained in a simple, easy and understandable manner as is the case in this research. In addition, no prior study appears to have underpinned, the concept of barriers to integration of research knowledge into clinical

practice to any theory. In the taxonomy provided in Table 2.5, the use of KABF (Cabana et al. 1999; Fischer et al. 2016) to underpin the barriers enables the description, identification and classification of barriers, making the tabulation of barriers in Table 2.5 applicable to different situations that involve the study of barriers to integration of knowledge into clinical practice as well as understand how those barriers could operationalized.

Grouping of the barriers and linking them to CDM has another purpose in this research. While section 3.4 to section 3.5 have dealt with the relationship between a single barrier and CDM, assuming that those barriers can be reduced or removed, by a mechanism of single component interventions, it was also necessary to determine how those barriers can be removed using a different mechanism called multi-component interventions when these barriers act together. Review of the extant literature suggested (see section 2.7.3.1) that it is desirable (and possibly even necessary) to use multi-component interventions for dealing with more than one barrier at a time in the KT process of CPG into CDM. Hence, it was deemed necessary in this research to provide a framework to group the barriers and link them to CDM, so that the relationship could be empirically tested and examined. In order to know, how complex is the combined impact of barriers to the integration of CPG into CDM, the CPG-CDM gap and also, how to overcome those barriers using appropriate interventions. At this point it is possible to make assumptions to test the model in Figure 3.5.
Unlike the scenario described in sections 3.2 to 3.4, which is dealing with operationalization of single barriers and their individual relationship with CDM, study of relationship between a group of barriers and CDM requires a different type of operationalization that needs to take into account the various ways multiple barriers could be grouped.

For instance, barriers could be grouped as follows:

- **(knowledge, attitude, self-efficacy, motivation) → (CDM) ….. (3.1)**
- **(knowledge, attitude, self-efficacy) → (CDM) ….. (3.2)**
- **(knowledge, attitude, motivation) → (CDM) ….. (3.3)**
- **(attitude, self-efficacy, motivation) → (CDM) ….. (3.4)**
- **(knowledge, self-efficacy, motivation) → (CDM) ….. (3.4.1)**
- **(knowledge, attitude) → (CDM) ….. (3.5)**
- **(knowledge, self-efficacy) → (CDM) ….. (3.6)**
- **(knowledge, motivation) → (CDM) ….. (3.7)**
- **(attitude, self-efficacy) → (CDM) ….. (3.8)**
- **(attitude, motivation) → (CDM) ….. (3.9)**
- **(self-efficacy, motivation) → (CDM) ….. (3.10)**

Although various types of groupings amongst the four barriers are possible, whether such groupings can be supported by theory was a question that required examination. The literature review (see section 2.5.2) showed that there are different ways, by which barriers could be grouped and related, for instance, TDF by Michie et al. (2011) which showed that 12 domains including: knowledge; attitude; self-efficacy and motivation, could be linked to practitioner behavioural change, using different theories. Such a classification proposed in the TDF is supported by various theories including: TPB; social learning theory; self-determination theory; cognitive-adaptation theory so on and so forth. The arguments of Michie et al. (2011) provide sufficient grounding to group the barriers as shown above. When, each one of these groups is treated with a multicomponent intervention, then the results should show, whether the intervention has any impact on the barriers by testing the various relationships empirically. That is to say, if the total effect of the elements in the group changes, then the result of application of the multicomponent KTI should indicate, a change in the CDM behaviour of the PTs. Put another way, if for example, the total effect of the group (knowledge, attitude, self-efficacy, motivation) changes in the positive direction, after introducing the multicomponent KTI, then CDM behaviour should change in the positive direction, indicating that the KTI has reduced the total negative effect of the group of elements representing the barriers, namely (lack of knowledge, unfavourable attitude, lack of self-efficacy and lack of motivation). The equations 3.1 to 3.10 provide the basis to formulate the hypotheses that can be used to test the model given in the Figure 3.5. However, it must be noted here that equation 3.1 is depicted in the Figure 3.5, whereas equations 3.2 to 3.10 were not depicted as models because those equations could be thought of, as variants of the original model depicted in the Figure 3.5.

Equation 3.1 led to the formulation of the hypothesis:

H5: The lesser the knowledge of CPG, favourable attitude, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.

Equations 3.2 to 3.4 led to the formulation of the following hypotheses:

H6a: The lesser the knowledge of CPG, favourable attitude and self-efficacy of PTs towards CPG, the lesser will be the integration of CPG into CDM.

H6b: The lesser the knowledge of CPG, favourable attitude and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.

H6c: The lesser the favourable attitude, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.

H6d: The lesser the knowledge of CPG, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.

Equations 3.5 to 3.10 led to the formulation of the following hypotheses:

H7a: The lesser the knowledge of CPG and favourable attitude of PTs towards CPG, the lesser will be the integration of CPG into CDM.

H7b: The lesser the knowledge of CPG and self-efficacy of PTs, the lesser will be the integration of CPG into CDM.

H7c: The lesser the knowledge of CPG and motivation of PTs, the lesser will be the integration of CPG into CDM.

H7d: The lesser the favourable attitude and self-efficacy of PTs towards CPG, the lesser will be the integration of CPG into CDM.

H7e: The lesser the favourable attitude and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.

H7f: The lesser the self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.

As far as the practical use of empirically testing the relationships posited in equations 3.1 to 3.10 is concerned, it is proposed that knowledge about the relationship will provide a way to predict, how the impact of barriers could be reduced, so that PTs could integrate CPG into CDM, and the CPG-CDM gap could be bridged. After setting out the theoretical framework, which provided the linkage between the single barriers and multiple barriers on the one hand and CDM on the other, it was necessary to identify and hence propose, how interventions can be linked to barriers so that those interventions could be used effectively to reduce the impact of barriers on the integration of CPG into CDM and the narrow the CPG-CDM gap. This is discussed in the next section.

3.6 Conceptualization of interventions and their relationship to barriers to CPG-CDM integration and CDM

The literature review revealed that interventions impact barriers and are useful in removing barriers (see section 2.7.3). Interventions are generally classified as single component and multicomponent interventions. An example of a single component intervention is educational material (EM) whereas virtual communities of practice (VCoP) represent a multicomponent intervention (see section 2.7.4.1 and section 2.7.4.2). There are only limited studies that have investigated how interventions affect barriers to integration of research knowledge into clinical practice in PT. Further, not many studies have investigated both single and multicomponent interventions in a single study to compare their effect in addressing those barriers. This raises a question about selecting an intervention and application of an intervention to address the identified barriers in this study to narrow or eliminate the CPG-CDM gap in the context of PT.

Although there is a dearth studies that have addressed the above question, the currently available research outcomes provide some basis to undertake an investigation that could compare the impact of single and multicomponent interventions on barriers. A comparative study of single and multicomponent interventions could provide knowledge on how, when and what type of intervention could or should be chosen to deal with barriers to achieve integration of research knowledge into clinical practice. It is also not clear in the literature that, whether a single component intervention is better than a multicomponent intervention or vice versa with arguments and counter arguments producing conflicting outcomes (see section 2.7.3.3). Thus, in this study, both single and multicomponent interventions were studied. The type of single component intervention chosen for the study was EM, which appears to be the most widely used, whereas the type of multicomponent intervention chosen for study was VCoP, which appears to be one of the least, used in intervention studies (see Table 2.10). A combination of KTIs (educational material (EM), knowledge broker (KB) and VCoP) are used to design a multicomponent KT strategy in this research, represented by the term VCoP throughout the thesis for convenience.

As far as the operationalization of interventions was concerned, this research relied upon the arguments in the literature, which show that research knowledge when translated into CDM using interventions, then those interventions, generally termed as KTIs, can be considered to support diffusion of research knowledge into clinical practice (Estabrooks et al. 2006).in addition, Sheringham et al. (2017) report that there is dearth of studies that are supported by theories with reference to the role of KTIs in CPG integration. Further, Coryn et al. (2011) argues that several studies that are claiming to be theory driven, in fact, failed to use theory in a meaningful way. Hudon et al. (2015) recommends that intervention studies that are strongly supported by theories are needed, particularly in the field of PT. Taking support from the above arguments, it is important to identify a theory that could support the concept of interventions to address the barriers leading to CPG-CDM gap. One of the theories that could be applied to test and find the utility of KTIs, in removing the barriers is the theory of diffusion of innovation (DoI) by Rogers (2003). For instance, Nilsen, (2015) argues that DoI is the single most influential theory, which is being used, in the field of knowledge management. Similarly, Davidoff et al. (2015), suggests that the use of DoI theory has become common to understand and explain the phenomenon of interventions, including the use of ‘opinion leaders’ in healthcare context. According to Rogers (2003), diffusion is the process by which, any research innovation could be communicated or transmitted, through a conduit or channel during some period of time, within a group of members in a social system. If this explanation of diffusion is applied to the KTIs, for instance EM as a KTI, it can be seen that EM can enable CPG as research knowledge to be communicated to practitioners, through different channels (e.g. e-mail). Thus, EM is believed to help the practitioners by enabling them to integrate CPG into practice. Although other theories could be used to explain the operation of KTIs (e.g. OMRU, CIFR, KTA), it appears to be that DoI provides a

simpler way to measure and explain the operation of the KTIs, in regard to translating research knowledge into clinical practice (Estabrooks et al. 2006). For instance, using the relative advantage (RA) of EM as a variable representing KTIs (see section 2.7.4.4) could help to understand the extent to which EM has enabled the diffusion of CPG into CDM as suggested by DoI. Here diffusion of innovation is used synonymously to represent translation of CPG. The impact of EM as a KTI, on the barriers, on translation of CPG on CDM can be explained using DoI. While DoI suggests four other constructs also to measure the DoI namely complexity, compatibility, trialability and observability, it is argued that using one of those five constructs could provide knowledge to explain to what extent diffusion has been affected. Thus, DoI was chosen as the theory in this research, to explain how interventions can impact the barriers and enable the translation of CPG into CDM and thereby bridging the CPG-CDM gap. In applying this theory, the researcher used the construct RA, as the concept that could explain the extent of advantage the intervention could offer (for instance EM could be sent over e-mail and is easy to be used by individual practitioners) relative to any other similar intervention (for instance education meeting like a conference or seminar, which requires the practitioners to be physically present in some venue, where the intervention is in operation). In addition, relative advantage as a construct is measured empirically, using a scale developed by Atkinson (2007) that has been tested for its reliability and validity.

The foregoing arguments show that RA can be directly related to the four barriers chosen for study, because as KTIs need to have RA, in order to remove the barrier, if CPG translation into CDM has to take place. These arguments are depicted in Figures 3.6 to 3.9 below.

Figure 3.6 Relationship between RA of EM and knowledge

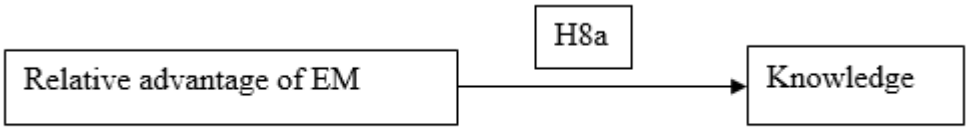


Figure 3.7 Relationship between RA of EM and attitude

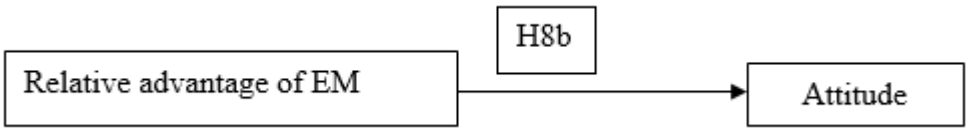


Figure 3.8 Relationship between RA of EM and self-efficacy

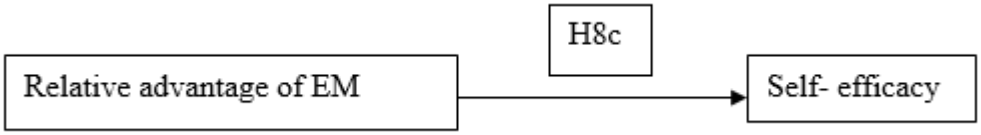
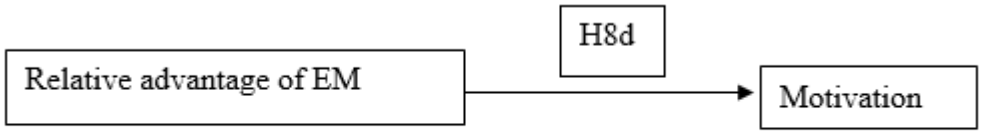


Figure 3.9 Relationship between RA of EM and motivation



In practical terms, the RA of an intervention could play an important role, in the adoption of an innovation (CPG as innovation in this research) and thereby can assist in reducing the CPG-CDM gap. With regard to the current research, EM could be used to narrow the CPG-CDM gap and the extent to which EM could act as an intervention was measured using RA of EM. Thus, the four relationships shown in Figures 3.6 to 3.9 above were required to be tested to find out, whether RA of EM really impacts the barriers. It is proposed that any increase in RA of EM in the positive direction, should enable PTs to enhance their knowledge about CPG or improve their attitude towards CPG or self-efficacy in understanding or implementing CPG in CDM or motivation to integrate CPG into CDM leading to a reduction in the barriers. That is to say, when RA of EM changes by one standard deviation in the positive direction, then the knowledge about CPG or attitude, self-efficacy in understanding or implementing CPG and the motivation of PTs in integrating CPG into CDM is also expected to increase correspondingly, in the positive direction. As a corollary, it can be stated that when RA increases in the positive direction, then lack of knowledge or unfavourable attitude of PTs, lack of self-efficacy and lack of motivation to integrate CPG into CDM are expected to reduce by one standard deviation, in the negative direction. The hypotheses that were therefore formulated based on the above relationships were:

H8a: Relative advantage of EM positively impacts the knowledge of PTs to integrate CPG into CDM.
H8b: Relative advantage of EM positively impacts the attitude of PTs to integrate CPG into CDM.
H8c: Relative advantage of EM positively impacts the self-efficacy of PTs to integrate the CPG into CDM.
H8d: Relative advantage of EM positively impacts the motivation of PTs to integrate the CPG into CDM.

However, after testing the influence of RA on the four barriers individually, it was essential to test the relationship between the four barriers and the CDM again after administering EM as KTI. The retesting will help to know whether the EM as a KTI has affected the barriers and their impact on CDM or not, or in other words it is to reconfirm the hypotheses H8a to H8d. Reconfirming implies testing of the impact of RA on the individual relationships as provided in Figures 3.1 to 3.4.

Similar arguments can be extended to predict that RA of VCoP as a multicomponent intervention affects the variable knowledge about CPG or attitude, self-efficacy to integrate the CPG and the motivation of PTs, in integrating CPG into CDM as barriers. However, it must be borne mind that VCoP is a multicomponent KTI that is expected to affect more than one barrier at a time. That is to say, RA of VCoP could be assumed to act on the various combinations of barriers, with one example illustrated in Figure 3.10, which indicates that all the four barriers are acting at the same time in the integration process of CPG into CDM.

Figure 3.10 Relationship between RA of VCoP and barriers

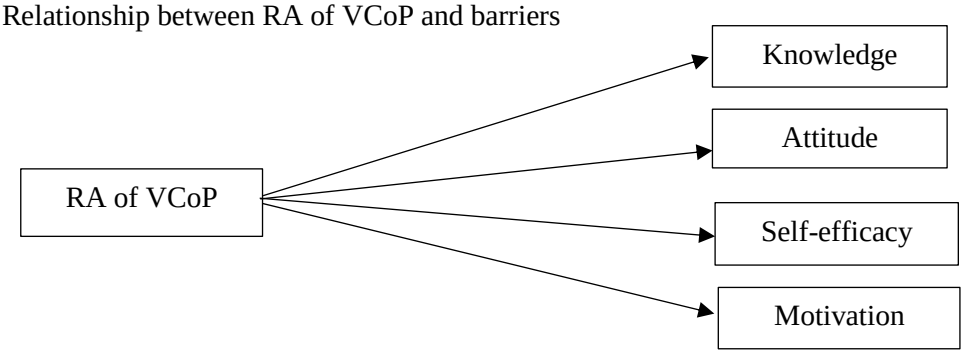


Figure 3.10 shows that multicomponent KTI can act on a group of barriers simultaneously. A combination of KTIs (educational material, knowledge broker and VCoP) as multicomponent KTI strategy was administered to the VCoP group. Henceforth the term VCoP refers to the multicomponent KTI. Applying the same arguments related to RA of EM to RA of VCoP, it is reasonable to propose that, if RA of VCoP increases in the positive direction, then it is expected that knowledge, attitude, self-efficacy and motivation of PTs to integrate CPG into CDM, which is considered as a group of multiple barriers in this research will also increase, in the positive direction. As a corollary, it can be stated that, when the RA of VCoP increases in the positive direction, then, the effect of a group of barriers on CPG-CDM gap would decrease. The above arguments led the researcher to formulate the hypothesis to test the model in Figure 3.10.

H9: Relative advantage of VCoP positively influences the knowledge of PTs to integrate CPG into CDM, the attitude of PTs to integrate CPG into CDM, the self-efficacy of PTs to integrate the CPG into CDM and the motivation of PTs to integrate the CPG into CDM.

While testing hypothesis H9, it was essential to group the barriers and examine the model to show that at least two barriers are found to be influenced by RA of VCoP, at any instant of time to confirm the multicomponent nature of VCoP and to reconfirm, whether the hypotheses H5, H6a to H6c and H7a to H7f are valid after the administration of VCoP as multicomponent KTI.

From the above discussions, it can be proposed that, when the total effect of group of elements changes in the positive direction, after introducing the multicomponent KTI, then the total effect of the group of variables, representing the barriers should reduce, i.e. a change would be shown in the negative direction. Alternatively, it can be stated that, if the total effect of the barriers changes in the negative direction, due to the impact of a multiple KTIs, then the CPG-CDM gap would narrow and CDM should change in the positive direction. While review of the literature showed that empirical and experimental research that are supported by theories, to address the multiple barriers of integration of CPG into CDM, using KTIs, is limited in the field of PT, this research proposes a novel way to identify the barriers leading to CPG-CDM gap, link the identified barriers to CDM and predict how and to what extent multicomponent KTIs affect translation of CPG into CDM. In addition to that, a comparative analysis will also be conducted between the impact of the single and multicomponent KTI on the CPG-CDM gap in the specific context of PT. Accordingly, the outcomes of this research can support PTs efforts to enhance the integration of CPG into CDM, by reducing the effect of barriers, eventually leading to optimum patient care.

From the foregoing discussions it can be seen that first multiple barriers or variables representing multiple barriers need to be linked to CDM prior to subjecting the variables to treatment by multicomponent KTI and verified for reliability and validity. Secondly, after the variables have been subjected to treatment by multicomponent KTI and the linkage between multiple variables and CDM needs to be tested and verified for reliability and validity to confirm the influence of the KTI on the variables.

After formulating the hypotheses, representing the various possible relationships between the identified variables representing barriers to the integration of CPG into CDM and CDM in different combinations as well as the impact of KTIs on the relationship between those variables and CDM, the next step taken was to compare the two KTIs and determine, which one of them is better, in bridging the CPG-CDM gap. A comparison would provide an answer to the question in the literature regarding, which one of the two KTI approaches (single component or multicomponent KTI) is better, so that the most useful one could be used by PTs, to overcome the barrier. Thus, the next section sets out the theoretical framework that led to the development of the final hypothesis that was required to be tested to verify the comparison between the two KTIs.

3.7 Comparison of single versus multicomponent KTIs

The discussions in section 2.7.3.1 shows that interventions are of two types, single and multicomponent interventions, and there is a need to know which one of the two would be more effective as there is a dilemma in the minds of researchers about the effectiveness of a particular intervention. This leads to the inference that if the interventions are compared by applying them to the

translation process of CPG to CDM, then the comparison could throw light on, which one of the two could be more effective. The discussions under sections 3.5 and 3.6 about the KTIs clearly point out that testing the hypotheses formulated up to this point will provide information on, how and to what extent, each KTI approach (single or multicomponent) impacts the barriers and enable the PTs to integrate CPG into CDM. However, making a comparison between the two intervention approaches can be carried out in two ways:

3.7.1 Comparing the results of the verification of the hypotheses (H1 to H4, H5, H6a- H6d and H7a- H7f). In this method the barriers were identified and subjected to interventions to see the extent to which their effect on CDM has reduced or to what extent the CPG-CDM gap has been narrowed.

3.7.2 Comparing the results of the impact of the interventions by designing another method using theoretical underpinnings. In this case, an experiment could be conducted by applying the interventions to achieve the translation process of CPG to CDM, without knowing what barriers exist, for the translation to take place. In such a situation, the tests should be able to demonstrate that a difference in the CPG-CDM relationship exists, when the relationship is examined before and after the administration of the interventions, and such a difference could be evident as follows:

(a) there is a difference in the CPG-CDM relationship before and after inducing the translation process when a single component intervention is used for the translation;
(b) there is a difference in the CPG-CDM relationship before and after inducing the translation process when a multicomponent intervention is used for the translation;
(c) a difference exists between the CPG-CDM relationship achieved by a single component intervention and multicomponent intervention;

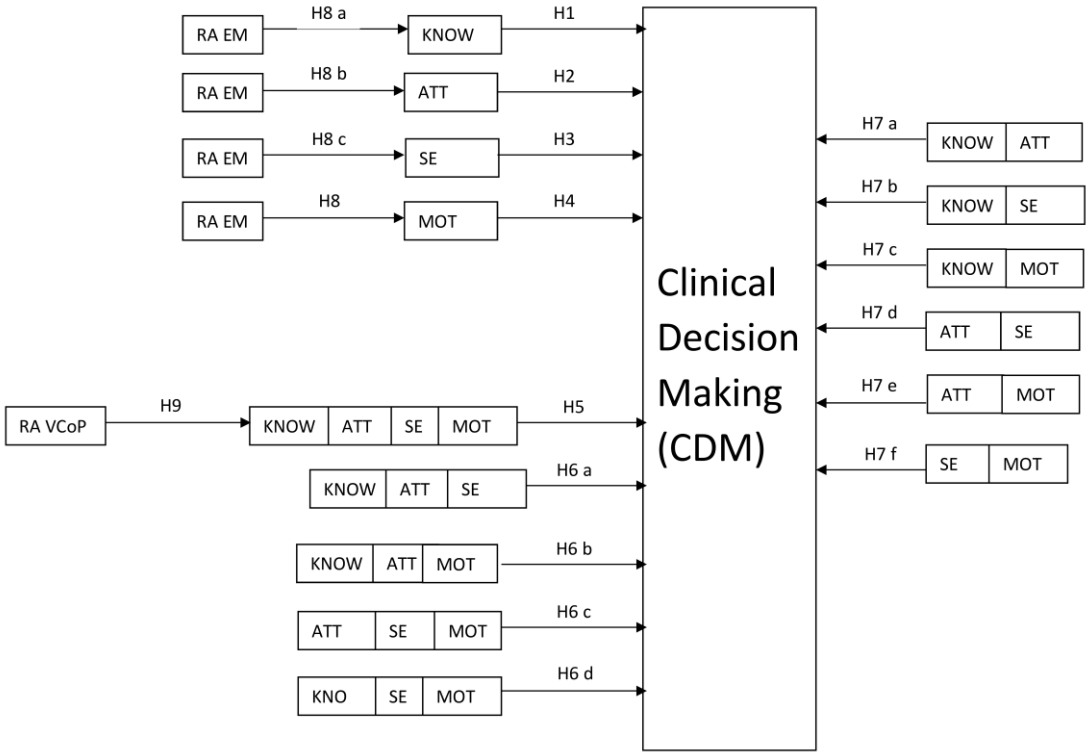
In addition, when measurements are made in two steps, namely before application of the interventions and after application of the intervention, then it is possible to show, whether barriers exist or not although, it may not be possible to know what those barriers are. Thus, two aspects can be verified by the induction of CPG translation into CDM. One is whether barriers exist (that is to say whether CPG-CDM gap exists), and the other is which of the two interventions is most effective. Accordingly, the following hypothesis was formulated.

***H10: When compared to single component intervention, multicomponent intervention is more effective in reducing or removing the impact of barriers to the integration of CPG into CDM*.**

By testing this hypothesis, it is possible to establish whether interventions affect CDM, CPG-CDM gap, translation of CPG-CDM, whether barriers exist, whether interventions impact those barriers and which one of the two interventions is more effective.

A conceptual model representation of the different relationships to be empirically tested, that emerged based on the above discussions, is given in Figure 3.11

Figure 3.11 Conceptual model representation of the different relationships to be investigated



3.8 Summary

This chapter has set out and explained the theoretical framework required to address the research questions put forward in this research. The theoretical framework provides the boundaries within which the research will be conducted. The framework is an attempt to answer the proposed research questions that has taken into consideration, the limitations of the previous research. Also, in this research, many of the relationships that are being examined have been represented as equations. This has resulted in a simple yet easily understandable definition of the relationships and explanations, thereof using appropriate theories reviewed in Chapter 2. Thus, this chapter has also provided the basis for developing the research methodology that was used in this research.

Chapter 4

Research methodology

4.1 Introduction

The previous chapter provided the theoretical framework for this research. Hypotheses were developed to answer the research questions. In order to examine the hypotheses a methodology was defined, developed and discussed in this chapter. Included in the chapter are details about the rationale behind the choice of research philosophy, ontology, approach and method, development of the research framework, research design, and the data analysis process employed. Sections 4.2 through 4.5 that follow set out the potential alternative choices that were available. Section 4.6 (Research Framework) subsequently then presents and discusses the choices that were made.

4.2 Research philosophy

The choice of the appropriate research philosophy for this research was based on epistemological considerations which concerned with all aspects related to how knowledge is understood. Epistemology provides the basis for the belief about what constitutes knowledge and how it is underpinned to a philosophy. Widely used philosophies include positivism and interpretivism (Saunders et al. 2015). Positivism is based on the belief that there is an objective truth that enables an understanding of the world and the phenomenon related to it. A positivist perspective would argue, for instance, that the phenomenon of CPG exists and can be understood objectively with regard to its existence, in terms of the concepts that signify an objective truth related to patient care. Positivism would provide the basis to view and understand CPG as an objective truth. However, there can be contradictions to this belief. For instance, some could argue that the phenomenon of CPG must be understood as knowledge describing multiple truths that are subjective. Such a belief is defined as interpretivism. If one applies interpretivism to the phenomenon of CPG, then it can be seen that every CPG requires interpretation that could bring out different truths independent of each other. In this situation, it is difficult to exclude every other truth in favour of a single truth, meaning that certain subjective understanding of different truths needs to be employed in describing the phenomenon.

While positivism is usually associated with objective ontology, a deductive approach, and quantitative method, interpretivism involves subjective ontology, an inductive approach, and qualitative method (Holden & Lynch, 2004). The advantages of positivism include describing the cause and effect relationships that could exist when two variables are involved in describing the phenomenon, the use of an existing theory to adopt a scientific approach in determining the cause and effect relationship between the variables, use of scientific laws in the study to test the hypotheses, use of a predetermined research design for the study and employing objective measures in understanding the phenomenon. The limitations of positivism include lack of understanding of the wider behaviour of people that

could make sense and enable the understanding of what happens in people's mind. In addition, phenomena are not always defined by a single objective way or law. There are happenings, for instance the feelings of people, which need different ways and approaches to unearth the knowledge about them. In such cases, positivism is unlikely to provide complete knowledge about the phenomena (Sekaran and Bougie, 2016). If these arguments are applied to the integration of CPG into CDM and CPG-CDM gap, then it can be seen that the phenomenon of CPG-CDM gap is more attuned to be dealt with using a positivist philosophy. The reason for this is that CPG-CDM gap as a phenomenon is likely to be better understood, if the knowledge related to the gap is thought of as really existing, supported by theory, and measured objectively.

Interpretivism, on the other hand, has the advantages of enabling the researcher to bring out multiple truths about a phenomenon that could coexist, understanding the actual feeling or thought or experience of people about a phenomenon, and describe the phenomenon using a mental model constructed by having deeper insight into the phenomenon. In addition, interpretivism paves the way for understanding the phenomena using qualitative methods and gaining knowledge about the different aspects, through the process of observation/involvement of the researcher in the phenomenon under study. Limitations of interpretivism include ignoring the existence of an objective view about a phenomenon and rejection of the existence of a single truth of a phenomenon, examples of which exist in this world (Sekaran and Bougie, 2016). For instance, if one views the CPG-CDM gap as a phenomenon that occurs due to cognitive learning ability of PTs, then it is not possible to describe the CPG-CDM gap using a single theory, because cognitive learning needs to be viewed using different principles like the phenomenon of learning, cognition and belief. In such cases, underpinning the investigation based on interpretivism could produce more meaningful outcomes. However, where the study is concerned with behavioural aspects (attitude, self-efficacy, and motivation) most of the research conducted in the past have chosen to use established theories implying the use of positivism, for the understanding of the behavioural phenomenon.

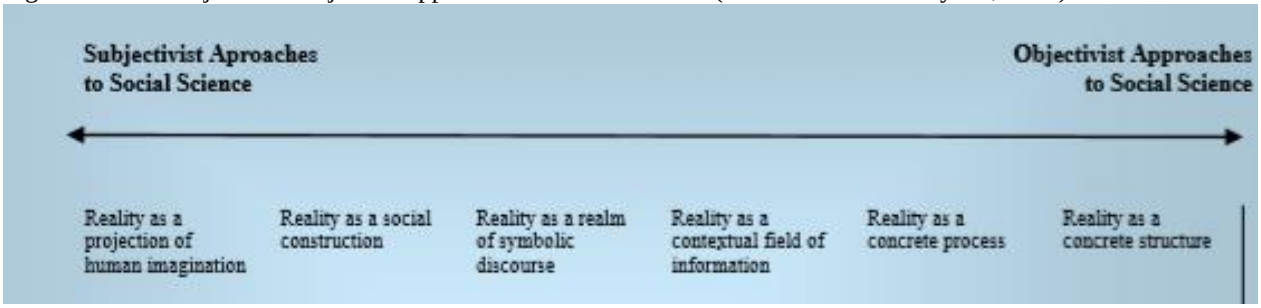
The above arguments suggest that CPG-CDM gap when investigated as a phenomenon involving behavioural aspects, it is worthwhile to consider the use of existing theories to explain the phenomena, indicating that a positivist epistemological stance could elicit a more complete knowledge about the CPG-CDM gap. Once the philosophical stand has been chosen, the next step that needs to be taken is to decide the ontological position to be used in this research. Ontology deals with the nature of the knowledge and is discussed next.

4.3 Ontology

According to Creswell, (2014), ontology provides the researcher with an understanding of the nature of the knowledge being discovered. Commonly used ontologies are subjective and objective

ontologies (Saunders et al. 2015). From figure 4.1 below, it can be seen that the ontological position taken by researchers will be part of the continuum with the extremes of pure subjectivity or pure objectivity (Holden & Lynch, 2004).

Figure 4.1 The subjective – objective approaches in social science (Source: Holden & Lynch, 2004).



A subjective ontology is usually associated with an interpretive research philosophy while the objective ontology is associated with the positivist philosophy (Holden & Lynch, 2004). In the field of knowledge translation (KT), researchers have adopted both subjective and objective ontologies (Nowell, 2015), although the usual ontological position taken by many researchers fall into the category of objective ontology. While there is no specific guideline that determines the choice of the ontology to be taken in order to answer the research questions, it has been recommended in the literature that it is useful to adopt a subjective ontological stance, if the researcher takes an interpretivist philosophical position and an objective ontological stand if the researcher takes a positivist research position (Holden & Lynch, 2004). A comparison of two ontologies shows that subjectivism offers advantages including building the ability in the researcher to understand the meanings that people attach to social phenomena, describe perceptions and consequences of social actors, and bring out the continuous process that involves an understanding of the constant state of revision of the social phenomena under study. In contrast, objectivism enables a researcher to gain knowledge on how social entities exist, external to social actors in reality. In addition, objectivism underpins reality as existing objectively, which implies that researchers are expected to exclude their own feelings and values in discovering the objective truth (Gray, 2013). If one applies these arguments to this research, related to barriers affecting integration to CPG into CDM and CPG-CDM gap, then researchers will be able to understand the experiences, feelings and perceptions of PTs to determine the nature of reality with regard to barriers affecting integration of CPG into CDM and the CPG-CDM gap. The result could be propositions that bring out the possible ways by which this phenomenon could be understood. This implies that the nature of knowledge about barriers, their impact on integration CPG into CDM and the creation of CPG-CDM gap can be thought to exist in multiple forms. For instance, subjective ontology could enable a researcher to understand barriers as real barriers, notional barriers, perceived barriers or neither a barrier nor a facilitator. Similarly, the impact of barriers on the integration of CPG into CDM could be thought of as something affecting the

PTs, the nature of which can be described as a perception or an experience or feeling that is not a constant. In this situation, it is difficult to argue that the knowledge about the impact on the integration of CPG into CDM existing in one particular form or described in one unique way.

In contrast, if one applies the objective ontology to the current research problem, then the nature of reality that could be understood is likely to be that barriers exist in a form that can be explained objectively, the barrier's impact on integration of CPG into CDM is an objective truth and the existence of CPG-CDM gap is true. In order to decide, which of the two ontologies to be applied, it is necessary to know the limitations of the two ontologies. While subjective ontology believes that social phenomena cannot be construed as variables that can be manipulated, in reality it can be seen that social phenomena could be construed as variables that could be altered intentionally to produce a desired state about the phenomena. For instance, if one views the existence of barriers as real and treat them as variables and their impact on integration of CPG into CDM can be altered by using empirically tested experiments, leading to an objective way of understanding the extent of impact of barriers on integration of CPG into CDM. It is not possible to deny this existence of an objective truth about the impact of barriers on integration of CPG into CDM. On the other hand, if one argues that objectivism suffers from the limitation that it cannot provide an understanding of how knowledge about barriers and their impact on integration of CPG into CDM exists in different forms, then such a limitation could hinder the exploration of barriers and their impact on integration of CPG into CDM. It is important that a researcher carefully weighs the pros and cons of choosing a particular ontological stance before adopting that ontology into research.

After having understood the importance of a specific ontological position, it is necessary for the researcher to understand the type of research approach that the researcher should adopt to answer the research questions. This aspect is discussed next.

4.4 Research approach

Widely used research approaches include deductive and inductive approaches. While in the literature the deductive approach is argued to be aligned with positivist research philosophy and objective ontology, at the same time inductive approach is shown to be aligned with interpretive research philosophy and subjective ontology (Creswell & Creswell, 2018; Creswell, 2014). Deductive approach involves deducing the hypothesis, indicating the variables to be measured to test a relationship between the variables, testing the hypothesis, assessing the outcomes of the test and modification of the theory that is being used in the study based on the findings of the assessment. Induction involves an understanding of the feeling of what is happening with regard to the problem under investigation, discovering the multiple ways the problem could be addressed, building a theory based on the findings of addressing the problem and either confirm an existing theory or bring a new

theory. Much of the research conducted in the area of KT or understanding the behaviour of PTs seem to use deductive approach rather than inductive approach. However, the choice of a particular research approach depends on the nature of the research question that the researcher aims to answer. In order to choose the particular research approach, it was necessary to study the difference between the inductive and deductive approaches, as illustrated in table 4.1

Table 4.1 The differences between the inductive and deductive approaches (Source: Saunders et al. 2015)

No.	Deductive emphasizes	Inductive emphasizes
1	scientific principles	gaining an understanding of the meaning humans attach to events
2	moving from theory to data	a close understanding of the research context
3	the need to explain causal relationships between variables	the collection of qualitative data
4	the collection of quantitative data	a more flexible structure to permit changes of research emphasis as the research progresses
5	the application of controls to ensure validity of data	a realization that the researcher is part of the research process
6	the operationalization of concepts to ensure clarity of definition	less concern with the need to generalize
7	a highly structured approach	
8	researcher independence of what is being researched	
9	the necessity to select samples of sufficient size in order to generalize conclusions	

From Table 4.1 and the arguments of Saunders et al. (2015), it is inferred that a deductive approach would be used if the researcher is testing a theory, and an inductive approach, if researcher is building a theory. In the current research, the aim was to understand, the impact of barriers on integration of CPG into CDM and the consequent effect on the CPG-CDM gap. If the researcher chose an inductive approach in addressing the research problem, then it would involve the collection of qualitative data by being part of the investigation of PTs and induct the findings based on the observations obtained through the investigation. On the other hand, if the researcher chose a deductive approach to address the research question, then the researcher would collect quantitative data while remaining independent of the investigation process (Saunders et al. 2015).

After understanding how and which research approach must be chosen for this research, the next step involved the choice of a particular research method to answer the research questions.

4.5 Research methods

Widely used research methods include quantitative and qualitative research methods. More recently, researchers have started to use mixed methods involving both types (Creswell & Creswell, 2018; Creswell, 2014).

4.5.1 Quantitative research method

According to Creswell & Creswell, (2018) a quantitative research method is used for testing objective theories by investigating the relationship between the variables. In turn, those variables can be measured using instruments leading to collection of numerical data and analysis by statistical methods (Creswell & Creswell, 2018; Creswell, 2014). Some of the advantages of quantitative research methods include use of statistical data in analysis, saving resources and time while analysing the data using software packages, possibility of generalization of findings, use of scientific methods in data collection and analysis, use of sampling methods, replicability, possibility to use control and study groups, absence of researcher bias and objectivity (Eyisi, 2016; Bryman, 2015; Denscombe, 2014; Lichtman, 2013; Johnson & Christensen 2012; Creswell 2009; Cohen et al. 2011; Shank &Brown 2007; Connolly 2007; Bryman 2001; Gorard 2001). Limitations of quantitative research method include lack of in-depth understanding of a phenomenon within its natural settings, lack of flexibility, inability to include imaginative, critical and creative thinking as part of the data collection and inability to examine complex and dynamic contexts (Eyisi, 2016; Berg & Howard 2012; Cohen et al. 2011; Shank &Brown 2007; Denzin & Lincoln 2005; Gorard 2001; De Vaus 1996).

In the field of PT and research related to KT, a number of examples of the use of quantitative methods in research can be found (Ferreira et al. 2017; Cleland et al. 2016; Mass et al. 2015; Tilson et al. 2014; Bernhardsson, 2014; Rebbek et al. 2013; Campbell, 2013; Russell et al. 2010). An important point that needs to be noted is that quantitative methods involve the use of predetermined variables, hypothesis, and design. These discussions clearly point out that the choice of quantitative research method is essentially dependent on the research questions to be answered and the philosophy, ontology and approach to research. However, it is useful to know that quantitative research could be conducted using several methods including descriptive research method, correlations study, developmental design, observational study, survey research, experimental research and causal comparative research (Willams, 2007). If a researcher was considering choosing a quantitative research method, then it is important to take into account, the above considerations carefully, failing which, there is a risk of the researcher not achieving the set aim and objectives.

4.5.2 Qualitative research methods

According to Creswell (2014), qualitative research methods are employed by researchers where they seek to derive meanings of phenomena from the view of social actors. One of the core activities involved in qualitative research is the collection of data by observation of people's behaviour and activity in their natural settings. Willams (2007) argues that qualitative research is concerned with discovery by using a holistic approach. Research adopting a qualitative method is usually concerned with describing, explaining and interpreting the collected data. Qualitative research is usually aligned with interpretive philosophy, subjective ontology and inductive research approach. Advantages of

qualitative research include its ability to aid problem solving, the possibility to collect data from the natural settings in which phenomena are studied, the possibility to collect a large volume of data about people's real life and situations, the use of non-numerical primary data (e.g. words and pictures which serve as useful tools to extract factual and descriptive information), emergence of theories from data and capability to understand human thoughts and behaviour. In addition, the researcher establishes a close relationship with the participants in the research to gain significant and in-depth understanding of the experience of the participants (Eyisi, 2016; Leedy & Ormrod 2014; De Vaus, 2014; Lichtman, 2013; Maxwell 2013; Johnson & Christensen 2012; Berg & Howard 2012; Shank & Brown 2007). Limitations of qualitative research include lack of ability to generalize findings, lack of replicability, nonuse of scientific methods and procedures of enquiry and investigations, lack of ability to verify how true the statements of the researchers are, inability to verify the reliability of the research, use of subjective methods that might lead to wrong, inaccurate and misleading outcomes and the possibility of the researcher bias in the study (Leedy & Ormrod 2014; De Vaus, 2014; Johnson & Christensen 2012; Atkins & Wallac 2012; Cohen et al. 2011; Shank & Brown 2007; Denzin & Lincoln 2005).

Qualitative research methods include case study, ethnographic study, phenomenological study, grounded theory study and content analysis (Williams, 2011). There are number of examples of researchers using qualitative study in the field of PT in regard to KT (Dannapfel et al. 2014; Salbach et al. 2009; Schreiber et al. 2009). From the above discussion, it can be seen that a researcher needs to be careful in applying qualitative methods to answer research questions, failing which there is a possibility that the researcher is misguided leading to lack of achievement of aim and objectives.

From the foregoing discussion, it can be seen that both qualitative and quantitative research methods could be used in research concerning the study of barriers and their impact on integration of CPG into CDM and the CPG-CDM gap. However, it is important that researcher need to be careful in choosing the most appropriate research method leading to achievement of the aim and objectives of the research.

The preceding discussion in sections 4.2 through 4.5 shows that there is a necessity for the researcher to choose and justify the choice of the most appropriate research philosophy, ontology, research approach and method, if the research questions need to be answered. As far as this research is concerned, the choices and their justification are provided in the research framework discussed in the next section.

4.6 Research framework

The research framework defines the philosophical and other practical elements of the research design that influence the selection of the research methodology (Cunningham, 2014). Thus, this section

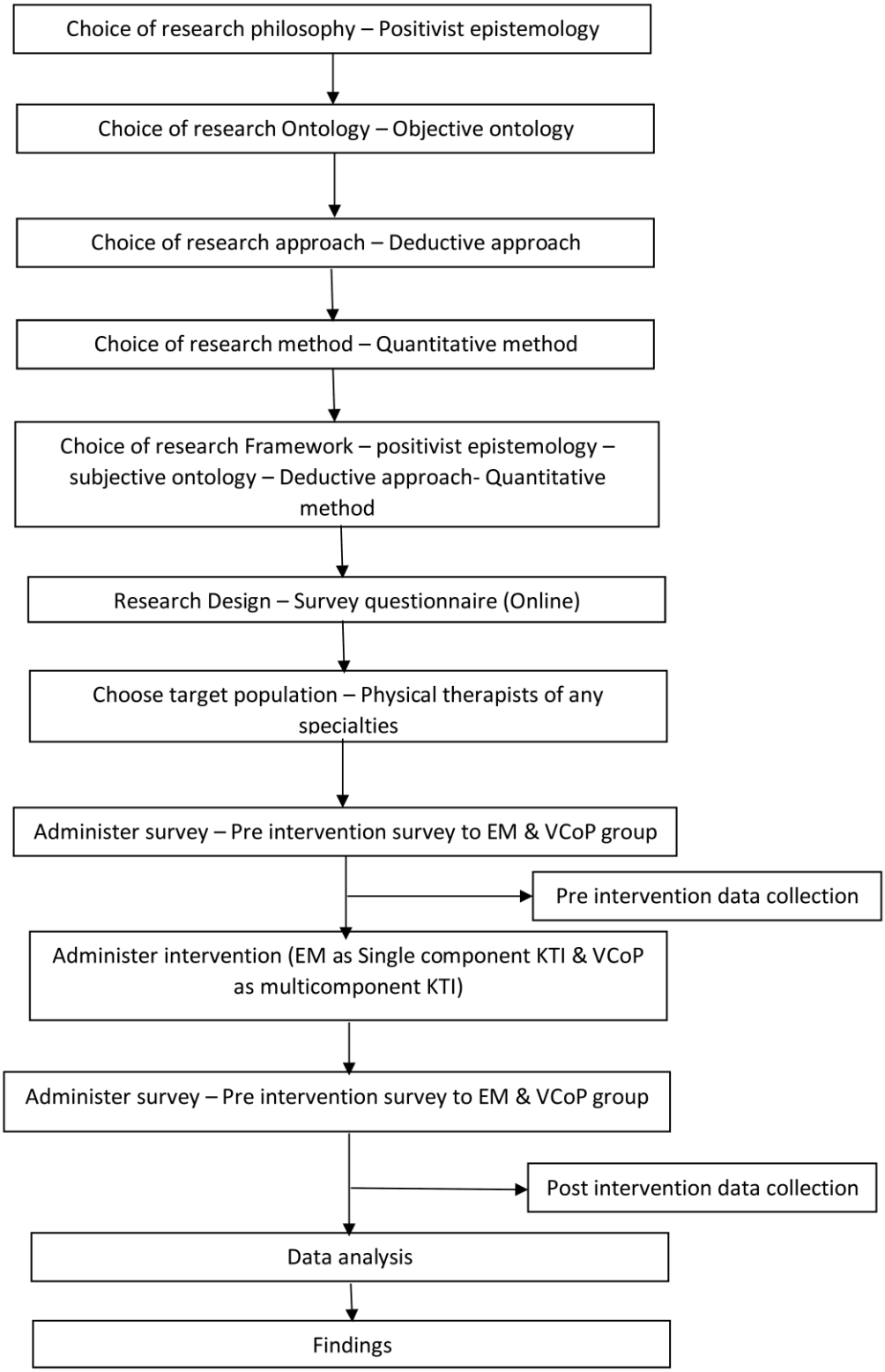
describes the choice of the research philosophy, ontology, approach and research method and justification thereof. As far as the research philosophy was concerned, in this research positivism was chosen. This choice was guided by the research questions and the theoretical framework given in Chapter 1 and Chapter 3 respectively. Answering the research questions involved identifying barriers as variables that could impact the integration of CPG into CDM and the CPG-CDM gap, and also identifying the most effective KTI that could bridge CPG-CDM gap. The philosophy behind the identification was that barriers to the integration of CPG into CDM exist in reality and those barriers cause the CPG-CDM gap. This argument can clearly be underpinned to positivist philosophy. The literature review supported this philosophical underpinning which led to the establishment of a relationship between barrier on the one hand, as well as KTIs and barriers on the other. These two relationships were sought to be established with the support of the theoretical framework (see Chapter 3) that pointed towards the existence of a single reality. Such a reality, namely the existence of an effective KTI that could possibly be used to remove one or more barriers to the integration of CPG into CDM leading to bridging of CPG -CDM gap led the researcher to adopt a positivist philosophical stance. In addition, the three main components under study, namely barrier, CDM and intervention, and KTIs were identified to be affecting large populations of PTs, indicating that the researcher could assume that knowledge about these components exist and in an objective form. Theoretical framework provided the basis to consider the identified elements as variables that could be manipulated. Such an assumption is possible if a positivist philosophical stance was adopted. The choice of the positivist research philosophy usually leads to the adoption of an objective ontology. As explained above, it can be seen that the three main identified components can be operationalized as measurable variables and such variables could be linked to understand the nature of the knowledge behind the linkage. The nature of the knowledge about identified components could be grounded on objective ontology as the identified components can be objectively measured using numbers. Further, the operationalization and linkage of the identified components could be understood by applying the statistical methods. Since the understanding of the variables and the relationship in a measurable manner points towards the existence of a single truth as reality, use of subjectivism was not possible because subjectivism points towards existence of multiple truths as reality. Thus, an objective ontological stance was adopted for this study.

Furthermore, it can also be seen that establishing relationships between variables leads to deducing results based on statistical analysis of the collected data. For instance, an understanding of the extent to which barriers impact the integration of CPG into CDM can be deduced by linking CPG to CDM. To make it easy and convenient to understand this environment in this research a new term called clinical practice guideline research environment was introduced. In this environment, CPG is the core issue that encompasses every aspect of the investigation. In such a situation, it is possible to justify the choice of deductive approach based on the discussion given in section 4.4.

Finally, taking into account that this research has chosen positivist philosophy, objective ontology and deductive approach for conducting the investigation, it is possible to argue that choosing quantitative research method rather than a qualitative method was justified. For instance, the preceding discussion shows that there is an objective truth, which exists in reality, namely an effective KTI that could bridge the CPG-CDM gap by impacting the barrier. Such an objective truth needs to be understood in an objective and measurable manner through the establishment of empirical relationships between barriers and CDM on one hand and barriers and interventions on the other, to deduce the extent to which the barriers impact CPG-CDM gap and the impact of the interventions on the barriers. According to literature, in order to gain this understanding and deduce the results of the analysis of empirical relationships, it is highly recommended to employ a quantitative method (Williams, 2011). Employing a quantitative method would enable the use of methods like an experimental study. Such analysis is expected to yield an objective truth about reality concerning the relationship amongst the variables namely barriers, CDM and interventions, as is supported by the arguments presented in section 4.5.1.

In summary, the research framework for this research used a positivist research philosophy, an objective ontology, a deductive research approach and quantitative research method to answer the research questions and the aim and objectives set out. Further, as part of the research framework it was necessary to contextualize the research by linking every step involved in research to CPG including the involvement of practicing PTs as participants in the study of translation process of CPG into CDM and the CPG-CDM gap. The research methodology has been pictorially captured in Figure 4.2. After presenting the research framework, the next step taken was to identify the research design.

Figure 4.2 Research methodology overview



4.7 Research design

According to Sekaran and Bougie, (2016) research design involves a series of steps including purpose of study, study setting, type of study, extent of researcher interference, time horizon, unit of analysis, sampling design, methods used for data collection, measurement of variables and data analysis. In short, the research design leads to identifying the way by which essential data is collected and analysed to derive findings that could help to answer the research questions. Each one of these steps is described in the subsequent sections.

4.7.1 Purpose of study

The main purpose of this study was hypothesis testing aimed at explaining the variance in the dependent variable (Kripanont, 2006). Hypothesis testing was used to serve the purpose of explaining the nature of certain relationships and establish the difference between the two types of interventions (single component KTI & multicomponent KTI) concerning two groups of PTs

4.7.2 Type of study

According to Adam et al. (2017) there are two types of investigations namely causal and correlational studies. Correlational study involves delineating important variables linked to the research questions whereas causal studies aim to delineate the cause of one or more effects. In this research both correlational and causal studies were conducted. Cause and effect relationship was established through the study of relationships between the variables and path analysis, whereas correlational study was employed to test the validity of the relationship between the variables (Adams et al. 2017).

4.7.3 Study setting and Unit of analysis

This study was conducted in the natural environment where work proceeds normally. The unit of analysis was PTs who were licensed and working in organizations or in private practice.

4.7.4 Time horizon of the study

This study used a combination of cross-sectional and longitudinal data, as it was required to collect data once for testing the relationship between variables, and more than once to conduct before and after study, that involved the comparison of the effectiveness of two types of interventions. Of the three research questions RQ1 and RQ2 required the data to be collected twice, to test the relationship between (a) barriers (independent variable) and CDM (dependent variable) and (b) relative advantage of the KTI (independent variable) and barriers (dependent variables) on the one hand and barriers (independent variable) and CDM (dependent variable) on the other with the population remaining the same. However, with regard to RQ3, there was a need to conduct before and after study to examine whether single and multicomponent KTIs had an impact on the barriers and CPG-CDM gap and to

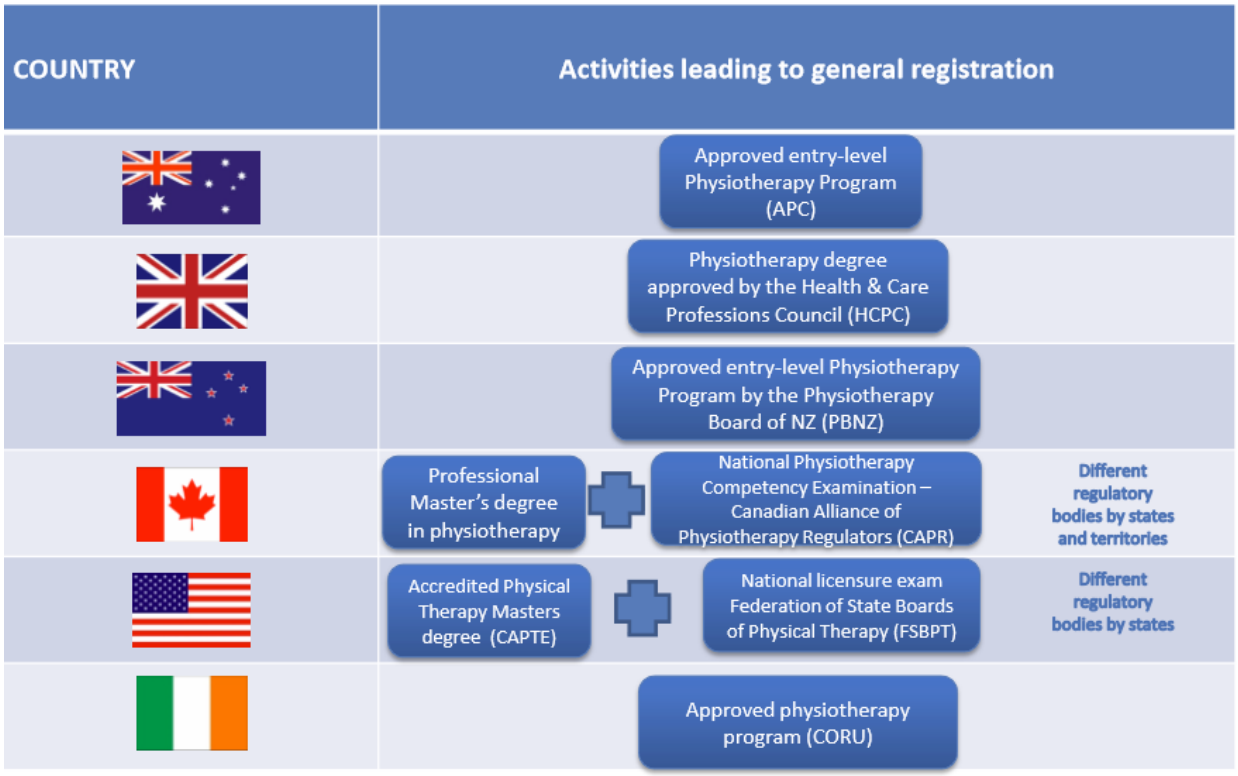
compare the effectiveness of the single and multicomponent KTIs (with the assumption that any change occurring with regard to the PTs is only due to the KTIs).

4.7.5 Extent of researcher interference with the study - data collection and data analysis

This study was conducted in a natural environment of the PT's workplace where the researcher interference within the normal flow of work was the minimum. The detailed process of collecting data from the PTs is explained in sections 4.15.1 and 4.15.3 and the detailed process for data analysis in section 4.17.

Further to explaining the details involved in the research design, it was necessary to define the territory in which the research was to be conducted. The research questions require identification of a target population of PTs, from whom the data was to be collected. PT is a global profession and there is variation in the way PTs practice in different countries, mainly restricted by the scope of practice defined by the associated regulatory authorities (see Figure 4.3). Thus, it was necessary to identify a specific territory. Such a specification of a territory provided conditions that are uniformly applicable to PTs, making the research process and its outcome consistent. For instance, in the USA, there is uniformity in the different conditions that govern the practice of PTs in all the states. Any research conducted in the USA can be considered to be applicable to the entire community of PTs practicing in the USA. An example of the applicability of this statement can be seen on the website of APTA (2018), that all the states in the USA allows direct access to the PT services for the patients. The preceding discussions clearly point out that territory matters as an important component of the research strategy, especially when the investigation pertaining to CPG and its integration into clinical practice of PTs are involved. This argument is supported by Ernstzen et al. (2017), who investigated CPGs pertaining chronic musculoskeletal pain and reviewed the literature, results of which show that CPGs are produced in specific countries and conducting research in those specific territories could provide the most up to date base.

Figure 4.3 Comparison of international accreditation systems for registered health professions- Activities leading to general registration Physiotherapy (Source: AHPRA, 2016).



Considering the above arguments, the USA was chosen as the territory for this research. In comparison to other countries, the USA offers a wealth of opportunities to conduct research in the area of CPG as it is a major contributor to the development of CPG as research knowledge, including CPG for VTE in PT. Additionally, the USA is a country in which practice of PTs is governed by stringent regulations, making the process of research meaningful in the context of studying the CPG-CDM gap in PT. Additionally a contradiction was noticed in the USA that is there is no enforcement of the integration of CPG into clinical practice leaving the option to the individual PTs. This meant that although USA is in the forefront of offering the best healthcare in the field of PT for patients and has strict laws governing the practice of PTs, yet it is not mandatory in the USA on the part of PTs to integrate CPG into CDM. Such contradiction is prone to affect the healthcare delivery system. This situation was more or less ideal for the current research. Any study conducted in that territory related to the topic of integration of CPG, CPG-CDM gap, and KTIs is expected to provide knowledge about, not only how to address the barriers to minimize CPG-CDM gap and the process of identification of KTIs to address the barriers, but also about the contradiction itself. It was also found through preliminary investigations and discussions with experts in the field in the USA that, access to PTs in USA is plausible due to the phenomenal reach of technological tools including internet and social media. It is advised in the literature that when a CPG that is designed in a specific context need to be adapted to suit the local context, if someone is trying to integrate that CPG in a different context. The integration will suffer from problems, if healthcare regulations, policies and practices differ

significantly from the original context for which the CPG was developed for (Dizon et al. 2016; Attia, 2013). CPG for VTE in PT is a guideline is found to be contextualized for application to the PTs in the USA, strengthening the choice of USA as a territory for this research. After specifying the research design, the literature points out the need to specify the research strategy which is expected to enable the researcher to establish causal relationship between variables. This is discussed in the next section.

4.8 Research strategy

Research strategies are used for exploratory, descriptive and explanatory research (Yin, 2003). Such strategies include experimental research, heuristic inquiry, action research, ethnographic research, survey research, case study, grounded theory and phenomenological research (Saunders et al. 2015). Among these strategies survey and experimental research methodologies were considered most useful and appropriate for this study.

Survey research is conducted on a sample of subjects drawn from a population and investigates the sample so that the results can be used to draw inferences about a wider population (Creswell & Creswell, 2018; Creswell, 2014). On the other hand, experimental research was used to expose an experimental group (e.g. PTs in the EM group or VCoP group) to treatment (exposure to CPG through KTIs e.g. EM or VCoP) to measure the effect of the treatment on a group. Pre and posttest (before-after study) measurements were made by administering an experimental variable (treatment variable e.g. KTI) (Oppenheim, 1992) before and after exposing the PTs to the treatment using KTIs. In general, methods are considered as ways or techniques or procedures used to collect and analyse data related to research questions or hypothesis (Kripanont, 2007; Crotty, 1998). Questionnaire method was used to collect data and to answer RQ1 and RQ2 by testing the relationship between (a) the barriers and CDM and (b) relative advantages of KTI and barriers. The performance of PTs before and after the administration of KTI (dissemination of CPG), in terms of the integration of CPG into CDM as well as the CPG - CDM gap was measured (Sekaran &Bougie, 2016; Grimshaw, 2000; Oppenheim, 1992). These discussions lead to a more detailed description of how the strategies of survey method and experimental research were implemented.

4.8.1 Survey research methodology

Amongst the different strategies used for conducting research (see above), the choice of a survey research method for this research was based on the purpose of the research which was to gain an understanding of the change in the management and behavioural aspects (barriers) of the PTs with regard to integration of CPG into CDM and bridging the CPG-CDM gap using interventions. Furthermore, in this research the main purpose was to develop predictor variables of CDM of PTs and barriers that impacted the CDM of PTs and CPG-CDM gap. This required collection of data from

PTs. Survey method was the preferred method to collect data because it provides such advantages as collection of large volume of data from a sizeable population in a cost-effective manner with a rapid turnaround. In addition, survey research methodology is considered to be comparatively simple to explain and understand (Saunders et al. 2015). One of the widely used methods to collect quantitative data through a survey strategy is a questionnaire. Data collected using questionnaire can be analysed using descriptive and inferential statistics. In addition, survey strategy could be utilized to explain specific relationships between variables and produce models to gain knowledge about the different aspects of the relationship between the variables. Use of sampling method, greater control over the research process, drawing conclusions that could be generalized across the whole population and lower cost of data collection are some of the other advantages associated with survey research methodology (Saunders et al. 2015). In this research, these advantages were useful for the researcher because, a large volume of data had to be collected from a sizeable number of PTs in the USA which would not have been possible with other methods (e.g. case study, action research) (Dinu & Dinu, 2014). However, researchers need to be cautious about the limitations of the survey method, which include requirement of a comparatively more expensive and time-consuming testing than most laboratory experiments using captive participant pools and the impracticality of implementing broad scripted scenarios for social interaction (Visser et al. 2000).

There are different types of survey methods, including mail survey, telephone survey, questionnaire survey and personal interviews (Creswell & Creswell, 2018; Fink, 2017; Creswell, 2013; Fowler, 2009). However, the rationale behind choosing the specific survey method depends on the cost, time required, accessibility and ease of collecting data. When this aspect was considered, a questionnaire method was deemed to provide better advantages when compared to other methods. The next section discusses the aspects concerning the choice of the questionnaire as an instrument for collecting data.

4.8.2 Instrumentation

According to Creswell (2014) an important part of survey strategy is the survey instrument. A survey instrument that is widely being used in collecting quantitative data is the questionnaire. When compared to other survey research methods, questionnaire method offered several advantages in this study. For instance, mail (postal), telephone or personal interviews could not have been employed for data collection because reaching PTs through mail would require postal address details, telephone numbers, and personal interviews require access in person to PTs and all these were not available. However, the questionnaire method of data collection could be made available to PTs in the USA through internet, which was an advantage provided by online survey method and not offered by other methods (Dinu & Dinu, 2014).

The development of an instrument to measure variables for this research involved testing the instrument for its reliability and validity. In order to ensure that the reliability and validity, researchers widely use already tested and validated instruments by adapting them to suit the purpose of their research (Creswell & Creswell, 2018; Creswell, 2014) as the already tested and validated instrumentation provide established validity scores obtained from past use, which can be used directly, or adapted. The instrument used for collection of data should be able to measure the variables under study using data collected through the instrument. Commonly used variable types include opinion, behaviour and attributes of respondents (Saunders et al. 2015). The instrument developed for this research was to be posted on the web to ensure its reach a wider audience (PTs) in the USA and should be self-administered. The questionnaire is the most suitable instrument that could be used to collect data for this research because of a number of reasons, including those given in table 4.2

Table 4.2 Advantages and disadvantages of survey questionnaire (Source Eiselen et al. 2007)

No.	Advantages	Disadvantages
1	Cost effectiveness to administer in comparison with face to face interviews	Response rate tend to be low
2	Relatively easy to administer	Lack of researcher control over who fills the questionnaire
3	Familiarity with the concept of questionnaire with the participants is high	Lack of interest in the participants if the subject matter is not interesting or sensitive or questionnaire is too long or complicated to complete
4	Reduction in chance of bias in comparison to interview	
5	Perceived by participants to be less intrusive compared to face to face interview leading to the possibility of the participants respond truthfully to sensitive questions readily	
6	Convenient as participants could complete the questionnaire at a time and place suitable to them	

Table 4.2 provides a comparison between the advantages and disadvantages of using a questionnaire as the instrument for this research. The next section discusses the development of research instrument for collecting the study data.

4.9 Survey questionnaire development

A questionnaire is a measurement tool (Oppenheim, 1992). The questionnaire specification informs the researcher of the issues to be investigated through operational statements and the research designs (Oppenheim, 1992). The questionnaire development for this research was based on items chosen from previous research studies similar to the current one which included the publications of those authors presented in Table 4.3. The items used in the questionnaire were carefully worded. Variables that were measured using the items were appropriately categorized, scaled and coded, alongside laying out the general format of the questionnaire. In all, for this research, four questionnaires were developed along with two objective tests to measure knowledge and CDMB.

Table 4.3 List of prior research work from which items were adapted for the survey questionnaire

No.	Construct / variables	Number of items	Authors
1	Knowledge	10	Silva and Costa (2015)
			Garland (2013)
			Salbach et al. (2007)
2	Attitude	12	Bernhardsson and Larsson, (2013)
			Quiros et al. (2007)
			Rubin and Parrish (2010)
3	Self – efficacy	9	McEvoy et al. (2010a)
			Rubin and Parrish (2010)
4	Motivation	7	Guay et al. (2000)
			Quiros et al. (2007)
			Jette et al. (2003)
5	Evidence based clinical decision making	7	Silva and Costa (2015)
			Weng et al. (2013)
6	Clinical practice guideline specific knowledge & CDM behaviour	20	Hillegass et al. 2015
			Hillegass et al. 2015
7	Relative advantage	6	Atkinson, (2007)

An important aspect of the study's instrument was that it was developed to be posted online to conduct an online survey using 'Survey monkey'. The use of web-based or internet survey enabled the researcher to collect data in a cost-effective manner and at the convenience of the respondents. The questionnaire was a self-administered questionnaire that was expected to be less time consuming and expensive to administer. Although questionnaire method offered many advantages such as its ability to conduct comparative surveys and cater for experimental designs, it was necessary to be aware of the disadvantages of using a self-administered questionnaire (Table 4.2). Despite the disadvantages, the advantages could be exploited using appropriate steps and addressing the limitations. For instance, low response numbers could be overcome by increasing the number of respondents to whom the questionnaire could be sent. Similarly, lack of guarantee over who fills the questionnaire could be overcome by subjecting the collected data to rigorous statistical analysis. In this research, such precautionary measures were taken to overcome the disadvantages of using self-administered instruments for survey research.

Using a web-based technique to collect data can be criticized to be affected by privacy issues, design and coverage issues (Neuman, 2014). However, it could be seen that the main advantage of using a web-based approach which is wider reach of the researcher to the respondents in the USA who are commonly expected to be aware of using an online questionnaire securely weighed over the limitations. In addition, online questionnaires for conducting survey research are seen to be

increasingly gaining popularity among researchers (Rice et al. 2017). Taking the support of these arguments, web-based questionnaire survey was adopted for this research. After discussing the strategy used for conducting this research, the next step was to develop the actual questionnaire.

The four sets of survey questionnaires were used to measure the six constructs identified in the theoretical framework namely knowledge, attitude, motivation of PTs to integrate CPG into CDM, self-efficacy of PTs to integrate CPG into CDM, CDM as clinical practice and relative advantage of the intervention as well as the research knowledge and CDMB of PTs objectively using scores. In addition, the survey questionnaires were used to collect demographic details of the respondents. The survey questionnaire was carefully laid out with measuring items categorized under multiple sections. Table 4.4 provides details of the four sets of questionnaires developed for the survey.

Table 4.4 List of the survey questionnaires developed for this research

No.	Title of the survey questionnaire	Reference	Purpose
1	Knowledge translation study pre-intervention survey (EM)	Appendix 4.1	Administered to the group of PTs prior to the administration of the single component KTI.
2	Knowledge translation study pre-intervention survey (VCoP)	Appendix 4.1	Administered to the group of PTs prior to the administration of the multicomponent KTI.
3	Knowledge translation study post-intervention survey (EM)	Appendix 4.2	Administered to the group of PTs after the administration of the single component KTI.
4	Knowledge translation study post-intervention survey (VCoP)	Appendix 4.3	Administered to the group of PTs after the administration of the multicomponent KTI.
5	CPG specific knowledge and CDMB objective test with scores	Appendix 4.4	Administered to the two groups of PTs prior to and after the administration of the single component and multicomponent KTIs.

The four survey questionnaires were developed by adapting items, from already validated instruments, published by other researchers. Table 4.3 provides the details of the authors who had developed survey instruments and validated them, and from which items were adapted for this research. The exact wording of items from the prior research were not employed, but were modified to suit the current research, but without sacrificing the ability of the item to measure the construct. An important feature of the instruments was that the “Knowledge translation study pre-intervention survey (EM)” and “Knowledge translation study post-intervention survey (EM)” instruments were administered to the PTs in sequence, before and after the administration of the intervention namely “education material (EM)” respectively. A similar approach was used in administering the questionnaires “Knowledge translation study pre-intervention survey (VCoP)” and “Knowledge translation study post-intervention survey (VCoP)” to PTs who were subjected to the intervention “virtual communities of practice (VCoP)”. Further, it is essential to note here that PTs were grouped into two categories, with one of them brought under the EM category and the other brought under the VCoP category. Those PTs under the EM category were subjected to the intervention EM while those under the category VCoP were subjected to the intervention VCoP. In order to gain an understanding

of how the questionnaires were constructed for use in the survey, including the scale of measurement, information on the adaptation of the items and the construct the items measure, the different sections of the survey questionnaires used in this research are explained next.

4. 10 Knowledge translation study pre-intervention survey questionnaires (EM & VCoP)

The first part of the initial research instrument developed for pre–intervention data collection, was a covering letter, describing the details of the study and specific information that were required to be disclosed to the participants of the study. The covering letter described the various aspects of this research including the title, aim and ethical approval obtained for this research from Brunel University, London (see Appendix 4.16). In addition, the details of the experimental study design that would require the participant to provide data prior to and after the administration of the interventions was clearly mentioned. Further, participants were informed about the voluntary nature of participation, maintenance of the anonymity of the respondents, ensuring confidentiality and appropriate use of the data for the purpose of this research through the covering letter. Informed consent of the participants was obtained by informing the participants about their right to participate or not participate in the survey or withdraw from the survey at any stage of answering the survey questionnaire.

Details about the contents of the sections 1- 6 with an example of an item each used to measure the constructs are provided next. The survey questionnaire was divided into seven sections used to measure the constructs depicted in the conceptual model for this research. The sections are (1) demographics of PTs-8 items (2) knowledge of PTs about CPG-10 items (3) attitude of PTs towards integration of CPG into CDM-12 items (4) self- efficacy of PTs to integrate CPG into CDM – 9 items (5) motivation of PTs to integrate CPG into CDM-7 items (6) clinical decision making based on the CPG for VTE – 7 items and (8) relative advantage of the interventions -6 items. A 5-point Likert scale was used to measure all the items in the sections 1-6 and 8 of the questionnaire. Section 7 measured the specific knowledge content of the CPG and CDM behaviour of the PTs, using case vignettes. A case vignette is a variant of case study (Kathiresan & Patro, 2013; Menon-Nair et al. 2007). The following sections describe about each section of the survey questionnaire.

4.10.1 Section 1: Demographics

The demographic section addressed eight aspects. The first (1) enabled the collection of data to know whether the participants were practicing in the USA at that point; an essential condition to participate in the survey. Any participant who was not practicing even if licensed was not eligible to participate

in the survey as the research is about integration of CPG into practice. The second question (2) was used to ascertain whether the participants were licensed to practice.

If the participant's answer was "No" to the question 1, then the participant would not proceed further with the survey. The next four items (i.e. 3 to 6) were included to collect data about the demographic characteristics of the participants namely gender, age, the number of years of clinical experience and the highest qualification. The next item (7) enabled the researcher to collect data to know whether the participant is a member of American Physical Therapy Association (APTA) and the last item (8) enabled the researcher to ascertain whether the participant is a member of 'Cardiopt' Yahoo group which is one of the official VCoPs under the Listserv of APTA. Questions 1, 2, 3, 7 and 8 were nominal questions. Questions 1, 2, 7 and 8 asked the respondents to choose either yes or no whereas question 3 enabled the participants to choose the one of the two responses either male or female. The items 4, 5, and 6 were ordinal scales which enabled the participants to choose from a range of options. For instance, 'age' of the participants (question 4) was measured using the scale 20-25 yrs., 26-30 yrs., 31-35 yrs., 36-40 yrs., 40-45 yrs., 46-50 yrs., 51-55 yrs., 56-60 yrs., and >60 yrs. Similarly, the number of years of clinical experience (question 5) was measured by a range of options namely <2yrs., 2-5 yrs., 6-10 yrs., 11-15 yrs., 16 to 20 yrs., 21-25 yrs., 26 to 30 yrs., and >30 yrs. Question 6 enabled the collection of data about the highest qualification achieved by the participants using an ordinal scale with options undergraduate university degree, postgraduate university degree, Doctor of Physical Therapy, PhD and others.

4.10.2 Section 2: Knowledge

As depicted in Table 4.3, section 2 of the questionnaire measures the knowledge of the PTs, regarding the CPG for VTE in PT, as an independent variable impacting CDM. As explained in the literature review (see section 2.5.4), having awareness about the CPG and being familiar with the recommendations of the CPG are considered as critical aspects that affect the knowledge as a variable in this study but not the knowledge content in the CPG. 'Knowledge' of CPG for VTE in PT was measured using 10 items. These items were adapted from the questionnaires by Silva and Costa, (2015), Garland, (2013) and Salbach et al. (2007). All items were measured using a 5-point Likert scale with '1' indicating 'strongly disagree' and '5' indicating 'strongly agree'. Responses tending towards strongly disagree would be indicating the existence of a barrier whereas the ones tending towards strongly agree as indicating the existence of a facilitator for PTs to be aware or familiar with CPG.

4.10.3 Section 3: Attitude of PTs towards integrating CPG into CDM

This section measured the attitude of PTs towards integrating CPG into CDM as an independent variable impacting CDM. From section 2.5.5 it can be seen that attitude of PTs towards integrating

CPG into CDM is a major barrier to the integration. Attitude was measured using 12 items adapted from questionnaires by Bernhardsson and Larsson, (2013), Rubin and Parrish, (2010) and Quiros et al. (2007). Items 1 to 4 and 11 and 12 in this section were measured using a 5-point Likert scale with '1' as indicating 'strongly disagree' and '5' as indicating 'strongly agree'. However, items 5 to 10 were reverse coded with '1' as indicating 'strongly agree' and '5' as indicating 'strongly disagree'. For items 1 to 4, 11 and 12, responses tending towards 'strongly disagree' would be indicating the presence of a barrier and those tending towards 'strongly agree' as indicating the presence of a facilitator for PTs to integrate CPG into CDM. Similarly, with regard to the reverse coded items 5 -10, responses tending towards 'strongly disagree' would be indicating the presence of a facilitator and those tending towards 'strongly agree' as indicating the presence of barrier for PTs to integrate CPG into CDM.

4.10.4 Section 4: Self- efficacy

Self-efficacy was measured as an independent variable, impacting CDM, using a 9-items adapted from McEvoy et al. (2010a) and Rubin and Parrish (2010). Self-efficacy is also referred to as confidence by some (e.g. Rubin & Parrish, 2010). Although the original questionnaire of Rubin and Parrish, (2010) assessed 'confidence' as a variable, this study adapted the questionnaire to measure self-efficacy because in the literature both confidence and self-efficacy have been used interchangeably. Hence items 2, 3, 4, 7, 8 and 9 of this section were adapted from Rubin & Parrish, (2010) to measure the construct 'self-efficacy whereas the remaining items 1, 5 and 6 in this section were adapted from the scale developed by McEvoy et al. (2010a). Items 1 to 9 were measured using a 5-point Likert scale with '1' as indicating 'strongly disagree' and '5' as indicating 'strongly agree'. It can be construed that responses tending towards 'strongly disagree' would be indicating, the presence of a barrier and those tending towards 'strongly agree' as indicating the presence of a facilitator for PTs to integrate CPG into CDM.

4.10.5 Section 5: Motivation

Motivation can be defined as the processes that account for an individual's intensity, direction and persistence of effort toward attaining a goal (Ryan & Deci, 2000). Motivation is found to be an important variable that affect the KT amongst the PTs (Ramirez –Velez et al. 2015; Silva et al. 2015; Bernhardsson et al. 2014; Queiroz, 2013; Gorgon, 2012; Salbach, 2007; Jette, 2003). Motivation as a variable and its relevance to this study are explained in section 2.5.7. This section of the survey questionnaire gathers data about motivation of PTs to integrate CPG into CDM and the researcher adapted the items developed by Guay et al. (2000), Quiros et al. (2007) and Jette et al. (2003). Motivation of PTs towards integrating CPG into CDM was measured using seven items with each item measured using a 5-point Likert scale with '1' indicating 'strongly disagree' and '5' indicating strongly agree. Yet again, it can be seen that a response tending towards the point 'strongly disagree'

would indicate the presence of a barrier and the one tending towards the point ‘strongly agree’ to indicate, the presence of a facilitator.

4.10.6 Section 6: Clinical decision making

CDM is related to information that needs to be gathered, which tests to be ordered, how to interpret and integrate the information to draw diagnostic conclusions, and which treatments have to be given. (Merck Manual, 2016). As already explained in section 2.4.1, when research knowledge is integrated into CDM, it is regarded as EBCDM. There is only limited number of studies that have developed instruments to measure CDM in general and a detailed search of different databases did not reveal the availability of any previous publication that has measured EBCDM, in regard to CPG for VTE in PT. However, items to measure CDM from previously validated instruments developed by Silva and Costa, (2015) and from Weng et al. (2013) could be used. The construct was measured using seven items using a 5-point Likert scale. In six items (1, 2, 3 4, 6 and 7) the point ‘1’ indicated a response of ‘strongly disagree’ and ‘5’ indicated a response of ‘strongly agree’. As far as the item 5 in this section was concerned the Likert scale was reversed with ‘1’ indicating a response of ‘strongly disagree’ and ‘5’ indicating a response of ‘strongly agree’. Again, it can be seen that with regard to items 1,2,3 4, 6 and 7, a response tending towards the point ‘strongly disagree’ indicates the presence of a barrier and the one tending towards the point ‘strongly agree’ to indicate the presence of a facilitator except in the case of the item 5. The scale of the item 5 was reverse coded and hence a response tending towards the point ‘strongly disagree’ indicated the presence of a facilitator and the one tending towards the point ‘strongly agree’ to indicate the presence of a barrier.

4.10.7 Section 7: CPG specific knowledge and CDM behaviour

This section measured two quantities namely CPG specific knowledge and CDM behaviour vignette.

4.10.7.1 CPG specific knowledge

This section measures the score that a PT can obtain when subjected to a test indicating the level of CPG specific knowledge that the PT has. There were ten items used to measure the CPG specific knowledge as a score. The items were developed based on the fourteen recommendations of the CPG for VTE in PT, that help measure the CPG specific knowledge that could be expressed as a total score. An instrument that could yield a CPG specific knowledge score was not readily available in the relevant literature and hence, there was a need for developing such an instrument. The process of developing the ten items involved the identification of the CPG, deliberating on the fourteen recommendations of the CPG by a panel of experienced experts in the field from five nations namely USA, UK, Philippines, India and Bahrain, including the main author of the CPG (from USA) and the researcher and practicing PTs. An initial instrument comprising 15 items was developed by the researcher and reviewed by the panel mentioned above and a final instrument with ten items was

developed to be administered on the PTs to measure their CPG specific knowledge. The content, wordings, format and the ability of the item to measure accurately were validated by the panel for use in the survey. This entire process culminated in a unique *CPG specific knowledge score measuring instrument*. Each one of the items represented one specific aspect of the CPG knowledge. There was a marking rubric to decide whether the response of the participants was correct or wrong with a key answer to each item. The ten items and the marking rubric are provided in Appendix 4.5. Each item was a statement, derived from the fourteen recommendations of the CPG, resulting in ten statements and the PTs had to respond by choosing from a 'yes' or 'no' option against each statement. Thus, when the test to measure CPG specific knowledge was conducted on the PTs, for every correct response a PT will get one mark and for every wrong response the PT will get a score as zero. Participant PTs can score zero or ten or any score in between zero and ten.

4.10.7.2 CDM behaviour vignette

A CDM behaviour vignette provides an imaginary case scenario, to understand and decide what decision has to be taken to treat a patient if encountered in actual clinical practice. In order to understand whether the CPG specific knowledge identified by the researcher in the *CPG specific knowledge score measuring instrument* can be translated into CDMB, the researcher devised a corresponding measuring instrument called *CDM behaviour vignette score measuring instrument*. Using this instrument, the researcher could tabulate a score that reflected the CDM behaviour of PTs. The major challenge was developing imaginary vignettes that could be used by PTs to participate in the survey, derived from the CPG recommendations to assess the CDM behaviour of PTs. During the process of developing this instrument, the researcher studied the relevant literature, consulted similar knowledge produced by other researchers, used prior experience as an academic when case scenarios were created to make students understand concepts and, above all, interpreted the CPG recommendations to create the case vignettes. The case vignettes were subjected to review of a panel of experts (as referred it in the previous section) and the expert panel corroborated the content, meaning, formatting, ability to measure the CDM behaviour and the number of items in the vignette. A CDM behaviour vignette specific score measuring instrument with a set of ten items was developed.

It is recommended as ideal to observe the practitioner at work and by reviewing the charts (patient records) retrospectively to measure professional practice in healthcare. However, when these two methods are not possible, proxy measures such as 'case vignettes' can be used (Ayanniyi et al. 2017; Menon-Nair et al. 2007). Case vignettes are written clinical scenarios used to assess the professional practice. Thus, based on the recommendation of several authors who conducted empirical studies to measure knowledge and CDM component of the CPGs in healthcare profession, a CDM behaviour vignette was developed as proxy for this research (Ayanniyi et al. 2017; Te Boveldt et al. 2015;

Learman et al. 2014; Rutten et al. 2006; Menon-Nair et al. 2007). This process culminated in a unique *CDM behaviour vignette score measuring instrument*. Each one of the items represented one specific aspect of CDM behaviour. The marking rubric to decide whether the response of the participants was correct or wrong with a key to each item was developed in the same way as the CPG specific knowledge score measuring instrument. The ten items and the marking rubric are provided in Appendix 4.5. Each item in the CDM behaviour vignette derived from the 14 recommendations of the CPG resulting in a final 10 vignettes and the PTs were requested to respond by choosing from an 'yes' or 'no' option against each vignette.

4.10.8 The development of the final instrument

The final instrument developed was a combination of the two instruments namely *CPG specific knowledge score measuring instrument* and *CDM behaviour vignette score measuring instrument* with total of twenty items that were used to measure the CPG knowledge and CDM behaviour of those PTs who participated in the survey. The combination was random and items of the two instruments were mixed in no particular order. This did not affect the scores obtained by the participants as each one of the items developed for measuring either CPG knowledge or CDM behaviour had no specific effect if the sequence or the order in which they were administered on the PTs were changed randomly. Each item could be measured exclusive of the other. Further to the development of the knowledge translation study pre-intervention survey questionnaire (EM & VCoP), the next step, involved was the development of the Knowledge translation study post-intervention survey questionnaire (EM & VCoP). This is discussed next.

4.11 Knowledge translation study post-intervention survey questionnaire (EM & VCoP)

The purpose of the instrument was to collect data from the same population of PTs who were subjected to the KTIs namely EM and VCoP and see the effect of the KTIs on the four barriers under investigation in this research. The PTs as respondents of this study belonged to two groups with one group identified to be subjected to the intervention EM and the other identified to be subjected to the intervention VCoP. However, since there was a need to test the impact of KTIs on the four barriers, a relationship between the KTIs and the four barriers was drawn in the theoretical framework (see Figures 3.6 - 3.10). The impact of the KTIs was tested by assessing the change that would have occurred on the variables namely knowledge, attitude, motivation of PTs to integrate CPG into CDM and self-efficacy of PTs to integrate CPG into CDM using statistical tests. In addition, since the KTIs were hypothesized to impact the barriers, a change in the barriers was hypothesized to impact CDM as clinical practice in turn. Hence, the instrument developed was used to collect data from PTs after the administration of the KTIs with regard to the four barriers and CDM alongside the KTIs. Furthermore, while testing the impact of the KTIs on the four barriers and the impact of barriers on CDM, it was essential to use the same instrument pertaining to barriers and CDM to assess the extent of change that

would have occurred with respect to pre- administration of KTIs stage. That is to say, the instrument used to measure the four barriers and CDM was essentially the same as the one used at the pre-intervention stage with the exception that at the post-intervention stage a section related to the measurement of the KTIs was administered to collect data and measure the KTIs. Relative advantage was used to measure KTIs. Further, CPG specific knowledge and CDMB of PTs were also measured using the same instrument as the one used at the pre-intervention stage because any change occurring in the CPG specific knowledge and CDMB, measured at the pre-intervention stage, needed to be reflected during the measurement at the post-intervention stage to assess the impact of the intervention with respect to the measurement of the same items used at the pre-intervention stage. The following section discusses the instrument developed to measure the relative advantage only as the rest of the measurements in the instrument are the same as the ones used in "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*".

4.11.1 Section 8: Relative advantage of the intervention

For the post intervention data collection, there was a need to add items to the existing survey questionnaire to measure another construct namely single and multicomponent intervention. As explained in Sections 2.7.4.4 and 3.5, 'relative advantage' of the intervention was selected to represent intervention as the construct. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The rationale for selecting relative advantage as a variable to represent single and multicomponent interventions in this study was described in detail in the section 3.6. Relative advantage of the interventions was added to the instrument "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*" thus developing the post intervention questionnaire titled "*Knowledge translation study post-intervention survey questionnaire (EM & VCoP)*". To measure the construct relative advantage, the researcher relied upon the questionnaire used by Atkinson (2007). With regard to the KTIs as educational material and Virtual communities of practice (VCoP), the construct was also measured using the same 6 items, but with clear mention of EM & VCoP in the questions that would differentiate the two interventions clearly.

The items in this section were measured using a 5-point Likert scale with the point '1' indicating a response of 'strongly disagree' and '5' indicating a response of 'strongly agree', when a response tending towards the point 'strongly disagree' would indicate that the intervention does not impact barriers and one tending towards the point 'strongly agree' to indicate that the intervention does impact barriers. The final self-administered instrument comprising eight sections with close ended questions was titled as "*Knowledge translation study post-intervention survey questionnaire (EM)*" and "*Knowledge translation study post-intervention survey questionnaire (VCoP)*" (see section 8 in the Appendices 4.7 and 4.8). At this stage the instruments were ready to be administered. However,

before they could be used in the main survey it was necessary to conduct pre-test and pilot test on the instruments. The next section describes in detail about the pre-testing process.

4.12 Pre-test of the instruments

The research instruments were subjected to pre-test to evaluate the ability of the items to measure the constructs they are actually expected to measure and conduct a trial with a group of respondents so that the researcher could detect any shortcomings in the instrument with regard to format, design and instructions (Walston et al. 2017; Sekaran and Bougie, 2016). In addition, pre-test was expected to provide feedback to get a better understanding of the content of the survey, language used and typographical errors if any. Pre-test could be conducted using any or a combination of methods including expert review, focus groups, cognitive interviews and field testing (Walston et al. 2017). As part of the field test pre-test could be conducted by administering the instrument on colleagues, respondent surrogates or respondents the result of which could be used to refine the survey instrument (Cooper and Schindler, 1998). In this research, an expert review and field test was conducted. As part of the expert review, a request was sent to ten colleagues to participate in the pre-test process and eight volunteered to participate. The volunteers were five PTs (with more than fifteen years of clinical experience and ten years academic experience) and three academics (not clinicians). Hard copies of the final instruments were sent to the panel of volunteers and reviewers who provided feedback on the survey questionnaire. The feedback was taken into consideration and incorporated in the instruments. In addition to the 8 reviewers, section 7 of the survey questionnaire was emailed to the primary author of the CPG for VTE in PT and the feedback was used to refine section 7 of the instrument. The comments and feedback of the reviewers are summarized in Table 4.5

Table 4.5 Feedback on the preliminary questionnaires from reviewers after pretest

Comments	Questions code	Reviewer 1 (PT)	Reviewer 2 (PT)	Reviewer 3 (PT)	Reviewer 4 (PT)	Reviewer 5 (PT)	Reviewer 6 (Academic)	Reviewer 7 (Academic)	Reviewer 8 (Academic)	Action Taken
General Comments		Section on attitude is too long	Questionnaire is long	Reduce the no. of items under attitude	Need long time to complete	Questionnaire is long	Grammar Errors	Grammar Errors Questionnaire is long	Section on Knowledge and attitude are too long English language use	Rectified
Comments on Specific Questions	Knowledge questions 8,9 &10	Related to EBP	Applicable only to graduates after 2015 (release of CPG)	Specific CPGs are not taught in academic programs	Applicable to EBP than CPG	What about people graduated earlier?	Is it a part of your training at school?	Nil	Nil	Knowledge questions 8, 9 & 10 Deleted
	Attitude question 1	Same as Self-efficacy Q7	Similar (Self-efficacy Q7)	Same as Self-efficacy Q7	Repeated (Self-efficacy Q7)	Repeated	Self-efficacy Q7 - Similar	See Self-efficacy Q7	Repeated – Self-efficacy Q 7	Attitude question 1 Deleted. Self-efficacy Q7 retained
	Attitude question 12	Same as Self-efficacy Q7	Similar (Self-efficacy Q7)	Self-efficacy Q7	Repeated-Self-efficacy Q7	Repeated	Self-efficacy Q7 - Similar	See Self-efficacy Q7	Repeated – Self-efficacy Q 7	Attitude question 12 Deleted. Self-efficacy Q 7 retained
	Self-efficacy Q 3 & 4	More suitable for EBP	Applicable to EBP	Fits more in knowledge section	Applicable to EBP than CPG	Suitable for EBP	Nil	Nil	Nil	Self-efficacy Q 3 & 4 deleted
	Motivation question 6	Time is environmental factor	Time – common barrier for all PTs		Time? Motivation?	Nil	Nil	Nil	Nil	Motivation question 6 Deleted
	Clinical decision making questions 1 & 2	Somewhat similar	Nil	Same	Nil	Nil	Similar	Nil	Nil	Clinical decision making questions 1 & 2 retained for Pilot test
	Clinical decision making question 3	Related to EBP	Nil	Nil	Applicable to EBP	Suitable for EBP	Nil	Nil	Nil	Clinical decision making question 3 retained for Pilot test
	Relative advantage questions 1- 6	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

In addition, the instruments were administered to 15 surrogates of the actual population in Bahrain and 12 completed responses were obtained. The feedback received generally was related to language and formatting which were incorporated in the instruments. While there is no consensus on the size of the sample population to be used in the pre-test (see Zikmund, 2003- recommended sample size 25 subjects; Czaja, 1998 - between 20 and 70 respondents; Sudman 1983- 20 to 50 cases) a population of 15 is considered acceptable by Sheatsley (1983). Taking into account the results of the expert review and the surrogate population survey, the final instruments were made ready to be used in the pilot survey.

4.13 Pilot survey

Fink (2017) explains that pilot survey helps in revealing information that are of concern to the respondents while answering questions in the instrument that will be used in the main survey. Such concerns include clarity of language used, directions given to answer and check whether any modifications need to be carried out on the instrument so that the survey runs smoothly. In addition, Creswell (2014) points out that pilot testing will facilitate assessing the content validity of scores on an instrument and also help the researcher in improving the items, format and scales. Ticehurst and Veal, (2000) argue that pilot study should be used not only to improve the language but to test all aspects of a survey. Keeping these aspects in mind, a total of fifty PTs was approached to participate in pilot survey. These PTs comprised practitioners, colleagues and interns. While twenty-five as a minimum number of participants could be considered as adequate by some (e.g. Cooper & Schindler, 1998), forty-one complete responses were received. The data thus collected were used to conduct the preliminary statistical analysis and verify the basic reliability and validity of the instrument. It must be pointed out that the pilot survey was conducted on the instruments namely "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*", "*Knowledge translation study post-intervention survey questionnaire (EM)*" and "*Knowledge translation study post-intervention survey questionnaire (VCoP)*". The pilot survey was conducted as follows:

The fifty participants were divided into two groups of twenty-five each, randomly. One group was chosen to be administered EM as KTI. The other group was chosen to be administered the KTI, VCoP. Initially the survey questionnaire "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*" was distributed to all the fifty participants electronically. Forty-one fully completed survey questionnaires were returned. Next, the participants were divided into two groups that were identified as the EM group and VCoP group. The EM group was administered the KTI, EM and the VCoP group was administered the KTI, VCoP. Forty-one completed and valid responses were returned with twenty-one accounting for EM group and twenty accounting for VCoP group. Statistical analysis of the responses is provided next. The main focus of the statistical analysis was the reliability and validity test, a practice recommended by many other researchers (e.g. Johanson

& Brooks, 2010; Light et al. 1990). Modifications were made to the survey instruments after the pilot tests but before reporting those modifications it was necessary to understand the reliability and validity tests that were carried out which were portable to the main survey. Discussions on reliability and validity tests follow.

4.13.1 Reliability

According to Fink, (2017) reliability measures the consistency of the data collected. Ticehurst and Veal, (2000) state that if research is repeated at a later date or conducted on a different sample of participants then the extent to which the findings of the research could be achieved again is called reliability. Sekaran and Bougie (2016) argue that reliability provides a way to evaluate the goodness measure and indicates the extent of accuracy in a measurement. The most commonly used test to measure the reliability is the Cronbach's coefficient alpha, which measures the inter-item consistency reliability (Sekaran & Bougie, 2016; Nunnally 1979; Cronbach 1951). According to Sekaran and Bougie (2016), it is measured as the degree to which two items measure independently the same concept, in which case they will be correlated to each other. Widely accepted value of Cronbach's alpha is 0.7, while values less than 0.6 are considered as poor and those above 0.8 are considered as good. Furthermore, Cronbach's alpha is considered to indicate strong reliability if the value approaches 1.0. For this research, a value of 0.6 was accepted as the reference value of reliability to be achieved as supported by literature (Sridharan et al. 2010; Marshall, 2000). Tables 4.6, 4.7 and 4.8, provide the Cronbach's alpha values of the data collected through the survey questionnaires. SPSS version 21 was used to test the reliability of the collected data. In addition to Cronbach's alpha, two more tests namely inter-item correlation and item-total correlation were introduced at this stage. These two measures indicate the internal consistency present within the data. According to Sekaran and Bougie (2016), internal consistency measures the extent to which items in a survey questionnaire are correlated with each other as independent variables and is assessed as the inter-item correlation and item to total correlation. The literature shows that acceptable correlation between items could be greater than or equal to 0.3 while item to total correlation could be greater than or equal to 0.5. Item to total correlation indicates the correlation of an item to the summated scale and the inter-item correlation (Hair et al. 2018). While there is no agreement amongst researchers to clearly adopt inter-item correlation value as greater than or equal to 0.3 and item to total correlation as greater than equal to 0.5 (e.g. Waqas et al. 2017; Leite & Beretvas, 2010), a large majority of the researchers agree that inter-item correlations and item-to-total correlations should be greater than equal to 0.3 and 0.5 respectively, figures adopted in this research. Next section examines the reliability test conducted on data collected through the pilot survey.

4.13.2 Reliability measurement of the instrument Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)

The data collected from the 41 respondents belonging to both EM and VCoP group were analysed using SPSS version 21. Table 4.6 provides the results of the analyzed data.

Table 4.6 SPSS report before deletion of items causing problems to alpha, inter-item correlation and item-total correlation

No.	Construct	Items	Number of items	Cronbach's alpha (≥0.6)	Item-item correlation (≥0.3)		Item-total correlation (≥0.5)		Remarks
					Min.	Max.	Min.	Max.	
1.	Knowledge	QK1 – QK7	7	0.744	-0.363	0.8	-0.155	0.814	Items causing concern were QK1, QK2 and QK3
2.	Attitude	QA1-QA10	10	0.833	-0.085	0.708	0.206	0.674	Items causing concern were QA2, QA3, QA7 and QA10
3.	Self-efficacy	QSE1-QSE7	7	0.595	-0.246	0.659	0.124	0.581	Items causing concern were QSE2 and QSE5
4.	Motivation	QM1-QM6	6	0.782	0.011	0.703	0.198	0.868	Items causing concern were QM3 and QM4
5.	Clinical decision making	QCDM1-QCDM7	7	0.735	-0.00	0.741	0.153	0.702	Items causing concern were QCDM2, QCDM3 and QCDM5

As shown in Table 4.6, all the constructs suffered from internal consistency problems although reliability measures were exceeding 0.6 except in the case of the construct self-efficacy (alpha = 0.595). Some items in each construct were found to cause the problem (Table 4.6). Those items were deleted, and the reliability tests were conducted again. The SPSS report obtained after removing certain items that were mentioned in Table 4.6 is provided in Table 4.7.

Table 4.7 SPSS report after deletion of items causing problems to alpha, inter-item correlation and item-total correlation

No.	Construct	Items retained	Number of items retained	Cronbach's alpha (≥0.6)	Item-item correlation (≥0.3)		Item-total correlation (≥0.5)		Remarks
					Min.	Max.	Min.	Max.	
1.	Knowledge	QK4 – QK7	4	0.853	0.454	0.8	0.551	0.785	Items deleted were QK1, QK2 and QK3
2.	Attitude	QA1, QA4, QA5, QA6, QA8 and QA9	6	0.848	0.331	0.708	0.571	0.7	Items deleted were QA2, QA3, QA7 and QA10
3.	Self-efficacy	QSE1, QSE3, QSE4, QSE6 and QSE7	5	$0.697 \approx 0.7$	0.178	0.659	0.373	0.545	Items deleted were QSE2 and QSE5; item QSE3 was causing concern but was retained as it was thought the problem could have arisen due to small sample size and will be under observation to know whether it is causing the problem during the analysis of the main survey
4.	Motivation	QM1, QM2, QM5 and QM6	4	0.852	0.467	0.703	0.568	0.787	Items deleted were QM3 and QM4
5.	Clinical decision making	QCDM1, QCDM4, QCDM6 and QCDM7	4	0.778	0.186	0.741	0.302	0.755	Items deleted were QCDM2, QCDM3 and QCDM5; item QCDM1 was causing concern but was retained as it was thought the problem could have arisen due to small sample size and the item will be under observation to know whether it is causing the problem during the analysis of the main survey

From Table 4.7, it can be seen that the Cronbach's alpha values of all constructs are either equal to or exceeding 0.6. However, the inter item and item to total values for the constructs self-efficacy and CDM were still having a small problem with some items still causing concern (Table 4.7). Since this analysis was conducted at the pilot survey stage, these items were retained as it was felt that correlation values could improve with increased sample size during the main survey. Thus, at this stage, the survey questionnaire for measuring the barriers knowledge, self-efficacy, attitude and motivation and CDM were finalized to be used in the main survey by retaining the items mentioned in Table 4.7. Next, the reliability test of the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (EM)*" was conducted.

4.13.3 Reliability measurement of the instrument Knowledge translation study post-intervention survey questionnaire (EM)

As mentioned in section 4.13, this survey questionnaire was distributed to those respondents who were administered with EM as a single component KTI and collect data about the intervention. While the Sections 1 to 7 and the items in those sections in the instrument were exactly the same as the one used in the instrument "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*". The only difference was that an additional section 8 was introduced to measure the construct relative advantage (RA) that represented the EM as a single component KTI. Thus, the reliability test was conducted only on the items used to measure the construct RA. Since the relative advantage refers to the EM as a single component KTI, the construct was referred to as RAEM. The reliability test as mentioned in the previous section was conducted using Cronbach's alpha and inter-item and item-total correlation. The results obtained based on the output of SPSS is provided in Table 4.8.

Table 4.8 SPSS output on statistical testing of relative advantage

No.	**Construct**	**Items**	**Number of items**	**Cronbach's alpha (≥0.6)**	**Item-item correlation (≥0.3)**		**Item-total correlation (≥0.5)**		**Remarks**
					Min.	**Max.**	**Min.**	**Max.**	
1.	Relative advantage	QRA1-QRA6	6	0.846	0.182	0.719	0.467	0.768	Item QRA1 was found to cause problems to inter-item correlation. However, the item was retained as it was felt that the problem could be due to small sample size. This item will be evaluated closely in the main survey.

The results of the reliability test showed that Cronbach's alpha stood at 0.846 indicating good reliability. However, there was some concern with regard to inter-item and item-total correlation readings. It was found that the item QRA1 was causing concern while other items were found to have correlations greater than 0.3 and 0.5 corresponding to inter-item and item-total correlations respectively. However, considering the fact the pilot study population size was relatively low, any

decision to either retain or delete QRA1 was postponed to the main survey where the sample size was expected to be much larger. It must be noted here that the survey questionnaire distributed post-intervention administration was the same for both EM and VCoP only with a difference of the term VCoP in place of EM. Hence another reliability test on RA with regard to the instrument *Knowledge translation study post-intervention survey questionnaire (VCoP)* was not considered necessary. The items deleted at the end of the reliability test were QK1, QK2, QK3, QA2, QA3, QA7, QA10, QSE2, QSE5, QCDM2, QCDM3 and QCDM5.

4.13.4 Validity measurement of the instrument Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)

Creswell (2014) argues that validity enables the researcher to draw meaningful findings from the scores of the instrument. Ticehurst and Veal (2000) argue that research on business topics can suffer from validity problems especially when the instrument measures attitudes and behaviour as there are questions that are raised always about the true meaning of the responses received in surveys and self-reporting of behaviour. Further, Sekaran and Bougie (2016) argue that there are different types of validity assessments used to test the goodness of measures including content validity, criterion-related validity, construct validity and discriminant validity. Each one of these validity tests are discussed next with regard to this research.

4.13.4.1 Content validity

Also called face validity, content validity examines the agreement that an item, scale or measure is seen to logically reflect what it aims to measure accurately. In other words, content validity checks whether the measuring instrument provides enough coverage of the research questions (Saunders et al. 2015). In addition, Hair et al. (2018) argue that content validity is assessed by administering pre-tests on multiple sub-populations. In this research face validity was tested using judgement of what is considered as adequate coverage by requesting a panel of experts in the field including two academics, one practitioner and one researcher to examine whether each one of the items in the survey questionnaire corresponded with the concept being measure. Some minor revisions were made based on the suggestions of the panel for instance grammatical aspects and formatting aspects related to demographic questions. Pre-test and a pilot study were conducted as part of testing the instrument with a sub-population, as was indicated in section 4.13.

4.13.4.2 Construct validity

Saunders et al. (2015) claim that construct validity is that validity that enables the researchers to measure the extent to which the measurement items in a questionnaire actually measures the presence of those variables the researcher aims to measure. Some argue that construct validity could be tested in terms of convergent, discriminant, and nomological and criterion validity (Bamberger, 2017).

Convergent validity is also defined as criterion validity (Zikmund, 2003) and associated with correlational analysis, and it is the ability of an item to accurately make predictions. Hair et al. (2018) claim that convergent validity indicates whether items used to measure a specific construct converge or have a high proportion of the variance in common. That is to say, it tests the extent to which two items measuring a construct correlate with higher correlation values indicating greater convergence validity. Hair et al. (2018) argue that reliability is also a measure of convergent validity. Literature shows that acceptable values of item-total correlations should be greater than or equal to 0.5 whereas item-item correlation should be greater than or equal to 0.3 (Robinson et al. 1991a). Furthermore, Cohen et al. (2011) suggests three levels of inter-item correlation (r), namely small correlation (both positive and negative, r = 0.10 to 0.29), medium correlation (r = 0.3 to 0.49) and large correlation (0.5 to 1). As explained in section 4.13.2, it can be seen that item-total correlation values are higher than 0.5 for nearly all items in the survey questionnaires "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*" and *Knowledge translation study post-intervention survey questionnaire (EM)*. Convergent validity was tested using the inter-item correlation (≥0.3) and item-total correlation (≥0.5). Based on the results of the pilot test (see section 4.13.2 & 4.13.3) some items were deleted from the survey instruments (see Table 4.7 &4.8).

Discriminant validity was tested but details of discriminant validity are discussed in section 5.5.3.1 as it forms part of the structural equation modeling (SEM). Discriminant validity is defined as the measure of correlation between dissimilar concepts and should be low (Zikmund, 2003). Thus, it can be seen that construct validity at the pilot survey stage was established in terms of convergent, criterion and content validity whereas the discriminant validity was tested at the main survey data analysis stage. At this stage the final set of items that were used in main survey were confirmed, as presented in Table 4.9. The next section discusses details regarding the main survey conducted for this research.

Table 4.9 List of variables retained after the pilot study

No.	Description	Coding for Pilot study	Recoding for the main survey
	Knowledge		
1	I understand the core elements of the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy that is required for Evidence Based Clinical Decision Making (EBCDM).	Q K4	K1
2	I have clear understanding regarding the use of Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy for Evidence Based Clinical Decision Making (EBCDM).	Q K5	K2
3	I have sufficient knowledge to implement Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy as part of Evidence Based Clinical Decision Making (EBCDM).	Q K6	K3
4	I am familiar with the recommendations given in the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy.	Q K7	K4
	Attitude		
5	Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is important to facilitate my work.	Q A1	A1
6	I consider that using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy will not improve the patient outcomes.	Q A4	A2 RC
7	I consider that using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy restricts the clinical judgment of PTs.	Q A5	A3 RC
8	The judgment of experienced colleagues or supervisors offers a better basis than Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) as research evidence for improving clinical practice.	Q A6	A4 RC
9	Experienced PTs should disregard research evidence such as Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy when it conflicts with their intuition.	Q A8	A5 RC
10	Engaging in evidence-based practice Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy makes clinical practice too mechanistic and rigid.	Q A9	A6 RC
	Self - efficacy		
11	I have the ability to identify gaps in my knowledge required for managing Venous thromboembolism (VTE).	Q SE1	SE1
12	I have the ability to determine how useful (clinically applicable) the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy for EBCDM.	Q SE3	SE2
13	I have the ability to apply Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy to individual patients in my clinical practice.	Q SE4	SE3
14	I feel confident in my ability to use Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy to guide clinical practice decisions.	Q SE6	SE4
15	I understand how to evaluate the outcomes of my practice decisions using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.	Q SE7	SE5
	Motivation		
16	I think integrating Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice is interesting.	Q M1	M1
17	I do not think that Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is a good thing to pursue in my clinical practice. (RC)	Q M2	M2RC

18	I do not wish to change my clinical practice, regardless of the recommendations given in Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.	Q M5	M3RC
19	I am interested in learning or improving the skills necessary to incorporate Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice.	Q M6	M4
Clinical decision making			
20	I ask my patients about their preferences and I consider them in my clinical decision making in regard to management of Venous thromboembolism (VTE).	Q CDM 1	CDM 1
21	Currently much of my clinical decision-making in regard to management of Venous thromboembolism (VTE) incorporates recommendation in the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.	Q CDM 4	CDM 2
22	My clinical decision making for VTE is influenced by Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.	Q CDM 6	CDM 3
23	I have confidence in clinical decision-making that is based on Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.	Q CDM 7	CDM 4
Relative advantage of educational material (EM)			
24	Using the intervention (Educational material) for learning about the CPG for VTE was better than not using it.	Q RAEM1	RAEM1
25	Using the intervention (Educational material) was more interesting for learning about the CPG for VTE than without it.	Q RAEM2	RAEM2
26	Using the intervention (Educational material) made learning about CPG for VTE a better experience than I would have otherwise.	Q RAEM3	RAEM3
27	I learned about CPG for VTE more quickly and easily using the intervention (Educational material).	Q RAEM4	RAEM4
28	I had more fun learning about CPG for VTE using the intervention (Educational material).	Q RAEM5	RAEM5
29	The intervention (Educational material) about CPG for VTE offered me real advantages over the way I usually learn about CPGs.	Q RAEM6	RAEM6
Relative advantage of Virtual communities of practice (VCoP)			
30	Using the intervention (interactions in the VCoP) for learning about the CPG for VTE was better than not using it.	Q RAVCoP1	RAVCoP1
31	Using the intervention (interactions in the VCoP) was more interesting for learning about the CPG for VTE than without it.	Q RAVCoP2	RAVCoP2
32	Using the intervention (interactions in the VCoP) made learning about CPG for VTE a better experience than I would have otherwise.	Q RAVCoP3	RAVCoP3
33	I learned about CPG for VTE more quickly and easily using the intervention (interactions in the VCoP).	Q RAVCoP4	RAVCoP4
34	I had more fun learning about CPG for VTE using the intervention (interactions in the VCoP).	Q RAVCoP5	RAVCoP5
35	The intervention (interactions in the VCoP) about CPG for VTE offered me real advantages over the way I usually learn about CPGs.	Q RAVCoP6	RAVCoP6

4.14 Main survey

Following the completion of the pilot test and finalization of the research instrument, main survey was conducted to collect data from the target population of PTs. The number of PTs across the world is very high. However, in order to collect data, it was necessary to define the research setting and identify the target population of PTs, so that the sample size could be determined. The next section discusses this issue.

4.14.1 Research setting

As mentioned in section 4.7.5, PTs are the focus of this research. CPG as research knowledge is a major concern of every PT and their clinical practice. Hence data was to be collected from actual PT practitioners. Any qualified and practicing PT was potential target for collecting data because those PTs were expected to have the ability to integrate CPG into practice. Again, PTs of both gender and having a minimum qualification of a bachelor's degree in PT could participate in the survey as research shows that gender is not an issue in integration of CPG into CDM (Stewart et al. 2003) and any PT with a bachelor's degree could understand and integrate CPGs into CDM. The research targeted only those PTs, who had been practicing recently, and had at least practice experience of one year. Participating PTs were not restricted, in regard to their status as working professionals, for instance, they could be working for an organization or practicing on their own. Since previous KT studies conducted in the field of PT have already identified the above-mentioned characteristics of the PTs as important and argued that these characteristics are predictors or antecedents in the models proposed by those studies, this research did not focus on these aspects. Including those factors in the research would have resulted in deviating from the focus of this research, which is the impact of barriers on integration of CPG to CDM.

This research was conducted in the USA. Although this research could have been conducted in any other country, USA was chosen for the reasons mentioned in section 4.7.5 above. Furthermore, the research was conducted in a CPG that concerns any PT with any specialization or no specialization. Thus, any active PT practitioner with any specialization, but with a license to practice in the USA could participate in the research. There was no specific requirement of the PTs being at the work place as the research did not involve any particular work-based examination of concepts. This enabled the researcher to conduct online survey and using a social media forum (Yahoo group) which provided an advantage to the PTs to participate in the survey regardless of time, place and distance. Participating PTs may or may not have any exposure to the CPG under study.

4.13.2 Target population

The PTs could be residents of any state in USA. All participants were required to be above 20 years of age. The number of practicing PTs in USA ran in to hundreds of thousands. For instance, one estimate shows that the number of practicing PTs in the USA as 200,000 (DATAUSA, 2018). Accessing all the PTs to participate would be next to impossible, especially when they are distributed across a country as a wide as the USA. Hence, a sampling procedure was used so that a representative sample of the population could be requested to participate in the survey. Sample size was computed using a sampling procedure.

4.14.3 Sampling

While there are multiple ways of sampling, this research used the simple random sampling method. Random sampling is a probability sampling method. Advantages of sampling includes more accurate than census (collecting data from entire population), quicker, better response rate and cheaper (Fricker, 2016). Disadvantages of sampling include the presence of sampling error including errors created by problems pertaining to field work, the characteristics of the data collection instrument and difficulties related to managing large amounts of data (Sapsford & Jupp, 2006). In simple random sampling method, the term 'random' indicates that each one of the units in the population being researched has an equal and independent opportunity of being included in the sample. The term 'independent' implies that the choice of a unit does not affect the choice of another element. The term 'simple' indicates that each time a unit is chosen from the target population to be included in the sample, nothing affects the choice. Here the population indicates the total number of PTs available in USA and individual PTs are the units chosen as samples.

In order to determine the sample size, this research relied upon the formula derived by Cochran (1977) for continuous data (see equation 4.1).

$n_0 = [(t^2 \times s^2) \div d^2] \rightarrow (4.1)$

where n_0 = sample size; t = the t-value for a particular confidence level (95% is the confidence level widely used in research); s = estimate of standard deviation (calculated as s = number of points on the scale ÷ number of standard deviations) [e.g. if a researcher used a 9-point scale then there are 8 standard deviations (four to each side of the mean); that is s = 9/8]; and d = acceptable margin of error [(number of points on primary scale multiplied by acceptable margin of error)].

Applying the above formula for this research the following values were derived:

t = 1.96 (for a confidence level of 95%)

s = 5 ÷ 4 = 1.25

d = 5 x 0.03 where 0.03 is the assumed margin of error = 0.15

Thus, from equation (4.1) the sample size that could be used to collect data using the research instrument was calculated as:

$n_0 = [\{(1.96)^2 (1.25)^2\} \div (0.15)^2] = [\{(3.84) (1.56)\} \div (0.0225)] = [5.99 \div (0.0225)] = 266.22$

While the sample size calculated as 266 is an estimate only, it can be seen that the formula is pertaining to only the research instrument and does not take into account the population size. To

address this issue, Cochran (1977) provided a formula (see equation 4.2) to generate a correction factor if the sample size exceeds 5% of the total population.

$\underline{n} = (n_0) \div [1 + (n_0 / \text{Population})] \rightarrow (4.2)$

However, if the population of PTs is taken as 200,000 (an estimate given by DATAUSA, 2018), then the sample size calculated as 266, is seen to be less than 5% of 200,000 which is 10,000. In this case, there is no requirement to introduce the correction factor, as the 5% of 200,000 which is 10,000 is greater than 266. Thus, the sample size for this research was fixed as 266. After finalizing the sample size, the next step taken was collection of data. As noted previously, data was collected two times (pre-intervention stage and post intervention stage. On both occasions the samples chosen were independent random samples meaning the samples were carved out of the same population of PTs in USA. While this could imply that the participants could be an entirely new set of PTs at the post intervention stage, such a situation was unlikely to affect the results. The reason was every participant was required to answer the questionnaire (post intervention) after being administered the KTI and its influence on the behaviour of PTs with regard to CPG was expected on any PT. In either case the impact of the KTI on the barrier was being measured and matched pair measurement was impossible as respondents' identity was kept anonymous. Again, validity of random sampling method was measured using Levene's test to confirm that both the samples belonged to the same target population of PTs in the USA. Thus, any possible situation at the post intervention stage that is samples were either the same as the ones who participated in the survey at the pre-intervention stage or were an entirely new set of samples who participated in the survey post intervention stage or were a mixture of both did not matter. Hence the sample size of 266 was applied on both the occasions. The data collection process is explained next.

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4.15 Data collection

While the sample size was identified for the research, the data collection from the targeted sample of PTs posed a challenge, as the researcher was located at Bahrain. Online survey method could be useful in this situation and Survey Monkey was used as the platform to post the survey questionnaire online. Initially, the researcher had to identify PT practitioners in the USA to participate in the survey. 4 fellow practitioners acquainted to the researcher were approached. Each one of the acquaintances provided a list of practicing PTs known to them. The acquaintances included the primary author of the CPG for VTE in PT, who provided a list of e-mail addresses of practicing PTs in USA. In addition, the researcher had a network of practicing PTs in the USA, who helped in getting the emails of some more PTs known to them but maintaining the anonymity by not providing their names or other details. A total of 375 practicing PTs' list called 'EM' group was prepared using the information gathered this way which included the e-mail addresses, but the names of the potential participants were requested to

be withheld by the researcher to the acquaintances to maintain anonymity. However, those known to the researcher were not included in the survey to maintain consistency in adhering to the condition of anonymity of the participants. Similarly, an email request for obtaining permission to recruit members for this study was emailed to the administrators of VCoP under APTA Listserv which had about 500 members in the Cardiopt Yahoo group. The administrator of the Cardiopt Yahoo group consented for the researcher to use the platform for the study and provided access enabling the researcher to reach out to the members of the VCoP.

4.15.1 Data collection at the pre-intervention stage

The request for participation in the survey was sent to the PTs in the USA, using the email list that constitutes the EM group (for administration of the single component KTI group). The email content included the URL generated on Survey Monkey (https://www.surveymonkey.com/r/?sm=3VGvoRi7TzJZAbtYmwZIKA_3D_3D) on which the survey questionnaire (see Appendix 4.6) was posted. Using the mailing list, emails were sent to the sample population of PTs in USA (n= 375 PTs). In addition, access to a Yahoo group of PTs (that serve as the VCoP group for administration of multicomponent KTI), who were members of APTA was available which included 500 PTs. On the VCoP platform a message requesting participation in this study along with the URL of Survey Monkey (https://www.surveymonkey.com/r/T658RC3), on which the survey questionnaire was posted (see Appendix 4.9). The message with URL that is posted on the VCoP was automatically routed to the members by the platform through an e-mail, which is the feature of the Yahoo group. Thus, the anonymity of the members was maintained. The data provided by the respondents of both the groups, namely EM and VCoP, were directly saved on the database of Survey Monkey. Thus, the data collection at the pre-intervention stage was completed. Then the stage was set to collect data from the participants of the EM and VCoP groups at the post-intervention stage, after the KTIs were administered. The process of administering the KTIs is discussed next.

4.15.2 Administration of the KTIs

After collecting data from the participants (i.e. EM and VCoP groups) at the pre-intervention stage, the researcher sent emails to the participants of the EM group with the educational materials (single component KTI) of this study as attachment. The educational materials included the original article published by APTA about CPG for VTE, an executive summary of the CPG for VTE in PT, a power point presentation highlighting the 14 recommendations of the CPG and other relevant information pertaining to CPG. Information detailing what is expected of the EM group participants was also sent. Here the EM was supposed at act as the single component intervention aimed at addressing at least one barrier to the integration of CPG into CDM at a time.

Similarly, with regard to the VCoP group, once the data collection at the pre–intervention stage was completed, the researcher proceeded with administering the multicomponent KTI to the participants of the VCoP. One component of the multicomponent KTI strategy was the VCoP itself (considered as a KTI), where a Yahoo group was available for the members to conduct discussions in multiple forms (sharing of knowledge, experiences, opinions and clarifications about the CPG) were possible. In addition, educational materials (14 recommendations of the CPG, decision making algorithms and other supporting information related to the CPG) was posted on the group which is essentially considered as KTI. Further, the discussions on the VCoP was stimulated by two case vignettes of the CPG (e.g. see Appendix 4.10) and the discussions were moderated by a person called the knowledge broker (KB), which is essentially considered as KTI. Each one of these interventions was expected to stimulate discussions or knowledge sharing amongst the members leading to the dissemination of research knowledge amongst the members. It can be seen that although referred as VCoP, it essentially comprised different interventions (EM & KB) and could be regarded as multicomponent KTI that had the potential to address multiple barriers to the integration of CPG to CDM simultaneously.

For a clear understanding by the participants, the researcher posted a note explaining the requirements of participating in the experiment and the conditions to observe and contribute to the discussions that were going to be conducted on VCoP medium (Yahoo group). Unlike the case of EM, where the copies of the CPG for VTE in PT were e-mailed to the members, it was not possible for the researcher to send the copy of the CPG to the members of the VCoP by e-mail as no e-mail address of any member was available to the researcher. However, when the web link for accessing the article is posted with a message in the Yahoo group, it will be automatically delivered to the members of the group. So, the researcher posted the web link (https://academic.oup.com/ptj/article/96/2/143/2686356) on the VCoP (Yahoo group) for the community members to access the original article. In addition, researcher posted the 14 recommendations of the CPG for VTE in PT, decision making algorithms and other supporting information related to the CPG on the forum as images. Once the web link was posted, the Knowledge broker (KB), who is the main author of the CPG for VTE in PT was initiated the discussions amongst the members of the VCoP. The discussion was about the two case vignettes mentioned above. KB requested the VCoP members to analyse the case vignettes, which acted as proxies of actual clinical situations. Members were asked to provide their recommendations for managing the case scenarios depicted in the vignettes using the research knowledge provided CPG for VTE in PT. The recommendations were expected to be important clinical decisions to be made by PTs. Those decisions were expected to be the same as the one the PTs would take in the actual clinical practice if they encountered a similar situation as the one depicted in the vignettes (assuming that in the actual situation the PTs have access to the same research knowledge as the one facilitated by the VCoP). Some of the members actively participated by posting their opinions on the cases and

proposed their clinical decisions for the specific case scenario. There was a broad agreement about the proposed clinical decisions amongst the members and there was some disagreement also among the participants in the discussion. Some of the excerpts from the discussions are attached in the Appendices (See Appendices 4.11, 4.12 & 4.13). An important feature of the VCoP is that those members who did not participate in the discussions or provide recommendations were also receiving and witnessing the activity on the Yahoo group, thus providing an opportunity to those members also to integrate research knowledge into clinical practice. Literature suggests that members of a VCoP can demonstrate varying activity level as 'super users' (who interact often and post comments frequently), active contributors, observers and passive members (see section 2.7.4.2). Further the posting activity of the members in a VCoP, not necessarily correspond to their reading activity as well as learning. Eventually all members are provided with the opportunity to learn through reading the postings and listening to the interactions even if they do not post (Ford et al. 2015). Hence this research, VCoP as a multicomponent KTI provided the opportunity for the members to interact, facilitating the integration of CPG for VTE in PT.

4.15.3 Data collection at the post-intervention stage

At the pre-intervention stage, while the survey questionnaire titled "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*" was sent to the 375 PTs, using the e-mail list, prepared by the researcher, the same questionnaire was provided to the 500 members available on the Yahoo group also. However, at the post-intervention stage the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (EM)*" was sent only to those 375 PTs of the EM group whereas the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (VCoP)*" was provided to the 500 members of the Yahoo group. This is due to the reason that section 8 of the questionnaire is designed differently for the groups as it is expected to measure 'relative advantage' of the EM and VCoP as different interventions for the EM group and VCoP group respectively. Another URL namely https://www.surveymonkey.com/r/?sm=ObT3hxZNlr_2B61wo0IDM5pw_3D_3D was created for data collection from the EM group. Similarly, https://www.surveymonkey.com/r/PTKGQCP was created by Survey monkey to collect data from the participants at the post-intervention stage from the VCoP group (see Appendix 4.14). The responses provided by the participants of both the EM and VCoP group were automatically saved into the database of Survey Monkey for use in the analysis stage. After continuous follow-up, the responses summarized in Table 4.10 were received.

Table 4.10 Response rate to the pre-intervention and post -intervention survey questionnaires.

Stage	Intervention – Educational material (EM group): Total estimated population of PTs: 200,000			Intervention – Virtual communities of practice (VCoP group): Total estimated population of PTs: 200,000		
	Sample size	**Total No. of responses received and (%)**	**Valid responses after data cleaning**	**Sample size**	**Total No. of responses received and (%)**	**Valid responses after data cleaning**
PRE-Intervention	266	140 (52.6%)	92	266	112 (42.1%)	72
POST-Intervention	266	86 (32.3%)	66	266	75 (28.2%)	53
Knowledge-CDMB score –PRE-Intervention	266	140 (52.6%)	95	266	112 (42.1%)	93
Knowledge CDMB score – POST-Intervention	266	86 (32.3%)	77	266	75 (28.2%)	59

It can be seen that the response rates at the pre-intervention stage of EM group was found to be 52.6% while for the VCoP group it was found to be 42.1%. Literature shows that there is no specific minimum requirement for response rate for online surveys although the study by Nulty, (2008) showed that response rate as low as 20% were accepted by Griffith University when a survey was conducted online to collect data. In general, Sekaran and Bougie (2016) argue that a response rate of 30% is acceptable. In the absence of any firm conclusion about the acceptable response rates in the online surveys and taking into consideration the arguments of Sekaran and Bougie (2016), it was concluded that the response rate achieved in this research was considered acceptable at the pre-intervention stage. Again, some (e.g. Jones et al. 2003) consider that in before-after study, calculation of sample size is necessary only at the stage which is before administration of intervention and not a necessity at a stage that is after administration of intervention. Thus, it can be concluded that the response rate achieved for this research is acceptable.

4.16 Data editing and coding

Before analysing the collected data, it was necessary to process the data so that SPSS version 21 could be used to conduct data analysis. Processing the data includes verifying assumptions including no data entry errors, no missing data, normal distribution of data, outliers, and that multicollinearity are within limits. These are essential conditions to conduct analysis using structural equation modelling (see section 4.17.1). Since the data was collected using Survey Monkey, there was no human intervention involved in data entry, i.e. error caused by manual data entry was completely removed. As far as missing data was concerned, all responses which were affected by missing data were deleted from the database of responses generated by Survey Monkey. This yielded a set of data that had no missing data.

Normality was tested using standard deviation, skewness and kurtosis. From the review of the literature, it was found that data was considered to be distributed around the normal if it is within 2.0 standard deviations from the normal (Gelman, 2007). Skewness measures the asymmetry, for instance, positive skew points towards a long tail to the right side of normal and negative skew points to long tail on the left side of the normal. Similarly, kurtosis indicates the tail-weight, with positive measures indicating heavier tails around the normal while negative measures indicating lighter tails. According to the literature skewness measures should fall under ±2.0 (Khan, 2015; George & Mallery, 2010; Kunnan, 1998), whereas kurtosis measures should fall under ±3.0 (Kline, 2005). However, Kline, (2011) also suggests a skewness measure of 3.0 and kurtosis measure of 10 are also acceptable. Considering the different arguments for this research a skewness measure of 2.0 was set as acceptable while a kurtosis measure of 3.0 was set as acceptable.

Further to setting the acceptable measures of standard deviation, skewness and kurtosis, the next test conducted was the detection of the outliers. One of the most acceptable methods used to detect multivariate outliers suggested in the literature is the Mahalanobis distance (Leys et al. 2018). Mahalanobis distance is defined as 'D^2' and is expressed in terms of the standard deviation units that are calculated between a set of scores, for an individual case and the sample means for all variables (Kline, 2005). According to Hair et al. (2018), Mahalanobis distance is measured as a ratio (D^2/df) where 'df' represents the degrees of freedom and the set of data are acceptable, when the ratio ranges between 3 and 4. For this research (D^2/df) was set as 4, taking into account the recommendation of Hair et al. (2018). Again, Burke (2001) claims that outliers detected to the extent of 20% of the overall responses collected for the research are allowable or else the outliers need to be deleted. In this research the outliers were deleted. As far as multicollinearity is concerned, it was defined as the high degree of correlation amongst the dependent variables. According to Pallant (2016), correlations around 0.8 or 0.9 are reasons for concern. In this research, correlations amongst the dependent variables was set not to exceed 0.9 implying that multicollinearity will not be considered to be present, if correlation amongst dependent variables is less than 0.9. After deciding on the number of tests that need to be conducted, as part of the data management and clean up and the acceptable values that need to be met for using the data in the data analysis process, the next step taken was to describe the data analysis process.

4.17 Data analysis

SPSS version 21 and AMOS version 18 were used at the data analysis stage. Use of SPSS/AMOS enabled the implementation of a general approach to data analysis including SEM, analysis of covariance structures, or causal modeling. Although other software tools were available (e.g. Lisrel (linear structural relationship) and SAS (statistical analysis system)) this research used SPSS/AMOS due to the various advantages SPSS/AMOS offers in data analysis (Arbuckle, 2016). The data

analysis consisted of the descriptive statistics (e.g. minimum, maximum, frequency, percent, mean, standard deviation, skewness, and kurtosis and Pearson correlation), reliability and validity measurement of the research model for instance assessing the Cronbach's alpha, internal consistency, convergent validity, discriminant validity and analysing data by SEM. While descriptive analysis has been discussed already, the next discussion focuses on SEM.

4.17.1 Structural equation modelling

SEM is considered to be the method of choice for concept and theory development in social sciences (Hair et al. 2014). While in empirical research hypotheses verification as well as concept and theory development are complex steps encountered by researchers, SEM is considered useful, when dealing with latent constructs that are ill-defined and structural relationships including directional effects are not supported by sound theory (Astrachan et al. 2014; Hair et al. 2014). Advantages and disadvantages of using SEM are provided in Table 4.11.

Table 4.11 Advantages and disadvantages of SEM (Source: Jeon, 2015)

No.	Advantages	Disadvantages
1	SEM is the only method that uses the concept of latent (unobservable) variable in analysis. Majority of the methods use single indicators to measure the reliability and validity of complex constructs which is overcome using latent variables.	SEM concepts could be complex and not well understood leading to poor and inappropriate interpretation of results.
2	Using multiple indicators (observed variables) enable the examination of the relationship between latent variables unaffected by the measurement error of observed variables.	SEM may not be a useful tool in explanatory research with many variables and in situations that are week or non-existing substantive theory.
3	Relationship amongst dependent variables, simultaneous estimation of exogenous and endogenous variables, and the causal relationship existing between the exogenous and endogenous variables are possible in SEM.	Multiple statistical methods are used leading to possible errors creeping in.
4	It is possible to study the direct, indirect and total effect of more than one exogenous variable and endogenous variable that are being estimated in SEM.	Due to sampling or selection effects of individuals, measures, and occasions results obtained using SEM may lack generalizability.
5	Confirmatory factor analysis, correlation analysis, and regression analysis can be conducted simultaneously in a model.	Confirmation Bias
6	SEM can show reciprocal causal relationship between latent variables.	Measure of goodness fit of a model does not imply that the model is correct but only plausible. Additionally, acceptable goodness fit of the model does not indicate that hypothesized models are strong.
7	Easily accessible	Does not work well when time as a factor is used in measurement.

The various terminologies that are used specifically in regard to SEM are provided in glossary of terms in Appendix 4.15. SEM is argued to be a combination of factor analysis and regression or path analysis (Sunthonwutinun & Chooprayoon, 2017). SEM can be used to explain the dependent

variables and enables to modelling of the direction of the relationship, represented by multiple regression equations simultaneously. While implementing SEM care must be exercised to ensure that certain assumptions are made, and those assumptions are verified to be satisfactory. These include that different kinds of scales are used, data is distributed normally, the variables are related linearly, and the available sample size is sufficient.

SEM facilitates:

- testing of alternative models and relationships between variables (Ullman & Bentler, 2003; Byrne, 2005).
- generalizability of the models across groups (Kline, 2005; Ullman & Bentler, 2003).
- tabulation of reliability and error terms (Ullman & Bentler, 2003; Byrne, 2005).
- identification of a model that can make theoretical sense (Kline, 1998)
- fits well to the data (Arbuckle & Wothke, 1999; Ullman & Bentler, 2003) and
- the testing of whether a model is simple (parsimonious) (Arbuckle & Wothke, 1999; Ullman & Bentler, 2003).

Broadly, SEM involves five steps, namely specification of the model, identification of the model, selection of the measures, collection of data, data cleaning and preparation, analysis of the model and its evaluation, and re-specification of the model (Kline, 1998). A detailed explanation and analysis of each one of these steps is provided in the next chapter. In addition, SEM was performed using SPSS/AMOS software.

4.17.2 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) is a method that can be used to arrive at a smaller number of unobserved variables (latent variables) that could be sufficient enough to explain, for the covariance, among a larger number of observed variables (manifest variables) (Albright & Park, 2009). CFA is a hypothesis or theory propelled analysis that can lead the researcher to test the hypothesized relationship, in a model. According to Albright and Park (2009), CFA generates many goodness-of-fit measures that could be used to study a model. Typically, CFA is carried out, using sample covariances, instead of correlations, with the researcher having a good idea about the number of factors, the linkage between those factors as well as the linkage between the factors and the measured variables (Ullman, 2006). CFA presents the measurement model of SEM. Benefits of using CFA include:

- filling the commonly seen gap that exists between theory and observation.
- enabling the possible rejection of model or theories, based on the results produced.

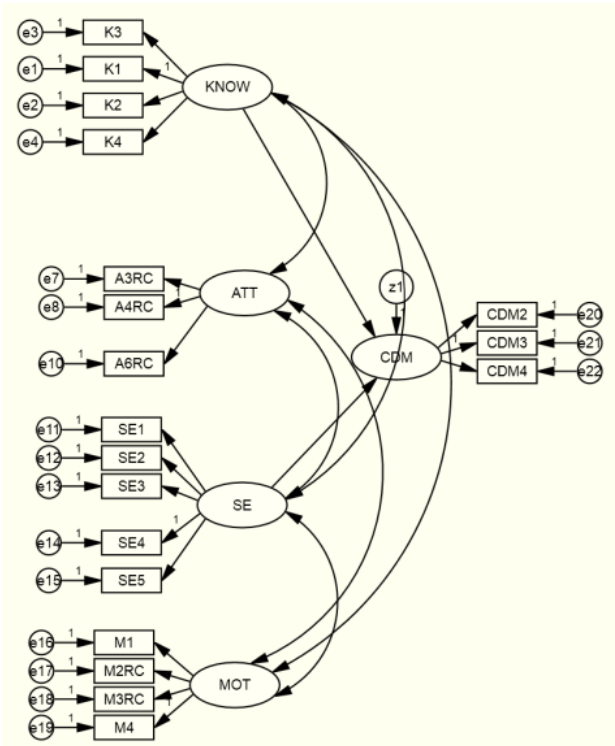
- testing the fit of the data to the theory driven model.
- identification of possible weakness of particular items in the model.
- could be considered as a process that includes steps, namely model conceptualization, identification, parameter estimation, data-model fit examination and possible re-specification of the model.

There are some limitations of CFA that researchers must consider when dealing with CFA that the analysis is strictly confirmatory during post hoc modification. Because of this, the model could become somewhat exploratory (Conway & Huffcutt, 2003). Likewise, it is argued that small sample sizes may cause concern due to normality issues leading to problems in fitting data to the model (Raykov, 1998). Further, it is suggested that lower number of respondents when compared to degrees of freedom which will be a problem when CFA uses Maximum Likelihood estimation method (McCrae et al. 1996). In this research CFA was applied to the models provided in Figures 3.1 to 3.10 and equations 3.1 to 3.10 and 3.4.1. The detailed analysis provided in Chapter 5.

4.17.3 Path analysis

Path analysis is an extension of multiple regressions and is a method by which it is possible to visualize the phenomena, using path diagrams. It is part of SEM. An example of a path diagram is given in the Figure 4.3.

Figure 4.3 Example of path analysis done in this research



In Figure 4.3, the rectangles indicate the variables whereas each path is depicted by a straight line with an arrow head at one end (showing expected causal relationship). The double headed arrow lines that are curved connect predictor variables (represent non-causal relationship). The straight lines with single arrowhead are the paths, and curved ones represent the correlation among the variables. The small circle connected to the dependent variable, through a single headed arrow is the error term, which is part of every regression equation (Janssens et al. 2008; Norman & Streiner, 2003; Hox & Bechger, 1998). Path analysis helps in explaining the causal relationships, examine the direct and indirect effects of the exogenous variables, on the endogenous variables (Jeon, 2015). While path diagrams provide benefits of simultaneous analysis of complex models and decomposition of correlations, researchers must also be cautious about the disadvantages of using path analysis which include; making assumptions that are hard to satisfy, collinearity issues, relationship amongst variables may not be causal, sample size problems and the limitation of being useful, only for continuous variables. The complete details of how the path analysis was conducted are provided in Chapter 5. Data analysis conducted using CFA and path analysis enabled the researcher to test the hypotheses and determine the causal relationship between the variables. After describing the process of performing the CFA and path analysis, it was found necessary to explain that, the unidimensionality nature of the relationship, between the exogenous and endogenous variables.

According to Gerbing and Anderson (1988), unidimensionality refers to the presence of, only one underlying dimension in the model and explains, whether the reliability values could be accepted as reliability is considered to indicate unidimensionality. Unidimensionality was tested using AMOS output on the regression estimates and critical ratio (CR) generated, using the maximum likelihood (ML) method. Finally, Levene's test was conducted to test the validity of the before and after tests, using SPSS. This test was conducted on both EM and VCoP groups. Using Levene's test, equal variance of two independent samples of the same population was tested to confirm that the respondents who participated in the before and after tests, belonged to the same population (Janssens et al. 2008). In addition, Details regarding Levene's test is provided in Chapter 5 under section 5.22.

4.18 Summary

This chapter has developed the research framework and explained that a positivist philosophy, objective ontology, deductive research approach and quantitative research method were adopted for this research. In addition, the chapter has presented the research design and developed a survey research strategy to conduct the research. Survey questionnaire was developed to collect data, from the target population of PTs in USA. The online data collection mechanism utilized has been described, with Survey Monkey as the tool to collect data. Specific instruments for before and after tests have also been developed. Data analysis tests have been described. Overall, the chapter sets the stage for conducting the data analysis provided in the next chapter.

Chapter 5

Data Analysis

5.1 Introduction

This chapter deals with the analysis of the collected data. The steps involved in the data analysis process have been outlined in Chapter 4. The analysis is based on the theoretical models that have been drawn in Chapter 3. However, the data analysis has been compartmentalised to address the three research questions separately, a process suggested by Shuval et al. (2007). To begin with, the descriptive statistics of the collected data has been provided. This is followed by, the reliability and validity tests of the data and test instrument. Next, the details of the structural equation modelling (SEM) have been provided. SEM is divided into two sections, the confirmatory factor analysis (CFA) and the path analysis. Finally, the findings of the analysis have been provided.

5.2 Brief description of the process of data analysis

In this research, three questions are being addressed. RQ1 has been addressed using the models found in Figures 3.1, 3.2, 3.3 and 3.4. The statistical tests related to those models have been conducted, using SPSS (version 21) and AMOS (version 18). SEM has been used to establish the cause and effect relationship between the independent and dependent variable. RQ2 has been addressed in the same way. However, RQ3 is an experiment and hence, uses longitudinal study. In this case, there is only a comparison between the analysed data collected before and after; an intervention has been introduced to impact the barriers. In this section, only reliability and validity of the tests have been established and descriptive statistics have been used to answer the question. It can be seen that the three research questions have been separately dealt with; as far as analysis is concerned and analysing the data in this manner is supported by the arguments of Shuval et al. (2007) (see section 5.1 above).

5.3 Demographic data analysis

This section discusses the details of the demography of the participants of the survey. Table 5.1 provides data regarding the distribution of the respondents, under different demographic categories namely gender, age, currently practicing, licensed to practice in the country, number years of clinical experience, qualification, membership in APTA and membership in Cardiopt Yahoo group (Listserv of APTA). It can be seen that by gender, there is almost an equal participation of both male and female PTs in the educational material group (EM group) although, female PTs, outnumber the male PTs at the pre-intervention stage, whereas in the Virtual Communities of practice group (VCoP group), it can be seen that female PTs, outnumber the male PTs. While the gender distribution, does not affect the research as the focus is not on the demographic factors, it is significant that the proportion of male to female PT participants in the VCoP group is 1:3.7 which shows that more

number of female PTs used VCoP as multicomponent strategy for CPG integration than male PTs in this research.

Again, with regard to age factor, it can be seen that in the EM group, the maximum percentage of PTs fall under the categories 36 to 40 years of age and 41 to 45 years of age, while in the VCoP group, there is a fairly equal distribution under the different age categories except in the case of the PTs, under the category 46 to 50 years of age. This shows that as far as the age of the population of PTs, who have participated in the survey is concerned, there is a fair representation, from the various age groups and hence, the results of the research are unlikely to be affected by the age factor of the participants.

Table 5.1 Demographic data analysis

Demographic parameter	**Variable/range**	**EM group (%)**		**VCoP group (%)**	
		Pre-intervention	**Post-intervention**	**Pre-intervention**	**Post-intervention**
Gender	Male	43.16	50.65	21.28	28.81
	Female	56.84	49.35	78.49	71.19
Age	26 to 30 years	3.16	0.00	7.53	8.47
	31 to 35 years	7.37	7.79	20.43	16.95
	36 to 40 years	34.74	35.06	15.05	18.64
	41 to 45 years	44.21	44.16	17.20	18.64
	46 to 50 years	9.47	10.39	5.38	10.17
	51 to 55 years	1.05	2.60	13.98	6.78
	56 to 60 years	--	--	10.75	8.47
	Above 60 years	--	--	8.60	11.86
Currently Practicing	Yes	100	100	100	100
	No	0	0	0	0
Licensed to practice in the country	Yes	100	100	100	100
	No	0	0	0	0
Number years of clinical experience	Less than 2 years	--	--	1.08	1.69
	2 to 5 years	3.16	0.00	10.75	5.08
	6 to 10 years	7.37	11.69	19.35	18.64
	11 to 15 years	32.63	25.97	16.13	18.64
	16 to 20 years	47.37	49.35	13.98	27.12
	21 to 25 years	6.32	7.79	11.83	13.56
	26 to 30 years	3.16	5.19	5.38	1.69
	more than 30 years	--	--	21.51	13.56
Qualification of participants	Undergraduate University degree	37.89	38.96	5.38	6.78
	Postgraduate University degree	15.79	18.18	24.73	18.64
	DPT /Doctor of Physical therapy	46.32	41.56	59.14	66.10
	PhD	--	--	9.68	6.78
	Other	0.00	1.30	1.08	1.69
Membership in APTA	Yes	31.58	28.57	97.85	98.31
	No	68.42	71.43	2.15	1.69
Membership in Cardiopt Yahoo group (Listserv of APTA)	Yes	0.00	0.00	100.00	100.00
	No	100	100	0	0

Next, as far as the category of PTs, who are licensed to practice in the USA was concerned, it is seen that 100% of the participants are licensed to practice in the USA which provided a strong base to collect credible data. With regard to number of years of clinical experience is concerned, it is seen that in the EM group, the maximum number of participants were under the categories of 11 to 15 years (32.63% at the pre-intervention stage; 25.97% at the post-intervention stage) and 16 to 20 years (47.37% at the pre-intervention stage; 49.35% at the post-intervention stage) whereas, in the VCoP group, the maximum number of participants were under the category of 6 to 10 years (19.35%) at the pre-intervention stage and under the category of 16 to 20 years (27.12%) at the post-intervention stage. This data indicates that majority of PTs, who have participated in the survey were, in the range of 6 to 20 years of experience which provides a strong support in regard to conducting the experiments in the research as experienced PTs are expected to be better equipped to participate in the experiments contemplated in this research.

In regard to the qualification of participants, it was found that participants holding a DPT / Doctor of Physical therapy degrees outnumbered the others which is a strong indicator that more number of PTs are being qualified with DPT, in alignment with the vision of APTA to achieve entry level PT qualification as DPT by 2020 in the USA. This also can be attributed that PTs with DPT showed higher interest in participating in this research that focused on research knowledge (CPG), its translation into clinical practice, barriers to the translation of research knowledge into clinical practice (CPG-CDM gap) and KTIs. In the EM group participants holding DPT / Doctor of Physical therapy degrees were found to be 46.32% at the pre-intervention stage and 41.56% at the post-intervention stage. Similarly, in the VCoP group, the figures were even better, with 59.14% of the participants at the pre-intervention stage and 66.10% of the participants at the post-intervention stage, found to hold DPT / Doctor of Physical therapy degrees. It is reasonable to conclude that responses obtained from such a highly qualified community of PTs, becomes very credible as seldom one comes across a research effort where the number of PTs who participated in any survey who were holding DPT / Doctor of Physical therapy degrees is as high as the one found in this research.

Another credible demographic factor that emerged as significant is the membership in APTA. It must be pointed out here that APTA is a highly respected and well recognised PT organisation in the USA and participants holding membership in APTA became particularly useful respondents in this research. The reason is that, APTA encourage research integration in clinical practice and strongly support the development of CPGs in PT and members of APTA become samples for conducting research because they are exposed to research outcomes produced by APTA and are automatically expected to integrate research knowledge into clinical practice more or less by default. Research conducted on CPG for VTE in PT and its translation into CDM, based on the response given by

members of APTA acquires significance because of their ability to understand the aim of this research and respond to the survey questionnaire. It can be seen that in regard to the VCoP group, 97.85% of participants at the pre-intervention stage and 98.31% at the post intervention stage were members of APTA. Similarly, in regard to the EM group, 31.58% of the participants at the pre-intervention stage and 28.57% of the participants at the post-intervention stage were members of APTA. An important point that must be highlighted here is that in either the EM or VCoP group there was no requirement for the participating PTs, to be members of APTA. Such an overwhelming population of participants in the survey were members of APTA, is major plus point of this research to gain credibility. Finally, there was a general question asked about the participants being members of Cardiopt Yahoo group (Listserv of APTA) to differentiate between the EM and VCoP group. Members of Cardiopt Yahoo group (Listserv of APTA) would imply that those participants will be administered multicomponent KTI. It is clear from the data provided in Table 5.1 that 100% of the participants in the VCoP group were members of the Cardiopt Yahoo group (Listserv of APTA), whereas the figure with regard to EM group, there was no participants, with membership in the Cardiopt Yahoo group (Listserv of APTA). Thus, it is evident that EM group members were not administered with multicomponent KTI and VCoP group members were not administered single component KTI. After analysing the demographic factors, the next section discusses the descriptive statistics.

5.4 Descriptive statistics

Analysis of the descriptive statistics involves assessing the mean, median, standard deviation, normality of distribution of data and testing the multicollinearity of the collected data. Detailed measurement of mean, median, standard deviation and normality are provided in Appendix 5.1 that is related to the survey instrument titled "*Knowledge translation study pre-intervention survey questionnaire (EM)*". From Appendix 5.1, it can be seen that for all the items, the mean was in the range of 3.21 and 4.26; the median was in the range of 3 and 4; the standard deviation in the range of 0.58 and 1.15; skewness ranged between -1.33 and - 0.039; and kurtosis ranged between -0.48 and 3.93. These figures are tabulated in Table 5.2.

Table 5.2 Descriptive statistics- of EM group-Pre-intervention stage

	Mean		**Median**		**Std. Deviation**		**Skewness**		**Kurtosis**	
	Max	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
EM group (pre-intervention)	4.2609	3.2065	4.0000	3.0000	1.1535	0.5783	-0.0388	-1.3279	3.9216	-0.4775

It can be seen that while the median of the responses to all items were in the range between neutral and agree (except the those that were reverse coded, in which case, the responses were in the range neutral and disagree) and the standard deviation for all items did not exceed 1.154 which is within the

specified limit of 2.0 (see section 4.16). Again, normality of data can be said to have been established as both skewness and kurtosis were found to be within acceptable limits of ±2.0 and ±3.0 respectively (see Table 5.2). In addition, Mahalanobis distance (D^2/df) (see section 4.16) was calculated for all the responses by regressing, all the items, measuring the latent constructs with another variable (e.g. in this research, the total number of 23 items, measuring knowledge, attitude, Self-efficacy, motivation of PTs towards integrating CPG into CDM and clinical decision making (CDM) were identified as independent variables and regressed with qualification of participants as dependent variable; there was no specific choice of a dependent variable for conducting regression, as the Mahalanobis distance was measured, only with regard to the responses of the participants collected to measure the latent variables. Any variable that is continuous could be used as the dependent variable, as long as those dependent variables are part of the research. The D^2 was produced by the SPSS report and degrees of freedom (df) was calculated as (number of items used as independent variable -1), that is (23-1 = 22. Thus, the distance (D^2/df) was computed for each D^2 value, generated by SPSS, against each response and divided by 22. As explained in section 4.16), the (D^2/df) was calculated for all the responses and was found to be within the acceptable limit of <4.0, prescribed in the literature. Calculation of Mahalanobis distance helped in removing those responses that were outliers. Thus, from the total number of 120 responses received, 27 outliers were removed from the analysis, leaving behind the final 93 responses for analysis. The D^2 readings reported by SPSS are provided in Appendix 5.5. Multicollinearity was checked, using the sample correlation which is provided in section 4.16.

A similar analysis was performed, with regard to data collected using the survey questionnaires "*Knowledge translation study pre-intervention survey questionnaire (VCoP)*", "*Knowledge translation study post-intervention survey questionnaire (EM)*" and "*Knowledge translation study post-intervention survey questionnaire (VCoP)*". The descriptive statistics readings generated by SPSS are provided in Appendices 5.2, 5.3 and 5.4. The minimum and maximum readings, pertaining to the descriptive statistics are provided in Table 5.3.

Table 5.3 Descriptive statistics

	Mean		**Median**		**Std. Deviation**		**Skewness**		**Kurtosis**	
	Max	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
EM group (post-intervention)	4.3485	3.3333	4.0000	3.5000	1.3166	0.5094	0.2910	-1.9440	4.3620	-1.1085
VCoP group (pre-intervention)	4.5972	3.5139	5.0000	4.0000	0.8557	0.4639	0.6616	-1.2322	2.5344	-1.0217
VCoP group (post-intervention)	4.6038	3.2264	5.0000	3.0000	0.7610	0.4556	0.7906	-0.8446	4.2399	-1.8817

From Table 5.3, it can be seen that all of the responses, were under the category neutral and strongly agree (mean figures for all items, fell between 3.2 and 4.6 while, median figures for all items were found to lie between 3 and 5, except for those items that were reverse coded, where the points between 3 and 5 indicate neutral to strongly disagree). Similarly, the standard deviation figure

(maximum of 1.32) for all items were found to be, within the limit of 2.0, set for this research. Again, while skewness figure (maximum was 1.94) for all items, were found to be, within the limit of ±2.0, except some kurtosis figures were above ±3.0. Since, the test of kurtosis was relevant to checking the normality of data, when the standard deviation and skewness figures were found to be, within the acceptable limits and only some responses (a total of four responses, of which three were related to EM-post-intervention responses and one was related to the VCoP post-intervention response, accounting for just about 3% of the responses, related to the three survey questionnaires) showed a higher kurtosis than 3.0, it was concluded that the data was normally distributed. As far as Mahalanobis distance figures were concerned, it was seen that, all the D^2 readings generated by SPSS, for the items in the three survey questionnaires and the corresponding (D^2/df) were found to be, within the acceptable limit of < 4.0. This led to the conclusion that the data was free of outliers. In fact, with regard to the survey questionnaire, "*Knowledge translation study pre-intervention survey questionnaire (VCoP)*", 112 completed questionnaires were received and after cleaning for the outliers, only 72 responses were included in the final data analysis. Similarly, with regard to the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (EM)*" the total number of completed responses received was 86 and after cleaning the outliers, the final number of accepted responses were only 66. Finally, with regard to the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (VCoP)*", the total number of completed responses received was 75 and after cleaning the outliers, the final number of accepted responses stood at 53. Thus, it was concluded that the assumptions made by the researcher, prior to subjecting the data for analysis have been found to be satisfactory.

After analysing the demographic data and descriptive statistics, the rest of the data analysis was planned. The details of the plan are provided as follows. Prior to providing the details of the plan, it must be understood that data was collected from two groups of PTs. The reason for grouping them are given section 4.8 in Chapter 4. One group of PTs were called the EM group and the other group of PTs were called VCoP group (see section 4.8). Here again, the EM group of PTs were part of the sample sets drawn, from the target population of PTs. Two independent sample sets were drawn, from the target population of PTs and brought under EM group. One sample set was called the EM group (Pre-intervention) and other sample set was called the EM group (Post-intervention). Similar was the grouping done in the case of the VCoP group, with one sample set of PTs called as VCoP group (Pre-intervention) and VCoP (Post-intervention). Thus, the data was collected twice, from the EM groups (once each from EM group (Pre-intervention) and EM group (Post-intervention)) and twice, from the VCoP groups (once each from as VCoP group (Pre-intervention) and as VCoP group (Post-intervention)). While, the data analysis steps are the same for the data collected twice per group, there are some commonalities between the group, which will enable the data analysis to be common for both the EM and VCoP groups. For instance, the reliability and validity tests and the SEM tests are

the same, for both the EM and VCoP groups, at the pre-intervention stage whereas; there is slight difference in the post intervention stage. Further, at the post intervention stage, the reliability and validity of the data and the research instrument were not repeated for all the constructs because the research instrument was essentially the same, as that of the pre-intervention stage with only one difference. The difference was that there was a section, related to relative advantage was introduced, in the instrument used to collect data, at the post intervention stage to measure the construct intervention using the concept of relative advantage. Thus, the complete data analysis process will be provided in the following sections for the EM group (Pre-intervention), which will be used as the basis to report the outcome of the data analysis conducted, on the data collected from the other groups namely EM group (Post-intervention), VCoP group (Pre-intervention) and VCoP (Post-intervention).

5.5 Data analysis pertaining to EM group at the Preintervention stage

5.5.1 Reliability

The first test conducted was the reliability test followed by the validity test. As mentioned in section 4.13.1 Cronbach's alpha was used to verify the reliability of the data collected and the instrument used for the main survey. SPSS was used to compute the Cronbach's alpha and the concise report of the SPSS output is given in Table 5.4, with regard to the five constructs measured in the EM group (Pre-intervention).

Table 5.4 Internal consistency of readings obtained from SPSS for EM group (Pre-Intervention)

No.	Construct	Items	Number of items	Cronbach's alpha (≥0.6)	Item-item correlation (≥0.3)		Item-total correlation (≥0.5)		Remarks
					Min.	Max.	Min.	Max.	
1.	Knowledge	K1 – K4	4	.917	.588	.941	.706	.862	All items retained
2.	Attitude	A1, A2RC, A3RC, A5RC, A6RC	5	.846	.419	.702	.592	.769	Item deleted was A4RC
3.	Self-efficacy	SE1-SE5	5	.913	.564	.845	.717	.808	All items retained
4.	Motivation	M1, M2RC, M3RC, M4	4	.863	.543	.853	.621	.817	All items retained
5.	Clinical decision making	CDM2-CDM4	3	.920	.733	.841	.805	.885	Item deleted was CDM1

From Table 5.4, it can be seen that with respect to the list of items used for measuring the five constructs mentioned in the table, the alpha values were indicating the reliability level was 'good', as all the values were found to be greater than 0.8 (see table 5.4), with the minimum value being 0.846 and the maximum value being 0.92. As far as the internal consistency was concerned, inter item

correlations were well above the minimum value, fixed at 0.3 with the minimum reading showing as 0.419 and the maximum reading showing as 0.941. Thus, all the inter-item correlation values were between the range of medium and high. Finally, the other internal consistency measure of, item-total correlation was also found to meet the criterion, set for the minimum at 0.5 with the minimum measured value being 0.592 and the maximum value reported as 0.885. Thus, the reliability and internal consistency measures were found to be satisfactory. However as shown in Table 5.4, two items were deleted to achieve satisfactory reliability results, namely A4RC and CDM1. Items A4RC and CDM1 exhibited, low item-total correlation (0.39 and 0.319 respectively) when compared to the reference value, set for this research which is equal to 0.5 and hence those two items were deleted. Thus, the reliability of the instrument and data collected using the survey instrument "Knowledge translation study pre-intervention survey questionnaire (EM)" was accepted as reliable. The next section discusses the validity test.

5.5.2 Validity

Content validity, convergent validity, discriminant validity and construct validity were tested in this section which is in line with the explanations given in section 4.13.4. As mentioned in section 4.13.4.1, content validity was tested by sending the main survey questionnaire to a panel of experts in PT including the author of the CPG for VTE in PT, two academics and a consultant and was cleared by this panel with regard to the language, format, scales used and the ability of the contents to measure the variables, they were expected to measure. Final set of items validated by the panel and used in the main survey is provided in Table 4.9. Convergent validity (also known as criterion validity) was tested, using the internal consistency measures with all items, measuring item-item correlation better than the reference value of 0.3 and item to total correlation better than the reference value of 0.5 (see Table 5.4). In addition, construct validity was said to have been achieved if the convergent validity is achieved (see section 4.13.4.2). At this point, it must be pointed out that a detailed analysis and discussion about the discriminant validity although had to be conducted here, to test the construct validity, as construct validity also includes the testing of discriminant validity, but the analysis and discussions were decided to be presented in the section, related to CFA where it was possible to use SPSS/AMOS to test the discriminant validity. Thus, it is necessary to refer to section 5.5.3.1 to understand whether discriminant validity was achieved or not. Once, the reliability and validity criteria were tested, the next step taken was to conduct the SEM, comprising the CFA and path analysis.

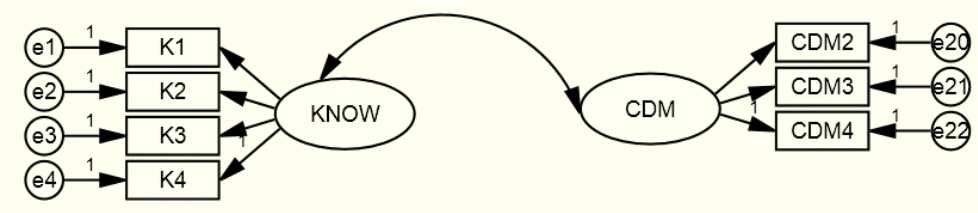
5.5.3 Analysis of the models specified in the theoretical framework pertaining to EM group

This section analyses the models in Figures 3.1, 3.2, 3.3 and 3.4, beginning with the one in Figure 3.1. This is the initial model which tested the relationship between knowledge and CDM. The first test conducted was the construct reliability which is discussed next.

5.5.3.1 Construct reliability

Construct reliability is similar to the reliability test conducted at the item level but referring to a test conducted at the construct level. According to Holmes-Smith et al. (2006), construct reliability is a measure of internal consistency, present in a set of measures and accounts for the extent to which, a set of measures can be related to the common latent construct. That is to say, it is similar to Cronbach's alpha (Morrison et al. 2017), although literature shows that it can be measured using squared multiple correlation (SMC) (Bollen, 1989). SMC was computed using AMOS but before computing it, the initial model was drawn using AMOS (see Figure 5.1).

Figure 5.1 Initial covariance model relating knowledge to CDM (EM group: pre-intervention)



In Figure 5.1, the circles or ellipse indicate the latent variables, rectangles indicate the observed variables, single headed arrows indicate variance and double headed arrows indicate covariance. The data entered into SPSS was used in AMOS. The AMOS output for SMC was assessed. According to Holmes-Smith (2012), acceptable values of SMC should be > 0.3. Table 5.5 shows the AMOS output of SMC for the model given in Figure 4.1.

Table 5.5 Squared Multiple Correlations of items shown in Figure 5.1

	Estimate
K1	.422
K2	.615
K3	.944
K4	.935
CDM2	.774
CDM3	.912
CDM4	.712

From Table 5.5, it can be seen that all SMC exceed 0.3 indicating that construct reliability is achieved. Next, the discriminant validity was tested to gain knowledge on, whether an item used to measure a construct is empirically unique and measures the variable under study that other measures used in the SEM; do not capture (Hair et al. 2017). In other words, discriminant validity implies that an item purported to measure a construct, does not correlate too highly with measures, and from it is supposed to differ (Campbell 1960, p. 548). According to Farrell (2010, p.324), lack of discriminant validity could indicate that constructs have an influence on the changes occurring in more than just the

observed variables to which those constructs are theoretically underpinned. This can lead to uncertainty in the results giving rise to questions whether the assumed paths in the SEM are real or as a result of statistical discrepancies. According to Holmes-Smith (2012), large correlations between latent constructs (> 0.8 or 0.9) are causes of worry, indicating lack of discriminant validity. In this research, a value of sample correlations not exceeding 0.9 was set as the reference value to achieve discriminant validity as well as checking the presence of multicollinearity. Thus, for the model in Figure 5.1, sample correlation figures were examined using AMOS is provided in Table 5.6.

Table 5.6 Sample correlation of items depicted in Figure 5.1

	K1	**K2**	**K3**	**K4**	**CDM2**	**CDM3**	**CDM4**
K1	1.000						
K2	.744	1.000					
K3	.588	.766	1.000				
K4	.646	.733	.941	1.000			
CDM2	.272	.363	.489	.448	1.000		
CDM3	.283	.426	.467	.447	.841	1.000	
CDM4	.295	.404	.427	.427	.733	.808	1.000

Table 5.6 shows that one correlation between K3 and K4 was measured as 0.941, which is greater than 0.9. However, to confirm whether this is a computational error or not, another test, namely standardised residual covariance (SRC) was conducted which are called pattern coefficients and represent the standardised factor loadings, generated by AMOS and are empirically distinguishable. To measure this, the influence of each construct, on items not hypothesised to be related to that construct is computed, by multiplying the latent factor correlation by the factor loadings of the item. An acceptable value of SRV recommended in the literature is found to be 2.0. Table 5.7 provides the results from AMOS about the SRC of the items in model provided in Figure 5.1.

Table 5.7 Standardised residual covariance between items of the model in Figure 5.1

	K1	**K2**	**K3**	**K4**	**CDM2**	**CDM3**	**CDM4**
K1	.000						
K2	1.998	.000					
K3	-.343	.035	.000				
K4	.149	-.191	.016	.000			
CDM2	-.194	.084	.442	.104	.000		
CDM3	-.318	.379	-.071	-.228	.004	.000	
CDM4	.132	.584	.063	.081	-.071	.019	.000

From Table 5.7, it can be seen that all covariance measures between items of the two constructs are within the set reference value of 2.0. Considering the two reports (sample correlation and standardised residual covariance) produced by AMOS, it was concluded that the discriminant validity was established, even though one value of sample correlation, between K3 and K4 was found to be higher

than 0.9. This deviation was accepted to see, whether the impact of the construct is similar on K3 or K4 is similar, when the model is tested at the path analysis stage. Further using the above arguments, it was also concluded that multicollinearity was not present despite the fact that one correlation value was found to be higher than 0.9 as literature shows that partial multicollinearity is rarely absent (Voss, 2004). After establishing the discriminant validity, the model in Figure 5.1, was tested for goodness fit. It is recommended in the literature that it is useful to test, whether the data collected to measure the observed variables fits the model in Figure 5.1. Goodness fit measures are recommended in the literature, for measuring the fit of the data to the model, include Root Mean Square Residual (RMR), Comparative fit index (CFI), Tucker-Lewis index (TLI), Root Mean Square Error of Approximation (RMSEA), Chi-square, Normed Fit Index (NFI), Relative Fit Index (RFI) and Goodness-of-Fit-Index (GFI) (Arbuckle, 2016; Schermelleh-Engel et al. 2003). Since each index provides different information on the fitness of data to the model, it is recommended that at the least, more than one index is reported in the research. Recommended acceptable values of fitness indices GFI, NFI, RFI, TLI, IFI and CFI is >0.9, whereas for RMR and RMSEA it was less than 0.1. Thus, for the model in Figure 5.1, the goodness of fit indices was reported as in Table 5.8.

Table 5.8 AMOS goodness fit output (covariance): KNOW-CDM relationship, pre-intervention stage of EM group

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.037	.888	.759	.412
Saturated model	.000	1.000		
Independence model	.318	.328	.104	.246

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.915	.862	.935	.893	.934
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.182	.132	.235	.000
Independence model	.556	.519	.595	.000

From Table 5.8 it can be seen that at least, three indices namely NFI, IFI and TLI are reported to be greater than 0.9 and RMR was found to be 0.037 (<0.1). Thus, it can be seen that for the model in Figure 5.1 the model fitness to the data has been established using four of the goodness fit parameters. At this stage, the CFA was complete which showed that the minimum number of factors, required to

test the structural model has been identified. Thus, the next section discusses the structural analysis of the model in Figure 5.1.

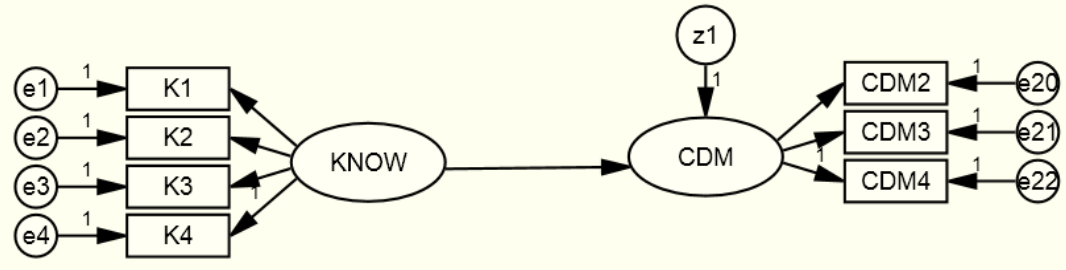
5.6 Structural equation modelling

As mentioned in section 4.17.1, SEM comprises the following steps namely specification of the model, identification of the model, selection of the measures, collection of data, data cleaning and preparation, analysis of the model and its evaluation, and re-specification of the model (Kline, 1998). Each one of these steps are described and analysed next.

5.6.1 Model specification

This is a diagrammatic representation of a relationship between variables or can also be drawn as a mathematical representation. The initial model is specified in Figure 5.1. There is one exogenous variable and one endogenous variable namely KNOW and CDM respectively.

Figure 5.2 Structural model of the relationship between variables knowledge and CDM for the EM pre-intervention group



5.6.2. Measure selection to data preparation

Between measure selection and data preparation, the steps involved include data collection, data cleaning and data preparation. Measure selection is an activity that is concerned with selection of items or observed or manifest variables, used to measure the unobserved variable or latent variable. According to Jöreskog, (1977), the minimum number of items required to measure a latent construct is two. This condition of having minimum items was ensured in the current model (Figure 5.2).

The measures selected were tested for psychometric properties to ensure that those measures are reliable and valid. While Cronbach's alpha was used to measure, the reliability and found to satisfy the minimum condition that alpha value exceeds 0.6 (see section 5.5.3.1). Validity measures included content, convergent and discriminant validities and have been reported already in section 5.5.3.1 and found to satisfy the minimum conditions (Kline, 2015). Data collection involved sampling process and required drawing samples from the target population with researchers arguing that it could be chosen based on a thumb rule. For instance, Jung and Lee, (2011) suggest, a sample size as low as 50 samples, for conducting the test on the structural model while Gorsuch, (1983) suggests a sample size

of 200. Since, there is no consensus on the sample size to be adopted for conducting SEM and review of the literature shows that rule of thumb is widely used in SEM analysis, for this research 200 samples were chosen as the sample size, which is considered as acceptable based on the thumb rule (Abramson et al. 2005). After selecting the sample size, the next step involved was data cleaning. As explained in section 4.16 data was cleaned and hence there were no missing data or data entry errors and the outliers are within the acceptable limits, making the data accurate enough (literature points out that accuracy of data to the extent of 95% is commonly accepted and it is possible to use simple steps like descriptive statistics to determine the unusual data points (Abramson et al. 2005)). After cleaning the data, the data was prepared for analysis which included that the data was tested for normal distribution using standard deviation; skewness and kurtosis (see section 4.16). One of the important reasons, why normal distribution of data is found to be an important aspect, in the analysis is the fact, the Maximum Likelihood (ML) method was used in this research, as part of SEM. The use of ML method ensures that estimates generated using ML are unbiased, asymptotically efficient and consistent (Curran et al. 2002; West et al. 1995). Literature points out that ML method, as such is relatively robust from deviations that could occur in multivariate normality conditions (Kline, 2015). After ensuring that the data has been prepared for the analysis, the next step taken was the model analysis (also called as model estimation) (Abramson et al. 2005).

5.7 Model analysis

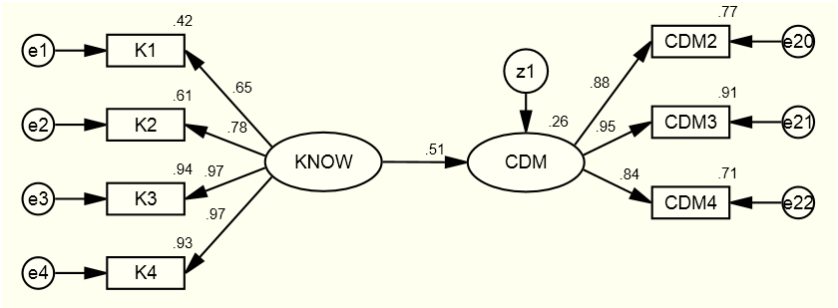
Literature shows that model analysis is a procedure by which, it is possible to test, whether data fits the model or not. Maximum likelihood method has been used to analyse the model, as recommended in the literature (Kline, 2015). To analyse the model, the initial model presented in Figure 5.2 was used. Knowledge (KNOW) and clinical decision making (CDM) are two latent variables. KNOW, is the exogenous variable and CDM, is the endogenous variable. The main idea behind establishing this relationship was to test, whether there is a linear, positive and direct relationship between KNOW and CDM or not. If there is a linear, positive and direct relationship, then it implies that any change in KNOW in the positive direction, will change CDM in the positive direction, in the same proportion as the change observed in KNOW. This also implies that, when a PT has higher knowledge in CPG, then lack of knowledge in CPG as a barrier, has to be lower. This aspect was to be tested, using SEM, in which the step, ‘model analysis’ is an important part as it shows, whether the data fits the model or not. AMOS was used to analyse the model. Usually, AMOS produces two types of models, one named as standardised and the other named as unstandardized. The difference between the two models is provided in Table 5.9.

Table 5.9 Difference between standardised and unstandardized models generated by AMOS (Adapted from Arbuckle and Wothke, (1999) and Kline, (1998)

Parameter estimates, and their standardized or unstandardized output		
Parameter estimate	**Standardized output**	**Unstandardized output**
Unanalysed association between exogenous variables	Pearson's correlations	Covariance coefficients
Direct effects on endogenous variables	Regression beta- weights	Unstandardized regression coefficients
Variances of endogenous variables (and hence their converse, error variances)	Squared multiple correlations (i.e., R^2)	Unreported
Variances of exogenous variables (and hence their converse, error variances)	Unreported	Variances

It is important to note here that, when compared to standardised model, unstandardized models produce regression weights, covariances, intercepts and variances in the path diagram, whereas in the standardised model, the standardised regression weights, correlation and squared multiple correlations are displayed. Again, in the standardised output derived from the analysis of data by AMOS, it can be seen that it is independent of units in which the variables used in the model are measured, whereas in regard to the unstandardized output produced by AMOS, the output is based on each variable own metric. Additionally, it is possible to compare variables in the standardised output, whereas it is not possible in the unstandardized output. Also, in the standardised model, the output is not affected by the choice of the identification constraints, whereas the opposite is true in the unstandardized output (Arbuckle, 2005; Abramson et al. 2005). Keeping the above in view, this research reports the output, produced by the standardised model. It is worthwhile to note here that the regression beta weights reported in the standardised model were classified, as having small, moderate and large weights with regression values equal to 0.1, 0.3 and 0.5 respectively by Kline, (2015) which is useful to interpret the results. Thus, the initial model was analysed, beginning with reporting the SMC between the variables, which is depicted in the AMOS output. The standardised output from AMOS is provided in Figure 5.3, in which it can be seen that the SMC of CDM, as an endogenous variable is given as 0.26.

Figure 5.3 Standardised output produced by AMOS for the relationship between KNOW and CDM for the EM – pre-intervention group



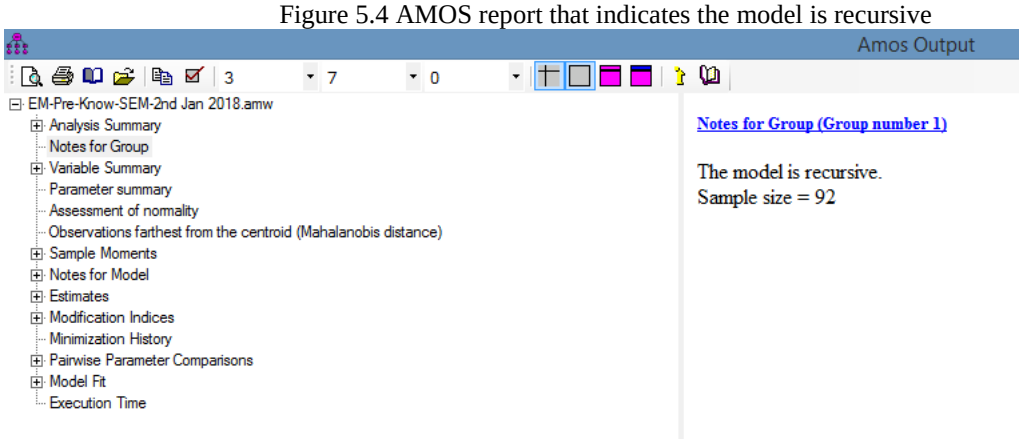
It must be noted here that SMC is synonymous with R^2 statistic reported the analysis of data, using multiple regression and is independent of any unit (Arbuckle, 2014). Figure 5.3 shows that the SMC of 0.51, related to the endogenous variable CDM, indicates that 51% variance in CDM is explained by the exogenous variable KNOW. Thus, SMC provides a method to test the fitness of the data to the

model. Further to checking the SMC, the next step taken was to see, whether the model can be identified as it is argued that unidentified models need to be re-specified (Kline, 1998; Ullman, 2001).

5.7.1 Model identification

Theoretical identification of the model is an important step included in SEM (Kline, 2015). Theoretical model enables researchers to investigate, whether there is a unique solution that exists for every parameter in the model. One way of testing a theoretical model is by checking, whether the model is recursive. Models are considered recursive, when there is a unidirectional causal relationship that exists, between the variables depicted in the model (Kline, 2015; Arbuckle, 2012; Byrne, 2001; Ullman, 2001). The advantage of using AMOS was that, the software package generates reports, directly indicating, whether a model is recursive or not. Thus, the report generated by AMOS for the model in Figure 5.2, is provided in Figure 5.4, which shows that the model is recursive, and it can be concluded that the model is identified.

Figure 5.4 AMOS report that indicates the model is recursive



Two more tests were conducted to test the model identification. They were multicollinearity and the other was assessing, whether the number of parameters identified in the model was more than required or adequate or less as literature shows that there is a limit to the number of parameters that could be fitted in SEM (Abramson et al. 2005). Multicollinearity was tested, using sample correlation between items (see section 4.16) with none of the correlation values exceeding 0.9, the minimum condition to be met.

Further, a parameter could be the regression coefficient (coefficients indicated on the single headed arrows between the latent variables and the observed variables, as well as those linking the latent variables), the variance (the manifest variables) and the covariances (double headed arrows amongst the latent variables). The number of parameters indicates the total number of regression coefficients, variances and covariances. For instance, in the model given in Figure 5.2, the number of regression coefficients is 8, the number of variances is 7 and the number of covariances is nil. Thus, the number

of parameters is 15; and these are referred as data points in the model and the number of data points in the model was calculated by the formula given in the equation 5.1 (Ullman, 2006).

Number of data points = [p (p+1)]/2 → (5.1)

where p = number of observed variables in the model which is equal to 7. Thus, using the equation 5.1, the number of points was calculated as 56/2 = 28. According to the literature, the number of parameters in the model must be less than the number of data points, if the model is identified, which in this case is true (Ullman, 2006). That means the number of parameters found in the model was 15 and the number of data points calculated was 28, indicating that the number of data points is greater than the number of parameters in the model, confirms that the model is identified. Again, in the literature, it is pointed out that a model could be just identified (saturated model), over identified (default model) or under identified (independence model). Besides, literature informs that in under-identified models, the number of distinct variances and covariances put together is less than the number of parameters in the covariance matrix, whereas in the over-identified models, the number of parameters is less than, the sum of the number of distinct variances and covariances and in the just-identified model, the number of parameters indicated are the maximum possible (Kline, 2015) which is equal to the number of data points (Ullman, 2006). The above results were compared with the AMOS output given in Table 5.10.

5.7.2 CMIN

Table 5.10 Test of model identification for the model in Figure 5.3

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	52.219	13	.000	4.017
Saturated model	28	.000	0		
Independence model	7	612.657	21	.000	29.174

Table 5.10 shows that in the default model, which is the model under testing depicted in Figure 5.3, is shown to have 15 parameters, when compared to the maximum number of data points the model can have, which is 28 indicating the model is identified. The above tests, led to the inference that the observed and latent variables in the model in Figure 5.3, could be retained for further testing as those variables are adequate to test the model. Thus, the next step taken was to test the fitness of the model for testing, before path analysis could be conducted to test the significance of the relationship.

5.7.3 Model fitness

According to Kline, (2015), model fitness enables a researcher to evaluate the identified model, just before conducting the path analysis. AMOS was useful, in examining the model fitness of the model in Figure 5.3. Assessing the model fitness involves, testing the parsimony of the model, comparing the identified model to the baseline model, checking the minimum sample discrepancy function as well as the population discrepancy measure (Arbuckle, 2014, 2005, 1999; Holmes-Smith, 2012, 2000; Byrne,

2006, 2001; Bollen & Long, 1993; Browne & Cudeck, 1993; MacCallum, 1990; Steiger, 1990; Mulaik et al. 1989). While Arbuckle, (2014) claims that model evaluation is a difficult and unsettled issue, in this research, the researcher conducted the four tests mentioned above.

5.7.4 Test of parsimony

As suggested in the literature, the model was tested for its parsimony by examining the Parsimony Goodness-Fit-Index (PGFI) and Parsimony Normed Fit Index (PNFI) reported by AMOS (Schreiber et al. 2006). While there are conflicting values recommended, as cut-off in the literature, it appears that these two indices would lie in the range of zero to one (Hooper et al. 2008). For instance, Mulaik et al. (1989) argue that acceptable value of PGFI and PNFI could be within 0.5, while Schreiber et al. (2006) suggest that values approaching 1.0 are considered as acceptable. However, some researchers have opted for values greater than 0.5, for instance, Manayan et al. (2017). Keeping these arguments in view, this research adopted a cut off value of 0.5 for both PGFI and PNFI. The AMOS report on PNFI is provided in Table 5.11, as some researchers suggest that it is a good practice to report, at least one parsimony index (Hooper et al. 2008).

Parsimony-Adjusted Measures

Table 5.11 Parsimony index of the model depicted in Figure 5.3

Model	PRATIO	PNFI	PCFI
Default model	.619	.566	.578
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Table 5.11 shows that the reported PNFI value is greater than 0.5 and hence, it was concluded that the model was parsimonious.

5.7.5 Comparing the identified model to the baseline model

The identified model is compared with the baseline models, in order to test for its goodness of fit to the data, using model fit indices. The research model is the default model, while the baseline models are the saturation model and the independence model. The report generated by AMOS, enables a comparison of the default model with the saturated and independence model. According to the literature, (Schermelleh-Engel et al. 2003), a model considered to be saturated, if the number of free parameters is equal to the sum of the number of variances and covariances in the model. This argument is useful in Chi-square test, where the factor λ^2 becomes zero. λ^2 indicates, the parameter CMIN which is the discrepancy function. So, in the saturation model, when the number of free parameters is equal to the sum of the number of variances and covariances in the model, the λ^2 will be equal to zero. In regard to the independence model, literature posits that it is a restrictive model and assumes that the manifest variables are error-free, all factor loadings are equal to one and the observed

variables are uncorrelated (Schermelleh-Engel et al. 2003). Thus, while testing the model fitness, the default model is first compared with the saturated model and independence model, to see whether model fits the data. The report generated by AMOS is provided in Table 5.12.

Table 5.12 shows that the default model is better than the independence model, with regard to the fitness indices (CMIN/DF) = (λ^2/df) = (4.02), RMR (0.037), NFI (0.915), IFI (0.935) and CFI (0.934). However, some of the fitness indices of the default model, did not meet the reference values set for this research, namely (λ^2/df) which should be ≤ 3, GFI ≥ 0.9, TLI ≥ 0.9 and RMSEA ≤ 0.1. One way to achieve this is to, re-specify the model by deleting the items that maybe causing this anomaly. However, there are arguments in the literature (e.g. Hooper et al. 2008) that as per best practices of reporting, a variety of fit indices could be reported; confirming that fitness of data to the model is achieved. Based on the above arguments, it was concluded that there is no need to re-specify the model and the analysis could be taken to the next step of testing the sample discrepancy function.

Table 5.12 Baseline comparison of the default model in Figure 5.3

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	52.219	13	.000	4.017
Saturated model	28	.000	0		
Independence model	7	612.657	21	.000	29.174

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.037	.888	.759	.412
Saturated model	.000	1.000		
Independence model	.318	.328	.104	.246

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.915	.862	.935	.893	.934
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.182	.132	.235	.000
Independence model	.556	.519	.595	.000

5.7.6 Sample discrepancy function (CMIN/DF)

Literature posits that there is a need to understand that, model fit that takes into account, the discrepancy that could exist between the sample and the fitted covariances matrices (Hu & Bentler, 1999) and is usually measured using Chi-Square value (CMIN/DF). (CMIN/DF) values approaching 1 are considered to indicate that, the model is correct for the sample size chosen, but it is not clear in the literature, how much closer to or farther from 1 can be allowed (Arbuckle, 2005). Again, while some

(Byrne, 2006) argue that (CMIN/DF) values up to 3, are considered to indicate, a correct model and some other researchers insist that (CMIN/DF) is very sensitive to sample and relying upon this statistic is unrealistic (e.g. Fabrigar et al. 1999; Millis et al. 1999). In addition, if 3 is taken as the reference value, then for the model in Figure 5.3, it can be seen that (CMIN/DF) is exceeding this value and hence, it may lead to an inference that there is sample discrepancy in fitting the model to the data, implying that choice of the sample size for the research, may not be appropriate. However, considering the criticism levelled against the use of (CMIN/DF) as a measure of sample discrepancy function, the researcher relied upon other recommendations found in the literature (e.g. Joreskog & Sorbom, 1989) which say that, commonly used goodness of fit measures can also provide information, about the presence or absence of sample discrepancy. Thus, for this research, it was concluded that if the goodness fit indices are satisfactory, then the sample discrepancy will not be present. Table 5.12, it can be seen that the fitness indices RMR, NFI, IFI and CFI satisfy the reference requirement of ≥ 0.9 indicated that sample discrepancy is not present in this research.

5.7.7 Population discrepancy function

After testing the data and its fitment to the model, with regard to the presence of sample discrepancy, the next test conducted was the population discrepancy measure, which is an indicator of the model fitting to the population under examination. One way to measure the population discrepancy is the root mean square error of approximation (RMSEA). While acceptable values of RMSEA reported in the literature is a maximum of 0.1 (Browne & Cudeck, 1993), in this research, it was measured as 0.182 (see Table 5.2) which shows that RMSEA is not valid. But some researchers (e.g. Rigdon, 1996) argue that CFI could be used to measure the population discrepancy. The reference value fixed for accepting CFI reading, reported by AMOS was 0.9. From Table 5.2, it can be seen that CFI value stood at 0.934, indicating that the population discrepancy is not present and hence, the data fits the model. The foregoing discussions have analysed the model, with regard to its estimation and fitness showing that the model depicted in Figure 5.3, could be used for conducting the path analysis, which is discussed next.

5.8 Path analysis

After measuring the constructs and their relationship, the next step taken was to understand, the causal relationship between the exogenous and the endogenous variable, using path analysis. AMOS generates, path coefficients and those coefficients were tested for statistical significance. Table 5.13, is the AMOS report on the path coefficient, generated for the relationship between KNOW and CDM.

Maximum Likelihood Estimates

Table 5.13 Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	KNOW	.341	.068	5.015	***	par_5
*** A p-value is statistically significant at 0.001 level (two-tailed)							

From Table 5.13, the validity of the path can be determined by statistically testing, the significance of the path using p-value. A path is statistically significant if the p-value is less than the cut-off figure of 0.05. If one applies this argument to the path KNOW → CDM has been found statistically significant. The SMC value of the endogenous variable CDM was found to be 0.26 (see Table 5.14 and section 5.5.3).

Squared Multiple Correlations: (Group number 1 - Default model)

Table 5.14 SMC of the relationship KNOW → CDM

Dependent variable	Estimate (SMC)
CDM	.263

SMC is related to the linkage between predictor and predicted variables. The interpretation of Table 5.14 is that the determinant KNOW accounts for 26.3% of variance in CDM. The interpretation is that when knowledge is having significant impact on CDM.

Next, the regression weights of the valid path that was examined which helped to determine the relative effect of the independent variable on the dependent variable (Hair et al. 2017). This is provided in Table 5.15. Regression weights provided the basis to verify the hypothesis and to decide whether the hypothesis could be accepted or rejected.

Standardized Regression Weights: (Group number 1 - Default model)

Table 5.15 Standardized Regression Weights of the model in Figure 5.3

			Estimate
CDM	←	KNOW	.513

The reference regression weights that could be considered as useful is provided in section 5.7. Kline, (2015) explains that regression beta weights 0.1, 0.3 and 0.5 in the standardised output can be classified, as small, moderate and large effects respectively, on the dependent variable, caused by the independent variable. Table 5.15 shows that KNOW is having a large effect, on CDM (standardised regressing beta coefficient of 0.513 which is classified as large by Kline, (2015). Thus, with regard to Table 5.15, it is possible to interpret the results and verify the relevant hypothesis as follows.

The path KNOW → CDM is significant. Knowledge as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is large because the standardised regression weight, measured for the relationship KNOW → CDM was 0.51, which is greater than 0.5 (Kline, 2015). That is, when knowledge increases, and is in the positive direction, then that increase in knowledge, is expected to influence the clinical decision making, in the positive direction, leading to greater integration of knowledge into CDM. As a corollary, it can be said that when knowledge is lower and in the negative direction, then that lower knowledge, is expected to influence the clinical decision making, in the negative direction, leading to lesser integration of knowledge into CDM. Thus, higher the knowledge, higher will be the integration of CPG into CDM and lower the knowledge, lower will be the integration of CPG into CDM. Based on these interpretations, it is possible to infer that the hypothesis H1, which says that "the lesser the extent of knowledge of PTs about CPG, the lesser will be the integration of CPG in CDM" is accepted. After testing the hypothesis, the next taken was to test the unidimensionality, which verifies, whether only one underlying dimension is present in the model and explains, whether the reliability values could be accepted, as reliability is considered to indicate unidimensionality.

5.9 Unidimensionality

One way of checking unidimensionality is to examine the regression weight output from AMOS and see, whether any of the C.R. value is lower than 1.96 and the estimates (factor loadings) are lower than 0.5 (Janssens et al. 2008). Table 5.16 provides the report from AMOS, which shows that C.R. values are not less than 1.96 and the factor loadings are not less than 0.5. Thus, it can be concluded that unidimensionality is established.

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

Table 5.16 Regression Weights of the model in Figure 5.3

			Estimate	**S.E.**	**C.R.**	**P**	**Label**
CDM	←	KNOW	.341	.068	5.015	***	par_5
CDM2	←	CDM	**1.005**	.092	**10.936**	***	par_1
K4	←	KNOW	**1.000**				
K3	←	KNOW	**.961**	.043	**22.590**	***	par_2
K2	←	KNOW	**.794**	.071	**11.163**	***	par_3
K1	←	KNOW	**.686**	.088	**7.800**	***	par_4
CDM4	←	CDM	**1.000**				
CDM3	←	CDM	**1.155**	.096	**12.036**	***	par_6

After analysing the relationship given in Figure 3.1, the other relationships in the theoretical framework depicted in Figures 3.2 to 3.10 and those defined by the equations 3.1 to 3.10, were subjected to statistical analysis, following the procedure as described in sections 4.17.1 to 4.17.3. The

entire analysis for each one of those relationships is provided in Appendices 5.6 to 5.8 except for equations 3.2, 3.3, 3.4, 3.4.1, 3.8 and 3.9 which have been found to be insignificant statistically. The results of the analysis only are discussed here, keeping in mind, the volume of the content that will be required to be presented, if the entire analysis of data were to be described here.

5.10 Relationship between ATT and CDM, SE and CDM, and MOT and CDM on EM group -pre-intervention stage (Figures 3.2, 3.3 and 3.4)

From Appendices 5.6 to 5.8, it can be seen that the relationships ATT → CDM, MOT → CDM, and SE → CDM are statistically significant, with p-values found to be lower than the cut off value of 0.05. Next, the SMC value was examined for CDM, as an endogenous variable, taking into account, the individual relationship it has with the exogenous variables, namely ATT, MOT and SE. The SMC values reported by AMOS were 0.39 (ATT as predictor), 0.32 (MOT as predictor) and 0.32 (SE as predictor). The interpretation is that, ATT accounts for 39% of variance in CDM, whereas MOT and SE account for 32% of the variance in CDM, respectively. As far as the standardised regression coefficients are concerned, the output from AMOS was used to interpret and the results are given below in Table 5.17.

Standardized Regression Weights: (Group number 1 - Default model)

Table 5.17 Standardised Regression Weights of the model in Figure 5.3

Dependent variable		Independent variable	Estimate
CDM	←	ATT	0.62
CDM	←	MOT	0.57
CDM	←	SE	0.56

Based on the values given in Table 5.17 and the classification of regression weights by Kline, (2015), it can be argued as follows:

The paths ATT → CDM, MOT → CDM and SE → CDM are statistically significant. Attitude, motivation of PTs to integrate CPG into CDM and self-efficacy of PTs to integrate CPG into CDM, as independent variables act as predictors of clinical decision making. The relationships between ATT, MOT and SE on the one hand, and CDM on the other, are positive and the effect of ATT, MOT and SE on CDM is large because, the standardised regression weight measured for the relationships are greater than 0.5 (Kline, 2015). That is when; attitude, motivation and self-efficacy of PTs to integrate CPG into CDM, change in the positive direction, then that change is expected to influence the CDM in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when attitude, motivation and self-efficacy of PTs to integrate CPG into CDM change in the negative direction, then that change is expected to influence CDM in the negative direction, leading to

lesser integration of CPG into CDM. Thus, the higher the attitude, motivation and self-efficacy of PTs to integrate CPG into CDM, the higher will be the integration of CPG into CDM. Similarly lower the attitude, motivation and self-efficacy of PTs to integrate CPG into CDM, lower the integration of CPG into CDM. Based on these interpretations, it is possible to infer that the hypotheses H2, H3 and H4 are accepted. All the statistical analyses that have been described above, used in testing and verifying hypotheses H2 to H4 and the model in Figure 5.3 are provided in Appendices 5.6 to 5.8.

5.11 Relationship between KNOW, ATT, SE, MOT and CDM on VCoP group at the Preintervention stage (Figure 3.5 and equations 3.1 to 3.10 and 3.4.1)

The relationships depicted in Figure 3.5 and defined by equations 3.1 to 3.10 and 3.4.1 was tested using AMOS (see Appendix 5.9). While the relationship depicted in Figure 3.5 (defined by the equation 3.1) was found to be reliable and valid at the CFA level (see Figure 5.4).

Figure 5.4 CFA model of equation 3.1

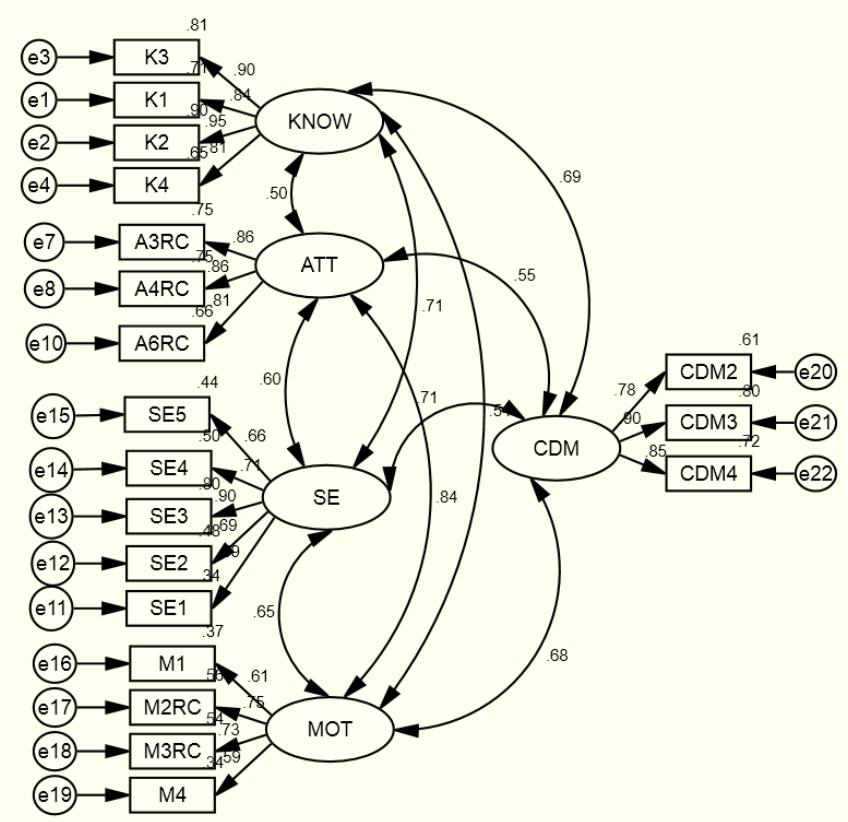


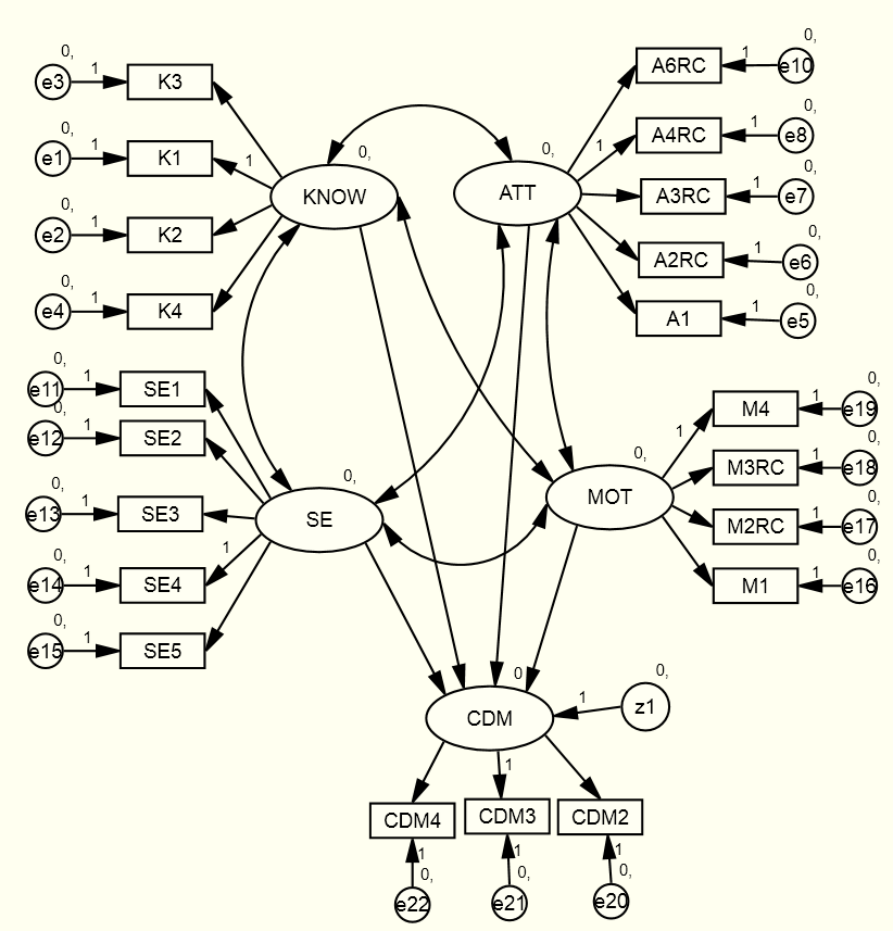
Table 5.18 shows that all the covariances are statistically significant. Further, the model was found fit (IFI=0.926, TLI=0.908, CFI=0.924, RMR=0.022 and RMSEA=0.081)

Table 5.18 Covariances: (Group number 1 - Default model) (for Figure 5.4)

			Estimate	**S.E.**	**C.R.**	**P**	**Label**
CDM	↔	KNOW	.165	.039	4.200	***	par_15
CDM	↔	MOT	.120	.035	3.375	***	par_16
SE	↔	MOT	.085	.028	3.089	.002	par_17
ATT	↔	SE	.135	.039	3.470	***	par_18
KNOW	↔	ATT	.148	.045	3.315	***	par_19
KNOW	↔	SE	.126	.033	3.846	***	par_20
ATT	↔	MOT	.183	.050	3.657	***	par_21
KNOW	↔	MOT	.092	.031	2.969	.003	par_22
CDM	↔	SE	.129	.033	3.872	***	par_23
CDM	↔	ATT	.168	.047	3.562	***	par_24

However, the initial model (the structural model) (see Figure 5.5) was not found to be valid when tested at the structural stage.

Figure 5.5 Structural model of the CFA model in Figure 5.4



Since, the structural model shown in Figure 5.5 was not found to be statistically significant, it was concluded that the equation 3.1 was not valid and consequently hypothesis H5 was not accepted. Next, the structural model was re-specified and different combinations of the linkage between the endogenous and exogenous variables was tested as depicted in equations 3.2 to 3.10 and 3.4.1and it

was found that equations 3.2, 3.3, 3.4, 3.4.1, 3.8 and 3.9 were not valid. Only equations 3.5, 3.6, 3.7 and 3.10 were found to be valid. See Table 8a-8d in appendix 5.9 for the details of the SEM of the valid models. This indicates that hypotheses H6a, H6b, H6c, H6d, H7d and H7e were rejected. The valid relationships are depicted in Figures 5.6, 5.7, 5.8 and 5.9.

Figure 5.6 Representation of the Equation 3. 5

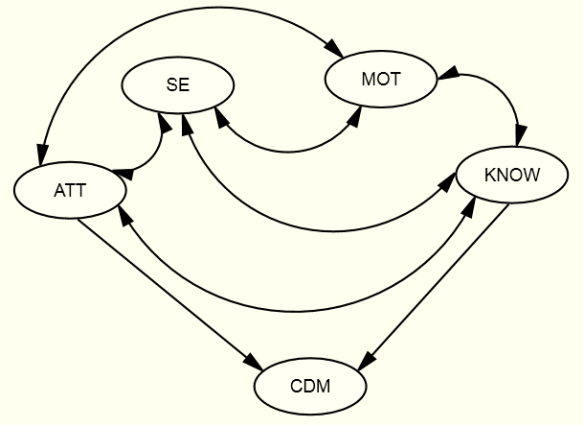


Figure 5.7 Representation of the Equation 3.6

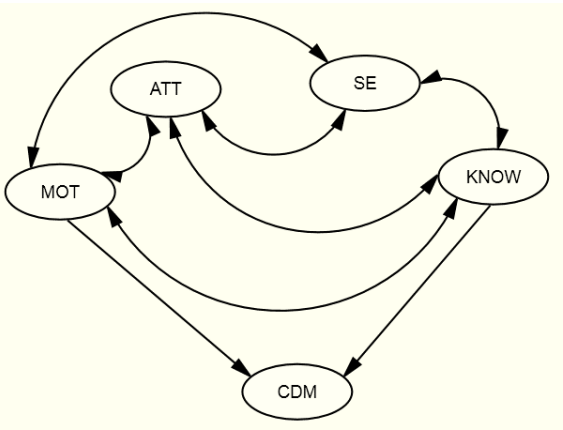


Figure 5.8 Representation of the Equation 3.7

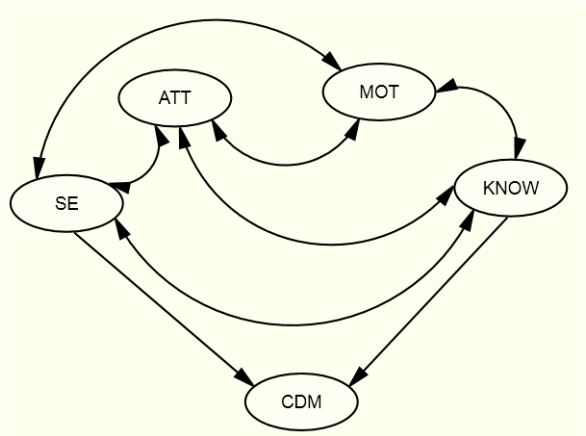
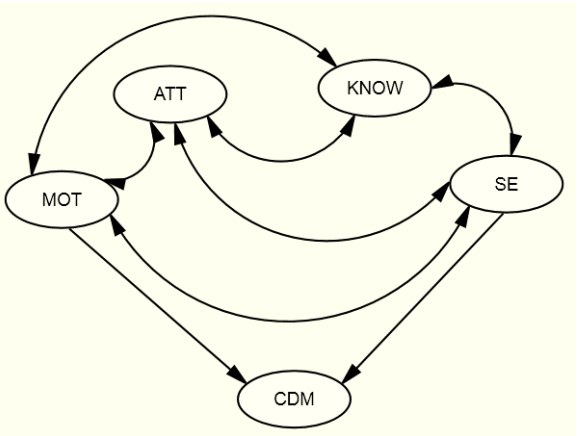


Figure 5.9 Representation of the Equation 3.10



The result of the statistical analysis with regard to Figures 5.6, 5.7, 5.8 and 5.9 are provided in Table 5.19.

Table 5.19 Testing of equations 3.5, 3.6, 3.7 and 3.10 (Figures 5.6 to 5.9)

No.	Relationship	Squared Multiple Correlation	Standardised Regression weight	Interpretation	Result
1	KNOW→CDM	0.561 that is 56.1% variance in CDM is accounted for by KNOW and ATT	0.545	The path KNOW → CDM is statistically significant. Knowledge, as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, knowledge changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when knowledge changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the knowledge, the higher will be the integration of CPG into CDM. Similarly, lesser the knowledge, lower will be the integration of CPG into CDM.	
	ATT → CDM		0.309	The path ATT → CDM is statistically significant. Attitude, as an independent variable, acts as a predictor of clinical decision making. The relationship between ATT and CDM is positive and the effect of ATT on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when attitude changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when attitude changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the attitude is moderate, the integration of CPG into CDM is expected to be moderate.	**Hypothesis H7a is accepted**
	KNOW↔ ATT KNOW↔MOT KNOW ↔ SE ATT ↔ SE ATT ↔ MOT MOT ↔ SE		All covariances were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lesser motivation and self-efficacy were found to be associated with KNOW and ATT and found to be statistically significant. This indicates that their association can affect the relationships KNOW→CDM and ATT→CDM indirectly. *This could also imply that KNOW and ATT along with SE and MOT affect CDM indicating that equation 3.1 is valid and hypothesis H5 can be partially accepted.*	
2	KNOW→CDM	0.585 that is 58.5% variance in CDM is accounted for by KNOW and SE	0.358	The path KNOW → CDM is statistically significant. Knowledge, as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when, knowledge changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when	**Hypothesis H7b is accepted.**

				knowledge changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the knowledge is moderate, the integration of CPG into CDM is expected to be moderate.	
	SE → CDM		0.468	The path SE → CDM is statistically significant. Self-efficacy, as an independent variable, acts as a predictor of clinical decision making. The relationship between SE and CDM is positive and the effect of SE on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when self-efficacy changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when self-efficacy changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the self-efficacy is moderate, then the integration of CPG into CDM is expected to be moderate.	
	KNOW↔ ATT KNOW↔ MOT KNOW ↔ SE ATT ↔ SE ATT ↔ MOT MOT ↔ SE		All covariances were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lesser attitude and motivation were found to be associated with KNOW and SE and found to be statistically significant. This indicates that their association can affect the relationships KNOW→CDM and SE→CDM indirectly. Again, this indicates that their association can affect the relationships KNOW→CDM and SE→CDM indirectly. *This could also imply that KNOW and ATT along with SE and MOT affect CDM indicating that equation 3.1 is valid and hypothesis H5 can be partially accepted.*	
3	KNOW→CDM	0.621 that is 62.1% variance in CDM is accounted for by KNOW and MOT	0.468	The path KNOW → CDM is statistically significant. Knowledge, as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when, knowledge changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when knowledge changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the knowledge is moderate, the integration of CPG into CDM is expected to be moderate.	**Hypothesis H7c is accepted**
	MOT → CDM		0.431	The path MOT → CDM is statistically significant. Motivation of PTs in integrating CPG into CDM, as an independent variable, acts as a predictor of clinical decision making. The relationship between MOT and CDM is positive and the effect of MOT on CDM is moderate because, the standardised regression weight measured for the relationship is	

				greater than 0.3 but less than 0.5 (Kline, 2015). That is when motivation of PTs in integrating CPG into CDM changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when motivation of PTs in integrating CPG into CDM changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the motivation of PTs in integrating CPG into CDM is moderate, then the integration of CPG into CDM is expected to be moderate.	
	KNOW↔ ATT KNOW↔MOT KNOW ↔ SE ATT ↔ SE ATT ↔ MOT MOT ↔ SE		All covariances were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lesser self -efficacy and motivation were found to be associated with KNOW and SE and found to be statistically significant. This indicates that their association can affect the relationships KNOW→CDM and MOT→CDM indirectly. This indicates that their association can affect the relationships KNOW→CDM and MOT→CDM indirectly. *This could also imply that KNOW and ATT along with SE and MOT affect CDM indicating that equation 3.1 is valid and hypothesis H5 can be partially accepted.*	
4	MOT → CDM	0.593 that is 59.3% variance in CDM is accounted for by MOT and SE	0.343	The path MOT → CDM is statistically significant. Motivation of PTs in integrating CPG into CDM, as an independent variable, acts as a predictor of clinical decision making. The relationship between MOT and CDM is positive and the effect of MOT on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when motivation of PTs in integrating CPG into CDM changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when motivation of PTs in integrating CPG into CDM changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the motivation of PTs in integrating CPG into CDM is moderate, then the integration of CPG into CDM is expected to be moderate.	**Hypothesis H7f is accepted.**
	SE → CDM		0.502	The path SE → CDM is statistically significant. Self-efficacy, as an independent variable, acts as a predictor of clinical decision making. The relationship between SE and CDM is positive and the effect of SE on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when self-efficacy changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when self-efficacy changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the self-efficacy, the higher will be the integration of CPG into CDM. Similarly, lesser the self-efficacy, lower will be the integration of CPG into CDM.	

	KNOW↔ ATT KNOW↔ MOT KNOW ↔ SE ATT ↔ SE ATT ↔ MOT MOT ↔ SE		All covariances were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lesser knowledge and attitude were found to be associated with MOT and SE and found to be statistically significant. This indicated that their association can affect the relationships MOT→CDM and SE→CDM indirectly. This indicates that their association can affect the relationships MOT→CDM and SE→CDM indirectly. *This could also imply that KNOW and ATT along with SE and MOT affect CDM indicating that equation 3.1 is valid and hypothesis H5 can be partially accepted.*	

After verifying the hypotheses H7a, H7b, H7c and H7f, the next step involved the analysis of data related to administration of the KTIs on the KNOW, ATT, SE and MOT. The results of the analysis related to hypotheses testing are discussed in the following sections.

5.12 Relationship between RA and KNOW, RA and ATT, RA and SE, and RA and MOT (Figures 3.6 to 3.9) on EM group at the Post intervention stage

As mentioned in the theoretical framework (see section 3.6), EM as single component KTI was administered to the EM group. The data was collected on the intervention, using the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (EM)*". It must be noted here that this questionnaire is exactly the same as the one namely "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*", except that in this questionnaire, an additional section, namely relative advantage of the KTI has been added to collect data about EM as a KTI. Thus, the data analysis will be restricted to only this section of the questionnaire (section 8), as the remaining sections are exactly the same as that of the questionnaire "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*". The results provided in Table 5.20, are related to the two parameters namely squared multiple correlation of the endogenous variable and standardized regression weight, both produced by AMOS, which were found to be good enough to test the hypotheses. Rest of the analysis is presented in Appendices 5.10 to 5.13.

Table 5.20 Analysis of the models in Figures 3.6 to 3.9

No.	Relationship	Squared Multiple Correlation	Standardised regression weight	Interpretation	Result
1	RA→ KNOW	0.079 that is 7.9% variance in KNOW is accounted for by RA	0.281	The path RA → KNOW is statistically significant. Relative advantage of EM as a KTI and as an independent variable, acts as a predictor of knowledge. The relationship between RA and KNOW is positive and the effect of RA on KNOW is approaching the moderate level because, the standardised regression weight measured for the relationship is close to 0.3 (Kline, 2015). That is when, relative advantage of EM changes in the positive direction, then that change is expected to influence knowledge change in the positive direction moderately. As a corollary, it can be said that when relative advantage of EM changes in the negative direction, then that change is expected to influence knowledge change in the negative direction moderately.	**Hypothesis H8a is accepted**
2	RA → ATT	0.433 that is 43.3% variance in ATT is accounted for by RA	0.658	The path RA → ATT is statistically significant. Relative advantage of EM as a KTI and as an independent variable, acts as a predictor of attitude. The relationship between RA and ATT is positive and the effect of RA on ATT is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, relative advantage of EM changes in the positive direction, then that change is expected to have a large influence on the attitude change in the positive direction. As a corollary, it can be said that when relative advantage of EM changes in the negative direction, then that change is expected to have a large influence on the attitude change in the negative direction.	**Hypothesis H8b is accepted**
3	RA → SE	0.345 that is 34.5% variance in SE is accounted for by RA	0.588	The path RA → SE is statistically significant. Relative advantage of EM as a KTI and as an independent variable, acts as a predictor of self-efficacy. The relationship between RA and SE is positive and the effect of RA on SE is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, relative advantage of EM changes in the positive direction, then that change is expected to have a large influence on self-efficacy to change in the positive direction. As a corollary, it can be said that when relative advantage of EM changes in the negative direction, then that change is expected to have a large influence on self-efficacy to change in the negative direction.	**Hypothesis H8c is accepted**
4	RA → MOT	0.411 that is 41.1% variance in MOT is accounted for by RA	0.641	The path RA → MOT is statistically significant. Relative advantage of EM as a KTI and as an independent variable, acts as a predictor of motivation of PTs in integrating CPG into CDM. The relationship between RA and MOT is positive and the effect of RA on MOT is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, relative advantage of EM changes in the positive direction, then that change is expected to have a large influence on the motivation of PTs in integrating CPG into CDM to change in the positive direction. As a corollary, it can be said that when relative advantage of EM changes in the negative direction, then that change is expected to have a large influence on the motivation of PTs in integrating CPG into CDM to change in the negative direction.	**Hypothesis H8d is accepted**

The results of the testing of the hypotheses H8a to H8d show that EM as KTI, impacts the KNOW, ATT, SE and MOT. After confirming the impact of EM on KNOW, ATT, SE and MOT, the next step taken was to test, whether the variables KNOW, ATT, SE and MOT, subjected to the intervention of EM, whether impact CDM or not. This was tested in the next section; thereby reconfirming the hypotheses H1 to H4 as mentioned in the theoretical framework (see section 3.6).

5.13 Relationship between KNOW and CDM, ATT and CDM, SE and CDM, and MOT and CDM) on EM group post intervention stage

The complete statistical analysis of the four relationships KNOW → CDM, ATT → CDM, SE → CDM and MOT → CDM (analysed using the data collected through the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (EM)*") is provided in Appendices 5.14 to 5.17 whereas the results of the hypotheses testing is provided in Table 5.21.

Table 5.21 Analysis of the data collected from EM group post-intervention

No.	Relationship	Squared Multiple Correlation	Standardized Regression weight	Interpretation	Result
1	KNOW↔ CDM	---	---	Analysis of the relationship KNOW → CDM could not proceeded with as the relationship was not found significant at the CFA stage. This indicates that after the introduction of EM as the intervention, the barrier knowledge of PTs in the CPG for VTE was found to have no statistically significant relationship with CDM. This is an anomalous situation which is contradictory to actual happenings. Needs further investigation.	**Hypothesis H1 is rejected**
2	ATT→ CDM	0.48 that is 48% variance in CDM is accounted for by ATT	0.693	The path ATT → CDM is statistically significant. Attitude, as an independent variable, acts as a predictor of clinical decision making. The relationship between ATT and CDM is positive and the effect of ATT on CDM is large because, the standardized regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when attitude changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when attitude changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the attitude, the higher will be the integration of CPG into CDM. Similarly, lesser the attitude, lower will be the integration of CPG into CDM.	**Hypothesis H2 accepted**

				Further, a one-unit increase in attitude results in a 0.693 unit increase in the integration of CPG into CDM. When one compares this result with that of the impact of barriers prior to introduction of the intervention (see sections 5.5 to 5.10), it can be seen that the introduction of EM has enhanced the variance in CDM accounted for by ATT from 38.9% to 48%. However, the total impact of ATT on CDM has been increased marginally only from 0.62 to 0.693. This shows that EM's effect on the attitude of PTs is not high although there is a significant variance in CDM accounted for by ATT. This shows that attitude of PTs has been enhanced by EM and hence the intervention EM appears to be effective in reducing the impact of the barrier in the process of integration of CPG into CDM by PTs.	
3	SE → CDM	0.53 that is 53% variance in CDM is accounted for by SE	0.728	The path SE → CDM is statistically significant. Self-efficacy, as an independent variable, acts as a predictor of clinical decision making. The relationship between SE and CDM is positive and the effect of SE on CDM is large because, the standardized regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when self-efficacy changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when self-efficacy changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the self-efficacy, the higher will be the integration of CPG into CDM. Similarly, lesser the self-efficacy, lower will be the integration of CPG into CDM. Further, a one-unit increase in self-efficacy results in a 0.728 unit increase in the CDM and hence integration of CPG into CDM. Now this result was compared with the result obtained prior to the administration of the intervention as given in 5.7 and 5.9. It can be seen that the variance accounted for in CDM by SE has been enhanced from 31.7% to 53%. Similarly, the total effect of motivation on CDM has been enhanced from 0.521 to 0.728. This shows that self-efficacy of PTs has been enhanced by EM and hence the intervention EM appears to be effective in reducing the impact of the barriers in the process of integration of CPG into CDM by PTs.	**Hypothesis H3 accepted**
4	MOT → CDM	0.728 that is 72.8% variance in CDM is accounted for by MOT	0.853	The path MOT → CDM is statistically significant. Motivation of PTs in integrating CPG into CDM, as an independent variable, acts as a predictor of clinical decision making. The relationship between MOT and CDM is positive and the effect of MOT on CDM is large because, the standardized regression	**Hypothesis H4 accepted**

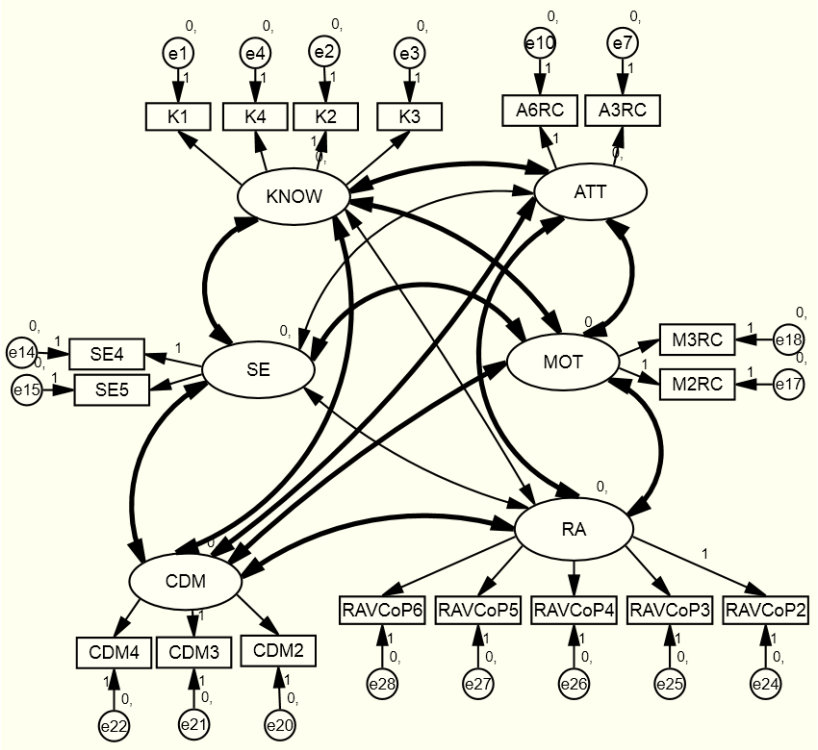
				weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when motivation of PTs in integrating CPG into CDM changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when motivation of PTs in integrating CPG into CDM changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the motivation of PTs to integrate CPG to CDM, the higher will be the integration of CPG into CDM. Similarly, lesser the motivation, lower will be the integration of CPG into CDM. Further, a one-unit increase in motivation results in a 0.858 unit increase in clinical decision making and hence the integration of CPG into CDM and vice versa. Now this result was compared with the result obtained prior to the administration of the intervention as given in (see sections 5.5 to 5.10). It can be seen that the variance accounted for in CDM by MOT has been enhanced from 32.2% to 72.8%. Similarly, the total effect of motivation on CDM has been enhanced from 0.57 to 0.853. This shows that motivation of PTs has been enhanced by EM and hence the intervention EM appears to be effective in reducing the impact of the barriers in the process of integration of CPG into CDM by PTs.	

The impact of the four variables KNOW, ATT, SE and MOT that were found to be affected by KTIs (see Tables 5.20 and 5.21) on CDM relationships, KNOW → CDM, ATT → CDM, SE → CDM and MOT → CDM (analysed using the data collected through the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (EM)*") has been interpreted in Table 5.21. This led to the retesting of the hypotheses H1 to H4, post administration of EM as KTI. This helped the researcher to know whether the administration of KTI had impact on those four variables or not. Thus, from Table 5.2, it can be seen that only three hypotheses namely H2, H3 and H4 were found to be valid. H1 was rejected. After this, the next step involved was the testing of the relative advantage (RA) of VCoP and its influence on the variables KNOW, ATT, SE and MOT.

5.14 Testing the relationship between RA and KNOW, RA and ATT, RA and SE and RA and MOT (Figure 3.10) on VCoP group at the Post intervention stage

As mentioned in the theoretical framework (see section 3.6), a combination of KTIs (educational material (EM), knowledge broker (KB) and VCoP) as multicomponent knowledge translation intervention strategy was administered to the VCoP group. The data was collected on the intervention using the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (VCoP)*". It must be noted here that this questionnaire is exactly same as the one namely "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*" except that in this questionnaire an additional section namely relative advantage of the KTI has been added to collect data about VCoP as a KTI. Thus, the data analysis was restricted to only this section as the remaining sections are exactly same as that of the questionnaire "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*". The actual model tested is given in Figure 5.10. It must be mentioned here that only correlational analysis was conducted to identify the relationship between VCoP and the group of variables KNOW, ATT, SE and MOT as the main aim was to test the hypothesis H9. Testing of H9 require to prove that there is a statistically significant relationship between the variables KNOW, ATT, SE and MOT on the one hand as a group and RA on the other in the presence of CDM.

Figure 5.10 Correlation amongst KNOW, ATT, SE, MOT, CDM and RA reported by AMOS after analysing data collected using the survey questionnaire "*Knowledge translation study post-intervention survey questionnaire (VCoP)*") (IFI=0.909, CFI=0.902, RMR=0.031; RMSEA=0.083)



The AMOS report derived from testing the model in Figure 5.10 is provided in Table 5.22 which provides information on the statistical significance of the correlational analysis conducted on the model.

Covariances: (Group number 1 - Default model)

Table 5.22 Correlational analysis of the relationships amongst the variables, KNOW, ATT, SE, MOT, CDM and RA depicted in the model in Figure 5.10.

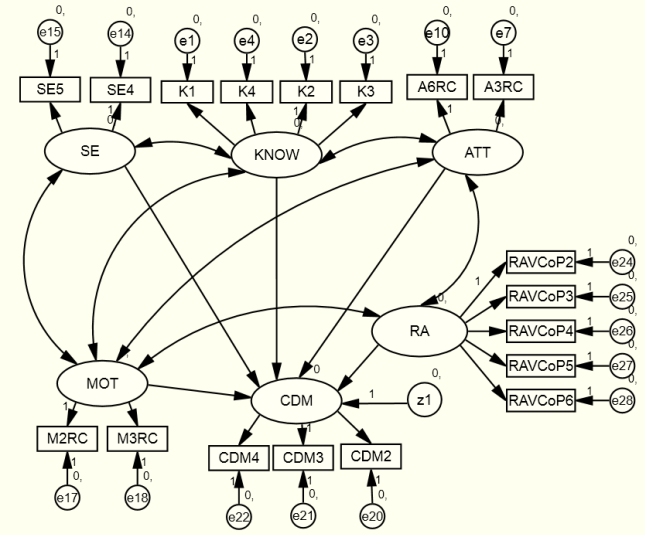
			Estimate	**S.E.**	**C.R.**	**P**	**Label**
RA	↔	MOT	.051	.024	2.150	.032	par_13
RA	↔	SE	.033	.020	1.658	.097	par_14
ATT	↔	SE	.023	.025	.908	.364	par_15
CDM	↔	ATT	.085	.041	2.064	.039	par_16
CDM	↔	MOT	.108	.039	2.734	.006	par_17
RA	↔	CDM	.058	.030	1.947	.051	par_18
MOT	↔	SE	.062	.028	2.248	.025	par_19
ATT	↔	MOT	.104	.036	2.903	.004	par_20
RA	↔	ATT	.061	.028	2.211	.027	par_21
KNOW	↔	SE	.131	.044	2.963	.003	par_22
CDM	↔	KNOW	.230	.058	3.972	***	par_23
RA	↔	KNOW	.030	.025	1.194	.232	par_24
KNOW	↔	MOT	.067	.034	2.005	.045	par_25
KNOW	↔	ATT	.079	.039	2.042	.041	par_26
CDM	↔	SE	.160	.052	3.086	.002	par_27

From Table 5.22, it can be seen that the rows coloured in grey are those that indicate relationships, whose correlation is not significant. That is to say that RA does not influence KNOW and SE directly, but could have an indirect influence, through its relationship with ATT and MOT. This interpretation has a bearing on the statistically significant relationship that exists, between KNOW and ATT, KNOW and MOT and SE and MOT. In addition, it is seen that both SE and KNOW are shown to affect CDM, in the presence of RA, implying that RA could influence KNOW, through the relationships RA↔MOT and MOT↔KNOW and RA↔ATT and ATT↔KNOW. Similarly, RA could influence SE, through the relationships RA↔MOT and MOT↔SE.

Furthermore, the statistical significance of the correlation between RA and CDM (RA↔CDM), although found to be on the borderline case of acceptance (since the p-value is shown to be 0.051), and could potentially be rejected, as it is higher than the acceptable reference value of 0.05 by 0.01, it was yet accepted, considering the fact that 0.051 could be approximated to 0.05, if reduced to two decimal points. Additionally, it must be borne in mind that the sample size was also very low and could be a possible reason for this situation and could improve with higher sample size. The inference that could be drawn at this stage was that the variables KNOW, ATT, SE and MOT as independent variables, could be linked to CDM, after the administration of VCoP, based on the report generated by AMOS (Table 5.21), because the influence of RA on those variables has been statistically verified and

analysed to check, which of the variable combinations could significantly affect CDM. However, since the covariances between RA and KNOW, as well as RA and SE are not statistically significant, it can be inferred that hypothesis H9 can only be partially accepted, because all the variables namely KNOW, ATT, SE and MOT are not influenced by RA directly. Based on this inference, an initial model was drawn to test the impact of the variables KNOW, ATT, SE and MOT on CDM, after the administration of VCoP to reconfirm the hypotheses H5, H6a to H6d and H7a to H7f, to test whether VCoP affects CDM. That is, when the KNOW, ATT, SE and MOT in a group are linked to CDM, then the influence of VCoP as a KTI, could be tested by examining the relationship, between the variables KNOW, ATT, SE and MOT, as a group on one hand and CDM on the other. The initial model drawn is given in Figure 5.12.

Figure 5.12 Initial model drawn to test the relationship between KNOW, ATT, SE and MOT as exogenous variables and CDM as the endogenous variable in the presence of RA using the data collected using the questionnaire "Knowledge translation study post-intervention survey questionnaire (VCoP)" post administration of VCoP



5.15 Relationship between KNOW, ATT, SE, MOT and CDM (Figure 5.12) on VCoP group post intervention

The model in Figure 5.12 was tested using AMOS (see Appendices 5.19 to 5.23 for the results of the analysis) and the significant combinations of statistically significant relationships have been depicted in Figures 5.13 to 5.17. All the thick lines in the figures indicate statistically significant paths.

Figure 5.13, Equation 3.3, KNOW→CDM (significant), ATT→CDM (significant)
SMC (CDM) = 0.707
CMIN=40.36, DF=30, (p-value 0.098), (CMIN/DF) = 1.345
RMR = 0.026, IFI = 0.959, TLI = 0.934, CFI = 0.956, RMSEA = 0.081

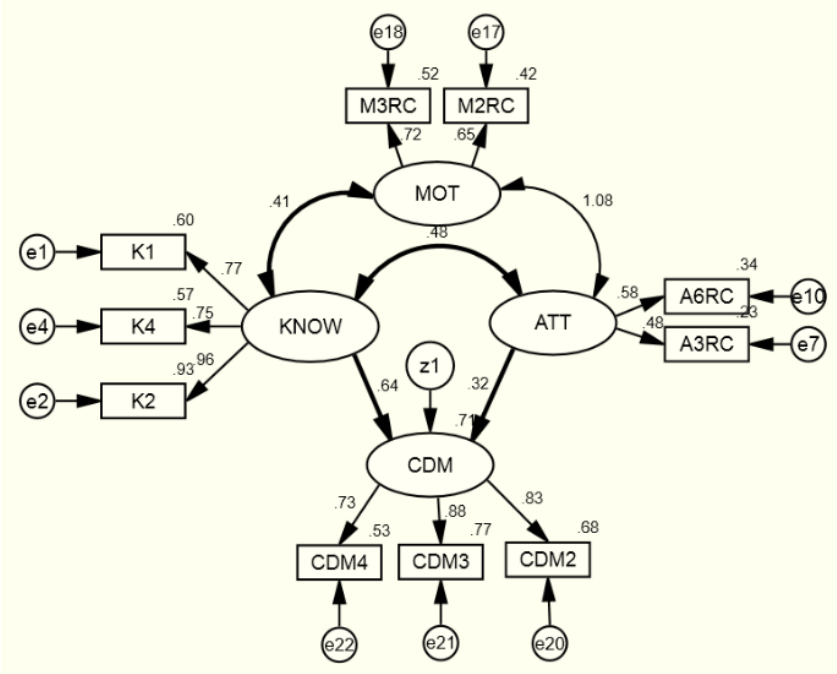


Figure 5.14, Equation 3.4.1, KNOW→CDM (significant), MOT→CDM (significant)
SE↔KNOW→CDM is valid
SMC (CDM) = 0.872, IFI = 0.909, CFI = 0.904, RMR = 0.024

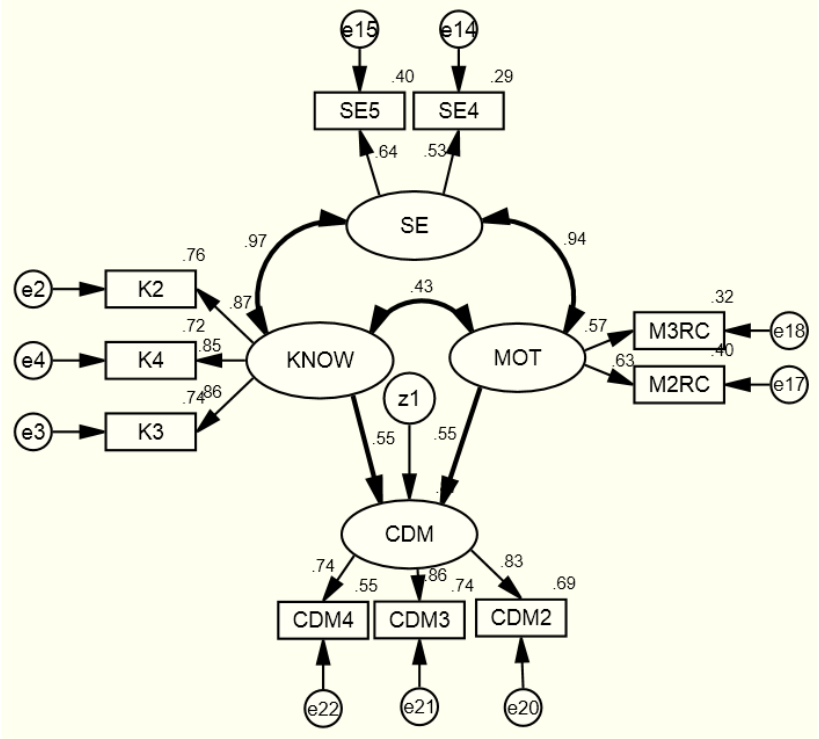


Figure 5.15, Equations 3.7 and 3.3, KNOW→CDM (significant), MOT→CDM (significant), ATT→CDM (not significant), ATT↔MOT→CDM (significant) (equation 3.3)

SMC (CDM) = 0.713

CMIN=39.921, DF=30, (p-value: 0.106), (CMIN/DF) = 1.331

RMR = 0.026, IFI = 0.961, TLI = 0.937, CFI = 0.958, RMSEA = 0.08

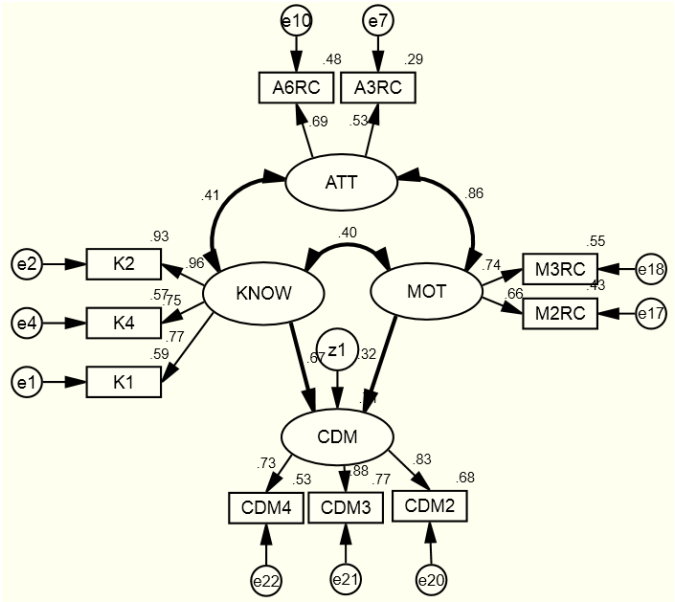


Figure 5.16, Equation 3.8 and 3.1, ATT→CDM (Significant), SE→CDM (significant)

SMC (CDM) = 0.828, IFI = 0.921, CFI = 0.915, RMR = 0.031, RMSEA = 0.1

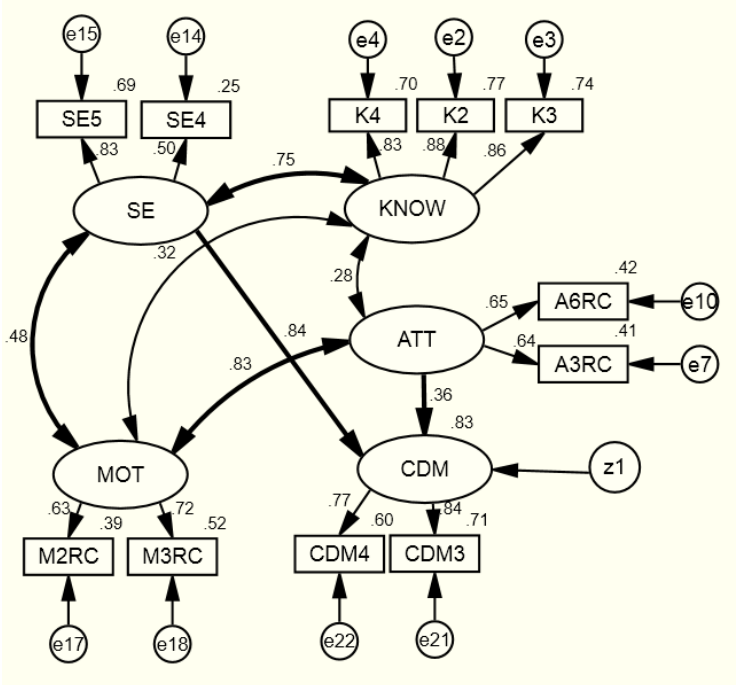
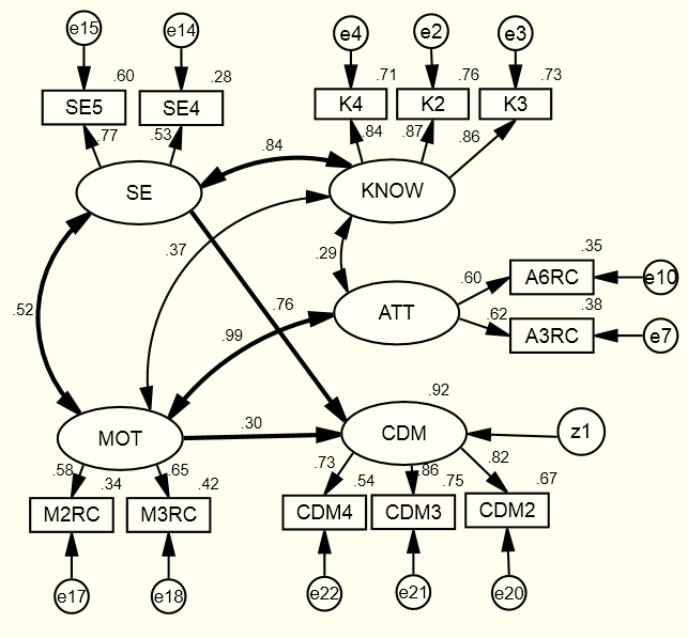


Figure 5.17, Equations 3.10 and 3.1, SE→CDM (Significant), MOT→CDM (significant)
SMC (CDM) = 0.915, IFI = 0.905, CFI = 0.9, RMR = 0.033



Results of the analysis of the models in Figures 5.13 to 5.17 are given in Table 5.23.

Table 5.23 Results of the analysis of the models in Figures 5.13 to 5.17

No.	Relationship	Squared Multiple Correlation	Standardised Regression weight	Interpretation	Result
1	KNOW→CDM	0.707 that is 70.7% variance in CDM is accounted for by KNOW and ATT	0.640	The path KNOW → CDM is statistically significant. Knowledge, as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, knowledge changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when knowledge changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the knowledge, the higher will be the integration of CPG into CDM. Similarly, lesser the knowledge, lower will be the integration of CPG into CDM.	**Hypothesis H7a is accepted**
	ATT → CDM		0.317	The path ATT → CDM is statistically significant. Attitude, as an independent variable, acts as a predictor of clinical decision making. The relationship between ATT and CDM is positive and the effect of ATT on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when attitude changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when attitude changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the attitude is moderate, the integration of CPG into CDM is expected to be moderate.	
	KNOW↔ ATT KNOW↔MOT ATT ↔ MOT		All covariances were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lesser motivation and self-efficacy were found to be associated with KNOW and ATT and found to be statistically significant. This indicates that their association can affect the relationships KNOW→CDM and ATT→CDM indirectly.	
2	KNOW→CDM	0.872 that is 87.2% variance in CDM is accounted for by KNOW and	0.554	The path KNOW → CDM is statistically significant. Knowledge, as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, knowledge	**Hypothesis H7c is accepted**

		MOT		changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when knowledge changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the knowledge, the higher will be the integration of CPG into CDM. Similarly, lesser the knowledge, lower will be the integration of CPG into CDM.	
	MOT → CDM		0.551	The path MOT → CDM is statistically significant. Motivation of PTs in integrating CPG into CDM, as an independent variable, acts as a predictor of clinical decision making. The relationship between MOT and CDM is positive and the effect of MOT on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, motivation of PTs in CPG into CDM changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when motivation changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the motivation, the higher will be the integration of CPG into CDM. Similarly, lesser the motivation, lower will be the integration of CPG into CDM.	
	KNOW↔MOT KNOW ↔ SE MOT ↔ SE		All covariances were found to be significant at a p-value of 0.05 or less.	The other barrier namely lesser self-efficacy of PTs was found to be associated with KNOW and MOT and found to be statistically significant. This indicates that its association can affect the relationships KNOW→CDM and MOT→CDM indirectly. *This also indicates that SE affects CDM indirectly as a covariant of KNOW and MOT leading to partial validity of equation 3.4.1and partial acceptance of hypothesis H6d.*	
3	KNOW→CDM	0.713 that is 71.3% variance in CDM is accounted for by KNOW and MOT	0.666	The path KNOW → CDM is statistically significant. Knowledge, as an independent variable, acts as a predictor of clinical decision making. The relationship between KNOW and CDM is positive and the effect of KNOW on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when, knowledge changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when knowledge changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the knowledge, the higher	**Hypothesis H7c is accepted**

				will be the integration of CPG into CDM. Similarly, lesser the knowledge, lower will be the integration of CPG into CDM.	
	MOT → CDM		0.315	The path MOT → CDM is statistically significant. Motivation of PTs in integrating CPG into CDM, as an independent variable, acts as a predictor of clinical decision making. The relationship between MOT and CDM is positive and the effect of MOT on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when motivation of PTs in integrating CPG into CDM changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when motivation of PTs in integrating CPG into CDM changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the motivation of PTs in integrating CPG into CDM is moderate, then the integration of CPG into CDM is expected to be moderate.	
	KNOW↔MOT KNOW ↔ ATT MOT ↔ ATT		All covariances were found to be significant at a p-value of 0.05 or less.	The other barrier namely less favourable attitude was found to be associated with KNOW and MOT and found to be statistically significant. This indicates that its association can affect the relationships KNOW→CDM and MOT→CDM indirectly. *This also indicates that attitude affects CDM indirectly as a covariant of KNOW and MOT leading to partial validity of equation 3.3 and partial acceptance of hypothesis H6b.*	
4	ATT→CDM	0.828 that is 82.8% variance in CDM is accounted for by KNOW and SE	0.356	The path ATT → CDM is statistically significant. Attitude, as an independent variable, acts as a predictor of clinical decision making. The relationship between ATT and CDM is positive and the effect of ATT on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when attitude changes in the positive direction, then that change is expected to influence the clinical decision making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when attitude changes in the negative direction, then that change is expected to influence clinical decision making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the attitude is moderate, the integration of CPG into CDM is expected to be moderate.	**Hypothesis H7d is accepted.**

	SE → CDM		0.837	The path SE → CDM is statistically significant. Self-efficacy, as an independent variable, acts as a predictor of clinical decision making. The relationship between SE and CDM is positive and the effect of SE on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when self-efficacy changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when self-efficacy changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the self-efficacy is moderate, then the integration of CPG into CDM is expected to be moderate.	
	KNOW↔ ATT KNOW↔ MOT KNOW ↔ SE ATT ↔ MOT MOT ↔ SE		Only three covariant relationships KNOW ↔ SE ATT ↔ MOT MOT ↔ SE were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lack knowledge of PTs and motivation were found to be associated with ATT and SE and found to be statistically significant. This indicates that their association can affect the relationships ATT→CDM and SE→CDM indirectly. *This also implies that KNOW and MOT alongside ATT and SE act on CDM indirectly leading to the inference that equation 3.1 is valid partially and hypotheses H5 is accepted partially.*	
5	MOT → CDM	0.915 that is 91.5% variance in CDM is accounted for by MOT and SE	0.303	The path MOT → CDM is statistically significant. Motivation of PTs in integrating CPG into CDM, as an independent variable, acts as a predictor of clinical decision making. The relationship between MOT and CDM is positive and the effect of MOT on CDM is moderate because, the standardised regression weight measured for the relationship is greater than 0.3 but less than 0.5 (Kline, 2015). That is when motivation of PTs in integrating CPG into CDM changes in the positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to moderate integration of CPG into CDM. As a corollary, it can be said that when motivation of PTs in integrating CPG into CDM changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to moderate integration of CPG into CDM. Thus, when the motivation of PTs in integrating CPG into CDM is moderate, then the integration of CPG into CDM is expected to be moderate.	**Hypothesis H7f is accepted.**
	SE → CDM		0.762	The path SE → CDM is statistically significant. Self-efficacy, as an independent variable, acts as a predictor of clinical decision making. The relationship between SE and CDM is positive and the effect of SE on CDM is large because, the standardised regression weight measured for the relationship is greater than 0.5 (Kline, 2015). That is when self-efficacy changes in the	

				positive direction, then that change is expected to influence the clinical decision-making change in the positive direction, leading to greater integration of CPG into CDM. As a corollary, it can be said that when self-efficacy changes in the negative direction, then that change is expected to influence clinical decision-making change in the negative direction, leading to lesser integration of CPG into CDM. Thus, greater the self-efficacy, the higher will be the integration of CPG into CDM. Similarly, lesser the self-efficacy, lower will be the integration of CPG into CDM.	
	KNOW↔ ATT KNOW↔ MOT KNOW ↔ SE ATT ↔ SE ATT ↔ MOT MOT ↔ SE		Only three covariant relationships namely KNOW ↔ SE, ATT ↔ MOT and MOT ↔ SE were found to be significant at a p-value of 0.05 or less.	The two other barriers namely lesser knowledge and attitude were found to be associated with MOT and SE and found to be statistically significant. This indicated that their association can affect the relationships MOT→CDM and SE→CDM indirectly. Thus, KNOW and ATT together with MOT and SE affect CDM. *This implies that equation 3.1 is partially accepted and hypothesis H5 is partially accepted.*	
	KNOW→ CDM SE → CDM ATT↔KNOW ATT↔SE MOT↔KNOW MOT↔SE MOT↔ATT		Found to be statistically not significant	Hypothesis H7b is rejected.	
	ATT→ CDM MOT → CDM SE↔KNOW ATT↔SE MOT↔KNOW MOT↔SE KNOW↔ATT		Found to be statistically not significant	Hypothesis H7e is rejected.	

At this stage, the results of the analysis of the data collected from four groups, namely EM-pre-intervention, EM-post-intervention, VCoP-pre-intervention and VCoP-post-intervention groups were completed except for the one collected in section 7, in the survey questionnaires distributed to the relevant groups. Prior to analysing the data collected using the questions given section 7, it was necessary to summarise the outcome of the data analysis conducted up to now. This was done comparing the results provided in sections 5.10 to 5.15 above.

5.16 Inference drawn from the data analysis pre-intervention of EM

From sections 5.8 and 5.10 it can be seen that hypotheses H1 to H4 could be accepted. This indicates that the four variables KNOW, ATT, SE and MOT, act as barriers to the integration of CPG into CDM, because the four variables have been found to have direct, positive and significant relationship with CDM. This implies that when any change in the positive direction occurs in KNOW, ATT, SE and MOT, then this change will be reflected on CDM, which is expected to change in the positive direction. This can be interpreted in a way that, when KNOW, ATT, SE and MOT change in the positive direction, the barriers lack of knowledge, the unfavourable attitude, lack of self-efficacy of PTs to integrate CPG into CDM and lack of motivation are expected to change in the negative direction. This is a significant finding.

5.17 Inference drawn from the data analysis pre-intervention of the VCoP

From section 5.15, figures 5.6 to 5.9 and Table 5.19, it can be seen that hypotheses H7a, H7b, H7c and H7f could be accepted, whereas hypothesis H5 could be accepted partially. This indicates that collectively the four variables KNOW, ATT, SE and MOT can affect CDM. This implies that two or more variables from the group KNOW, ATT, SE and MOT could act in combination. That is when the group of variables including the minimum number of two or maximum number of four act together, then combined influence of the variables is expected to affect CDM in the positive direction. Similarly, when those variables act in combination, then the combined influence is expected to affect CDM negatively. Thus, when the combination of the variables KNOW, ATT, SE and MOT change in the positive direction, then the change in CDM will be in the positive direction. This implies that, when the combined impact of variables is changing in the positive direction, then their combined effect can impact on barriers namely lack knowledge, lack of attitude, lack of self-efficacy to integrate CPG into CDM and lack of motivation of PTs to integrate CPG in to CDM leading to a change in the negative direction. Although the results have not been able to address all the hypotheses provided in Table 5.24, the results have shown examples of the combination of variables as a set of four, three and two could affect CDM. This is a major finding of this research which requires the investigation of the impact of multicomponent KTIs on multiple barriers.

5.18 Inference drawn from the data analysis post-intervention of EM

After administering the KTIs, the same questionnaire as mentioned was distributed to the participants to collect data to test the influence of the KTI on the variables KNOW, ATT, SE and MOT. The results showed that there is an impact of the KTI, on the individual barriers. Results obtained using AMOS showed that the following hypotheses are valid, H2 to H4 (see Table 5.21). H1 was not valid, indicating that knowledge is unlikely to impact CDM, after the PTs have been exposed to the CPG. Results further showed that the effect of the KTI variables ATT, SE and MOT was expected to reduce the impact of the barriers to the integration of CPG into CDM. This was evident from the pre and post-intervention results, details of which are discussed in Chapter 6.

5.19 Inference drawn from the data analysis post-intervention of VCoP

Results in section 5.15 showed that the hypotheses H7a, H7c, H7d and H7f are valid. This indicated that VCoP as the KTI has impacted the barriers grouped under different sets, at the same time, indicating its ability to act as the multicomponent KTI. These results when compared with those obtained prior to the administration of the KTI; there was definite difference in the results which showed that the operation of the KTIs has affected the barriers. Detailed discussion on this issue is provided in Chapter 6.

5.20 Results of the statistical analysis to test the hypotheses H1- H9

The result of the data analysis up to now was used to test the hypotheses HI to H9, is given in Table 5.24. From the analysis at this stage, the comparison between single and multicomponent KTIs yielded mixed results, which is discussed in this section.

Table 5.24 Summary of the verification of hypotheses

No.	Hypotheses	EM group		VCoP group	
		Pre intervention	**Post intervention**	**Pre intervention**	**Post intervention**
1	*H1: The lesser the extent of knowledge of PTs about CPG, the lesser will be the integration of CPG in CDM.*	Accepted	Rejected	NA	NA
2	*H2: The lesser the extent of favorable attitude of PTs towards CPG, the lesser will be the integration of CPG in CDM.*	Accepted	Accepted	NA	NA
3	*H3: The lesser the extent of self-efficacy of PTs towards CPG, the lesser will be the integration of CPG in CDM.*	Accepted	Accepted	NA	NA
4	*H4: The lesser the extent of motivation of PTs towards CPG, the lesser will be the integration of CPG in CDM.*	Accepted	Accepted	NA	NA
5	*H5: The lesser the knowledge of CPG, favourable attitude, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Accepted partially
6	*H6a: The lesser the knowledge of CPG, favourable attitude and self-efficacy of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Rejected
7	*H6b: The lesser the knowledge of CPG, favourable attitude and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Accepted partially
8	*H6c: The lesser the favourable attitude, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Rejected
9	*H6d: The lesser the knowledge of CPG, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Accepted partially
10	*H7a: The lesser the knowledge of CPG, and favourable attitude of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Accepted	Accepted
11	*H7b: The lesser the knowledge of CPG, and self-efficacy of PTs, the lesser will be the integration of CPG into CDM.*	NA	NA	Accepted	Rejected
12	*H7c: The lesser the knowledge of CPG, and motivation of PTs, the lesser will be the integration of CPG into CDM.*	NA	NA	Accepted	Accepted
13	*H7d: The lesser the favourable attitude and self-efficacy of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Accepted
14	*H7e: The lesser the favourable attitude and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Rejected	Rejected
15	*H7f: The lesser the self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	NA	Accepted	Accepted

16	*H8a: Relative advantage of EM positively impacts the knowledge of PTs to integrate CPG into CDM.*	NA	Accepted	NA	NA
17	*H8b: Relative advantage of EM positively impacts the attitude of PTs to integrate CPG into CDM.*	NA	Accepted	NA	NA
18	*H8c: Relative advantage of EM positively impacts the self-efficacy of PTs to integrate the CPG into CDM.*	NA	Accepted	NA	NA
19	*H8d: Relative advantage of EM positively impacts the motivation of PTs to integrate the CPG into CDM.*	NA	Accepted	NA	NA
20	*H9: Relative advantage of VCoP positively influences the knowledge of PTs to integrate CPG into CDM, the attitude of PTs to integrate CPG into CDM, the self-efficacy of PTs to integrate the CPG into CDM and the motivation of PTs to integrate the CPG into CDM.*	NA	NA	NA	Accepted partially

It can be seen from Table 5.24 that the same assumptions have been tested on those two occasions, which led the researcher to observe for any change in the behaviour of PTs in integrating CPG for VTE in PT into CDM, in the presence of barriers as well as after the introduction of KTIs to influence the barriers. As mentioned in Table 5.24, it is seen that not all hypotheses were accepted, which gave an indication about those variables that could act as barriers to the integration of CPG into CDM, which variables did not act as barriers, which group of barriers could act as barriers and which group did not. If the same hypotheses had not been tested throughout the research, it would have implied that there is no relationship between the two tests that were conducted in this research; prior to the administration of KTIs and post administration of the KTIs. Testing the same hypotheses twice clearly pointed out that, if there were changes in the management and behavioural aspects of PTs, those managerial and behavioural changes must have affected those hypotheses, which indeed has been demonstrated in this research. A new set of hypotheses would have necessitated testing of new aspects that are unrelated to the initial conditions. The rejection or acceptance some hypotheses at the post intervention stage, which were accepted initially, demonstrated that the changes that have occurred in the managerial and behavioural aspects of PTs are due to the impact of KTIs. This led to the understanding of the cause and effect relationship that exists between those managerial and behavioural barriers that affect PTs in their integration of CPG into CDM and the KTIs, an important finding of this research. This concluded the data analysis of the data collected using EM and VCoP to verify the hypotheses HI to H9. AT this stage a comparison between single and multicomponent KTIs was carried out which yielded mixed results. Such a comparison was necessary to test the hypothesis H10.

5.21 Results of the statistical analysis to test the hypotheses H10

While testing H10, the main assumptions made in this test need to be understood. The population of PTs, who were chosen as the target population had certain common characteristics, implying that any random sample drawn from the target population will have equal chance of being selected or replaced. Another assumption was that CPG for VTE in PT is newly published and hence the participants in the sample population were expected to have similar managerial and behavioural characteristics with regard to integration of CPG. This assumption was necessary as the administration of KTIs required a homogenous sample population that could yield reproducible results. In addition, the mean of responses of the collected data, using the four questionnaires, analysed using SPSS showed that the trend of the responses swayed indicating improvements when the means between pre and post intervention administration were compared. For instance, the maximum figure for the mean of the responses obtained for EM group pre-intervention was 4.26 (see Table 5.2), while the figure for the mean of the responses obtained for the EM group post-intervention was 4.35 (see Table 5.3). Similarly, the maximum figure for the mean of the responses obtained for the VCoP group pre-intervention was 4.59 (see Table 5.3), while the figure for the mean of the responses obtained for the

VCoP group post-intervention was 4.60 (Table 5.3). Although the differences seem to very little, the trend is clear which shows that post-intervention administration, there is a trend that shows that the maximum responses were orienting towards the point 'strongly agree' on the Likert scale. These assumptions were essential to derive meaningful results that could be interpreted to understand the phenomenon of KT of CPG into CDM. Keeping these assumptions at the background, the differences in variances reported by AMOS are used, while testing the relationship between barriers and CDM. The relationships tested, the variances recorded, and the interpretation provided thereof are in sections 5.8 and 5.10 and Tables 5.19, 5.20, 5.21 and 5.23. However, one point that attracts attention is that the minimum and maximum variances, reported by AMOS during the analysis of data collected from both the EM and VCoP groups, at the pre and post-intervention stage showed marked differences. Those readings are illustrated in Table 5.25 for interpretation.

Table 2.25 Comparison of variances amongst different groups

Relationship	**Variances (SMC) of relationships -EM group pre-intervention**		**Variances (SMC) of relationships -EM group post-intervention**		**Variances (SMC) of relationships - VCoP group pre-intervention**		**Variances (SMC) of relationships - VCoP group post-intervention**		**Interpretation**
	Min	Max	Min	Max	Min	Max	Min	Max	The interpretation is that while the variance difference is high in the case of VCoP (91.5 - .56.1) with regard to EM group it can be seen that the variance difference is (26.3% - 72.8%)
KNOW →CDM	26.3%								
ATT→CDM		39%							
ATT→CDM			48%						
MOT → CDM				72.8%					
KNOW→CDM ATT → CDM					56.1%				
KNOW→CDM MOT → CDM						62.1%			
KNOW→CDM ATT → CDM							70.7%		
MOT → CDM SE → CDM								91.5%	

From Table 2.25, it can be seen that the EM as a single component KTI, is able to influence the barriers to a greater extent in the post-intervention administration stage showed as a variance of 24.8% ((Post intervention variance of 72.8%)- (Preintervention variance of 48%) =24.8%). As far as the VCoP was concerned, 21.5% of variance was shown ((Post intervention variance of 91.5%) - (Preintervention variance of 70%) = 21.5%). Thus, when one sees the difference in the variance accounted for in CDM by the barriers after the administration of the KTIs, and then it is possible to infer that EM appears to be better with a 24.8% difference. But as far as the variance accounted for in CDM by the barriers itself was concerned, VCoP as a multicomponent KTI produced a maximum variance, accounted for in CDM after the administration of VCoP which is reported as 91.5% when compared to EM which is reported as 72.8%. This can be interpreted that, in this research, while EM as a single component KTI produced a better impact directly on a barrier, the same KTI, does not

produce the maximum variance accounted for in CDM, on a barrier in comparison to VCoP. Thus, taking into account the maximum variance accounted for in CDM as the criterion, it is interpreted that a multicomponent KTI strategy is better than single component KTI in achieving the integration of CPG into CDM. On the other hand, when one wants to know the impact of the different barriers individually on CDM, even when those barriers could act together, then EM as a single component KTI could be more useful. These are the inferences drawn from the data analysis in this section. Thus, in either case hypothesis H10 is found to be acceptable (Table 5.26).

Table 5.26 Comparison of impact of EM as single component KTI and VCoP as multicomponent KTI on barriers to the integration of CPG into CDM.

No.	Hypothesis	Result
1	*H10: When compared to single component intervention, multicomponent intervention is more effective in reducing or removing the impact of barriers to the integration of CPG for VTE in PT into CDM.*	Accepted

After concluding this data analysis, the next step taken was to analyse the data collected using section 7, in the following survey questionnaires "*Knowledge translation study pre-intervention survey questionnaire (EM & VCoP)*", "*Knowledge translation study post-intervention survey questionnaire (EM)*" and "*Knowledge translation study post-intervention survey questionnaire (VCoP)*". This section dealt with the actual research knowledge of the PTs and their clinical decision making behaviour before and after the administration of the KTIs. As mentioned in the theoretical framework assessing the specific research knowledge in terms of CPG for VTE in PT as well as the change in their CDM behaviour that occurred due to the impact of the two above mentioned KTIs was the central point of this study (see sections 4.10.7.1 and 4.10.7.2). It was not clear in the literature, whether single and multicomponent KTIs are effective in influencing the barriers to the integration of research knowledge (CPG) into clinical practice (CDMB) in the field of PTs and whether KTIs are capable of achieving the translation of research knowledge into clinical practice in reality.

5.22 Analysis of data related to the experiment conducted on KT of research knowledge (CPG) into clinical practice (CDMB)

The data analysis given in the previous sections showed that the barriers, impact of KTIs on those four barriers in the KT process of CPG into CDM. In addition to that experiments were carried out to assess, whether the actual translation of knowledge have taken place due to the administration of KTIs measured empirically by change in the CPG specific knowledge and the CDM behaviour of the PTs, as explained in section 3.7 in the theoretical framework. In this experiment, CPG specific knowledge of the PTs related to CPG for VTE in PT was actually tested, using a newly developed CPG specific knowledge score and the CDMB of the PTs using a CDM behaviour vignette score measuring instruments at the pre and post administration of the KTIs. These instruments had statements extracted from the first version of the CPG for VTE in PT developed in 2015 and when answered objectively to

measure the specific CPG knowledge and reflect the CDM behaviour of PTs. Those statements were put across to the PTs participating in the research asking them to choose the right answer by ticking the 'yes' or 'no' option given in the instrument. Data was collected from the EM group and VCoP group of PTs before and after the administration of the KTIs. The score obtained by the PTs, before the administration of the KTIs indicated their current knowledge specific to CPG that could be integrated into their clinical practice and their CDMB in clinical practice. The two scores namely, knowledge score and CDMB score obtained by them, in the post administration stage of the intervention indicated that whether actual translation of CPG knowledge into their decision making would have taken place or not. This inference was possible because any PT who had any knowledge or no knowledge of CPG; when KTIs are being administered then, the knowledge could have been enhanced due to the intervention and reflected in the CDMB. There was an expected difference in their knowledge score and CDMB score in the pre and post intervention administration of the KTIs. In this situation, the focus is only on the influence of the KTIs, on the actual CPG specific knowledge and CDMB of the PT and any change in the scores was attributed to the influence of KTIs on the barriers, although the test was not intended to identify any hidden barriers. This is described next.

The section 7 of the questionnaires contained 10 statements each to measure CPG specific knowledge and CDMB of PTs. Each statement carried one mark for a right answer and zero mark for a wrong answer. That is a PT who is tested using the scale can score a maximum of 20 marks. In the first stage, the current knowledge level scores and their current CDMB level scores were measured prior to the introduction of the interventions. In the second stage, the knowledge level scores and their CDMB level scores post intervention were measured again. Two comparisons were made. First the change in the knowledge and CDMB level scores prior to the introduction and post introduction of EM as intervention were compared. This was repeated in the case of PTs in the VCoP group. Second a comparison between the knowledge and CDMB level scores obtained by PTs in the EM and the VCoP groups was made post introduction of the interventions. The results were computed as percentages scored by the PTs in either group.

Figure 5.18 shows the comparison of the KNOW scores of those PTs in the EM group pre and post intervention phases with regard to the CPG for VTE in PT. Figure 5.19 shows the comparison of the KNOW scores of those PTs in the VCoP group pre-and post intervention phase. Figure 5.20 shows the comparison of the KNOW scores of those PTs who participated in the EM and VCoP groups in the post intervention phase.

Figure 5.18 Comparison of knowledge scores obtained by EM group between pre and post intervention

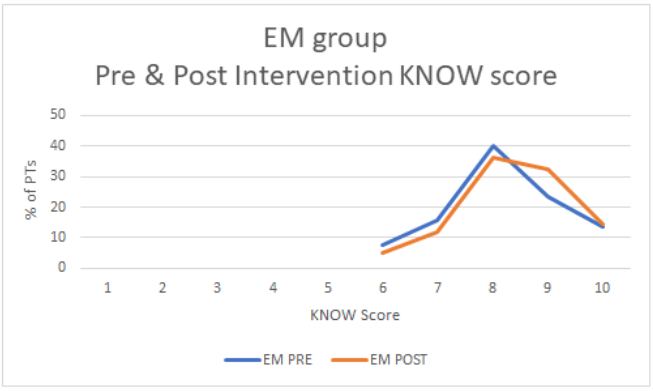


Figure 5.19 Comparison of knowledge scores obtained by VCoP group between pre and post-intervention

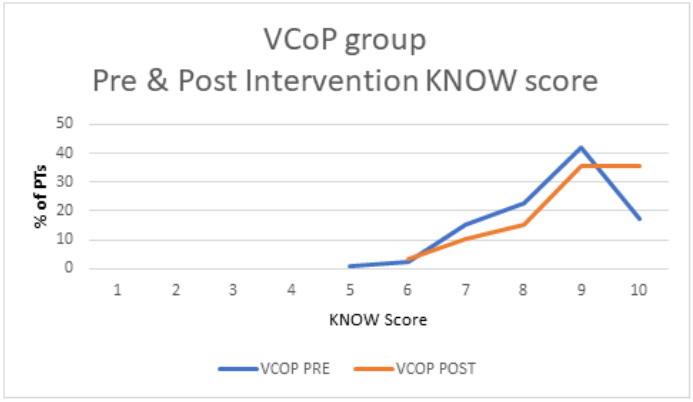


Figure 5.20 Comparison of knowledge scores obtained by EM and VCoP groups post-intervention

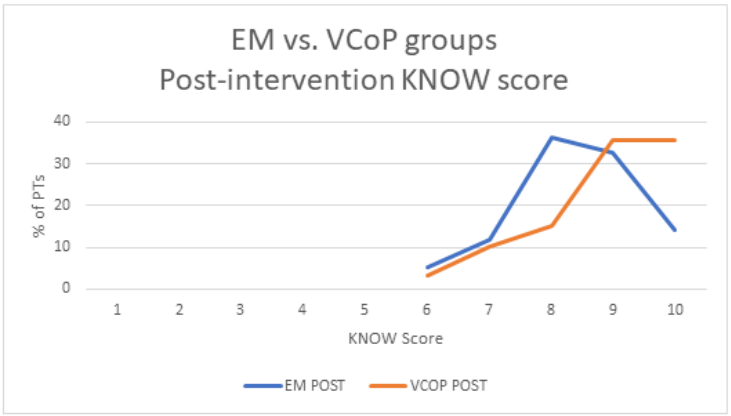


Figure 5.18 shows that there is a close alignment in the scores of the PTs, between pre and post introduction of EM, except in the range of scores between 8 and 10. However there is a significant difference in the scores between pre and post introduction of the VCoP group, with post intervention scores showing significant improvement over the pre intervention scores (Figure 5.19). This showed that VCoP as a multicomponent KTI strategy is able to make a significant improvement to the CPG specific knowledge of the PTs. Finally, from Figure 5.20 it can be seen that VCoP has brought higher improvement to PTs, with a higher score than EM, although EM has brought higher improvements to

the PTs who have scores in the range 7 to 9. This information shows that while, EM appears to be effective as an intervention in the lower score range related to knowledge of PTs, the VCoP appears to be more effective as a multicomponent intervention in the higher score range, related to CPG specific knowledge for VTE in PT.

Similarly, the CDM scores were compared. Figure 5.21 shows the comparison of the scores of the PTs in the EM group prior to and post introduction of the intervention with regard to the integration of CPG for VTE, assessed as CDMB. Figure 5.22 shows the comparison of the CDMB scores of those PTs in the VCoP group before and after the intervention. Figure 5.23 shows the comparison of the CDMB scores of those PTs who participated in the EM and VCoP groups post introduction of the intervention.

Figure 5.21 Comparison of CDMB scores obtained by EM group between pre and post-intervention

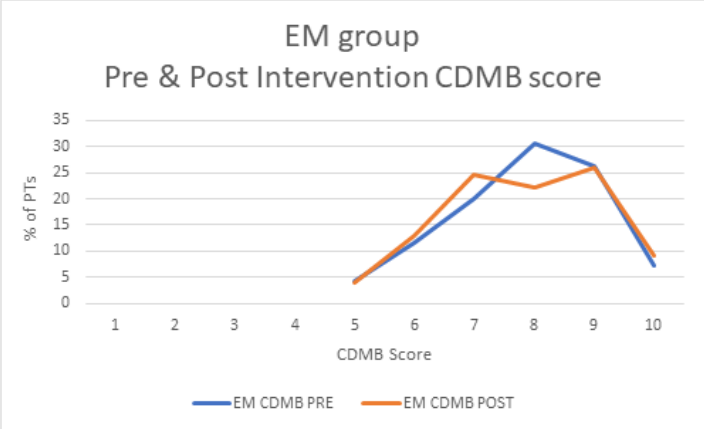
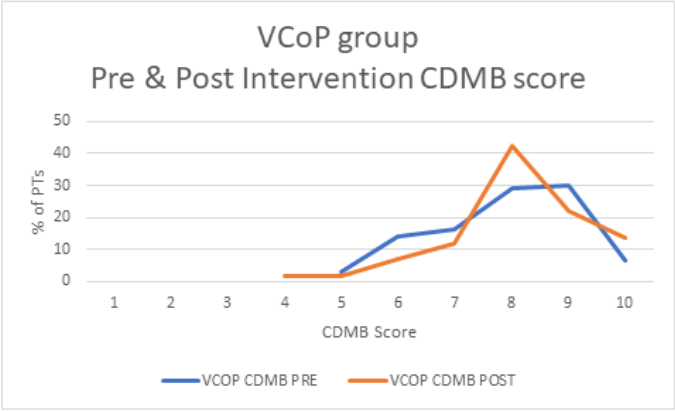


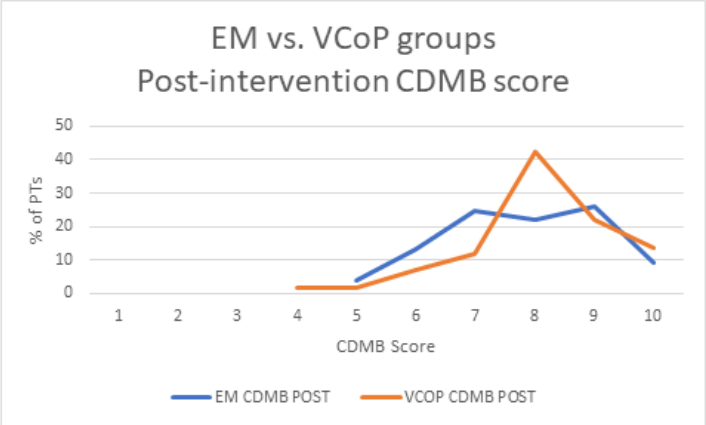
Figure 5.22 Comparison of CDMB scores obtained by VCoP group between pre and post-intervention



In Figure 5.21, it can be seen that the scores of PTs in the EM group, post intervention is better in the ranges 6-7 and 9-10 with regard to CDMB. However, in the case of VCoP post intervention scores appear to be distinctly better than the pre- intervention CDMB scores (see Figure 5.22). Finally, with regard to the comparison between the scores of PTs in the EM and VCoP groups, it can be seen that VCoP group has been able to improve the CDMB score significantly, when compared with CDMB

score of EM group (see Figure 5.23). Especially in the ranges 7.5-8.5 and 9.5-10, VCoP has shown higher improvements in the CDM of PTs after the intervention has been introduced to the PTs. However, it must be noted that EM has been very effective in improving CDMB in the range 5-7.5 which cannot be ignored.

Figure 5.23 Comparison of CDMB scores obtained by EM and VCoP groups post-intervention



From these experiments it can be inferred that, VCoP is very effective as a multicomponent intervention in the highest range of scores of CPG knowledge and CDMB while EM is seen to be effective at lower range of scores as a single component intervention. Thus, while a comparison does not clearly indicate that VCoP is more effective than EM across all ranges of the scores with regard to both the CPG research knowledge and CDM, it is certainly more effective at a higher level which indicates that its effectiveness when compared to that of EM can be considered to be significant. This argument provides the basis to conclude that VCoP is more effective in improving the CPG specific knowledge and CDMB of PTs as higher percentage of PTs are able to achieve integration of CPG research knowledge in to CDMB to the best possible extent as recommended in the CPG.

As far as the validity of the data was concerned, Levene's test of equal variance was conducted. This test provided the basis to conclude that there was equal variance, measured in the data collected between the pre and post intervention stages of administration of the KTIs. Further, Levene's test helped to establish homogeneity in the two sample groups, who participated in the pre and post intervention administration experiment. Examples of the outcome of the independent sample t-test have been reported in Appendices 5.24 to 5.27. The results show that the test of equal variance in the two groups of PTs, who participated in the pre and post intervention experiments is not significant, indicating that the null hypothesis namely the variance two groups of participants having the same variances is accepted. Thus, while establishing the validity using the Levene's test, the results also established that the populations are homogenous.

5.23 Chapter summary

This chapter has provided extensive data analysis used in this empirical study that used several statistical tests to derive the findings. The findings show that, out of the 21 hypotheses proposed, 16 of them have been accepted. The results of the data analyses showed that VCoP as a multicomponent KTI is better than EM, when the criterion being judged is which KTI produces maximum variance, while EM is better when one wants to study the impact of individual barriers on the translation of knowledge to CDM in the context of PTs. Use of SEM provided a meaningful method to handle the extensive data analysis. Complex models have been carefully discussed in detail, linking them to the research questions. In addition, a new step of corroborating the results of the empirical study of comparing the KTIs was introduced in this research by which it is possible to verify the hypotheses in a robust manner. Findings show that barriers to KT exist and both single component and multicomponent KTIs are effective tin dealing with those barriers in achieving KT of CPG into CDM, thereby bridging the CPG-CDM gap. Thus, this chapter as the data analysis and findings sets the basis for discussing the findings provided in the next chapter.

Chapter 6

Discussion

6.1 Introduction

This chapter discusses the research findings that have emerged as a result of the data analysis conducted and provided in Chapter 5. The discussions centre around the three research questions set out in section 1.4. Each is taken in turn.

6.2 Research Question 1

RQ1: To what extent do the identified barriers lack of knowledge, attitude, self-efficacy and motivation affect the behaviour of PTs in integrating CPG to CDM?

This question was answered by:

- identifying some of the barriers that affect the integration of latest research knowledge produced in the field of PT into clinical practice;
- establishing how they affect the process of integration of research knowledge into clinical practice in the field of PT; and
- establishing the extent to which the barriers affected the integration of research knowledge into clinical practice in the filed of PT.

Non-integration of the latest research knowledge produced in the field of PT in to the clinical practice of PTs, resulting in a research- practice gap is considered to be a major problem in the literature and in practice as it affects patient care (see section 2.3.2 in Chapter 2). There have been consistent calls in the literature to investigate this issue (Bérubé et al. 2018; Stander et al. 2018; Ladeira et al. 2017; De Souza et al. 2017; Sibley & Salbach, 2015; Bernhardsson et al. 2014; Campbell et al. 2013; Scott et al. 2012; Schreiber et al. 2009; Salbach et al. 2007; Jette et al. 2003) due to its relevance to patientcare. In order to study the concept of research knowledge, CPG was selected to represent research knowledge. Further CPG for VTE in PT, being recent and relevant to patient care was chosen as the specific example of research knowledge for this study and the other reasons for this selection were discussed in sections 2.3.1.1 and 3.1. Next, the concept of CDM was taken as the clinical practice behaviour to be investigated. The rationale for the choice of CDM was provided in section 2.4. Then, the specific gap that exists between the research knowledge and its integration into clinical practice that is termed as CPG-CDM gap was investigated (see section 2.3.2). Finally based on the findings of the literature review, the concept of barriers that hinder the integration of CPG into CDM was studied (see section 2.5). The following assumptions that are supported by literature were made:

- CPG is a facilitator of CDM and not a barrier (see Appendix 2.4).
- CDM is a facilitator of management of patientcare and not a barrier (see section 2.4.2).

- There is a relationship between CPG and CDM as has been established by the CPG for VTE in PT (see section 2.4.1).

Barriers to the integration of research knowledge into clinical practice is an area not well understood in the literature (see section 2.5). There are conflicting arguments in the literature about what could be considered as a barrier in this context. This was a challenge as CPG itself is considered as a barrier by some (Fischer et al. 2016; Cabana et al. 1999) and contradictory to that, CPG as a facilitator of evidence based practice (EBP) by some others, enabling integration of research knowledge in clinical practice of PTs (Curtis et al. 2017; Nilsen & Bernhardsson, 2013; Salbach et al. 2010). In this ambiguous situation it was important to clearly understand and demonstrate what could be considered as a barrier. A definition of barrier to integration of research knowledge (CPG) into clinical practice of PTs (CDM) was drafted (see section 2.2). From the review of the literature (see section 2.4.1) it can be argued that barrier at the practitioner level are those which contribute to the creation of a CPG-CDM gap and hence, act as constraints or obstacles or components that affect individual PTs' ability to integrate CPG into CDM. Thus, using this definition, some of the barriers leading to CPG-CDM gap were identified in this research.

In addition, it was found that although there are some classifications of barriers to EBP that exist in the literature, there is no clear tabulation of barriers to integration of research knowledge into clinical practice based on their conclusions in the field of PT, clearly showing the existence of barriers at various levels. In this research, a thorough literature search related to barriers to integration of research knowledge into clinical practice in the field of PT was conducted and a table (see Table 2.5) was developed to identify the barriers existing at the individual practitioner level in the context of PT using the Knowledge attitude behaviour framework (KABF) by Cabana et al. (1999) and Fischer et al. (2016). The Four different barriers that were selected for this study based on the tabulation provided in Table 2.5 are: knowledge, attitude and motivation of PTs towards CPG and self-efficacy of PTs to integrate CPG into CDM. Detailed reviews of the identified barriers were given in section 2.5. The four barriers were studied to gain in-depth knowledge about the relationship that could exist between the barriers that affect PTs, their clinical practice and the CPG-CDM gap. Considering the fact that in the field of PT hardly any evidence could be found in the literature regarding the linkage between barriers that affect PTs, their clinical practice and the CPG-CDM gap in the context of individual practitioners, the study of these four barriers that have been broadly recommended in the literature provided a good starting point to conduct the investigations where none presently exist. Each one of the barriers was discussed in detail, in the sections 2.5.4, 2.4.5, 2.5.6, and 2.5.7 respectively. Theoretical support for the choice as well as the description of these barriers to the integration of CPG into CDM was provided in sections 2.3.5, 2.4.2, 2.5.1, and 2.7.5.

The phrase ‘barriers to the integration of CPG into CDM’ implied that an empirical relationship could be constructed between the individual barriers and a group of barriers on the one hand and CPG, CDM and the relationship between CPG and CDM on the other hand. For example, knowledge of PT in CPG, as an individual characteristic of a PT can be argued to have a direct relationship with the ability of the PTs to use that research knowledge in CDM. When PTs do not continuously acquire latest research knowledge and apply that knowledge in CDM then that lack of latest research knowledge becomes a barrier on the part of those PTs who do not regularly acquire latest research knowledge. Thus, knowledge can be argued to be related to CDM and management of patient care and can be posited that lack of knowledge acts as a barrier. This argument leads to a direct relationship between knowledge and CDM that provides some clue on the extent to which it can affect the relationship between CPG and CDM and hence the CPG-CDM gap and management of patient care. Similar arguments could be extended to the three other behavioural components of PTs namely attitude and its integration into CDM, self-efficacy and motivation of PTs in integrating into CDM leading to establishing direct relationships with CDM. The above relationships were depicted in Figures 3.1, 3.2, 3.3 and 3.4. In Chapter 3, the theoretical support to establish these relationships was provided (see sections 3.4.1, 3.4.2 and 3.4.3). These relationships were empirically tested and analysed in Chapter 5 (see sections 5.5 and 5.10). Before explaining the findings derived from the analysis of the relationship, it is necessary to understand to what extent the identified barriers could operate as a group or in combination and affect the integration of CPG into CDM. This is discussed next.

While the relationship between practitioner level behavioural and managerial barriers of PTs were related to CDM, it was also possible to conceive that barrier could coexist and operate in conjunction with each other. That is to say, the four barriers identified above could also be construed to act together at the same instant of time. Such an action could also witness an interaction amongst the four barriers leading to a complex situation. This situation was depicted in Figure 3.5. Theoretical support for such a conceptualisation was provided under section 3.5. While a cluster or group of barriers could be assumed to be linked to CDM, how and to what extent such a cluster of barriers influence CDM, is not well explained and understood in the literature and no empirical study has been conducted to investigate such a situation.

Based on the above arguments two sets of relationships was established one to explain the individual influence of barriers on CDM and the other the combined effect of barriers on CDM. They were:
Knowledge → CDM, Attitude → CDM, Self-efficacy of PTs to integrate CPG into CDM →CDM and Motivation of PTs towards integrating CPG into CDM → CDM. ……..(Relationship 1)

Knowledge, Attitude, Self-efficacy of PTs to integrate CPG into CDM →CPG) and (Motivation of PTs towards integrating CPG into CDM) → CDM…… (Relationship 2)

It is argued that, if these relationships are valid, then it is possible to explain the extent to which those barriers affect CDM and hence the extent of integration of CPG into CDM. The reason for arriving at this conclusion were explained in Tables 2.4 to 2.7 in which realistic examples were provided on, how the barriers act on CDM when CPG is involved and therefore the integration of CPG into CDM. Thus, on the one hand the influence of barriers on CDM has been derived from the literature and on the other it is argued that a direct relationship between the barriers and CDM could explain the extent of influence the barriers have on the integration of CPG into CDM and consequently the impact on the CPG-CDM gap in either reducing it or eliminating it.

The models depicted in (Relationship 1) above were tested using the data collected from the group of PTs, identified as EM group (see section 3.6). This group was named 'EM group' because this group was to be administered a single component intervention called education material (EM) later in the research. Similarly, the model in (Relationship 2) above was analysed using data collected from another group of PTs named 'VCoP group' because this group was to be administered a multicomponent intervention (see section 3.6).

At this stage findings of the data analysis were used to determine the extent to which the barriers identified in this research affected CDM, led to the following findings, provided group-wise:

6.3 Relationship between (Knowledge, Attitude, Self-efficacy and Motivation) and CDM

6.3.1 Educational material (EM) Group

Three steps were used to determine the extent to which, the barriers affected the integration of the CPG into CDM. First, the variance accounted for in CDM by a change in each one of the four barriers was analysed using the AMOS report. The second step involved was the establishment of statistical relationship between each one of the barriers and CDM, using standardised regression analysis report, produced by AMOS. The third step was the total effect of each one of the barriers on CDM and hence the CPG-CDM gap. These aspects are discussed next.

6.3.1.1 Pre-intervention SMC explained in CDM with regard to EM-group

From sections 5.8 and 5.10, the Table 6.1 was derived.

Table 6.1Variance accounted for in CDM due to change the barriers (EM-group Pre intervention stage)

Variable	Percent of variance accounted for in CDM (Estimate, SMC)
KNOW	26.3
ATT	39
SE	32
MOT	32

Table 6.1 clearly points out that any change in the barriers affecting the CDM behaviour of PTs.

6.3.1.2 Preintervention standardised regression weight (EM-group).

Next, the existence of statistically significant relationship between the barriers and the CDM behaviour of PTs was examined; using the AMOS report on standardised regression weights (Table 6.2).

Table 6.2 Statistical relationship between barriers and CDM (EM-group)

Dependent variable		Independent variable	Estimate
CDM	←	KNOW	0.513
CDM	←	ATT	0.62
CDM	←	MOT	0.57
CDM	←	SE	0.56

Results of the standardised regression tabulated in Table 6.2 indicate that there is large effect of barriers on the CDM behaviour of the PTs. This indicates that management and behavioural barriers with respect to CPG have a large effect on the CDM behaviour of the PTs. This signifies that when the impact of the barriers is large, it will be difficult for the PTs to bring about a change in practicing behaviour, indicating a large gap between the CPG and CDM. Perhaps this is what is happening in actual clinical practice.

6.3.1.3 Standardised total effect of each barrier on CDM

This quantity explains, to what extent, a unit change in a barrier introduces a change in CDM. Table 6.3 provides this information for the four barriers.

Table 6.3 Standardised total effect of barriers on CDM

	KNOW	ATT	SE	MOT
CDM	.513	0.623	0.563	0.568

From Table 6.3, it can be seen that a one standard deviation change in the knowledge of CPG, as a barrier is shown to effect a change of 0.513 standard deviation change in the CDM behaviour of the PTs, related to the integration of the CPG into CDM, in the positive direction. Similarly, a one unit standard deviation in attitude towards CPG, as a barrier is shown to effect change of 0.623 standard deviation in the CDM behaviour of the PTs, related to the integration of the CPG into CDM in the positive direction; a one standard deviation change in the self-efficacy in integrating the CPG, shown

to effect a change of 0.563 standard deviation change in the CDM behaviour of the PTs, related to the integration of the CPG into CDM in the positive direction; and a one standard deviation change in motivation of the PTs in integrating CPG into CDM, is shown to effect a change of 0.568 standard deviation change in the CDM behaviour of the PTs, related to the integration of CPG into CDM, in the positive direction. These measurements provide a clear idea, of the extent to which, the barriers affect CDM which is interpreted in Table 6.4.

Table 6.4 Interpretation of the statistical analysis related to EM-group before administration of KTI.

No	**Relationship between independent variable (IV) and dependent variable (DV)**	**Standardised total effect of IV on DV**	**Implied barrier effect standardised total effect of IV in the negative direction on CDM behaviour of PTs**	**Interpretation of barrier effect on CDM behaviour of PTs**
1	KNOW→CDM	0.513	Lack of knowledge in CPG (-KNOW) → (-0.513) CDM	Increase in knowledge = corresponding decrease in lack of knowledge as a barrier → (6.1)
2	ATT→CDM	0.623	Lack of favourable attitude towards CPG (-ATT) → (-0.623) CDM	Increase in favourable attitude of PTs in CPG = corresponding decrease in unfavourable attitude of PTs in CPG as a barrier → (6.2)
3	SE→CDM	0.563	Lack of self-efficacy of PTs in integrating CPG into CDM (-SE) → (-0.563) CDM	Increase in self-efficacy = corresponding decrease in self-efficacy as a barrier → (6.3)
4	MOT→CDM	0.568	Lack of motivation of PTs in integrating CPG into CDM (-SE) → (-0.568) CDM	Increase in motivation of PTs in integrating CPG into CDM = corresponding decrease in self-efficacy as a barrier → (6.4)

The interpretations provided in Table 6.4 can be further explained as follows. Considering Equation 6.1 the inference that can be drawn at this point is that, when lack of knowledge in the CPG acts as a barrier, it means that there will be less integration of the CPG into CDM behaviour of the PTs. If this barrier has to be eliminated or reduced, then the literature recommends the need to use interventions. The assumption here is that if the knowledge of the CPG is enhanced by an intervention, then automatically, the quantity called lack of knowledge of the PTs in the CPG is expected to reduce. This is clearly indicated by the Table 6.4 which shows that the effect of lack of knowledge of the CPG as a barrier has decreased on the integration of the CPG into CDM, by the statistically significant relationship that exists between KNOW and CDM. This also indicates that while the knowledge of the CPG increases, then the CDM behaviour of the PTs is expected to change, leading to the consequent enhancement in the integration of the CPG into CDM and probable improvement in patientcare management. This implies that, when the integration of the CPG into CDM is enhanced, then it is possible to argue that the CPG-CDM gap has been narrowed due to the enhanced integration of the

CPG into CDM and hence the impact of lack of knowledge as a barrier on the integration of the CPG into CDM is reduced. This is an important finding which is novel. The nearest findings found in the literature was that of Roelens et al. (2006), Lugtenberg et al. (2009) and Cabana et al. (2001), who all have argued that the barriers to integration of knowledge of the CPG into clinical practice in the field of medicine could exist, although such research findings are not conclusive, and no empirical evidence has been provided so far, particularly in the field of PTs. Thus, the findings of this research contribute to knowledge and practice directly by expanding the arguments of Roelens et al. (2006), Lugtenberg et al. (2009) and Cabana et al. (2001). Similar arguments could be extended with regard to the relationships between the behavioural attributes of the PTs namely ATT→CDM, SE→CDM and MOT→CDM.

Thus, it can be concluded that the barriers to integration of the CPG as research knowledge into CDM as clinical practice, at the practitioner level exist and affect the CPG-CDM gap. The foregoing discussions clearly point out that it is possible to predict the impact of barriers to integration of research knowledge into clinical practice in PT at the individual level by directly relating those barriers to CDM. These arguments point towards the achievement of hypothesis H1, H2, H3 and H4.The results show that CPG-CDM gap is created by barrier at the practitioner level and affect the PTs' ability to integrate CPG into CDM in terms of their managerial and behavioural attributes namely their knowledge in CPG and its integration into CDM for better patientcare management, attitude towards CPG and its integration into CDM, self-efficacy to integrate CPG into CDM and motivation to integrate CPG into CDM. It is clear that these four attributes have large effect on CDM behaviour of PTs.

6.3.2 VCoP group

As discussed in the case of the EM group, the variance accounted for in CDM by a change in a group of four barriers was analysed using AMOS, the establishment of statistical relationship between the group of four barriers and CDM using standardised regression analysis and the total effect of the four barriers on CDM and hence the CPG-CDM gap were examined. The results are given below.

6.3.2.1 Preintervention SMC in four barriers of VCoP-group

From the results presented in section 5.11 and Table 5.19, it can be seen that a group of four barrier was not found to have a statistically significant relationship with CDM implying that the four barriers may not act in tandem. The implication of this finding could be one of the followings:

- The barriers do not act in groups.
- From the four barriers identified that affect integration of the CPG into CDM, a combination of three barriers can be analysed at a time with a possibility of affecting the integration of CPG into CDM. That is, there could be possibilities that if one of the barriers is excluded as

an independent variable from the group of four barriers and made a covariate, then there may be a possible effect of the three barriers and the covariate on CDM. This was represented by equations 3.2, 3.3, 3.4 and 3.4.1

- Alternatively, there could be possibilities that if two of the barriers were to be excluded as independent variables from the group and made covariates, then there may be a possible effect of the barriers on CDM. This was represented by equations 3.5 to 3.10.

The analysis in section 5.11 revealed that there is a statistically significant correlation amongst the four barriers and CDM. That is to say, the barriers can act in a group or combination but in this research, they did not act in group of four. This showed that hypothesis H5 was not valid. This is a significant finding as the nearest finding in the literature that can align with this finding is that of the Theoretical domain framework (TDF) by Michie et al. (2011) which argues that the 12 domains could be linked to practitioner behavioural change, amongst which, many of the behavioural changes of the PTs could be brought under groups including the ones in this research. Even in their research, Michie et al. (2011) did not treat those behavioural aspects as barriers to integration of research knowledge into clinical practice, although it is implied in the literature that those behavioural attributes can act as barriers and interventions' can impact those barriers. This is an important finding of this research, namely that barriers to integration of research knowledge into clinical practice can be grouped and analysed to find how those groups of barriers influence the CPG-CDM gap. Thus, the possibility that the barriers do not act in groups is negated. The correlation amongst the group of barriers and CDM could signify that a group with lesser number of barriers, for instance combinations of three barriers, could directly influence CDM, with the fourth acting as covariate in the integration of CPG into CDM. This aspect is discussed next.

One of the four barriers was excluded from the group leading to the formation of a group of three barriers and the excluded barrier was associated with the three as a covariate. That is combinations of three barriers that affected the integration of the CPG into CDM were formed and considered as models and these combinations were indicated by equations 3.2, 3.3, 3.4 and 3.4.1 given in Chapter 3. The results of the analysis showed that all possible combinations of barriers in groups of three, with an excluded barrier as a covariate were not related to CDM and that there was no statistical significance in those relationships. Again, the interpretation could be that while the correlation amongst the barriers and CDM is found to be statistically significant (see section 5.11 and Table 5.19) they may not influence CDM as a group of three barriers with the excluded barrier as a covariate. That means hypotheses H6a, H6b, H6c and H6d were rejected. These findings are very similar to those discussed in the previous paragraph. After this process, the barriers in groups of two with the other two excluded barriers as covariates were tested and this combination appears to have direct influence on CDM. This is discussed next.

Some combinations of barriers to the integration of CPG into CDM in groups of two were formed and the excluded barriers were associated with the two barriers as covariates. Models were proposed, and those combinations are indicated by equations 3.5 to 3.10. Among those relationships, only equations 3.5, 3.6, 3.7 and 3.10 were found to be valid and equations 3.8 and 3.9 were not found to be valid. Therefore, hypotheses H7a, H7b, H7c and H7f were found to be valid and H7d and H7e were rejected. The detailed findings provided in Table 5.19 showed that amongst the six different combinations possible, only four combinations were found to be related to CDM and those relationships were found statistically significant. The variances accounted for in the CDM by those different combinations are reproduced in Table 6.5.

Table 6.5 Variance accounted for multiple barriers on CDM

No.	Relationship	Squared Multiple Correlation
1	KNOW→CDM	0.561 that is 56.1% variance in CDM is accounted for by KNOW and ATT
	ATT → CDM	
	KNOW↔ ATT; KNOW↔MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariance relationships statistically significant at a p-value of 0.5
2	KNOW→CDM	0.585 that is 58.5% variance in CDM is accounted for by KNOW and SE
	SE → CDM	
	KNOW↔ ATT; KNOW↔ MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariance relationships statistically significant at a p-value of 0.5
3	KNOW→CDM	0.621 that is 62.1% variance in CDM is accounted for by KNOW and MOT
	MOT → CDM	
	KNOW↔ ATT; KNOW↔MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariance relationships statistically significant at a p-value of 0.5
4	MOT → CDM	0.593 that is 59.3% variance in CDM is accounted for by MOT and SE
	SE → CDM	
	KNOW↔ ATT; KNOW↔ MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariance relationships statistically significant at a p-value of 0.5

From Table 6.5, it can be seen that the four combinations of barriers were found to account for a large variance in CDM, with a minimum of 0.561 accounted for by the group of barriers KNOW and ATT and the maximum accounted for by the group of barriers KNOW and MOT. In each one of the combinations, it is possible to see that the excluded variables have significant correlation with the barriers. The inference could be made that the barriers in groups of two and with combinations (KNOW, ATT), (KNOW, SE) (KNOW, MOT) and (SE, MOT), directly impact CDM with covariates (SE, MOT), (ATT, MOT), (ATT, SE) and (KNOW, SE) respectively. It can be argued that the covariates influence the main variates, in each one of the combination, indicating that they have an indirect effect on CDM. This is a significant finding, which clearly pointed out that the four barriers act on CDM, as a group, with some directly affecting CDM, while the others act indirectly. However, in order to gain greater knowledge on how the combinations actually affect CDM and to what extent,

and to make conclusions, further examination of the standardised regression weight, and standardised total effects of the groups of barriers on CDM was required, in a similar manner to that conducted in the case of the EM group.

6.3.2.2 Preintervention standardised regression weight of barriers and CDM (VCoP group)

This quantity explains to what extent a unit change in a group of barriers introduce a change in CDM. Table 6.6 provides this information for the four groups of barriers, whose relationship with CDM is statistically significant

Table 6.6 Standardised regression weights of the relationships between four different groups of barriers and CDM

No.	Relationship	Standardised Regression weight
1	KNOW→CDM	0.545
	ATT → CDM	0.309
	KNOW↔ ATT; KNOW↔MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariances were found to be significant at a p-value of 0.05 or less.
2	KNOW→CDM	0.358
	SE → CDM	0.468
	KNOW↔ ATT; KNOW↔ MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariances were found to be significant at a p-value of 0.05 or less.
3	KNOW→CDM	0.468
	MOT → CDM	0.431
	KNOW↔ ATT; KNOW↔MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariances were found to be significant at a p-value of 0.05 or less.
4	MOT → CDM	0.343
	SE → CDM	0.502
	KNOW↔ ATT; KNOW↔ MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT; MOT ↔ SE	All covariances were found to be significant at a p-value of 0.05 or less.

The results show that groups of barriers namely (KNOW, ATT), (KNOW, SE) (KNOW, MOT) and (SE, MOT) can predict, a change in CDM, when associated with covariants as (SE, MOT), (ATT, MOT), (ATT, SE) and (KNOW, SE) respectively. The extent to which, the combination of groups of barriers and their covariants affect CDM can be understood when the total effect of these barriers is examined.

6.3.2.3 Standardised total effect of four groups of barriers on CDM

The AMOS report on the four groups of barriers presented in Table 6.6, with regard to the total effect on CDM, in each case is provided below in Tables 6.7 to 6.10.

Standardized Total Effects (Group number 1 - Default model)

Table 6.7 Total effect of the combination of group of barriers (KNOW, ATT) with covariants (SE, MOT)

	MOT	SE	ATT	KNOW	CDM
CDM	.000	.000	.309	.545	.000

Standardized Total Effects (Group number 1 - Default model)

Table 6.8 Total effect of the combination of group of barriers (KNOW, SE) with covariants (ATT, MOT)

	MOT	SE	ATT	KNOW	CDM
CDM	.000	.468	.000	.358	.000

Standardized Total Effects (Group number 1 - Default model)

Table 6.9 Total effect of the combination of group of barriers (KNOW, MOT) with covariants (ATT, SE)

	MOT	SE	ATT	KNOW	CDM
CDM	.431	.000	.000	.468	.000

Standardized Total Effects (Group number 1 - Default model)

Table 6.10 Total effect of the combination of group of barriers (SE, MOT) with covariants (KNOW, ATT)

	MOT	SE	ATT	KNOW	CDM
CDM	.343	.502	.000	.000	.000

Tables 6.7 to 6.10 indicate the following. From Table 6.7, it can be seen that the total effect of KNOW on CDM is more dominant than ATT. This implies that, where PTs' self-efficacy and motivation in integrating CPG into CDM are supporting the knowledge of CPG and their attitude towards CPG, then knowledge could be a greater barrier than the others. That is, in regard to the PTs' behavioural attributes when SE and MOT are positively associated with KNOW and ATT, then it is the knowledge of the CPG requires greater attention when compared to the attitude of the PTs, towards CPG. Perhaps changing the attitude of the PTs towards the CPG is less difficult, when compared to their knowledge in the CPG as barriers, assuming that SE and MOT of the PTs have no direct impact on CDM in this study. The extent of influence of the covariants on KNOW and ATT is large (all exceeding 0.5) as can be seen from Table 6.11.

Table 6.11 Correlation between covariants in the analysis of the standardised total effect of KNOW and ATT on CDM

			Estimate
KNOW	↔	ATT	.497
KNOW	↔	SE	.726
KNOW	↔	MOT	.561
ATT	↔	SE	.593
ATT	↔	MOT	.830
SE	↔	MOT	.646

This is a significant result that shows clearly that the behavioural and managerial attributes could vary amongst the PTs and if two barriers have direct relationship with CDM, and then the remaining two could be associated to CDM indirectly. This phenomenon could be witnessed in the real world situations, where behavioural attributes do not manifest uniformly in all human beings and if one or two of them are dominant then others could be less dominant but still contribute to the behavioural and managerial attributes. Hence, it can be proposed that some barriers behave as direct barriers to the integration of CPG into CDM in groups, while others could be associated indirectly with them. No such findings have been reported in the available literature, and group behaviour and interaction amongst the barriers has not been studied in regard to the PTs yet. The nearest supporting arguments come from Fischer et al. (2016) and Cabana et al. (1999) who posited that barriers could act together on clinical practice but did not empirically test their model to establish any statistically significant relationship on their group interaction of barriers directly on CDM or indirect interaction of barriers on CDM.

Similar arguments can be extended in relation to the findings derived from the Tables 6.8 to 6.10 (Appendix 6.1). However, one noticeable point that emerges is that; KNOW is a barrier in all the three groups, followed by SE and MOT, which are barriers in two groups. Thus, it is possible to conclude that, in this research, knowledge of the CPG appears to be a dominant barrier followed by the self-efficacy and motivation of the PTs to integrate the CPG into CDM. The least affecting barrier among the PTs appears to be attitude. These are significant findings. It is possible to explain this situation in the following manner. The most natural thing that is witnessed in human behaviour is that the behavioural attributes like attitude, self-efficacy and motivation, might not manifest together, at the same time and at the same level. It is possible in some human beings that, the attribute of attitude is a barrier and in some others one of the remaining factors as self-efficacy, motivation and knowledge in practice can be a barrier. Further, these barriers can also coexist, meaning that some of them could be dominant and some others could be less dominant. In some practitioners, more than one attribute could be dominant and, in some others, nothing is dominant. If one takes into account these happenings as natural phenomena observed in human beings, it is possible to infer that the findings of this research with regard to group of attributes operate like barriers in combinations of two. If this argument is taken into account, then the results of this research, which showed that groups of four and three barriers do not have statistically significant direct and positive relationship with CDM can be explained. It is possible that in reality, groups of four and three barriers do not act in combination at the same time on CDM and CPG-CDM gap directly amongst the PTs. It is also possible to argue that the results of this research showed that only two barriers to integration of the CPG into CDM act directly on PTs with support from associated barriers. These are inferences that need to be further explored. However, in the field of PTs there are no similar findings that could be compared with these results, while in other fields like nursing; there are some publications with regard

to CDM that provide the knowledge about some relationships that appear to confirm this result. For instance, Smith et al. (2008) argue that clinical decision makers are affected by many attributes of the individual decision makers including knowledge, attitude, motivation and self-efficacy. The finding of this research is in alignment with the arguments of Smith et al. (2008) but has expanded those arguments to a specific case of CDM in PT, by empirically testing the behavioural attributes of the PTs. Thus, in one way, the findings of this research confirm the arguments of Smith et al. (2008) and on the other hand, this study adds to the existing knowledge by postulating that those attributes can act as barrier in PT, thereby bringing in the new dimension of viewing the attributes as barriers to the integration of the CPG into CDM, that can eventually affect the patientcare. The findings confirmed that hypothesis H5 is accepted partially. Thus, it can be concluded that RQ1 has been achieved.

6.4 Research Question 2

RQ2: In order to address the identified barriers, can single and multicomponent KTIs be used to change the practice behaviour of PTs in integrating CPG to CDM?

In order to address this question, the following steps were taken, which are discussed thereafter.

- discussion on the definition of the KTIs and their relationship to barriers to integration of the CPG into CDM;
- discussion on the choice of KTIs and an attribute of the interventions that could be used to represent the intervention;
- discussion on the administration of KTIs on the two groups of PTs chosen for study namely the EM-group and VCoP group;
- measurement of the impact or influence of KTIs on the barriers to integration of the CPG into CDM and the CPG-CDM gap;
- discussion on the use of the same set of hypotheses H1 to H7 for affirming the hypotheses or falsifying them, when tested across the same sample population, prior to and post administration of the KTI;
- discussion of the findings of the relationship between KTI and barriers on the one hand and interventions and the CPG-CDM gap on the other; and
- discussion on whether the KTIs really changed the behavioural attributes of the PTs after the administration of the intervention when compared to the pre-intervention stage.

6.4.1 Discussion on the definition of the KTIs and their relationship to barriers

The definition of interventions used in this research was that interventions impact barriers and can be used to remove barriers (see section 2.7.3). A distinction must be made here between the interventions used in healthcare contexts and the ones referred in this research were used to address managerial and behavioural barriers. While Interventions used in healthcare contexts address the health issues of

patients, those used in this research addresses the managerial and behavioural attributes. The difference is intervention used in addressing healthcare issues are related to medical or physiotherapeutic issues, whereas those used here address human behavioural as well as managerial attributes.

Interventions are generally classified as single component and multicomponent interventions. An example of a single component intervention is educational material (EM) whereas a virtual community of practice (VCoP) represents a multicomponent intervention (see section 2.7.4.1 and section 2.7.4.2).

6.4.2 Discussion on the choice of KTIs and an attribute of the interventions

As explained in section 2.7.3.1 single component interventions are those that impact one barrier at a time, whereas multicomponent interventions are those that can impact more than one barrier at the same instant of time. Literature review showed that research on single and multicomponent interventions is an under investigated area and hence several related aspects including: whether to use an intervention to address a barrier; which one to use and to what extent to use are the questions that have not been well addressed by researchers (see section 2.7.3.2). Lack of an in-depth understanding of interventions could be one of the reasons for dearth of studies, explaining how to address the CPG-CDM gap.

While embarking on understanding the concept of interventions, the literature review showed that KTIs (see section 2.7.3) were identified as potential interventions that could be useful in addressing barrier leading to reduction in CPG-CDM gap (Logan and Graham, 1998; Graham & Logan, 2004a: Graham & Logan, 2004b; Iles and Davidson, 2006, Jette et al., 2003, Salbach et al., 2007) and thereby bridging the research–practice gap. The literature also showed that KT intervention strategies greatly vary; for instance, diffusion, dissemination and implementation are the three common processes that are commonly being used in the KT literature, particularly with reference to CPGs. This research used the diffusion intervention strategy reasons for which have been already explained in section 2.7.4.4 and the use of interventions was supported by Rogers' (2003) theory of diffusion of innovation (DoI). This theory provided a simple and effective way to measure and explains the operation of the KTIs in regard to translating research innovation into clinical practice (Estabrooks et al. 2006).

It was also necessary to explain why EM and VCoP were chosen as single and multicomponent interventions respectively for this research. In order to choose these two interventions, the researcher relied upon the definitions given by EPOC (2015). In addition, by applying the theory of DoI, it was seen that both EM and VCoP could diffuse CPG and be communicated or transmitted through a conduit or channel during some period of time within a group of members in a social system. One

important aspect of the choice of EM as a single component intervention and VCoP as the multicomponent intervention was that EM has been widely used in the KT studies conducted in the field of PT, whereas VCoP is sparingly used as a KTI. However, whether these two interventions have impacted any barrier to integration of research knowledge into clinical practice is not well researched (see sections 2.7.4.1, 2.7.4.2 and 2.7.4.3). There are suggestions in the literature to conduct KT studies using EM and VCoP as KTIs to impact barriers to integration of research innovation into clinical practice and hence these two KTIs were operationalised in this research to study their impact on the four barriers to the integration of CPG into CDM chosen in this research.

Further, while operationalising the KTIs using single and multicomponent strategy, there was a necessity to represent the KTIs and their ability to diffuse CPG into CDM. Amongst the five constructs that were identified by Rogers (2003) to represent the KTIs, relative advantage (RA) was chosen as the construct in this research, and the rationale for choosing it was given in section 2.7.4.4. So, the four barriers that affected the translation or diffusion of CPG into CDM and CPG-CDM gap were identified to test whether they acted as real barriers or perceived barriers, EM and VCoP were identified as KTIs to test whether they impact or influence the barriers to the integration of the CPG into CDM and the CPG-CDM gap and RA was chosen as the construct to study the extent to which the KTIs enabled the integration of the CPG into CDM and reduced the CPG-CDM gap by affecting the barriers. At this stage, the empirical test that needed to be conducted was defined. The next step taken was to administer the KTIs and then measure the impact of the KTIs.

6.4.3 Discussion on the administration and influence of KTIs on EM and VCoP groups

EM and VCoP were both administered online. The process of administration was explained in section 4.15.2. As mentioned earlier, (see section 2.3.1.1) the CPG used was CPG for VTE in PT. In EM, the 14 recommendations of the CPG, decision making algorithms and other supporting information related to the CPG were included. The administration of EM by e-mail enabled the participating PTs to study the EM and respond with how the relative advantage of EM affected their CDM in regard to CPG for VTE in PT. In VCoP, in addition to the provision of the EM, the discussions on the VCoP were stimulated by two case vignettes of the CPG (Appendix 4.10) and the discussions were moderated by a person called the knowledge broker (KB). Each one of these interventions could have stimulated learning, discussions or knowledge sharing amongst the members. The administration of VCoP required the participants to evaluate the relative advantage of VCoP that affected their CDM in regard to CPG for VTE in PT. Results of the analysis of the data gathered from the PTs of EM and VCoP groups showed that RA is correlated to the barriers and CDM. Results pertaining to the EM group were discussed in sections 5.12 and 5.13 while that of VCoP in 5.14. In these sections, it was established that RA is correlated to the barriers and CDM although some barriers were not found to be correlated to RA. For instance, in regard to the EM group, knowledge of the PTs in CPG was found

not to be correlated to CDM after the administration of the intervention. Similarly, with regard to VCoP, both knowledge of the PTs in CPG and self-efficacy of the PTs were not correlated to RA. Comparable results are hard to find in the literature as there is a paucity of empirical studies conducted in the same context as that of this research. However, there are few studies that have broadly indicated that when interventions are used, it is possible that behavioural attributes are influenced by KTIs in the healthcare field but not in PT. For instance, Grudniewicz et al. (2015) argued that EM affects the knowledge, attitude and behaviour of the Physician, but in the case of VCoP, no such study has been found in the literature that has used VCoP to study the change in the decision making behaviour of the healthcare professionals. However, that multiple barriers coexist and can affect the translation of knowledge to clinical practice, at the same time has been clearly established in this research (see section 6.2). Thus, it is reasonable to expect that multicomponent KTIs could find use in tackling the impact of multiple barriers acting at the same time.

At this point it is important to explain the lack of correlation between KNOW and RA in regard to VCoP and is not clear why this anomalous situation has occurred as it would be reasonable to expect that RA is related to KNOW. The possible reason could be that knowledge in CPG as a managerial barrier to the integration of CPG in CDM and management of patientcare may not be directly correlated to KTIs as that knowledge may be impacted by those KTIs indirectly through the other barriers associated with it. While no association between KNOW or ATT or SE or MOT was tested as associates in the case of EM because the assumption was that single component interventions affect single barriers at a time, the results of the correlation test of the barriers in the case of VCoP showed that there is a statistically significant association between KNOW on the one hand and ATT, SE and MOT on the other. This result related to VCoP could be explained by the argument that it is difficult to isolate any behavioural attribute in human beings as those attributes coexist. Hence the lack of statistically significant relationship between KNOW and RA could be due to the fact that RA may not be effective on knowledge when compared to other diffusion of innovation constructs like complexity, compatibility, trialability and observability (see section 2.7.4.4). This aspect needs to be further investigated. The reference to the four DOI constructs has been made here due to the support this study has drawn from the theory of DOI as diffusion of innovation has been shown to be affected by these factors in a group as well as in isolation (Hsu et al. 2013; Chaudoir et al. 2013). However, the indirect influence of RA on KNOW through the associated barriers indicated in the data analysis chapter (see section 5.14) in which barriers were grouped and analysed explains to some extent how knowledge is affected by KTIs.

However, in the case of SE, in regard to the EM group, RA is statistically significantly related to SE, whereas in regard to the VCoP group it is not. The reason could be that SE is a behavioural construct and when tested independently may have direct relationship to the KTI whereas when tested in a

group, the impact of RA could be indirect. It is seen from section 5.14 that the correlation figures of the associations SE↔KNOW, KNOW↔MOT, KNOW↔RA and MOT↔RA are statistically significant. Thus, it is possible that the lack of direct correlation between SE and RA is due to the indirect effect of the association SE is found to have with KNOW, ATT and MOT. This situation might have also occurred due to the low impact of RA on SE and it is quite likely other DOI constructs mentioned above have a direct and statistically significant influence on SE than RA, an argument that needs to be investigated in the case of multicomponent KTIs. One important result that attracts attention is that RA is significantly correlated with regard to ATT, SE, MOT (large correlation), and KNOW (medium correlation) individually as a single component intervention (see Table 6.12)

Correlations: (Group number 1 - Default model)

Table 6.12 Correlation between RA on the one side and ATT, SE and MOY on the other for EM-group post intervention

			Estimate
KNOW	↔	RA	.281
ATT	↔	RA	.658
SE	↔	RA	.588
MOT	↔	RA	.641

However, with regard to VCoP, the results show that the correlation between RA on the one hand and ATT and MOT on the other are low and it does not have any correlation with KNOW and SE (see Table 5.22). This shows that RA may be less effective in influencing ATT and MOT as barriers and its effectiveness may be large when it acts on single barriers ATT, MOT and SE. Besides RA may not be effective in influencing KNOW and SE together as a group of barriers and KNOW as a single barrier. That is to say at this stage it is seen that EM is able to influence more barriers than VCoP as an intervention. But this needs to be tested with regard to the relationship between the barriers and CDM post intervention, at which stage only it is possible to conclude which of the KTIs is more effective in regard to their influence on CDM post-intervention. Keeping the above discussions in view it is now possible to confirm hypotheses H8a, H8b, H8c and H8d while partially confirm H9 due to the lack of direct correlation between RA and SE and KNOW.

The above discussions clearly point out to what extent the single and multicomponent interventions influenced the barrier. The next step taken was to measure the impact or influence of the barriers affected by KTIs on CDM. While the results of these discussions could not be compared with any other similar study conducted before, it is possible to draw parallel to the studies conducted by Cabana et al. (1999) and Fischer et al. (2016). However, the results are unique to the field of PT and contribute to the main body of knowledge related to KTIs and their relationship to barriers. Similar findings have not been reported by other researchers in the context of PTs.

6.4.4 Measurement of the impact or influence of KTIs on the barriers

This is discussed in the following two sections, one with reference to the EM group and the other with reference to VCoP group.

6.4.4.1 EM group-post intervention

The results of the statistical analysis, post intervention (Table 5.21) showed that the total effect of ATT, SE and MOT on CDM individually is as given in Tables 6.13, 6.14 and 6.15.

Table 6.13 Standardized total effect of ATT on CDM, AMOS report on EM-group

	ATT	**CDM**
CDM	.693	

Table 6.14 Standardized total effect of SE on CDM, AMOS report on EM-group

	SE	**CDM**
CDM	.728	.000

Table 6.15 Standardized total effect of MOT on CDM, AMOS report on EM-group

	MOT	**CDM**
CDM	.853	.000

The following inference can be made using the results provided in Tables 6.13, 6.14 and 6.15 (see Table 6.16).

Table 6.16 interpretation of the statistical analysis related to EM-group after administration of EM

No.	**Relationship between independent variable (IV) and dependent variable (DV)**	**Standardised total effect of IV on DV**	**Implied barrier effect standardised total effect of IV in the negative direction on CDM behaviour of PTs**	**Interpretation of barrier effect on CDM behaviour of PTs**
1	KNOW→CDM	Not significant	Not significant	Not significant
2	ATT→CDM	0.693	Lack of favourable attitude towards CPG (-ATT) → (-0.693) CDM	Increase in favourable attitude of PTs in CPG = corresponding decrease in unfavourable attitude of PTs in CPG as a barrier → (6.5)
3	SE→CDM	0.728	Lack of self-efficacy of PTs in integrating CPG into CDM (-SE) → (-0.728) CDM	Increase in self-efficacy = corresponding decrease in self-efficacy as a barrier → (6.6)
4	MOT→CDM	0.853	Lack of motivation of PTs in integrating CPG into CDM (-SE) → (-0.853) CDM	Increase in motivation of PTs in integrating CPG into CDM = corresponding decrease in self-efficacy as a barrier → (6.7)

While the interpretations of the outcomes are similar to those given in section 6.3.1.3 those interpretations can be summarised as in equations 6.5 to 6.7.

6.4.4.1.1 Post intervention by EM

From the discussions above and equations 6.5, 6.6 and 6.7 it can be concluded that post-intervention of EM group hypotheses H1 is falsified whereas H2, H3 and H4 were confirmed. Further, from Tables 6.13, 6.14 and 6.15, it is clear that post-intervention the effect of EM as single component KTI on the EM-group is significant and large. A comparison of these results with those obtained at the pre-intervention stage of EM-group yielded the following result (Table 6.17).

Table 6.17 comparison of the standardised total effect of barriers on CDM on EM group

No.	**Relationship between independent variable (IV) and dependent variable (DV)**	**Standardised total effect of IV on DV (pre-intervention)**	**Standardised total effect of IV on DV (post-intervention)**	**Difference in the total effect of IV on DV between pre and post intervention stages**	**Interpretation of barrier effect on CDM behaviour of PTs**
1	KNOW→CDM	0.513	Not significant	Not comparable	Not comparable because KNOW at the post intervention stage was not found significant.
2	ATT→CDM	0.623	0.693	0.07	Post intervention, the effect of the PTs' attitude towards CPG has increased.
3	SE→CDM	0.563	0.728	0.165	Post intervention, the effect of the PTs' self-efficacy to integrate CPG into CDM has increased.
4	MOT→CDM	0.568	0.853	0.305	Post intervention, the effect of the PTs' motivation to integrate CPG into CDM has increased.

The following can be derived from Table 6.17.

EM as intervention has influenced ATT, SE and MOT and their relationship to CDM. That means, a one standard deviation changes in ATT or SE or MOT in the positive direction is expected to result in a difference of 0.07, 0.165 and 0.305 standard deviations change respectively, in the positive direction on CDM post intervention. This indicates that KTIs have enhanced the effect of behavioural attributes ATT, SE and MOT implying that KTIs can impact barriers to the integration of CPG into CDM. The highest impact appears to be on MOT followed by SE and ATT. The conclusion is that if the barrier effect on PTs is high, then KTIs can reduce the impact by influencing on the behavioural attributes of PTs. That is if the PT is having ATT as a barrier to the extent of 0.5 standard deviations on CDM, then EM as a KTI can influence it and reduce it and make it positive through the following regression equations:

$CDM = k0 + \beta 1ATT + e0 = k0 + 0.623\ ATT + e0 \rightarrow (6.8)$ (pre-intervention)

CDM = k1 + β2ATT + e1 = k1 + 0.693 ATT + e1 → (6.9) (post-intervention)

Suppose ATT is considered as a barrier at the pre-intervention stage with a barrier effect of say 0.5 that is (-0.5) and does not exceed 1, then from equation 6.8 we have:

CDM = k0 + 0.623 (-0.5) + e0

CDM = k0 - 0.312 + e0 → (6.10) (pre-intervention)

If EM as KTI is administered, then ATT should be affected in a way that the attitude should turn positive. That is to say, when KTI is administered the positive half of ATT (that is 0.5 built into the PT) is expected to be enhanced and thus reducing the impact of the negative attitude then from equation 6.9 we have

CDM = k1 + 0.693 (0.5) + e1 (post-intervention)

CDM = k1 + 0.3465 + e1 → (6.11) (post-intervention)

When equations 6.10 and 6,11 are added to find the resultant CDM then we have

2CDM = (k0 + k1) + (-0.312) + (0.3465) + (e1 + e2) → (6.12) (post-intervention)

Equation 6.12 can be rewritten as

2CDM = (k0 + k1) + 0.0345 + (e1 + e2) → (6.13) (post-intervention)

From equation 6.13, it can be seen that the impact of KTI on ATT has reversed the change in CDM, from the negative to positive and reversed the attitude from a barrier to a facilitator (a positive change is considered as facilitator). Here the assumption is that the current attitude of the PT is constant and the KTI is impacting the positive side of ATT, rather than the negative side which is implied by the regression equations. It is also assumed that ATT changes linearly, without which it is not possible to apply the regression equations. Similar arguments can be extended to other barriers. Thus, it can be concluded that EM as single component KTI is effective in reducing the impact of barrier, in different proportions as indicated by Table 6.17, an argument that can be extended to explain the reduction of CPG-CDM gap. Lack of empirical studies in a similar context that have dealt with single and multicomponent KTIs in a single research has made comparisons to other research outcomes difficult, although by and large, the results confirm the findings of several researchers on this aspect (Ferreira, 2017; Camden et al. 2017; Levac et al. 2016; Bernhardsson et al. 2014; Campbell et al. 2013; Rebbeck et al. 2013; Dizon et al. 2014b).

6.4.4.2 VCoP group - post-intervention

The results of the statistical analysis post intervention (Table 5.23) enabled the researcher to determine, the total effect of the statistically valid configurations of groups of barriers and their relationship to CDM. The total effect of the groups of barriers on CDM, post intervention of VCoP is provided in Table 6.18.

Table 6.18 Standardised total effects of IV on DV, VCoP-Post intervention

No.	Relationship	Standardised total effect of IV on DV
1	KNOW→CDM	0.649
	ATT → CDM	0.557
	KNOW↔ ATT; KNOW↔MOT; ATT ↔ MOT	All covariances were found to be significant at a p-value of 0.05 or less.
2	ATT→CDM	0.356
	SE → CDM	0.837
	KNOW↔ ATT; KNOW↔ MOT; KNOW ↔ SE; ATT ↔ MOT; MOT ↔ SE	Only three covariant relationships KNOW ↔ SE; ATT ↔ MOT; and MOT ↔ SE were found to be significant at a p-value of 0.05 or less.
3	KNOW→CDM	0.554
	MOT → CDM	0.551
	KNOW↔MOT; KNOW ↔ SE; MOT ↔ SE	All covariances were found to be significant at a p-value of 0.05 or less.
4	KNOW→CDM	0.666
	MOT → CDM	0.315
	KNOW↔MOT; KNOW ↔ ATT; MOT ↔ ATT	All covariances were found to be significant at a p-value of 0.05 or less.
5	MOT → CDM	0.303
	SE → CDM	0.762
	KNOW↔ ATT; KNOW↔ MOT; KNOW ↔ SE; ATT ↔ SE; ATT ↔ MOT MOT ↔ SE	Only three covariant relationships namely KNOW ↔ SE; ATT ↔ MOT and MOT ↔ SE were found to be significant at a p-value of 0.05 or less.

With regard to interpreting the outcomes tabulated in Table 6.18, the arguments provided in section 6.3.2.2 can be used and extended.

An examination of Table 6.18 shows that KNOW and MOT appear to be the dominant barriers in a grouping of barriers (three in a group) that influence CDM followed by SE and ATT (two in a group). The groupings show that each one of the 5 barrier groupings are associated with one or the other barrier, indicating that the total effect is a combination of the direct influence of variates on the dependent variable and association of the variates have with covariates. For instance, in the combination of variants where KNOW is involved, (that is KNOW, ATT with MOT as covariant; KNOW, MOT with ATT as covariant; and KNOW, MOT with SE as a covariant, KNOW is combining with ATT and MOT with different covariates, indicating that knowledge is influenced by the KTI. The interpretation could be that, once the KTI has been administered, the total effect on knowledge continues to be influenced by the KTI, which in turn influences CDM. Alongside KNOW, the KTI also influences ATT and MOT pairing with KNOW and influences CDM. Similarly, MOT is also pairing with two other barriers namely KNOW and SE indicating that KTI is influencing MOT alongside KNOW and SE, which in turn influence CDM. In addition, SE is pairing with MOT and ATT and is influenced by the KTI, alongside MOT and ATT, as also is ATT which is seen to pair with KNOW and SE and is influenced by the KTI along with KNOW and SE, all of which in turn

influence CDM. In all the five combinations of the barriers, shown in Table 6.18, only three covariates were found to have statistical significance, leading to the following interpretation.

(KNOW → CDM, ATT → CDM, KNOW↔ ATT; KNOW↔MOT; ATT ↔ MOT) indicates that MOT is correlated with KNOW and ATT, indicating that the association of MOT, influences the total effect KNOW and ATT have on CDM. That is, the knowledge and their attitude towards CPG continue to influence CDM after the KTI has been administered and MOT is indirectly related to CDM in this relationship. That is, a one standard deviation change in KNOW and ATT, each in the positive direction, introduces a 0.649 and 0.557 standard deviation change in CDM respectively, in the positive direction, in association with MOT (equation 3.5).

(ATT → CDM, SE → CDM, KNOW ↔ SE; ATT ↔ MOT; MOT ↔ SE) indicates that KNOW is correlated with SE and MOT is correlated with ATT and SE, indicating that the association of the covariates (KNOW and MOT) with the ATT and SE, affects the total effect of the barriers on CDM. This can be interpreted in a way that after the administration of the KTI, both ATT and SE, continue to influence CDM in association with MOT and KNOW. A one standard deviation change in ATT and SE in the positive direction, introduces a 0.356 and 0.837 standard deviation change in CDM in the positive direction respectively, in association with KNOW and MOT (equation 3.8).

(KNOW→CDM; MOT → CDM; KNOW↔MOT; KNOW ↔ SE; MOT ↔ SE) indicates that SE is correlated with KNOW and MOT, indicating that the association of the covariate SE, with the KNOW and MOT, affects the total effect of the barriers on CDM. This can be interpreted in a way that after the administration of the KTI, both KNOW and MOT, continue to influence CDM, in association with SE. A one standard deviation change in KNOW and MOT, in the positive direction, introduces a 0.554 and 0.551 standard deviation change in CDM, in the positive direction respectively, in association with SE. (equation 3.7)

(KNOW→CDM; MOT → CDM; KNOW↔MOT; KNOW ↔ ATT; MOT ↔ ATT) indicates that ATT is correlated with KNOW and MOT, indicating that the association of the covariate ATT with the KNOW and MOT, affects the total effect of the barriers on CDM. This can be interpreted in a way that after the administration of the KTI, both KNOW and MOT, continue to influence CDM in association with ATT. A one standard deviation change in KNOW and MOT, in the positive direction, introduces a 0.666 and 0.315 standard deviation change in CDM, in the positive direction respectively, in association with ATT (equation 3.7).

(MOT → CDM; SE → CDM; KNOW ↔ SE; ATT ↔ MOT and MOT ↔ SE) indicates that ATT is correlated with MOT and KNOW is correlated with SE, indicating that the association of the

covariates (KNOW and ATT) with the MOT and SE, affects the total effect of the barriers on CDM. This can be interpreted in a way that after the administration of the KTI, both MOT and SE, continue to influence CDM, in association with ATT and KNOW. A one standard deviation change in MOT and SE, in the positive direction, introduces a 0.303 and 0.762 standard deviation change in CDM, in the positive direction respectively, in association with KNOW and ATT (equation 3.10).

The above interpretation shows that SE is having the maximum effect on CDM (a standard regression weight of 0.837), which implies SE appears to be influenced by the KTIs the most, while MOT appears to respond the least to the KTIs. The arguments confirm that the equations 3.5, 3.7, 3.8 and 3.10 are valid. These results confirm that barriers are affected by KTIs at the same instant of time, in groups of different combinations, but not more than two barriers appear to have a concurrent influence on CDM. Even after the influence of the KTI, it is seen that barriers in groups of two are the only combinations that affect CDM, a result that is aligns with the results obtained at the pre-intervention stage. The only difference is that the combination of barriers that were found to be statistically related to CDM at the pre-intervention stage is only four, whereas at the post-intervention five such combinations were identified. This indicates that VCoP has enabled one more combination of barriers to be influenced, after its administration, leading to an increase in the number of combination of barriers that can be addressed by the KTI by one, and hence enhancement of the integration of the CPG into CDM. Again, these results are not comparable with any similar finding in the literature, as there are no similar studies that have been conducted to address barriers in groups. However, the results align with the framework developed by Fischer et al. (2016) and Cabana et al. (1999), who posited that barriers could act together on clinical practice but did not empirically test their model to establish any statistically significant relationship on their group interaction of barriers directly on CDM or indirect interaction of barriers on CDM. An important point that needs to be noted here is the lack of statistical validity with regard to models represented by equations 3.2, 3.4, 3.6 and 3.9. The reasons for this could be the same as the ones explained under section 6.3.2.3. Thus, it is possible to conclude that Hypotheses H5 can be partially accepted, because all the four barriers, as a group are involved, in determining the integration of the CPG into CDM, after the administration of the KTI, although all of them not directly (see Table 6.18, numbers 2 and 5). In addition, the row in the Table 6.18, indicates that KNOW and ATT as direct variables, in association with MOT, as a group of barriers influence CDM. This indicates that H6b is confirmed partially; because the group of three barriers do not directly influence CDM. Similar arguments, extended to rows 3 and 5, which show that the group of barriers KNOW, MOT and SE as a group influence CDM indicating that H6d is confirmed partially. This also shows that hypothesis H6a which discusses barriers KNOW, ATT and SE are falsified as the group of barriers was not found to have statistically significant relationship with CDM. Similar arguments can be made with regard to the group of barriers ATT, SE and MOT and hence hypothesis H6c was also falsified. The reasons for some of the barrier groups not

influencing CDM could be explained based on the fact that human behavioural attributes can manifest, in various combinations with some of them being dominant and some being dormant. The results are in agreement with some of the findings in the literature that suggest that behavioural attributes including motivation, attitude and self-efficacy are challenging to be changed and are even harder to define and less understood (e.g. Visser et al. 2016; Mohd et al. 2014; Usher, 2012). In addition, there appears to be an inbuilt relationship amongst the behavioural barriers, for example motivation and self-efficacy (Mohd et al. 2014) and motivation and attitude Visser et al. (2016), which point towards the complex inter-relationship that could come in to play when those barriers are grouped together, making some attributes to manifest more dominantly than the other or make some barriers to become dormant. This reasoning could be applied to the case of PTs and their CDM behaviour. This is a new finding that has not been found in any research in a similar context. This aspect, if not well understood could be a difficulty in identifying and isolating specific barriers that are dominant or dormant or appear prominently in groups. Thus, these findings contribute to both knowledge and theory and in a larger context to the practitioners who want to integrate the CPG into CDM and narrow CPG-CDM gap.

Further, with regard to the hypotheses H7a to H7f (see Table 6.18), it can be concluded that if one looks at the dominant pair of barriers that influence CDM, then using the results in rows 1 to 5 with serial numbers 1 to 5, the hypotheses H7a, H7c, H7d and H7f were confirmed, while H7b and H7e were falsified. While support for the confirmed hypothesis is explained by the theoretical support provided in Chapter 3, at the same time the falsification of the other hypothesis, could be explained as a possible result of the unpredictable nature of the behavioural and managerial attributes of the PTs that come into play in the CDM behaviour, that is not addressed by the KTI. The same attributes could show a different behaviour when the same KTI is administered, on a different population of PTs. Thus, on the one hand the results contribute as new knowledge in the context of CDM behaviour of PTs and CPG-CDM gap, while on the other it has thrown up new challenges that need to be investigated further.

After establishing statistically that some combinations of barriers are affected by VCoP more than the others, the next step taken was to verify whether there is any change in the barrier effect, on the integration of CPG into CDM due to VCoP. For this, a comparison of the combination of barriers, validated at the pre-intervention stage and those validated at the post-intervention stage was necessary and this is provided in Table 6.19.

Table 6.19 comparison of the standardised total effect of barriers on CDM on VCoP group between the pre and post-intervention stage

No.	**Relationship between independent variable (IV) and dependent variable (DV)**	**Standardised total effect of IV on DV (pre-intervention)**	**Standardised total effect of IV on DV (post-intervention)**	**Difference in the total effect of IV on DV between pre and post intervention stages**	**Interpretation of barrier effect on CDM behaviour of PTs**
1	KNOW → CDM	0.545	0.649	0.104	Post intervention, the effect of the PTs' knowledge in the CPG and attitude towards CPG have increased.
	ATT → CDM	0.309	0.557	0.248	
2	KNOW → CDM	0.468	0.554	0.086	With SE as covariate post intervention, the effect of the PTs' knowledge in CPG and motivation of PTs in integrating CPG into CDM have improved.
	MOT → CDM	0.431	0.551	0.120	
3	KNOW → CDM	0.468	0.666	0.198	With ATT as covariate Post intervention, the effect of the PTs' knowledge in CPG has improved but motivation of PTs in integrating CPG into CDM has come down.
	MOT → CDM	0.431	0.315	-0.116	
4	MOT → CDM	0.343	0.303	-0.04	Post intervention, the motivation of PTs in integrating CPG into CDM has almost remained the same and but their attitude towards CPG has improved.
	SE → CDM	0.502	0.762	0.26	

A comparison of Tables 6.6 and 6.18 showed that one group of barriers namely (KNOW→CDM and SE → CDM) did not find statistical significance, at the post-intervention stage, while a new group of barriers namely (ATT → CDM and SE → CDM) which was not validated at the pre-intervention stage was found valid. The reason for this could be that at the post-intervention, the combination of KNOW and SE could have been found statistically insignificant because of the association of other barriers or lack of support of the associated barriers. It appears that there is a need to have strong covariates in order to have valid barrier combinations. The same explanation could be given to the group (ATT → CDM and SE → CDM), which was not found statistically significant at the pre-intervention stage. These aspects need to be investigated separately. From the tabulated results given in Table 6.19, it can be seen that KTIs have influenced the barriers in those combinations namely (KNOW → CDM and ATT → CDM) and (KNOW → CDM and MOT → CDM). In these cases, the difference in the standardised total effect of the IVs on the DV clearly shows an enhancement indicating that the enhancement in the influence of KNOW, ATT and MOT in groups of two on CDM, is caused by the KTI. On the other hand, in the case of the group of barriers (MOT → CDM and SE → CDM), it is seen there is a difference in the report related to SE only, which indicates that only SE was enhanced to influence CDM due to the KTI whereas there was negligible change in

MOT. This could be again, due to impact of the covariates KNOW ↔ SE; ATT ↔ MOT and MOT ↔ SE, which needs further investigation.

There is, however, a unique situation. That is in the group comprising KNOW and MOT associated with the covariate ATT, while KNOW shows an improvement in the positive direction, MOT has shown a movement in the negative direction (when compared with the results achieved in the pre-intervention stage). This indicates that motivation of the PTs has reduced, which could be an anomalous situation. While the relationship between CDM on the one hand and MOT and KNOW the other has been found to be enhanced by the KTI, when those barriers were associated with SE, the negative influence on MOT within the same group with another associate ATT could only be explained as having been caused by ATT. That is, an increase in the favourable attitude of PTs towards the CPG due to the KTI, as an associate of MOT, might have caused a negative impact on motivation but this situation is practically difficult to explain. Motivation is an attribute that coexists with other barriers, in the human beings and is unlikely to dramatically vary, in association with other barriers especially with ATT. Perhaps there are other underlying barriers (e.g. anxiety) that can cause the level of motivation to decrease when there is an increase in the level of underlying barriers. This contradiction needs further investigation. While the comparison between the pre and post stage standardised total effect of barriers on CDM has shown mixed results, the important aspect that needs to be understood is that VCoP has the ability to influence the knowledge, their attitude towards to CPG, their level of self-efficacy in integrating CPG into CDM and in a specific condition the level of motivation to integrate CPG into CDM. The conclusion that can be made at this stage is that VCoP as a KTI has influenced two groups of barriers that have a direct relationship to CDM namely (KNOW and ATT) and (KNOW and MOT). This means that, a one standard deviation change in (KNOW and ATT) in the positive direction, caused by the KTI is expected to create a difference of 0.104 and 0.248 standard deviations respectively in the CDM behaviour of PTs in the positive side with reference to the pre-intervention stage but measured at the post intervention stage. This indicates that the KTI has enhanced the effect of managerial and behavioural attributes KNOW, ATT, SE and MOT in groups implying that multicomponent KTIs can impact multiple barriers to the integration of CPG into CDM. The conclusion is that if the barriers effect on PTs is high, then KTIs can reduce the impact by influencing on the behavioural attributes of PTs. This is tested by the regression equations defined next. However, it must be noted here that this complex outcome is not comparable with any similar findings in the literature, including the publications of Fischer et al. (2016) and Cabana et al. (1999), although these findings can be found in real life situations, which also needs further investigation. This is a unique finding.

After comparing the groups of barriers between the pre and post-intervention stage and discussing the results, the next step taken was to assess whether the KTI has impacted the barrier and the CPG-CDM

gap. This was assessed using regression analysis. Regression equations like the ones defined in equations 6.8 and 6.9 could be written for the case of those combinations of barriers which have been found to have statistical validity and tabulated in Table 6.18. One example is demonstrated here which can be extended to others.

(KNOW → CDM, ATT → CDM)

CDM = k2 + β3KNOW + β4ATT + e2 = k2 + 0.545 (KNOW) + 0.309 (ATT) + e2 → (6.14) (pre-intervention)

CDM = k3 + β5KNOW + β6ATT + e3 = k3 + (0.649) KNOW + (0.557) ATT + e3 → (6.15) (post-intervention)

To test the impact of barriers on CPG-CDM integration it was assumed as an example that let KNOW = (-0.4) as a barrier at the pre-intervention stage assuming that it can reach a maximum of ±1. If KNOW = (-0.4) then it is possible to assume that there is an element of KNOW = 0.6 that is positive and not a barrier. Similarly let ATT = (-0.3) as a barrier at the pre-intervention stage assuming that it can reach a maximum of ±1 implying that there is an element of ATT = 0.7 that is not a barrier. Now substituting the barrier values of KNOW and ATT in equation 6.14 we have

CDM = k2 + 0.545 (-0.4) + 0.309 (-0.3) + e2 → (pre-intervention)

= k2 -0.2180 – 0.0927 + e2 → (6.16) (pre-intervention)

Then using the values of KNOW and ATT at the post intervention stage in equation 6.15 we have

CDM = k3 + (0.649) (0.6) + (0.557) (0.7) + e3 → (post-intervention)

= k3 + 0.3894 + 0.3899 + e3 → (6.17) (post-intervention)

Adding 6.16 and 6.17 we have

2CDM = (k2 + k3) + 0.1714 + 0.2972 + (e2 + e3) → (post-intervention)

2CDM = (k2 + k3) + 0.4686 + (e2 + e3) → (6.18) (post-intervention)

Equation 6.18 clearly points out that the KTIs impact and could reverse the impact of barriers to the integration of CPG into CDM. This also implies that the CPG-CDM gap reduces by the value that can be determined using 6.18. That is if one assumes that k2 and k3 are equal to zero and e2 and e3 are also zero then using equation 6.16 it can be seen that CDM = (-0.3107). This can be explained by the following example. For instance, with regard to the knowledge if there is a one unit change in knowledge in the positive direction, then there will be a corresponding change in CDM in the negative direction which is indicated by equation 6.16. This shows that the CPG-CDM gap is increasing because when knowledge in CPG is acting as a barrier then CDM behaviour turns negative. This means that an increase in the barrier level affects makes PTs CDM behaviour to be negative indicating lower level of integration of CPG into CDM. But when KTIs are introduced then the impact of the KTIs reverses the impact of barriers due to the positive relationship CDM is shown to have with KNOW, ATT, SE and MOT (see equations 6.8 to 6.18). This result is practical and is supported by theories like OMRU although published research outcomes in this area are hard to find

leaving a problem behind which led to a situation wherein comparison of these results with others was not possible. Nevertheless, this is a unique contribution which will help PTs and the patients alongside other stakeholders like organisation. After concluding the measurement aspects related to the KTIs, the next section dealt with the verification of the hypotheses which is the direct result of the discussions.

6.4.5 Discussion on the use of the same set of hypotheses H1 to H7 pre and postintervention

It is important to note here that in this research the hypotheses that were formulated in the pre-intervention stage were again tested at the post-intervention stage with regard to both EM and VCoP groups. The reason was straight forward. If a comparison has to take place between the pre and post stage results, then the assumptions need to be the same to understand to what extent assumptions have been verified or falsified. If the assumptions are different, the option to compare is eliminated as the extent to which a certain assumption has been accepted or rejected cannot be assessed. Especially when the quantities under study are the same at the pre and post-investigation stages, then the same hypotheses should be verified to know the change occurring in the quantities. Thus, the use of the same hypotheses can be justified. This brings the discussion to the stage wherein it is possible to decide which of the hypotheses have been confirmed or rejected at the post intervention stage based on the discussions provided in this chapter up to this point.

Table 6.20 List of hypotheses confirmed or falsified at the post intervention stage of EM and VCoP groups

No.	Hypotheses	EM-group	VCoP-group
		Post intervention	**Post intervention**
1	*H1: The lesser the extent of knowledge of PTs about CPG, the lesser will be the integration of CPG in CDM.*	Rejected	NA
2	*H2: The lesser the extent of favorable attitude of PTs towards CPG, the lesser will be the integration of CPG in CDM.*	Accepted	NA
3	*H3: The lesser the extent of self-efficacy of PTs towards CPG, the lesser will be the integration of CPG in CDM.*	Accepted	NA
4	*H4: The lesser the extent of motivation of PTs towards CPG, the lesser will be the integration of CPG in CDM.*	Accepted	NA
5	*H5: The lesser the knowledge of CPG, favourable attitude, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Accepted partially
6	*H6a: The lesser the knowledge of CPG, favourable attitude and self-efficacy of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Rejected
7	*H6b: The lesser the knowledge of CPG, favourable attitude and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Accepted partially
8	*H6c: The lesser the favourable attitude, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Rejected
9	*H6d: The lesser the knowledge of CPG, self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Accepted partially
10	*H7a: The lesser the knowledge of CPG and favourable attitude of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Accepted
11	*H7b: The lesser the knowledge of CPG and self-efficacy of PTs, the lesser will be the integration of CPG into CDM.*	NA	Rejected
12	*H7c: The lesser the knowledge of CPG and motivation of PTs, the lesser will be the integration of CPG into CDM.*	NA	Accepted
13	*H7d: The lesser the favourable attitude and self-efficacy of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Accepted
14	*H7e: The lesser the favourable attitude and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Rejected
15	*H7f: The lesser the self-efficacy and motivation of PTs towards CPG, the lesser will be the integration of CPG into CDM.*	NA	Accepted

6.4.6 Discussion of the findings of the relationship between interventions and barriers on the one hand and interventions and CPG-CDM gap on the other.

From sections 6.4.4.1 and 6.4.4.2 above it can be concluded that interventions impact barriers. Examples discussed under sections 6.4.4.1 and 6.4.4.2 show how barriers could be impacted by both single and multicomponent KTIs. The discussions show that when barriers effect is reduced, the CDM behaviour of PTs is reversed, indicating that the integration of CPG into CDM is enhanced. The discussions show how the gap between CPG and integration of CPG into CDM is created due to the

presence of barriers, indicated by the large negative impact the barrier creates in CDM.At the same time, when the KTI is administered, it is seen that the negative impact on CDM is reversed, indicating the gap between CPG and CDM is narrowed. The change in the CPG-CDM gap is explained in terms of the negative and positive CDM behaviour.

6.4.7 Discussion on pre and postintervention results

This aspect was the real test of the research. This could be established with the help of the discussions in Sections 6.4.4.1 and 6.4.4.2 above. In the case of EM group, except for the barrier KNOW, the research demonstrated that there is a clear difference in the analysis of relationship between ATT, SE and MOT on the one hand and CDMB on the other, between the pre and post intervention stages. In the case of the VCoP group, the results obtained between the pre and post intervention stages showed that in the case of groups that had combinations of KNOW, ATT, SE and MOT in four, three and two barriers, there was a clear and demonstrable change. However, there was a case of MOT which was seen to show a negative trend. This was an anomalous situation and is most likely to happen in case other underlying barriers not discussed in this research had affected the barrier. Statistical analysis showed that the level of MOT has reduced indicating that the barrier effect of MOT has increased after the administration of the KTI, in a particular group of barriers (KNOW, MOT in association with ATT). If one has to explain this situation in real terms, then it is most likely to happen, if either KNOW or ATT has affected MOT in a way that PTs in the VCoP group, have been found to be not motivated with the KTI. However, this situation is contrary to another finding in this research, where the group of barriers included KNOW, MOT and associated with SE, showed that both KNOW and MOT had changed in the positive direction, after the administration of the KTI. While it is not possible to attribute the phenomenon of negative change in MOT post-intervention of the KTI to ATT, as the literature shows that ATT and MOT are inter linked and positively related (Visser et al. 2016), this is most likely to be explained by bringing into picture the role of unidentified underlying barriers.

6. 5 Research Question 3

RQ3: If single and multicomponent KTIs are used to change the practice behaviour of PTs in integrating CPG to CDM, which one of the two KTIs is more effective?

This question was answered in two steps. The first step involved was the comparison of the outcome of the empirical analysis involving RA and post-intervention of EM and VCoP. The next step involved allowing actual measurements of the knowledge and CDMB components, using scores assigned to the items, before and after administering the KTIs. These aspects are discussed next.

6.5.1 Step 1

6.5.1.1 Comparison of EM and VCoP based statistical analysis provided in Sections 6.4.1 and 6.4.2

From sections 6.4.1 and 6.4.2 it can be seen that the parameter standardised total effect of the barriers on CDM provides a method to compare the performance of the KTIs. Standardised total effect provides a value that indicates the strength of the relationship between the independent and dependent variables. The reason for choosing this parameter is that the ultimate aim of administering a KTI is to eliminate or reduce the effect of barriers, whether they exist as single or in combination. If one takes into consideration the strength of the path between the IV and DV, then it is possible to compare two paths that are identical and assess which of the two paths is stronger. Thus, the comparison between the outcomes achieved by the KTIs regardless of the number of barriers acting at a time, on the integration of the CPG into CDM could enable an understanding of which one of the KTI is more effective. Next, the results of the standardised total effect of the barriers on CDM measured post-intervention of EM are compared with, those obtained after the administration of VCoP. The assumptions made were:

- That the barriers coexist.
- That the measurements recorded after the administration of EM, amongst the coexisting barriers, each dominant barrier's standardised total effect could be measured individually.
- That in the case of administration of VCoP, amongst barriers coexisting, more than one dominant barrier could be identified and the standardised total effect on CDM of those identified dominant barriers could be measured individually.
- That the range of minimum and maximum standardised total effect of each individual barrier on CDM operating in groups could be derived post-intervention of VCoP group, leading to a comparison of its effectiveness with EM.

Table 6.21 Comparison of effectiveness of KTIs using standardised total effect of barriers on CDM

Barrier – EM – group (1)	**Standardised total effect of the barrier on CDM – EM – group (2)**	**Barrier combination – VCoP – group (3)**	**Range of standardised total effect of the barrier in column (1) on CDM – VCoP - group (4)**	**Comparison between columns (2) and (4) (5)**	**Interpretation (6)**
ATT	0.693	KNOW → CDM; ATT → CDM	ATT → CDM = 0.557	EM addresses ATT as a barrier better than VCoP	It is possible to argue that ATT appears to be more dominant as an individual barrier than in groups. Hence EM could be used to reduce the impact of ATT as a barrier instead of VCoP. Treatment of ATT as part of a group of barriers by VCoP is less effective when compared to its treatment as a barrier by EM as a single dominant barrier.
		ATT → CDM, SE → CDM	ATT → CDM = 0.356		
SE	0.563	MOT → CDM; SE → CDM	SE → CDM = 0.502	EM addresses SE as a barrier better than VCoP when SE manifests in combination with MOT	It is possible to argue that SE appears to be more dominant as an individual barrier than in groups when it combines with MOT. Hence EM could be used to reduce the impact of SE as a barrier instead of VCoP. Treatment of SE as part of a group of barriers by VCoP is less effective when compared to its treatment as a barrier by EM as a single dominant barrier.
		ATT→CDM; SE → CDM	SE → CDM = 0.837	VCoP addresses SE as a barrier better than EM when SE manifests in combination with ATT	It is possible to argue that SE appears to be more dominant as a barrier in a group when it combines with ATT than when acts as an individual barrier. Hence VCoP could be used to reduce the impact of SE as a barrier instead of EM. Treatment of SE as an individual barrier by EM is less effective when compared to its treatment as part of a group of barriers by VCoP as a dominant barrier.
MOT	0.568	KNOW → CDM; MOT → CDM (SE is the covariate)	MOT → CDM = 0.551	EM addresses MOT as a barrier better than VCoP when MOT manifests in combination with KNOW and SE	It is possible to argue that MOT appears to be more dominant as an individual barrier than in groups. Hence EM could be used to reduce the impact of MOT as a barrier instead of VCoP. Treatment of MOT as part of a group of barriers by VCoP is less effective when compared to its treatment as a barrier by EM as a single dominant barrier.
		KNOW → CDM; MOT → CDM (ATT is the covariate)	MOT → CDM = 0.315		
		MOT → CDM; SE → CDM	MOT → CDM = 0.303		

An interpretation of the findings tabulated in Table 6.21 could be that both EM and VCoP are effective when compared to each other, in specific situations. For instance, ATT in EM is more

effective when compared to VCoP, because even in the combination of other barriers, ATT's total effect on CDM (0.557) does not exceed the total effect of ATT on CDM as an individual barrier (0.693). However, in the case of SE, VCoP is more effective than EM, when SE operates in combination with ATT. In this case, it can be seen that VCoP impacts SE, in a way that the total effect of SE on CDM (0.837) is greater than the total effect of SE on CDM, introduced by EM (0.563). Again, VCoP is less effective in the case of MOT, when compared to EM and also in the case of SE, when it operates with MOT. The reason why EM is more effective in some cases, while VCoP is more effective in some other cases could be that the barriers do not manifest as dominant or dormant or neutral barriers at all times in all human beings. In the case of PTs, who have participated in this study are from the USA and this may be the case. Whether the results could be replicated in other contexts is a question that needs further investigation. However, what is clear is that it appears that some barriers are more dominant than others in different human beings that support the findings of this research. For instance, a study Campbell et al. (2013), confirmed that attitude was not influenced by KTI, but there was significant improvement in knowledge of the practitioners following administration of a multicomponent KTI. The result of this study shows attitude being a more dominant barrier compared to knowledge being a barrier. At this point it can be concluded that hypothesis H10 has been achieved. A second test was therefore conducted to assess which of the two KTIs is more effective and is explained next.

6.5.2 Step 2

6.5.2.1 Comparison of EM and VCoP based on the outcome of the analysis of knowledge and CDM scores

As explained in section 5.22, a test was conducted by allowing an actual example of research knowledge to be translated into clinical practice and measuring the knowledge and CDMB components using scores assigned to the items, before and after administering the research knowledge. The results of the analysis conducted using the scores clearly shows that both EM and VCoP are effective in certain conditions. These are tabulated in Table 6.22and 6.23.

Table 6.22 Tabulation of the percentage of participants against the range of knowledge scores – post intervention stage.

KTI	**Percentage of participants**									
	Knowledge score									
	1	2	3	4	5	6	7	8	9	10
EM group	0	0	0	0	0	5.19	11.69	36.36	32.47	14.29
VCoP group	0	0	0	0	0	3.39	10.17	15.25	35.59	35.59

Table 6.23 Tabulation of the percentage of participants against the range of CDMB scores – post intervention stage.

KTI	Percentage of participants									
	CDM scores									
	1	2	3	4	5	6	7	8	9	10
EM group	0	0	0	0	3.90	12.99	24.68	23.38	25.97	9.09
VCoP group	0	0	0	1.69	1.69	6.78	11.86	42.37	22.03	13.56

The data in Table 6.22 has been translated into graphs depicted in Figures 5.20 and 5.23 respectively. As explained in section 5.22 and from Figure 5.20, it can be seen that EM as an intervention is more dominant, in regard to the percentage of PTs who have achieved knowledge scores in the range 6 to 9, while VCoP is more dominant in the range 9 to 10. When compared to the CDMB score for the corresponding ranges (Figure 5.23) it can be seen that the percentage of PTs achieving the CDMB score in the EM group is better only in the range 5 to 7.5 (approximate), whereas those of the PTs in the VCoP group is better in the range 7.5 to 9. Again, in the range 9 to 10, both groups are achieving scores almost equally with the VCoP group achieving slightly better scores than the PTs in the EM group at 10. The interpretation is that VCoP is more effective, in the higher range of the scores that is 7 to 9, while EM is more effective in the range 5 to 7. The reason for this could be that the research knowledge contained in the CPG may be easily understood by most participants in the EM group up to a certain level but might be facing barriers beyond those levels in achieving higher scores. However, the percentage of PTs who have scored beyond 7 in the CDMB score is high, in the VCoP group, perhaps because of the multifaceted nature of the KTI, which enables the PTs to overcome multiple barriers. Effect of barriers to achieve high CDMB score by PTs in EM group could be large due to difficulties faced by PTs in understanding the CPG on their own or their knowledge in that CPG may not be high or their attitude towards the CPG could be less favourable or their motivation and self-efficacy could be lower due to lack of support and perhaps EM addresses only one dominant barrier affecting the PTs. Unlike in VCoP as a multicomponent KTI addressed multiple barriers and PTs could share their thoughts on the Yahoo forum, or access support from experts or mentors, PTs in EM group could be lacking all of those facilities leading to a lower level of integration of CPG into CDM and hence achieve lower CDMB scores. At the point of achieving CDMB score of 9, PTs in the EM group is slightly more than VCoP group. However, at the CDMB score of 10, PTs in the VCoP group were more than EM group. The better score of VCoP group could be attributed to the multiple form of support for knowledge exchange from the VCoP.

Another inference that can be derived by, inspecting Figures 5.20 and 5.23 is that VCoP as a KTI, is more effective in helping PTs to gain higher level of CPG knowledge, when compared to EM, whereas with regard to the CDMB score, VCoP is performing at a higher level to EM, to reach the maximum score achievable i.e. 10. If the results can be aggregated, it can be said that EM is more

effective in helping the PTs at lower levels of CPG knowledge acquisition than VCoP, which is seen to be more effective in the higher levels of knowledge acquisition of the CPG. Similarly, EM is more effective at a lower level, when compared to VCoP, which is more effective at the higher levels. However, both EM and VCoP seem to be effective, although not equally, indicating that whether the barrier is single or multiple, both the KTIs could be useful, when addressing CDMB and integration of research knowledge into clinical practice at the highest levels. Although not an accurate comparison, this method of using knowledge and CDMB scores provides an idea about the existence of barriers to acquiring CPG knowledge and its translation into CDMB and evaluating the KTIs. An important question that arises is that, why the number of PTs in both EM and VCoP group is less in achieving the highest level of CPG knowledge and integrating CPG into CDM. The answer could be that it is logical as attaining the highest level of knowledge and CDMB could be a tough proposition to many PTs and barriers could exist. But in the final analysis, it can be said that as the level of the CPG knowledge achieved by PTs increases which perhaps has been possible because the PTs overcame some behavioural and managerial barriers using KTIs, higher will be the level of research knowledge integrated into CDMB by PTs and better will be the patientcare.

As is the case with the rest of the chapter, the results achieved in this section could not be compared with similar findings of other researchers due to paucity of enough number of research publications in the field of PT. However, the intervention studies of Bernhardsson et al. (2014) and Campbell et al. (2013) provide some basis to compare the results of this research which indicate that the findings are in line with some of the researchers (Ferreira, 2017; Camden et al. 2017; Levac et al. 2016; Bernhardsson et al. 2014; Campbell et al. 2013; Rebbeck et al. 2013; Dizon et al. 2014b); Tilson et al. 2014) but contradicts some findings of Bernhardsson et al. (2014), Campbell et al. (2013) and Rutten et al. (2013). Furthermore, the results of this study show that the research efforts of Bernhardsson et al. (2014) and Campbell et al. (2013) have been expanded in areas related to KTIs and their impact on EBP that is essentially specified as the integration of CPG into CDM in this research. In addition, it can be seen that new knowledge has been generated to compare the two KTIs and their impact on CPG-CDM integration and impact on barriers using the method of knowledge and CDMB scores which is unique, novel and new. At this point, it can be concluded that RQ3 has been answered.

6.6 Summary

The discussions in this chapter show that a number of findings that have been derived for the research are new and contribute to knowledge, method and practice. The discussions have raised some unanswered questions and have identified areas for further research. Overall the chapter has answered all the three research questions with the help of the statistical analysis provided in Chapter 5, other theories and publications found in the literature. Thus, this chapter provides the basis for drawing conclusions provided in the next chapter.

Chapter 7

Conclusions

7.1 Introduction

The previous chapter discussed the findings, derived through the data analysis provided in Chapter 5 and in this chapter, conclusions are drawn. In addition, the contributions to knowledge, theory, methodology and practice are presented. While delineating the contributions, the researcher also stumbled upon a few limitations of this research and sets out directions for future research. The chapter begins with the description on how the objectives and aim set for this research have been achieved.

7.2 Objectives

7.2.1 Objective 1:

To gain knowledge about barriers causing R-P gap and interventions that reduce the impact of barriers through literature review.

One of the main objectives of this research was to understand why the latest research knowledge is not being integrated into clinical practice by PTs, resulting in PTs either managing to provide the current patientcare without updating it using the latest knowledge produced by researchers and/or deny the patients of the benefit of better healthcare that could accrue due to the latest research knowledge. Although it is widely recognized that embedding research knowledge in clinical practice does not happen readily due to barriers that hinder the change in clinical practice behaviour of practitioners leading to a R-P gap (e.g. Graham et al. 2018; Stander et al. 2018; Bérubé et al. 2018; Curtis et al. 2017), research findings that have addressed this problem, in the field of PT are hard to come across. Thus, relevant literature was studied to gain knowledge about the following: research knowledge; clinical practice; research-practice gap; barriers causing research-practice gap; interventions and impact of interventions on research-practice gap. The literature review also addressed the conceptual aspects, practical aspects, theoretical aspects and limitations plaguing the concepts, which in turn led to the determination of the gaps in the literature (see section 2.8). The gaps provided the basis for conducting this research. Thus, it can be concluded that objective 1 has been achieved.

7.2.2 Objective 2

To identify specific research knowledge, clinical practice, R-P gap, barriers and interventions through a study of relevant literature to develop a basis to address the identified gaps in the literature.

The literature review pointed out that one of the main reasons for the R-P gap was the PTs' managerial and behavioural barriers although empirical studies that have addressed this issue are few

and far between (e.g. Stander et al. 2018; Nilsen, 2015; Bernhardsson et al. 2014). Lack of knowledge on how to tackle barriers and narrow R-P gap was argued to be a major problem faced by PTs, affecting them in providing optimum patientcare. In order to investigate this phenomenon, it was necessary to choose specific examples of research knowledge, clinical practice and barriers affecting PTs' changing behaviour and patientcare management based on the outcome of the literature review (see chapter 2). In addition, to tackle the barriers, it was argued in the literature that interventions could be used, either to eliminate them or minimise their impact on the integration of research knowledge into practice (reduction in R-P gap). Specific examples of interventions had to be identified to conduct meaningful research that could lead to realistic outcomes. Thus, using Chapter 2 the examples pertaining to the phenomena discussed above were chosen for this research, which are tabulated in Table 7.1.

Table 7.1 Examples of the phenomena under study in this research

No.	**Phenomenon**	**Example chosen**	**Reference**
1	Research knowledge	Clinical practice guideline (CPG) – CPG for VTE in PT	Sections 2.3.1
2	Clinical practice	Clinical decision making (CDM)	Sections 2.4 and 2.4.1
3	Research-practice gap	CPG-CDM gap	Section 2.3.3
4	Barrier - Managerial	Knowledge in CPG of PTs	Sections 2.5.2 and 2.5.4
5	Barrier - Behavioural	Attitude, Self-efficacy of PTs to integrate CPG into CDM and Motivation	Sections 2.5.2, 2.5.5, 2.5.6 and 2.5.7
6	Bridging the CPG-CDM gap	Knowledge translation	Sections 2.7 and 2.7.2
7	Mechanism to bridge the CPG-CDM gap	Knowledge translation intervention(KTI)	Sections 2.7.3 ,2.7.3.1, 2.7.4.4
8	Knowledge translation Intervention – Single component	Educational Material (EM)	Section 2.7.4.1
9	Knowledge translation Intervention – Multicomponent	Virtual Community of Practice (VCoP)	Section 2.7.4.2
10	Knowledge translation Intervention – Multicomponent	Knowledge broker	Section 2.7.4.3

From these arguments it is possible to conclude that objective 2 was achieved.

7.2.3 Objective 3

To study models, framework and theories and establish the relationship between research knowledge, clinical practice, barriers to integration of research knowledge into clinical practice, R-P gap and barriers to integration of research knowledge into clinical practice and interventions in addressing the R-P gap.

This objective was achieved by studying different models, frameworks and theories that have been used by researchers in prior studies. For instance, CPG as research knowledge and its relationship to CDM as clinical practice behaviour of the healthcare practitioner is supported by the Knowledge-Attitude-Behaviour Framework (KABF) of Cabana et al. (1999) and the updated KABF by Fischer et al. (2016) in this research. Next, managerial and behavioural barriers, namely knowledge, attitude,

self-efficacy of PTs to integrate CPG into CDM and motivation of the PTs to integrate CPG into CDM, were explained using the models developed by Cabana et al. (1999) and Ottawa Model of Research Utilization (OMRU) framework (Logan & Graham, 1998). With regard to interventions, knowledge translation theories including OMRU and Roger's theory of DOI were used alongside the theoretical domains framework (TDF) developed by Michie et al. (2011). These models and theories provided the necessary support for conceptualisation of the relationships between barriers to the integration of CPG into CDM, CDM as well as interventions and the CPG-CDM gap. In addition, different relationships as depicted in Figures 3.1 to 3.5 and equations 3.1 to 3.10 and 3.4.1 have been established between barriers to integration of the CPG into CDM on the one side and CDM on the other. The relationships were ready to be tested and the findings derived were used to answer the research questions 1 to 3. It can therefore be concluded that objective 3 has been achieved.

7.2.4 Objective 4

To develop a theoretical framework, conceptualize the relationships mentioned above and test the hypothesised relationships

Sections 3.3.1 to 3.3.4 and 3.4 in Chapter 3 discussed the establishment of empirical relationships between the identified barrier with regard to EM as intervention. They were KNOW → CDM; ATT → CDM; SE → CDM; and MOT → CDM (see Figures 3.1 to 3.4). These relationships were conceptualised, operationalised and tested using appropriate theories and models that have been discussed in Sections 3.3.1 to 3.3.3 in Chapter 3. Hypotheses were formulated for each one of the relationships identified (H1 to H4). Similarly, with regard to VCoP, a relationship between the different combination of barrier groups identified and CDM was established as was shown in Figure 3.5. Hypotheses H5, H6a, H6b, H6c, H6d, H7a, H7b, H7c, H7d, H7e and H7f were formulated to test these relationships. Theoretical support was provided in Section 3.4 to derive the relationships and define the hypotheses.

Next KTIs were represented by RA, which was used to test the empirical relationship between KTIs and the barriers (see sections 3.5 and Figures 3.6-3.10). Hypotheses H8a, H8b, H8c, H8d and H9 were formulated (see Section 3.5) and were empirically tested. Finally, a relationship between research knowledge and CDM was established and tested (hypothesis H10). Support for formulating the relationship and hypotheses was provided in section 3.6. These hypotheses enabled the researcher to test the impact of barriers on the CPG-CDM gap, impact of barriers on CDM, impact of KTIs on barriers and the CPG-CDM gap and demonstrate which barriers are significant and which intervention is more effective than the other. Thus, it can be concluded that objective 4 has been achieved.

7.2.5 Objective 5

To develop a suitable research methodology to test the relationships empirically

Chapter 4 provides the complete discussion on the methodological aspects used in this research. A quantitative research method underpinned a deductive research approach, objective ontology and positivist epistemology. The rationale for the use of this method was set out. Using the methodological framework, a survey questionnaire strategy was implemented to collect data from PTs in the USA. For adopting and implementing the above method, related literature was used (see sections 4.5, 4.7.1 and 4.16.1). The data analysis was carried out using robust methods (Chapter 5), which included SEM and regression analysis. Thus, it can be argued that objective 5 has been achieved.

7.2.6 Objective 6

To verify the hypotheses using the outcomes of the empirical study

Hypotheses verification was carried out (sections 5.4, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14 and 5.20). The statistical analysis, namely correlational analysis, covariance analysis, regression weight analysis, SMC, final regression output CFA, SEM and path analyses were used to verify the hypotheses. The accepted and rejected hypotheses are provided in Tables 5.24, 5.26 and 6.20. Discussions on the findings substantiated why hypotheses were confirmed or rejected. Comparisons with other research outcomes provided details on how this research contributed to knowledge, practice and theory. Thus, it can be argued that objective 6 has been achieved.

7.3 Aim:

The aim was to conduct a comparative study of the effectiveness of single and multi-component knowledge translation interventions (KTIs) in bridging the research-practice gap (CPG-CDM gap) that affects Physical Therapists (PTs) by addressing barriers to change their practice behaviour.

This research investigated the R-P gap, barriers leading to R-P gap, compared two KTIs, explained the extent of specific types of interventions are effective in bridging the R-P gap and which one of those interventions is more effective. Two knowledge translation interventions (KTIs) namely single and multicomponent interventions (e.g. EM and VCoP respectively both represented by relative advantage (RA)) were chosen for study.

It was argued that if there is a relationship between the barriers and CDM then any other relationship between CDM and other phenomena including CPG will be affected by the barriers and it is possible to explain to what extent the translation of CPG into CDM is affected by the barriers (see section 3.2). It was further argued that if a relationship between the barriers and KTIs could be established, then it is possible to explain, to what extent the interventions impact those barriers (effectiveness) and hence impact of those barriers on the CPG-CDM gap (see sections 2.7.3, 2.7.3.1, 2.7.4.4, 3.5 and 3.6). In order to compare the effectiveness of the two selected KTIs, two groups of PTs were identified, and

an empirical study was conducted. Educational material (EM) was used as single component intervention and VCoP as multicomponent intervention the two groups. The results of the study provided in Chapter 5 while discussions on the results were provided in Chapter 6 which explained the effectiveness of the interventions (see sections 6.5.1.1 and 6.5.2.1). Thus, it can be concluded that the aim has been achieved. Further to this, the following sections discussed the contribution to knowledge.

7.4 Contribution to knowledge

This research contributes to the growing body of knowledge on the translation of research knowledge to clinical practice. While the literature recognises the existence of R-P gap as a universal phenomenon in the field of healthcare and there has been growing calls in the literature to identify reasons for the R-P gap and find mechanisms to bridge it (e.g. Graham et al. 2018; Stander et al. 2018; Chan et al. 2017; Curtis et al. 2017; Sibley & Salbach, 2015; Jones et al. 2014). However, in the field of PT, hardly any study has been conducted that has conclusively addressed this aspect, and this research was conducted to address this lacuna in the literature. The outcome of this research adds to the existing knowledge related to the KT research addressing the R-P gap (e.g. Graham et al. 2018; Stander et al. 2018; Bérubé et al. 2018; Curtis et al. 2017). It is argued in the literature that R-P gap exists in the field of PT although there is limited evidence to support such a claim (APTA, 2018; Stander et al. 2018; Nilsen. 2015; Bernhardsson et al. 2014) and in particular there is insufficient evidence from the studies (either empirical or experimental design) to understand this phenomenon and various aspects related to it (Squires et al. 2014). The findings of this empirical research have helped to confirm the existence of R-P gap in the context of PT. Thus, it is one of its kinds and has produced new knowledge in regard to several different aspects that are discussed in the next sections.

7.4.1 Identification of research knowledge (CPG) and clinical practice (CDM)

Relationship between research knowledge and clinical practice; relationship between CPG for VTE in PT and CDM

These findings are similar to those of the other researchers (Ferreira, 2017, Babatunde et al. 2017; Camden et al. 2017; Levac et al. 2016; Schreiber et al. 2015; Tilson et al. 2014; Dizon et al. 2014b; Bernhardsson et al. 2014; Rebbek et al. 2013; Campbell et al. 2013; Lizarondo et al. 2012; Demmelmaeir et al. 2012; Russell et al. 2010), who argued that PTs' management (knowledge) and behavioural aspects (attitude, self-efficacy and motivation), either individually or in groups act as barriers. This study differs from these researchers mentioned however, in that it has addressed CPG for VTE in PT for the first time as this CPG has not been studied to understand the existence of R-P gap until now.

No other study in the field of PT has conceptualised and investigated the CPG-CDM gap in regard to CPG for VTE in PT. This study defined CPG, CDM, CPG-CDM gap, barriers, single and multicomponent KTIs by providing examples and consolidating definitions. This research conceptualized the above mentioned concepts making the entire research as a clear conceptualisation of a specific R-P gap termed as CPG-CDM gap. As on date, it is hard to find any research that has conceptualised CPG and CDM in regard to R-P gap, the way this research has accomplished. A clear understanding of manipulating every component involved in the CPG-CDM gap has been provided, thereby enhancing the understanding of R-P gap in the context of PT.

No other study has conceptualised CDM to indicate the clinical practice behaviour of practitioners. This research has established that CDM can be used as a variable in the R-P gap and KTI studies and as an indicator of change in the clinical practice behaviour of PTs that is easy to measure. The linkage between CPG and barrier was identified. It was possible to identify, how latest research knowledge can be embedded in CDM, by addressing those barriers. Thus, this study removes the limitation of non-utilization of a simple method to predict, the change in the management and behavioural variables that can be addressed by interventions (KTIs) to influence the CDM of a practitioner. Further, this study provides guidance to the PTs in addressing causes of R-P gaps and how to narrow the R-P gap. The research has overcome the limitations of the research outcomes of Salbach et al. (2010), Campbell et al. (2013) and Bernhardsson et al. (2014) by using the example of CPG for VTE in PT and CDM.

7.4.2 Contribution to the body of knowledge of barriers to integration of research knowledge into clinical practice

This study related the CPG-CDM gap as a concept to those components that cause CPG-CDM gap as barriers; namely management and behavioural barriers, which in itself is a major contribution, as no other study to date has linked the barriers to CPG-CDM gap in the field of PT. Some of the barriers at the practitioner level were conceptualised and linked to CDM. The discovery was that in an environment characterised by CPG, any change that happens to the barriers or CDM, then CPG is expected to be affected and the CPG-CDM gap is expected to be affected. Further, this research identified the barriers at the practitioner level to the integration of CPG into CDM (see Table 2.5). This table can act as a guideline to identify barriers to integration of the CPG into CDM.

As part of the conceptualization, barriers were measured empirically using their complements. As explained in section the term complement of a barrier meant it's opposite. The four barriers (namely KNOW, ATT, SE and MOT) were measured in this manner. In this research the barriers were related to CDM directly in two ways. The first one was establishing a direct linkage between the complements of the individual barriers to CDM. It was proved that when the level of the complement

of the barrier was high, then apparently the level of the barrier was low and when the level of the complement of the barrier is low, then the level of the barrier was high. The second way was linking a group of barriers to CDM was through clustering of the complement of the barriers. It was argued that the complement of the barriers could be linked to CDM in groups of four, three and two. Conceptualising the relationship between the barriers and CDM, in the first way, provided the basis to administer, single component intervention to impact a single barrier at a time whereas, the second way provided the basis to administer the multicomponent intervention to impact multiple barriers at the same instant of time.

The results obtained by the above method showed that at any instant of time it is possible to impact a single barrier or group of barriers. As far as group of barriers is concerned the results showed that at any instant of time a maximum of two barriers in a group only affect the CPG-CDM gap. This is a unique discovery. This provides an opportunity to address the management and behavioural barriers of PTs, somewhat easily. Tackling more number of barriers at any instant of time in a group could be complex and difficult leading to difficulties in changing the behavioural aspects of PTs and narrow the CPG-CDM gap. Literature shows that changing any behavioural barrier is difficult (e.g. Stander et al. 2018; Curtis et al. 2017). Thus, while agreeing with the literature, this research has brought out the precise combination of barriers in groups of four, three and two that can affect CDM of PTs, a discovery that provides a new opportunity to manipulate the management and behavioural barriers to narrow the CPG-CDM gap.

The following contributions to the knowledge were made.

- Barriers at the practitioner level affect CPG-CDM gap
- Barriers at the practitioner level can be identified
- Barriers can be linked to CDM individually and in groups
- Individual barriers can be impacted using single component interventions
- Multiple barriers can be impacted by using multicomponent interventions
- Barriers can be represented by their complement

The nearest research outcomes that can be compared with the above findings were that of Cabana et al. (1999) and Fischer et al. (2016). But the research outcomes produced by both Cabana et al. (1999) and Fischer et al. (2016) were not empirical studies but proposed frameworks. Those studies did not provide model to predict the behaviour of barriers and their linkage to CDM and hence CPG-CDM gap.

7.4.3 Contribution to the body of knowledge of interventions impacting barriers and R-P gap

In this research, KTIs were used to address the CPG-CDM gap and the outcome of this research provides evidence on the concept of single and multicomponent interventions based on empirical research outcomes. A framework was developed, that provided a method to impact the identified barriers using both single and multicomponent interventions.

The interventions were conceptualized and represented as constructs (represented as RA) in the study and related to KNOW, ATT, SE and MOT individually and as a group four in a cluster. Thus, RA can be used to represent both the KTIs used in this research i.e. EM and VCoP. So far RA has not been tested empirically, as a construct representing KTI that could impact the barriers or their complements. Knowledge about this provides an understanding of, how KTIs function while impacting the barriers in an empirical investigation.

A comparison of interventions and discovery of the use of a particular intervention for specific situations depending on its effectiveness was an important contribution. This helped to measure the extent to which the interventions could affect the barriers and CPG-CDM gap. The outcome of this research provides a practical solution to narrow or eliminate the CPG-CDM gap by reducing the impact of barriers on the integration of CPG into CDM using a specific intervention as a remedy.

This is one of the first studies that has addressed barriers not only using both single and multicomponent KTIs in a comparative manner, but also the impact of those interventions on the specific barriers. This research finding also provides an answer to PTs to identify which intervention could be used to impact a particular barrier or a cluster of barriers. Further, to what extent is the impact leads to the determination of the extent to which CPG-CDM gap can be narrowed was found out. This is a unique discovery that promises to enable PTs to overcome their management and behavioural barriers by using interventions and enhance CDM, leading to benefits to patients by optimizing patientcare.

This is the first empirical research study of EM as a single component intervention affecting barrier. Secondly, this research used a unique combination of multicomponent intervention (VCoP, EM & KB) in the context of PT for the first time to understand how it affects barrier. Thirdly, using these KTIs, EM and VCoP to compare their effectiveness on impacting the barriers in one research is not common and perhaps not attempted in the literature yet. This research contributes to this unique knowledge on, how these specific KTIs affect the barriers and CPG-CDM gap. The use of EM has provided knowledge on, linking the KTI to individual barriers at a time. The use of VCoP has provided knowledge on linking the KTI to a group of barriers at a time.

7.4.4 Contribution to knowledge to determine the effectiveness of single and multicomponent KTIs by comparison

The total effect of a single barrier on CDM post intervention administration was compared between EM and VCoP (see section 6.3.4.1 and 6.3.4.2). This provided some idea on, which one of the two KTIs was more effective than the other. Here an important discovery was made regarding identifying the single barrier. Isolating a single barrier in a PT is not possible as the barriers coexist. What was possible was to identify the most dominant barrier in a PT that could be addressed. Examples discussed in section 6.4.2.1 clearly demonstrate that EM is effective in some situations whereas VCoP in some other. This is an important contribution to knowledge as using this method it is possible to identify individual barriers and group of barriers and manipulate them, a method hitherto not addressed in the literature and has been a challenge for PTs to integrate CPG into CDM by removing the barriers to reducing the CPG-CDM gap. This is new knowledge and no such measurement method has so far been discussed in the literature.

An instrument to measure CPG specific knowledge and CDMB score were developed and tested to assess the translation of CPG into CDM to compare the effectiveness of the KTIs (see section 5.21). The instrument can measure specific knowledge of CPG for VTE in PT and test the ability of the PTs to make correct clinical decisions based on the CPG recommendations. Multiple methods were used in the data analysis (see section 7.6.4). This included correlational analysis, covariance analysis, squared multiple correlational analysis, total effect analysis, ANOVA, non-parametric tests, regression analysis, standardized regression weight analysis, SEM, path analysis and predictability of dependent variable by the independent variable. Use of multiple methods to derive outcomes from the data analysis in one research provides an accurate assessment of the results. Most research studies do not use more than two or three methods in data analysis. In comparison this research has used multiple methods to respond to different situations that arose during the process of the data analysis. This is a contribution to research methodology that enables the use of multiple methods to arrive at accurate results. In addition, an instrument to measure CPG specific knowledge and CDMB score were developed and used compare the effectiveness of the KTIs (see section 5.21). Using two different methods to compare the KTIs in one research and corroborate the findings is unique.

It was generally believed that multicomponent KTIs are more effective than single component KTIs. But this research demonstrated that not only multicomponent KTIs are better in some instances but also, single component KTIs are effective. This finding aligns with the arguments of the researchers (Argyriou et al. 2015; Suman et al. 2015; Squires et al. 2014; Grimshaw et al. 2004) that there is no evidence to prove that multicomponent KTIs are more effective than the single component KTI or vice versa. These findings also contradict the arguments of some researchers (Stander et al. 2018; Nilsen. 2015; Bernhardsson et al. 2014; Campbell et al. 2013) who claimed that multicomponent KTIs

are more effective than the single component KTIs. This research has produced the first empirical evidence that shows how to compare the effectiveness of the KTIs and how to compare them in two different ways. This contribution has significant bearing on the PTs who could now identify how to overcome the impact of barrier caused by management and behavioural variables of PTs and narrow the CPG-CDM gap.

7.5 Contribution to theory

This section deals with the theoretical contributions made by this study. This research has conceptualised the research knowledge in PT, clinical decision-making behaviour, barriers to the integration of research knowledge into CDM, knowledge translation interventions and the research-practice gap. Each one of these aspects will be discussed next.

In this research multiple theories and models were used to underpin the concept of CPG without any conflict amongst those theories and yet laying a strong foundation to conduct the entire research which was an important contribution to theory. Combining many theories to conceptualise a single abstract phenomenon like CPG and explaining the nature of the concept and its relationship with different variables and PTs behaviour objectively yielded multiple outcomes that could act as extensions of those theories. For instance, using the model of Fischer et al. (2016) it was possible to cluster multiple barrier in an empirical model and study their relationship to CDM and CPG-CDM gap was a new way to understand how barriers influence CDM and CPG-CDM gap. This model could be used to study any future combination of barriers.

Further, the dominant theory used in this research is the KT theory. The main theoretical contribution of this research lies in expanding the application of KT theories to define the concept of CPG-CDM gap, an aspect not discussed in the literature. For instance, the KABF is a representation of KT theory and provides the basis to understand why there is a problem in Physicians integrating CPG in clinical practice and how to change the clinical practice behaviour of the physician, using the concept of barriers namely knowledge and attitude. However, this framework falls short of providing a generalized explanation on why CPG is not being integrated into clinical practice resulting in a R-P gap in multiple contexts for instance PT. In addition, although this framework prescribes the use of intervention strategies to tackle the barriers, it is only prescriptive in nature. It doesn't provide a clear-cut cause and effect relationship between the barriers and the CDM behaviour of the physician on the one hand and between interventions and barriers on the other. In this situation the ability of KABF to explain the linkage that exists amongst specific barriers, clinician behaviour and interventions used to overcome barriers to translating CPG to clinical practice diminishes. This is a major limitation of KABF as it cannot be used as a predictive model to link barriers as determinants of R-P gap and interventions as determinants that impact barriers. This research has overcome this limitation of

KABF by developing a predictive empirical model that links CPG, CDM, barriers, interventions and CPG - CDM gap. This model (see figure 3.11) has the potential to be applied to predict how and to what extent the barriers affect the CPG-CDM gap and the extent to which interventions can reduce the impact of barriers on the CPG- CDM integration. For example, the model developed in this research has a cause and effect relationship between barriers and CDM which indicates the extent to which the barriers could affect CDM and hence the integration of CPG into CDM. Similarly, the model could link the interventions to the barriers to determine the extent to which the interventions could reduce the impact of barriers on the CPG-CDM integration. The model was empirically tested in the context of PTs in the USA thereby providing the basis to test the validity of the model. This validation amply demonstrates that KABF could be transformed into a predictive model from being a prescriptive one. This is an important contribution to KT theory in the field of healthcare and specifically to the growing body R-P integration. To the best of the knowledge of the researcher no other study in the literature has attempted to expand KABF to CPG-CDM study until date by transforming it to a predictive model from being prescriptive.

In addition, while linking with CDM, CPG was conceived as the environment in which every component operating is characterised by CPG. This provides a unique definition to CPG as a concept that could be represented in multiple forms and variables in CPG-CDM studies. This is another contribution to theory. Application of KT theories to translation of CPG into CDM and address CPG-CDM gap (R-P gap) in the presence of barriers and with the application of KTIs in the field PT, confirms the conceptualisations of Cabana et al. (1999) and Fischer et al. (2016) using empirical research. The models derived in this research using KT theories have expanded the application of existing KT theories to PTs and their decision making behaviour. This is another contribution to theory.

Next use of CPG as research knowledge by applying models and theories like KABF, DOI and OMRU led to the definition of integration of CPG into clinical practice with regard to PTs and development of new relationships between:

- barriers to integration of research knowledge into CDM and CDM
- barriers to integration of research knowledge into CDM and CPG-CDM gap
- KTIs and barriers and
- KTIs and CDM as well as CPG-CDM gap.

Empirical models and equations were derived (see sections 3.3.1 to 3.3.4, 3.5 and 3.6). Thus, the application of the theories mentioned above to define and develop the new relationships expands the application of those theories in new areas not addressed to date. This contributes to theory.

Applying KABF (Cabana et al. 1999; Fischer et al. 2016), this research argues that, CDM could be conceptualised to address the CPG-CDM gap. CDM can now be used as a construct in similar models as the ones developed in this research. Again, the conceptualisation of CDM as representing clinical practice behaviour is new and application of the concepts developed by Cabana et al. (1999) and Fischer et al. (2016) to arrive at such a conceptualisation amounts to expanding the KABF model to the new area of CPG-CDM gap in PTs. Further in order to establish a relationship between CPG-CDM gap and barriers this research expanded the concepts developed by Cabana et al. (1999) and Fisher et al. (2016) and explained the cause and effect relationship between barriers and CPG-CDM gap. Additionally, it can be seen that conceptualisation of the four barriers namely lack of knowledge, lack of favourable attitude and lack of self-efficacy and motivation, using specific frameworks and theories (see sections-3.3, 3.3.1 to 3.3.3) is new. No other research has conceptualised single and groups of barriers the way it has been done in this research.

Regarding the conceptualisation of KTIs, it can be seen that the framework of Fisher et al. (2016) and DOI were used which is a new way of applying theory to the concepts of KTIs. Using KTIs to bridge the CPG-CDM gap is a new contribution to theory while using RA as a representation of single and multicomponent KTIs provides a new way to apply DOI in barrier studies. Finally, several empirical models have been developed in this research (see Figures 3.1 to 3.10 and equations 3.1 to 3.10 and 3.4.1) to link the barriers to CDM individually and in groups. These models provide the basis to generate future conceptualisations which is a contribution to theory. Further to discussing the contribution to theory, this research proceeds to conclude on the contributions to methodology.

7.6 Contribution to methodology

This research makes a methodological contribution by measuring:

7.6.1. Clinical practice as CDM

Clinical practice as CDM is a method hardly used in the clinical research. Most of the research conducted in healthcare has measured clinical practice as related to either self-reported adherence of the practitioner or by reviewing the patient records retrospectively to see adherence to CPG recommendations. Literature review showed that an important feature of the CPG is to support CDM aspect of the clinical practice (see section 2.3). However, CDM has hardly been considered as a measure of clinical practice in prior studies. This has enabled a new way of representing actual clinical practice as CDM instead of a more complex measure such as patientcare outcomes or very simple measure such as CPG adherence. CDMB is complex yet can be detailed and measured. This way of measuring clinical practice using CDMB provides PTs a simpler way to determine their ability to integrate CPG into CDM.

7.6.2. Using 'RA' to represent KTIs

Although models and frameworks (e.g. OMRU, CIFR, KABF) has a construct as 'intervention' referring to KTI, no mechanism is available to represent 'intervention' as a construct in empirical studies. In this study RA was identified and tested to represent 'intervention' in an empirical study. Rogers DoI and CFIR by Damschroder et al. (2009) as theories supported the use of RA in this study (See section 2.7.4.4). In addition, most of the previous measurement of KTIs have been based on simple before-after measurement of the variable under study or measuring a change in the variables e.g. dependent variable under study and implying the impact of KTIs. In this research a new way of representing the impact of KTIs in terms of RA was introduced that promises to change the way KTIs' influence or impact the barrier has been understood.

7.6.3. Verification of barriers in pre and post administration of KTIs

Measurement of barriers before and after the administration of the KTIs EM and VCoP has not been used commonly in KT studies. It appears that no prior study used the same instrument to measure barriers that have been impacted by two different types of KTIs at the pre and post intervention stage in a single research. Establishing the reliability and validity of the same questionnaire using data obtained from two groups of PTs i.e. EM group and VCoP group, in the same study is unique.

7.6. 4. Analysis of total effect of barriers on CPG-CDM gap

CPG-CDM gap was analysed using total effect of the barriers (or their complement) on CDM. Prior research has not used SEM to find out the total effect of the barriers, either as an individual barrier or group of barriers or their complements on CDM. Thus, this research has provided an important way to measure CPG-CDM gap. This gap was measured, using such quantities as variance (squared multiple correlations or SMC) of independent variables accounting for a change in the dependent variable, due to a change in the independent variables, regression weights and path coefficients (see section 6.3.6 and 6.3.7). The gap was measured by assessing the extent to which the total effect of the independent variable on CDM has changed due to the impact of the KTIs. It was interpreted that an increase in total effect of independent variables, post administration of the KTI implies that CPG-CDM gap is less. This also implies that decrease in the total effect of independent variables on CDM, implies that the CPG-CDM gap is high see section 6.3.6 and 6.3.7). This method was validated across two different groups of PTs under study. This method provides a simple, reliable and credible measurement of CPG-CDM gap. This is an important contribution to methodology.

After analysing the contribution to methodology at the measurement level, the next discussion provides the other methodological contributions this research has made.

7.6.5 Verification of same set of hypotheses at pre and post intervention stages

This research verified the same set of hypotheses at the pre-intervention and post intervention stages, indicating that if the same model is used at the pre and post intervention stages, then the same hypotheses should be valid with the measurements confirming that the relationships within the model are either statistically significant or not. In this comparative study, it was possible to compare the effectiveness of the two types of interventions which helped in identifying the variances and similarities between the two interventions. Comparison showed the areas of strength and weakness of the individual KTIs. No similar study has been found in the literature that has adopted a comparative study to evaluate two different types of KTIs in one research and validate models twice, i.e. pre and post intervention stages. This is a unique contribution to methodology.

7.6.6 Using SEM to analyse CPG-CDM gap and the impact of barriers

Using two types of interventions in a single study to address single and multiple barriers, using SEM was not found common in the literature. Common method used in research involving interventions is the t-test or at the most ANOVA or regression analysis. Use of structural models has yielded different combinations of barriers affecting CDM. Each model has a unique combination of barriers, directly affecting CDM and covariates associated with them. If SEM were not to be used, then it would not have been possible to study the impact of different combinations of the barriers as well as use variance, regression weights and path analysis to find the cause and effect relationship between the dependent and independent variable. This is a unique contribution to methodology as using this method; multiple models could be derived to find which of those models could be used to manipulate the management and behavioural variables which is not generally possible using ordinary univariate or multivariate analysis.

7.6.8 Levene's Test

Furthermore, Levene's test is not usually included in intervention studies and this test can be used to show that the samples belonged to the same population which was an essential condition that had to be satisfied. Levene's test showed that the data collected at the post intervention stage showed equal variance as that of the data collected at the pre-intervention stage. In pre and post-intervention Levene's test provides a method to compare the variances of the data collected at the two stages which in turn indicates that the randomly chosen samples belong to the same population under study.

After identifying the contributions to research methodology, this research proceeded to discuss the contributions to practice.

7.7 Practical implications

Lack of knowledge on barriers to integrate CPG into CDM and bridging the CPG-CDM gap were major challenges in the field of PT that has affected delivery of optimum patientcare (see sections

2.3.2 and 2.3.4). Other stakeholders affected by these challenges include organisations concerned with PT, healthcare facilities, policy makers, licensing and accrediting bodies, researchers, academics and regulators (Cheung et al. 2014). However, to date hardly any research has been conducted that has comprehensively addressed single and multicomponent KTIs to eliminate the impact of barriers on the integration of CPG into CDM leading to bridging the CPG-CDM gap. Potential benefits that can accrue to PTs and others out of the findings and contributions of this study include:

7.7.1 Identification of barrier and bridging of CPG-CDM gap leads to benefits. The immediate beneficiaries are PTs and patients. Reduction in the impact of barriers is expected to lead PTs to integrate CPG into CDM, leading to delivery of optimum care and thus directly benefiting patients.

7.7.2 PTs now can choose to employ the single or multicomponent interventions to eliminate barriers enhancing their knowledge in CPG and integrate into CDM by changing their CDM behaviour.

7.7.3 Bodies including insurance, funding agencies, regulatory authorities, professional bodies, licensing authorities and healthcare organisations can now encourage (or even enforce) integration of CPG into CDM. If barriers exist, then these bodies can enable PTs to overcome the barriers using the outcomes of this research which are cost effective, easy to use, convenient, less complicated, no time away from work, comfortable to access and use, and easy to access.

7.7.4 Researchers can benefit by expanding the research outcomes to investigate other CPGs and other forms of research knowledge that are linked to their integration into clinical practice. In addition, other fields of healthcare could also benefit from the contributions of this research. It is expected that medical and allied health professionals can derive benefits from this research.

7.7.5 Not many KTI studies have used online technology to deliver the KTIs to the target population as well as for data collection at the pre and post intervention stages. Data collection using online technology was more cost effective and that was able to withstand the tests of reliability and validity. Researchers can use this research design on any target population of PTs even if they are geographically dispersed. Compared to the other costly interventions studies (e.g. audit and feedback), this research design used KTIs that are relatively simple (EM), new (VCoP) as well as cost effective.

7.8 Limitations and Directions for future research

The main limitation of this research is that it is limited to one form of CPG that is CPG for VTE in PT. While this CPG is still new, its utility to PT practitioners is still being established. Next the research outcomes may not be generalizable as it was assumed that CPG-CDM gap was affected by

management and behavioural barriers to integrating CPG into CDM. However, there could be other variables that could act as barriers for instance cognitive, emotional, organisational and patient related barriers that need to be considered if the outcomes are to be generalised further. In addition, it was not possible to conclude that the findings of this research are applicable to other contexts where the use of EM and VCoP may not be possible. In that instance where other KTIs might have to be used, then it is necessary to repeat the research to find out whether the outcomes are similar to those obtained in this research. Further while linking the four barriers to CDM it was found out that the statistical relationships between some of the barriers and CDM (e.g. KNOW → CDM) as well as single component interventions and barriers (e.g. RA → Combination of Barriers) post introduction of interventions were either not significant or only partially significant. This could be due to the specific nature of the interventions and the results obtained in this research could be different if the concepts of barriers, CPG, interventions and CPG-CDM gap were different to that of this research. Similarly, in regard to multicomponent intervention it was found that only two barriers in combination at a time were affecting the CDM. This could be due to the nature of the intervention (VCoP) and any other type of intervention (e.g. knowledge broker combined with educational meeting) could produce a different result. In addition, it may also be necessary to understand how the association between the barriers could affect the CDM and the CPG-CDM gap. Moreover, this research relied on RA as the measure of the single and multicomponent KTIs. In this research RA was found to have a high level of statistically significant relationship with EM and there was no such relationship shown in regard to VCoP. Some barrier combinations were not found to be valid. Whether other measures such as complexity, compatibility, trialability and observability when used in conjunction with the outcomes of this research could vary and show better statistical relationship between the variables concerned. In addition, conducting this research in another country could produce a different result as cultural differences could affect PTs differently. In addition, some of the statistically insignificant results derived in this research could have been due to the lower sample size. This could be overcome in future studies by using a larger sample size. Further, the theoretical support provided in this research could explore the possibility of using those theories not used in this research to identify newer barriers that may affect clinical practice. For instance, use of factors like peer support (e.g. Ramirez –Velez et al. 2015; Bernhardsson et al. 2014) and lack of training (Silva et al. 2015) could provide new insights into the behaviour of PTs. These limitations provide an opportunity to enhance the research outcomes by conducting future research in those areas which are pointed out next.

This research was inspired by important research outcomes produced by researcher including Cabana et al. (1999) and Fischer et al. (2016) which had limitations. While expanding on those outcomes and addressing limitations this research brought out new contributions to knowledge, theory, methodology and practice. However, the outcomes of this research also suffered from limitations which provide the avenues for future research. For instance, future research could use different CPGs or research

knowledge and clinical practice variable other than CDM to find out how the current research outcomes can be compared and generalised. Next, future research could use other KTIs, (educational meetings, opinion leaders, performance and feedback and reminders) either as single component KTI or in combination a multicomponent KTI strategy to gain knowledge on how those KTIs impact barriers and CPG-CDM gap. Additionally, future researchers could consider other barriers and link them to clinical practice to see how those barriers impact clinical practice and what interventions could be used. In addition, future research could also consider the moderating effect of the KTIs on the relationship between barriers and CDM instead of the current conceptualisation of the KTIs impacting the barriers directly. This could yield a different result than the ones derived in this research. Finally, further research could also be conducted using DOI with measures such as complexity, compatibility, trialability and observability which could reveal newer insights into the impact of KTIs on the barriers and CPG-CDM gap.

References

Abramson, R., Rahman, S. and Buckley, P. (2005). Tricks and traps in structural equation modelling: A GEM Australia example using AMOS Graphics. Paper presented at the Australasian Business and Behavioural Sciences Association (ABBSA) Conference, August 5-7 August 2005, Cairns, Australia

Adams, R.C., Sumner, P., Vivian-Griffiths, S., Barrington, A., Williams, A., Boivin, J., Chambers, C.D. and Bott, L. (2017) 'How readers understand causal and correlational expressions used in news headlines', *Journal of experimental psychology: applied*, *23*(1), pp. 1-14.

Adams, J., Bakalar, R., Knecht, K., Mounib, E.L. and Stuart, N. (2008) *Healthcare 2015 and care delivery: Delivery models refined, competencies defined*. Somers, NY: IBM Corporation.

Aftab, R.A., Khan, A.H., Sulaiman, S.A.S., Khan, K. and Ali, I. (2014) 'Does guideline knowledge affect treatment compliance among emergency doctors?', *The American journal of the medical sciences*, 348(5), pp.357-361.

Ajimsha M. S., Kooven, S. and Al-Mudahka, N. (2018) 'Adherence of physical therapy with clinical practice guidelines for the rehabilitation of stroke in an active inpatient setting', *Disability and rehabilitation*, 40. pp.1-8.

Ajzen, I. (1991) 'The theory of planned behaviour', *Organizational behaviour and human decision processes*, *50*(2), pp.179-211.

Albright, J. J., Park, H. M. (2009). *Confirmatory factor analysis using Amos, LISREL, Mplus, and SAS/STAT CALIS*. Bloomington: Indiana University. [Online]. Available at https://scholarworks.iu.edu/dspace/handle/2022/19736.(Accessed: 3March 2016).

Alhalhouli, Z.T., Hassan, Z. and Der, C.S. (2014) 'Factors affecting knowledge sharing behaviour among stakeholders in Jordanian hospitals using social networks', *International Journal of Computer and Information Technology*, 3(5), pp.919-928.

American Physical Therapy Association (APTA) (2011) 'Today's Physical Therapist: A Comprehensive Review of a 21st-Century Health Care Profession [online]. Available at: https://www.apta.org/uploadedFiles/APTAorg/Practice_and_Patient_Care/PR_and_Marketing/Market_to_Professionals/TodaysPhysicalTherapist.pdf (Accessed: 3 March 2016)

American Physical Therapy Association (APTA) Clinical Practice Guideline Process Manual. (2018d). Alexandria, VA: American Physical Therapy Association.

American Physical Therapy Association (APTA). *Direct Access in Practice* (2018a) [online]. Available at: https://www.apta.org/DirectAccess/ (Accessed: 18 March 2017)

American Physical Therapy Association (APTA). *Vision 2020.* (2018b) [online]. Available at: http://www.apta.org/Vision2020/ (Accessed: January 2018)

American Professional Wound Care Association (APWCA). (2010) 'SELECT: Evaluation and Implementation of Clinical Practice Guidelines: A Guidance Document from the American Professional Wound Care Association', *Advances in skin and wound care*, 23(4), pp.161-168.

Amin, A. and Roberts, J. (2008) 'Knowing in action: Beyond communities of practice', *Research policy*, 37(2), pp.353-369.

Arbuckle, J. L. and Wothke, W. (1999) *Amos 4.0 User's Guide.* SPSS Marketing Department, SPSS Inc. Chicago: SmallWaters Corporation.

Arbuckle, J.L. (2014). IBM® SPSS® Amos™ 23 User's Guide. New York: Amos Development Corporation

Arbuckle, J.L. (2016) *IBM SPSS Amos 24 user's guide.* New York: Amos Development Corporation.

Argyriou, C., Georgiadis, G.S., Georgakarakos, E.I., Roumeliotis, S., Roumeliotis, A., Kikas, P., Tziakas, D. and Lazarides, M.K. (2015) 'Applying Evidence-Based Medicine in Actual Clinical Practice: Can We Bridge the Gap? A Review of the Literature', *Hellenic Journal of Cardiology*, 56, pp.373-378.

Asonganyi, E., Vaghasia, M., Rodrigues, C., Phadtare, A., Ford, A., Pietrobon, R., Atashili, J. and Lynch, C. (2013) 'Factors affecting compliance with clinical practice guidelines for pap smear screening among healthcare providers in africa: systematic review and meta-summary of 2045 individuals', *Public Library of Science ONE,* 8(9), p.e72712.

Atkins, L. and Wallace, S. (2012) *Qualitative research in education*. London: SAGE publications.

Atkinson, N.L. (2007) 'Developing a questionnaire to measure perceived attributes of eHealth innovations', *American Journal of Health Behaviour,* 31(6), pp. 612–621.

Attia, A. (2013) 'Adaptation of international evidence based clinical practice guidelines: The ADAPTE process', *Middle East Fertility Society Journal,* 18(2), pp.123-126.

Australia Health Practitioners Regulation Agency (AHPRA) (2016) *Accreditation publications* [online]. Available at: https://www.ahpra.gov.au/Publications/Accreditation-publications.aspx Accessed: (24 February 2018)

Ayanniyi, O., Egwu, R.F. and Adeniyi, A.F. (2017) 'Physiotherapy management of knee osteoarthritis in Nigeria-A survey of self-reported treatment preferences', *Hong Kong Physiotherapy Journal,* 36, pp.1-9.

Ayton, D.R., Barker, A.L., Morello, R.T., Brand, C.A., Talevski, J., Landgren, F.S., Melhem, M.M., Bian, E., Brauer, S.G., Hill, K.D. and Livingston, P.M. (2017) 'Barriers and enablers to the implementation of the 6-PACK falls prevention program: A pre-implementation study in hospitals participating in a cluster randomised controlled trial', *Public Library of Science ONE,* 12(2), p.e0171932.

Baarends, E., Van der Klink, M. and Thomas, A. (2017) 'An exploratory study on the teaching of evidence-based decision making', *The Open Journal of Occupational Therapy,* 5(3), p.8.

Babatunde, F.O., MacDermid, J.C. and MacIntyre, N. (2017) 'A therapist-focused knowledge translation intervention for improving patient adherence in musculoskeletal physiotherapy practice', *Archives of Physiotherapy* 7(1), p.1.

Baiardini, I., Braido, F., Bonini, M., Compalati, E. and Canonica, G.W. (2009) 'Why do doctors and patients not follow guidelines?', *Current opinion in allergy and clinical immunology,* 9(3), pp.228-233.

Baker, R., Camosso-Stefinovic, J., Gillies, C., Shaw, E.J., Cheater, F., Flottorp, S., Robertson, N., Wensing, M., Fiander, M., Eccles, M.P. and Godycki-Cwirko, M. (2015) 'Tailored interventions to address determinants of practice', *The Cochrane Library*.

Baldassari, C.M. (2017) 'Do Clinical Practice Guidelines Improve Quality?', *Otolaryngology–Head and Neck Surgery,* 157(1), pp.5-6.

Ball, B. (2012) *A summary of motivation theories*. [online]. Available at: https://www.yourcoach.be/blog/wp-content/uploads/2012/03/a-summary-of-motivation-theories1.pdf. (Accessed: 10 November 2017). pp.1-26.

Bamberger, P. (2017) 'Construct Validity Research in AMD', *Academy of Management Discoveries,* 3(3), pp.235-238.

Bandura, A. (1997) *Self-efficacy: The exercise of control*. 2nd edn. New York: W.H. Freeman and Co.

Barth, J.H., Misra, S., Aakre, K.M., Langlois, M.R., Watine, J., Twomey, P.J. and Oosterhuis, W.P. (2016) 'Why are clinical practice guidelines not followed?', *Clinical Chemistry and Laboratory Medicine (CCLM),* 54(7), pp.1133-1139.

Beam, A.L., Kartoun, U., Pai, J.K., Chatterjee, A.K., Fitzgerald, T.P., Shaw, S.Y. and Kohane, I.S. (2017) 'Predictive Modeling of Physician-Patient Dynamics That Influence Sleep Medication Prescriptions and Clinical Decision-Making', *Scientific Reports, 7*.

Beckman, M.G., Hooper, W.C., Critchley, S.E. and Ortel, T.L. (2010) 'Venous thromboembolism: a public health concern', *American journal of preventive medicine,* 38(4), pp. S495-S501.

Beggs, C. and Sumsion, T. (1997) 'After the workshop: a model to evaluate long-term benefits of continuing education', *Physiotherapy Canada,* 49(4), pp.279-283.

Bekkering, G., Tulder, van, Hendriks, E., Koopmanschap, M., Knol, D., Bouter, L. and Oostendorp, R. (2005a) 'Implementation of clinical guidelines on physical therapy for patients with low back pain: Randomized trial comparing patient outcomes after a standard and active implementation strategy', *Physical Therapy*, 85(6), pp. 544–55.

Bekkering, G.E., Hendriks, H.J.M., Van Tulder, M.W., Knol, D.L., Hoeijenbos, M., Oostendorp, R.A.B. and Bouter, L.M. (2005b) 'Effect on the process of care of an active strategy to implement clinical guidelines on physiotherapy for low back pain: a cluster randomised controlled trial', *Quality and Safety in Health Care*, 14(2), pp.107-112.

Berg, B. L. and Howard, L. (2012) *Qualitative Research Methods for the Social Sciences.* 8th edn. USA: Pearson Educational Inc.

Bernhardsson, S. and Larsson, M., E. (2013) 'Measuring evidence-based practice in physical therapy: Translation, adaptation, further development, validation, and reliability test of a questionnaire', *Physical Therapy*, 93(6), pp. 819–832.

Bernhardsson, S., Johansson, K., Nilsen, P., Oberg, B. and Larsson, M.E.H. (2013) 'Determinants of guideline use in primary care physical therapy: A cross-sectional survey of attitudes, knowledge, and behaviour', *Physical Therapy*, 94(3), pp. 343–354.

Bernhardsson, S., Larsson, M.E., Eggertsen, R., Olsén, M., Johansson, K., Nilsen, P., Nordeman, L., van Tulder, M. and Öberg, B. (2014) 'Evaluation of a tailored, multi-component intervention for implementation of evidence-based clinical practice guidelines in primary care physical therapy: A non-randomized controlled trial', *BioMed Central Health Services Research*, 14(1), p. 105.

Bernhardsson, S., Öberg, B., Johansson, K., Nilsen, P. and Larsson, M.E. (2015) 'Clinical practice in line with evidence? A survey among primary care physiotherapists in western Sweden', *Journal of evaluation in clinical practice*, 21(6), pp.1169-1177.

Bérubé, M.È., Poitras, S., Bastien, M., Laliberté, L.A., Lacharité, A. and Gross, D.P. (2018) 'Strategies to translate knowledge related to common musculoskeletal conditions into physiotherapy practice: a systematic review', *Physiotherapy*, 104(1), pp.1-8.

Bezoian, S., Rejeski, W.J. and McAuley, E. (1994) 'Self-efficacy influences feeling states associated with acute exercise', *Journal of Sport and Exercise Psychology*, 16(3), pp.326-333.

Bhattacharyya, O.K., Estey, E.A. and Zwarenstein, M. (2011) 'Methodologies to evaluate the effectiveness of knowledge translation interventions: A primer for researchers and health care managers', *Journal of Clinical Epidemiology*, 64(1), pp. 32–40.

Birrenbach, T., Kraehenmann, S., Perrig, M., Berendonk, C. and Huwendiek, S. (2016) 'Physicians' attitudes toward, use of, and perceived barriers to clinical guidelines: a survey among swiss physicians', *Advances in medical education and practice*. 7. p. 673.

Blankenship, S.S. and Ruona, W.E. (2007) 'Professional Learning Communities and Communities of Practice: A Comparison of Models, Literature Review', [Online]. Available at: https://files.eric.ed.gov/fulltext/ED504776.pdf. (Accessed: 12 May 2016).

Blanpied, P.R., Gross, A.R., Elliott, J.M., Devaney, L.L., Clewley, D., Walton, D.M., Sparks, C., Robertson, E.K., Altman, R.D., Beattie, P. and Boeglin, E. (2017) 'Neck Pain: Revision 2017: Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health from the Orthopaedic Section of the American Physical Therapy Association', *Journal of Orthopaedic and Sports Physical Therapy*, 47(7), pp. A1-A83.

Bob Tripicchio PT, D., Kris Bykerk PT, M.B.A. and Wegner, J. (2009) 'Increasing patient participation: the effects of training physical and occupational therapists to involve geriatric patients in the concerns-clarification and goal-setting processes', *Journal of Physical Therapy Education*, 23(1), p.55.

Bollen, K. A. (1989) *Structural Equations with Latent Variables.* New York: John Wiley and Sons

Boström, A.-M., Rudman, A., Ehrenberg, A., Gustavsson, J. and Wallin, L. (2013) 'Factors associated with evidence-based practice among registered nurses in Sweden: A national cross-sectional study', *BioMed Central Health Services Research*, 13(1), p. 165.

Boström, A.M., Sommerfeld, D.K., Stenhols, A.W. and Kiessling, A. (2018) 'Capability beliefs on, and use of evidence-based practice among four health professional and student groups in geriatric care: A cross sectional study' *Public Library of Science ONE,* 13(2), p.e 0192017.

Boyd, C.M., Darer, J., Boult, C., Fried, L.P., Boult, L. and Wu, A.W. (2005) 'Clinical practice guidelines and quality of care for older patients with multiple comorbid diseases: implications for pay for performance', *JAMA,* 294(6), pp.716-724.

Brennan, G.P., Fritz, J.M. and Hunter, S.J. (2006) 'Impact of continuing education interventions on clinical outcomes of patients with neck pain who received physical therapy', ***Physical Therapy****, 86*(9), pp.1251-1262.

Bridges, P.H., Bierema, L.L. and Valentine, T. (2007) 'The propensity to adopt evidence-based practice among physical therapists', ***BioMed Central Health Services Research***, 7(1), p.103.

Brown, C.J., Gottschalk, M., Van Ness, P.H., Fortinsky, R.H. and Tinetti, M.E. (2005) 'Changes in physical therapy providers' use of fall prevention strategies following a multicomponent behavioural change intervention', ***Physical Therapy***, 85(5), pp.394-403.

Bryman, A. (2001) *Social research methods*.5th edn. Oxford, UK: Oxford university press.

Bryman, A. (2015) *Social research methods*.5th edn. Oxford, UK: Oxford university press.

Buchard, P.A. (2009) 'Evidence based practice: Position of French-speaking physiotherapists in Valais Switzerland', ***Physiotherapy, the journal***, 9(91) pp. 50-57

Burke, S., (1998) 'Missing values, outliers, robust statistics and non-parametric methods', *LG-GC Europe Online Supplement*. pp.19-25

Byrne, B. M. (2005) 'Factor analytic models: Viewing the structure of an assessment instrument from three perspectives', *Journal of Personality Assessment*. 85 (1). pp. 17-32.

Cabana, M., Rand, C., Powe, N., Wu, A., Wilson, M., Abboud, P. and Rubin, H. (1999) 'Why don't physicians follow clinical practice guidelines? A framework for improvement', *JAMA,* 282(15), pp. 1458–65.

Cabana, M.D., Rand, C.S., Becher, O.J. and Rubin, H.R. (2001) 'Reasons for pediatrician nonadherence to asthma guidelines', *Archives of pediatrics and adolescent medicine*, 155(9), pp.1057-1062.

Camden, C., Rivard, L., Pollock, N. and Missiuna, C. (2015) 'Knowledge to practice in developmental coordination disorder: impact of an evidence-based online module on physical therapists' self-reported knowledge, skills, and practice', *Physical and occupational therapy in pediatrics*, 35(2), pp.195-210.

Camden, C., Rivard, L.M., Hurtubise, K., Héguy, L. and Berbari, J. (2017) 'Can a Community of Practice Improve Physical Therapists' Self-Perceived Practice in Developmental Coordination Disorder?', *Physical therapy*, 97(7), pp.746-755.

Campbell, L., Novak, I., McIntyre, S. and Lord, S. (2013) 'A KT intervention including the evidence alert system to improve clinician's evidence-based practice behaviour-a cluster randomized controlled trial', *Implementation Science*, 8(1), p. 132.

Canadian Health Services Research Foundation (CHSRF) (2003) '*The theory and practice of knowledge brokering in Canada's health system.'*[Online]. Available at: http://www.cfhi-fcass.ca/migrated/pdf/Theory_and_Practice_e.pdf (Accessed: 17 June 2016)

Canadian Institutes of Health Research (CIHR), 2016. Knowledge translation. [Online]. Available at: http://www.cihr-irsc.gc.ca/e/29418.html#2 (Accessed: 21 June 2017)

Cantero-Téllez R, Valdes k, Garcia-Orza, S. and Villafañe, J.H. (2018). 'Current Practice Patterns after Carpal Tunnel Release. A Survey of Clinical Practice Trends', *Mathews Journal of Orthopedics*, 3(1)

Ceccato, N.E., Ferris, L.E., Manuel, D. and Grimshaw, J.M. (2007) 'Adopting health behaviour change theory throughout the clinical practice guideline process', *Journal of Continuing Education in the Health Professions*, 27(4), pp.201-207.

Centers for disease control and prevention (CDC), 2018. *Venous Thromboembolism, Data and statistics* [online]. Available at: https://www.cdc.gov/ncbddd/dvt/data.html. (Accessed: 3rd March 2018).

Chan, W.V., Pearson, T.A., Bennett, G.C., Cushman, W.C., Gaziano, T.A., Gorman, P.N., Handler, J., Krumholz, H.M., Kushner, R.F., MacKenzie, T.D. and Sacco, R.L. (2017) 'ACC/AHA Special Report: Clinical Practice Guideline Implementation Strategies: A Summary of Systematic Reviews by the NHLBI Implementation Science Work Group', *Circulation*, 135(9), pp. e122-e137.

Chapman, G. B. (2004) The psychology of medical decision making. In: Koehler, D. J, and Harvey, N. (eds.) *Blackwell handbook of judgment and decision making.* Malden, USA: Blackwell Publishing. p 585–604

Chartered society of Physiotherapy (CSP), 2018. *'Health Select Committee Sustainability and Transformation Plans Inquiry*, Evidence from the Chartered Society of Physiotherapy. [Online]. Available at: http://www.csp.org.uk/documents/evidence-csp-health-select-committees-sustainability-transformation-plans-inquiry (Accessed: 14 March 2018)

Chaudoir, S.R., Dugan, A.G. and Barr, C.H. (2013) 'Measuring factors affecting implementation of health innovations: A systematic review of structural, organizational, provider, patient, and innovation level measures', *Implementation Science*, 8(1), p. 22.

Cheung, M., Ma, A.K., Thyer, B.A. and Webb, A.E. (2014) 'Research–practice integration in real practice settings: Issues and suggestions', *Research on Social Work Practice*, 25(4), pp.523-530.

Childs, J.D., Cleland, J.A., Elliott, J.M., Teyhen, D.S., Wainner, R.S., Whitman, J.M., Sopky, B.J., Godges, J.J., Flynn, T.W., Delitto, A. and Dyriw, G.M. (2008) 'Neck pain: clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association', *Journal of Orthopaedic and Sports Physical Therapy*, 38(9), pp. A1-A34.

Cleland, J.A., Fritz, J.M., Brennan, G.P. and Magel, J. (2009) Does continuing education improve physical therapists' effectiveness in treating neck pain? A randomized clinical trial', *Physical Therapy*, 89(1), pp.38-47.

Cochran, M. M. (1977) 'A comparison of group day and family child-rearing patterns in Sweden', *Child development*, 48 (2). pp. 702-707.

Cochrane, L.J., Olson, C.A., Murray, S., Dupuis, M., Tooman, T. and Hayes, S. (2007) 'Gaps between knowing and doing: understanding and assessing the barriers to optimal health care', *Journal of continuing education in the health professions*, 27(2), pp.94-102.

Cohen, L., Manion, L. and Morrison, K. (2011) *Research Methods in Education*. 7th edn. London: Routledge

Connolly, P. (2007) *Quantitative data analysis in education: A critical introduction using SPSS*. London: Routledge.

Conway, J.M. and Huffcutt, A.I. (2003) 'A review and evaluation of exploratory factor analysis practices in organizational research', *Organizational research methods*, *6*(2), pp.147-168.

Cooper D.R. and Schindler P.S. (1998) *Business Research Methods.* 6th edn. Boston: Irwin/ McGraw-Hill.

Cooper, J.A., Cadogan, C.A., Patterson, S.M., Kerse, N., Bradley, M.C., Ryan, C. and Hughes, C.M. (2015) 'Interventions to improve the appropriate use of polypharmacy in older people: a Cochrane systematic review', *British Medical Journal Open*, 5(12), p. e009235.

Coryn, C.L., Noakes, L.A., Westine, C.D. and Schröter, D.C. (2011) 'A systematic review of theory-driven evaluation practices from 1990 to 2009', *American journal of Evaluation*, 32(2), pp.199-226.

Cranley, L.A., Cummings, G.G., Profetto-McGrath, J., Toth, F. and Estabrooks, C.A. (2017) 'Facilitation roles and characteristics associated with research use by healthcare professionals: a scoping review', *British Medical Journal Open*, 7(8), p.e 014384.

Creswell, J.W. (2014) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches.* 4th edn. Thousand Oaks, California, USA: Sage Publications, Inc.

Creswell, J.W. and Creswell, J.D. (2018) Research *design: Qualitative, quantitative, and mixed methods approach*. 5th edn. Thousand Oaks, California, USA: Sage Publications, Inc.

Cronbach, L.J. (1951) 'Coefficient alpha and the internal structure of tests', *Psychometrika*, 16(3), pp.297-334.

Crotty, M (1998*) The foundations of social research: meaning and perspective in the research process*, London: SAGE publications.

Cunningham, K.B. (2014) 'Social research design: framework for integrating philosophical and practical elements', *Nurse Researcher,* 22(1), p.32.

Cunningham, K.B. (2014) 'Social research design: framework for integrating philosophical and practical elements', *Nurse Researcher* 22(1), p.32.

Curran, J.A., Grimshaw, J.M., Hayden, J.A. and Campbell, B. (2011) 'Knowledge translation research: the science of moving research into policy and practice', *Journal of Continuing Education in the Health Professions*, 31(3), pp.174-180.

Curran, P.J., Bollen, K.A., Paxton, P., Kirby, J. and Chen, F. (2002) 'The noncentral chi-square distribution in misspecified structural equation models: Finite sample results from a Monte Carlo simulation", *Multivariate Behavioural Research*, 37(1), pp.1-36.

Curran, V.R. and Fleet, L. (2005) 'A review of evaluation outcomes of web-based continuing medical education', *Medical education,* 39(6), pp.561-567.

Curtis, K., Fry, M., Shaban, R.Z. and Considine, J. (2017) 'Translating research findings to clinical nursing practice', *Journal of clinical nursing*, 26(5-6), pp.862-872.

Czaja, R. (1998) 'Questionnaire pretesting comes of age', *Marketing Bulletin-Department of Marketing Massey University*, *9*, pp.52-66.

D. Kahneman and A. Tversky (1979) 'Prospect theory: an analysis of decision under risk', *Econometrica,* 47(2) pp. 263–292

Daemers, D.O., van Limbeek, E.B., Wijnen, H.A., Nieuwenhuijze, M.J. and de Vries, R.G. (2017) 'Factors influencing the clinical decision-making of midwives: a qualitative study', ***BioMed Central** Pregnancy and Childbirth*, 17(1), p.345.

Damschroder, L.J., Aron, D.C., Keith, R.E., Kirsh, S.R., Alexander, J.A. and Lowery, J.C. (2009) 'Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science', *Implementation science*, 4(1), p.50.

Dannapfel, P., Peolsson, A. and Nilsen, P. (2013a) 'What supports physiotherapists' use of research in clinical practice? A qualitative study in Sweden', *Implementation Science,* 8(1), p. 31.

Dannapfel, P., Peolsson, A. and Nilsen, P. (2014) 'A qualitative study of individual and organizational learning through physiotherapists' participation in a research project', *International Journal of Clinical Medicine*, 5(9), pp.514-524.

Dannapfel, P., Peolsson, A., Ståhl, C., Öberg, B. and Nilsen, P. (2013b) 'Applying self-determination theory for improved understanding of physiotherapists' rationale for using research in clinical practice: A qualitative study in Sweden', *Physiotherapy Theory and Practice*, 30(1), pp. 20–28.

DATAUSA, 2018. *Physical therapists.* [online]. Available at: https://datausa.io/profile/soc/291123/ (Accessed: 14 March 2016)

Davidoff, F., Dixon-Woods, M., Leviton, L. and Michie, S. (2015) 'Demystifying theory and its use in improvement', *British Medical Journal Quality and Safety*, 24(3), pp.228-238.

Davies, P., Walker, A.E. and Grimshaw, J.M. (2010) 'A systematic review of the use of theory in the design of guideline dissemination and implementation strategies and interpretation of the results of rigorous evaluations', *Implementation Science*, 5(1), p.14.

Davis, D. and Davis, N. (2010) 'Selecting educational interventions for knowledge translation', *Canadian Medical Association Journal*, 182(2), pp. E89–E93.

Davis, D. and Taylor-Vaisey, A. (1997) 'Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines', *Canadian Medical Association journal*, 157(4), pp. 408–416.

Dawes, M. and Sampson, U. (2003) 'Knowledge management in clinical practice: a systematic review of information seeking behaviour in physicians', *International journal of medical informatics*, 71(1)

De Souza, F.S., Ladeira, C.E. and Costa, L.O. (2017) 'Adherence to Back Pain Clinical Practice Guidelines by Brazilian Physical Therapists: A Cross-sectional Study', *Spine*, 42(21), pp. E1251-E1258.

De Vaus, D. A. (2014) *Surveys in Social Research.* 6th edn. Abingdon, UK: Routledge.

De Vaus, D.A. (1996) *Surveys in Social Research.* 4th edn. London: University College of London Press.

Deci, E.L. and Ryan, R.M. (1985) 'The general causality orientations scale: Self-determination in personality', *Journal of research in personality*, 19(2), pp.109-134.

Demmelmaier, I., Denison, E., Lindberg, P. and Åsenlöf, P. (2012) 'Tailored skills training for practitioners to enhance assessment of prognostic factors for persistent and disabling back pain: four quasi-experimental single-subject studies', *Physiotherapy theory and practice*, 28(5), pp.359-372.

Denscombe, M. (2014) *The good research guide: for small-scale social research projects.* 5th edn. Maindenhead, England: Open University Press.

Denzin, N. K. and Lincoln, Y.S. (2005) *The SAGE Handbook of Qualitative Research*. 3rd edn. Thousand Oaks, California, USA: Sage Publications, Inc.

Deutsch, J.E., Romney, W., Reynolds, J. and Manal, T.J. (2015) 'Validity and usability of a professional association's web-based knowledge translation portal: American physical therapy association's PTNow.org', *BioMed Central Medical Informatics and Decision Making*, 15(1), p.79.

DiClemente, C.C. and Prochaska, J.O. (1983) 'Stages and processes of self-change of smoking: toward an integrative model of change', *Journal of consulting and clinical Psychology*, 51(3), pp.390-395.

Dinu, G. and Dinu, L. (2014) 'Using Internet as a commercial tool: A case study of e-commerce in Resita', *Procedia Engineering*, 69, pp.469-476.

Dizon, J.M., Dizon, R.J., Regino, J. and Gabriel, A. (2014a) 'Evidence-based practice training for health professionals in the Philippines', *Advances in medical education and practice*, 5, pp.89 - 94

Dizon, J.M., Machingaidze, S. and Grimmer, K. (2016) 'To adopt, to adapt, or to contextualise? The big question in clinical practice guideline development', *BMC research notes*, 9(1), p.442.

Dizon, J.M.R., Grimmer-Somers, K. and Kumar, S. (2014b) 'Effectiveness of the tailored evidence-based practice training program for Filipino physical therapists: A randomized controlled trial', *BioMed Central Medical Education*, 14(1), p. 147.

Dobbins, M., Ciliska, D., Cockerill, R., Barnsley, J. and DiCenso, A. (2002) 'A framework for the dissemination and utilization of research for health-care policy and practice', *Worldviews on Evidence-Based Nursing*, 9(1), pp.149-160.

Dobbins, M., Hanna, S.E., Ciliska, D., Manske, S., Cameron, R., Mercer, S.L., O'Mara, L., DeCorby, K. and Robeson, P. (2009) 'A randomized controlled trial evaluating the impact of knowledge translation and exchange strategies', *Implementation science*, 4(1), p.61.

Donald R. Cooper, Pamela S. Schindler (1998) *Business Research Methods*. 6th edn. Boston: Irwin/McGraw-Hill.

Eagly, A. H., and Chaiken, S. (1993). *The psychology of attitudes.* Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.

Edwards, I., Jones, M., Carr, J., Braunack-Mayer, A. and Jensen, G.M. (2004) 'Clinical reasoning strategies in physical therapy', *Physical Therapy,* 84(4), pp.312-330.

Eiselen, R., Uys, T. and Potgieter, T. (2007) *Analysing survey data using SPSS13*. 3rd edn. Johannesburg: STATKON, University of Johannesburg

El Morr, C., and Subercaze, J. (2010). Knowledge management in healthcare. In M. M. Cruz-Cunha, A. J. Tavares, R. J. Simões. (eds.) *Handbook of Research on Developments in e-Health and Telemedicine: Technological and Social Perspectives*. Medical Information Science Reference, Hershey, Pennsylvania: IGI Global pp. 490-510.

Eldh, A.C. and Wallin, L. (2015) 'How Single Is" Single"-Some Pragmatic Reflections on Single Versus Multifaceted Interventions to Facilitate Implementation: Comment on" Translating Evidence Into Healthcare Policy and Practice: Single Versus Multifaceted Implementation Strategies–Is There a Simple Answer to a Complex Question?", *International journal of health policy and management,* 4(10), p.699.

Ellen, M.E. (2012) '*Knowledge translation framework for ageing and health'*, Geneva: Department of Ageing and Life-Course, WHO. (Online). Available at: http://www.who.int/ageing/publications/knowledge_translation.pdf. (Accessed: 11 March 2015)

Elshaug, A.G., Watt, A.M., Mundy, L. and Willis, C.D. (2012) 'Over 150 potentially low-value health care practices: an Australian study', *The Medical Journal of Australia*, 197(10), pp.556-560.

Elwyn, G., Stiel, M., Durand, M.A. and Boivin, J. (2011) 'The design of patient decision support interventions: Addressing the theory–practice gap', *Journal of evaluation in clinical practice*, 17(4), pp.565-574.

Elwyn, G., Stiel, M., Durand, M.A. and Boivin, J. (2011) 'The design of patient decision support interventions: Addressing the theory–practice gap', *Journal of evaluation in clinical practice*, 17(4), pp.565-574.

English Oxford living dictionaries. Barrier. 2018. [Online]. Available at: https://en.oxforddictionaries.com/definition/barrier. (Accessed: 17 March 2018)

Effective Practice and Organisation of Care (EPOC) (2015) *Taxonomy-topics list*. Available at: http://epoc.cochrane.org/sites/epoc.cochrane.org/files/uploads/2015%20EPOC%20Taxonomy%20FINAL.pdf. (Accessed: 26 June 2016).

Ernstzen, D.V., Louw, Q.A. and Hillier, S.L. (2017) 'Clinical practice guidelines for the management of chronic musculoskeletal pain in primary healthcare: a systematic review', *Implementation Science*, 12(1), p.1.

Estabrooks, C.A. (1999) 'Modeling the individual determinants of research utilization', *Western Journal of Nursing Research*, 21(6), pp. 758–772.

Eyisi, D. (2016) 'The Usefulness of Qualitative and Quantitative Approaches and Methods in Researching Problem-Solving Ability in Science Education Curriculum', *Journal of Education and Practice*, 7(15), pp.91-100.

Farmer, A.P., Légaré, F., Turcot, L., Grimshaw, J., Harvey, E., McGowan, J.L. and Wolf, F. (2008) 'Printed educational materials: effects on professional practice and health care outcomes', *Cochrane Database Systematic Review*, *3*(3).

Ferreira, D. (2017) 'Utilizing Behaviour Change techniques to elicit adherence to Clinical Practice Guidelines', *Frontiers in public health*, *5*, p.7

Fink, A. (2017) *How to conduct surveys: A step-by-step guide*. 6thedn. Los Angeles: Sage Publications.

Fischer, F., Lange, K., Klose, K., Greiner, W. and Kraemer, A. (2016) 'Barriers and strategies in guideline implementation—a scoping review', *Healthcare* 4(3), p.36.

Ford, J., Korjonen, H., Keswani, A. and Hughes, E. (2015) 'Virtual communities of practice: can they support the prevention agenda in public health?', *Online journal of public health informatics*, *7*(2).

Forsetlund, L., Bjørndal, A., Rashidian, A., Jamtvedt, G., O'Brien, M.A., Wolf, F.M., Davis, D., Odgaard-Jensen, J. and Oxman, A.D. (2009) 'Continuing education meetings and workshops: effects on professional practice and health care outcomes', *The Cochrane Library*. Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD003030.

Fowler, F.J. (2009) *Survey research methods.* 4th edn. Thousand Oaks, California, USA: Sage Publications, Inc.

Francke, A.L., Smit, M.C., de Veer, A.J. and Mistiaen, P. (2008) 'Factors influencing the implementation of clinical guidelines for health care professionals: a systematic meta-review', *BioMed Central medical informatics and decision making*, 8(1), p.38.

Franco, L.M., Bennett, S. and Kanfer, R. (2002) 'Health sector reform and public-sector health worker motivation: a conceptual framework', *Social science and medicine*, 54(8), pp.1255-1266.

Fristedt, S., Areskoug-Josefsson, K. and Kammerlind, A.S. (2016) 'Factors influencing the use of evidence based practice among physiotherapists and occupational therapists in their clinical work', *The Internet Journal of Allied Health Sciences and Practice*, 14(3), pp.1-13.

Fritz, J.M., Cleland, J.A. and Brennan, G.P. (2007) 'Does adherence to the guideline recommendation for active treatments improve the quality of care for patients with acute low back pain delivered by physical therapists?', *Medical care*, 45(10), pp.973-980.

Fruth, S.J., Van Veld, R.D., Despos, C.A., Martin, R.D., Hecker, A. and Sincroft, E.E. (2010) 'The influence of a topic-specific, research-based presentation on physical therapists' beliefs and practices regarding evidence-based practice', *Physiotherapy Theory and Practice*, 26(8), pp.537-557.

Fuller, G.W., Nelson-Piercy, C., Hunt, B.J., Lecky, F.E., Thomas, S., Horspool, K. and Goodacre, S. (2018) 'Consensus-derived clinical decision rules to guide advanced imaging decisions for pulmonary embolism in pregnancy and the postpartum period', *European Journal of Emergency Medicine*, 25(3), pp. 221–222

Gabbay, J. and le May, A. (2004) 'Evidence based guidelines or collectively constructed "mindlines?" Ethnographic study of knowledge management in primary care', *British Medical Journal*, 329(7473), p.1013.

Gad El-Rab, W., Zaïane, O.R. and El-Hajj, M. (2017) 'Formalizing clinical practice guideline for clinical decision support systems', *Health informatics journal*, 23(2), pp.146-156.

Gagliardi, A.R. (2012) 'Translating knowledge to practice: optimizing the use of guidelines', *Epidemiology and psychiatric sciences*, 21(3), pp.231-236.

Gagliardi, A.R., Brouwers, M.C., Palda, V.A., Lemieux-Charles, L. and Grimshaw, J.M. (2011) 'How can we improve guideline use? A conceptual framework of implementability', *Implementation Science*, 6(1), p.26.

Gagliardi, A.R., Marshall, C., Huckson, S., James, R. and Moore, V. (2015) 'Developing a checklist for guideline implementation planning: review and synthesis of guideline development and implementation advice', *Implementation Science*, 10(1), p.19.

Gagné, M. and Deci, E.L. (2005) 'Self-determination theory and work motivation', *Journal of Organizational behaviour*, 26(4), pp.331-362.

Gardner, T., Refshauge, K., Smith, L., McAuley, J., Hübscher, M. and Goodall, S. (2017) 'Physiotherapists' beliefs and attitudes influence clinical practice in chronic low back pain: a systematic review of quantitative and qualitative studies', *Journal of physiotherapy*, 63(3), pp.132-143.

Garland, K.V. (2013) 'A survey of United States dental hygienists' knowledge, attitudes, and practices with infection control guidelines', *American Dental Hygienists Association*, 87(3), pp.140-151.

Geleris, P. and Boudoulas, H. (2011) 'Problems related to the application of guidelines in clinical practice. A critical analysis.', *Hellenic Journal of Cardiology*, 52, pp.97-102.

Gelman, A. (2008) 'Scaling regression inputs by dividing by two standard deviations', *Statistics in medicine*, 27(15), pp.2865-2873.

Gené-Badia, J., Gallo, P., Caïs, J., Sánchez, E., Carrion, C., Arroyo, L. and Aymerich, M. (2016) 'The use of clinical practice guidelines in primary care: professional mindlines and control mechanisms', Gaceta *Sanitaria*, 30(5), pp.345-351.

Gezer, N., Yildirim, B. and Özaydin, E. (2017) 'Factors in the Critical Thinking Disposition and Skills of Intensive Care Nurses', *Journal of Nursing and Care*, 6(390), pp.2167-1168.

Gigerenzer, G. and Goldstein, D.G. (1996) 'Reasoning the fast and frugal way: models of bounded rationality', *Psychological review*, 103(4), p.650.

Giguère A, Légaré F, Grimshaw J, Turcotte S, Fiander M, Grudniewicz A, Makosso-Kallyth S, Wolf FM, Farmer AP, Gagnon MP. (2012). Printed educational materials: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews 2012*. Issue 10. Art. No.: CD004398

Gómez, M.M., Rodríguez, S.E., Ramos, D.E., Fernández, A.C., Montejo, G.A. and García, O.L. (2009) 'Durability of the effects of a quality improvement intervention in hypertensive patients on long-term follow-up (CICLO-RISK study)', *Atencion primaria*, 41(7), pp.371-378.

Good, M. and Moore, S.M. (1996) 'Clinical practice guidelines as a new source of middle-range theory: Focus on acute pain', *Nursing Outlook*, 44(2), pp.74-79.

Gorard, S. (2001) *Quantitative Methods in Educational Research: The role of numbers made easy*. London: Continuum.

Gorgon, E.J.R., Barrozo, H.G.T., Mariano, L.G. and Rivera, E.F. (2012) 'Research evidence uptake in a developing country: a survey of attitudes, education and self-efficacy, engagement, and barriers among physical therapists in the Philippines', *Journal of evaluation in clinical practice*, 19(5), pp.782-790.

Graham, I. and Logan, J. (2004b) 'Innovations in knowledge transfer and continuity of care', *The Canadian journal of nursing research Archive',* 36(2), pp. 89–103.

Graham, I.D., Kothari, A. and McCutcheon, C. (2018) 'Moving knowledge into action for more effective practice, programmes and policy: protocol for a research programme on integrated knowledge translation', *Implementation Science*, 13(1), p.22.

Graham, I.D., Logan, J., Harrison, M.B., Straus, S.E., Tetroe, J., Caswell, W. and Robinson, N. (2006) 'Lost in knowledge translation: time for a map?', *Journal of continuing education in the health professions*, 26(1), pp.13-24.

Graham, K. and Logan, J. (2004a) 'Using the Ottawa model of research use to implement a skin care program', *Journal of Nursing Care Quality*, 19(1), pp. 18–26.

Graham, R., Steinberg, E., Greenfield, S., Wolman, D.M., and Mancher, M. (2011) 'Promoting Adoption of Clinical Practice Guidelines'. in *Clinical practice guidelines we can trust*. Institute of Medicine (US) Committee on Standards for Developing Trustworthy Clinical Practice Guidelines, Washington (DC), USA: National Academies Press.

Gray, D.E. (2013) *Doing research in the real world*. 3rd edn. London: Sage publications

Grimshaw, J.M., Eccles, M.P., Lavis, J.N., Hill, S.J. and Squires, J.E. (2012) 'Knowledge translation of research findings', *Implementation Science*, 7(1), p. 50.

Grol R, Wensing M, Eccles M, Davis D. (2013) *Improving patient care: the implementation of change in health care.* 2nd edn. Hoboken, USA: Wiley- Blackwell.

Grol, R. (2001) 'Successes and failures in the implementation of evidence-based guidelines for clinical practice', *Medical care*, 39(8 Suppl 2): II46-54.

Grol, R. and Grimshaw, J. (2003) 'From best evidence to best practice: Effective implementation of change in patients' care', *The Lancet*, 362(9391), pp. 1225–1230.

Gross, D.P. and Lowe, A. (2009) 'Evaluation of a knowledge translation initiative for physical therapists treating patients with work disability', *Disability and rehabilitation*, 31(11), pp.871-879.

Grudniewicz, A., Kealy, R., Rodseth, R.N., Hamid, J., Rudoler, D. and Straus, S.E. (2015) 'What is the effectiveness of printed educational materials on primary care physician knowledge,

behaviour, and patient outcomes: a systematic review and meta-analyses', *Implementation Science*, 10(1), p.164.

Guay, F., Chanal, J., Ratelle, C.F., Marsh, H.W., Larose, S. and Boivin, M. (2010) 'Intrinsic, identified, and controlled types of motivation for school subjects in young elementary school children', *British Journal of Educational Psychology*, 80(4), pp.711-735.

Guay, F., Vallerand, R.J. and Blanchard, C. (2000) 'On the assessment of situational intrinsic and extrinsic motivation: The Situational Motivation Scale (SIMS)', *Motivation and emotion*, 24(3), pp.175-213.

Gundersen, L. (2000) 'The effect of clinical practice guidelines on variations in care', *Annals of Internal Medicine*, 133(4), pp.317-317.

Gurses, A.P., Marsteller, J.A., Ozok, A.A., Xiao, Y., Owens, S. and Pronovost, P.J. (2010) 'Using an interdisciplinary approach to identify factors that affect clinicians' compliance with evidence-based guidelines', *Critical care medicine*, 38, pp. S282-S291.

Haagen, E.C., Nelen, W.L.D.M., Hermens, R.P.M.G., Braat, D.D.M., Grol, R.P.T.M. and Kremer, J.A.M. (2005) 'Barriers to physician adherence to a subfertility guideline', *Human Reproduction*, 20(12), pp.3301-3306.

Hair, J. F., Sarstedt, M., Ringle, C. M. and Gudergan, S. P. (2018) *Advanced Issues in Partial Least Squares Structural Equation Modeling (PLS-SEM).* Thousand Oaks, CA: Sage

Hair, J.F., Hult, G.T.M., Ringle, C.M., and Sarstedt, M. (2017) *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* 2nd edn., Thousand Oaks, CA: Sage.

Hajjaj, F.M., Salek, M.S., Basra, M.K. and Finlay, A.Y. (2010) 'Non-clinical influences on clinical decision-making: a major challenge to evidence-based practice', *Journal of the Royal Society of Medicine*, 103(5), pp.178-187.

Hanlis, E., Curley, J. and Abbass, P. (2009) Virtual Communities of Practice for Health Care Professionals in *Encyclopedia of Information Science and Technology.* 2nd edn. USA: Information Science Reference, IGI Global. (pp. 3986-3991).

Hanney, W.J., Masaracchio, M., Liu, X. and Kolber, M.J. (2016) 'The influence of physical therapy guideline adherence on healthcare utilization and costs among patients with low back pain: a systematic review of the literature' *Public Library of Science ONE*, 11(6), p.e 0156799.

Harting, J., Rutten, G.M., Rutten, S.T. and Kremers, S.P. (2009) 'A qualitative application of the diffusion of innovations theory to examine determinants of guideline adherence among physical therapists', *Physical Therapy*, 89(3), pp.221-232.

Heighes, P.T. and Doig, G.S. (2014) 'Intensive care specialists' knowledge, attitudes, and professional use of published research evidence: A mail-out questionnaire survey of appropriate use of research evidence in clinical practice', *Journal of Critical Care*, 29(1), pp. 116–122.

Henrik R. Wulff. and Peter C. Gotzsche. (2000). *Rational Diagnosis and Treatment: Evidence Based Clinical Decision-Making*. 3rd edn. Oxford, London: Blackwell Science Ltd.

Higgs, J. and Titchen, A. (1995) 'The nature, generation and verification of knowledge', *Physiotherapy*, 81(9), pp.521-530.

Hillegass, E., Puthoff, M., Frese, E.M., Thigpen, M., Sobush, D.C. and Auten, B. (2016) 'Role of physical therapists in the management of individuals at risk for or diagnosed with venous thromboembolism: Evidence-based clinical practice guideline', *Physical Therapy*, 96(2), pp.143-166.

Hisham, R., Ng, C.J., Liew, S.M., Hamzah, N. and Ho, G.J. (2016) 'Why is there variation in the practice of evidence-based medicine in primary care? A qualitative study', *British Medical Journal Open*, 6(3), p. e010565.

Hoeijenbos, M., Bekkering, T., Lamers, L., Hendriks, E., van Tulder, M. and Koopmanschap, M. (2005) 'Cost-effectiveness of an active implementation strategy for the Dutch physiotherapy guideline for low back pain', *Health policy*, 75(1), pp.85-98.

Hoesing, H. (2016) 'Clinical Practice Guidelines: Closing the Gap Between Theory and Practice', *White paper*. Joint Commission International. [Online] Available at: https://www.elsevier.com/__data/assets/pdf_file/0007/190177/JCI-Whitepaper_cpgs-closing-the-gap.pdf. (Accessed: 18 March 2016).

Hogan, D.L. and Logan, J. (2004) 'The Ottawa model of research use', *Clinical Nurse Specialist*, 18(5), pp. 255–261.

Hogg, M., and Vaughan, G. (2005). *Social psychology*. 4th edn. London: Prentice Hall.

Hogg, M., and Vaughan, G. (2018). *Social psychology*. 8th edn. Harlow, UK: Pearson.

Holden, M.T. and Lynch, P. (2004) 'Choosing the appropriate methodology: Understanding research philosophy', *The marketing review*, 4(4), pp.397-409.

Holmes-Smith, H., Coote, L., and Cunningham, E. (2006). *Structural Equation Modeling: From the Fundamentals to Fdvanced Topics*. Melbourne: School Research, Evaluation and Measurement Services.

Hormigo, P.A., Viciana, L.M., Gómez, J.L., Gallego, P.M., Orellana, L.J. and Morales, A.J. (2009) 'Improved effectiveness in the management of cardiovascular risk among type 2 diabetic patients in primary health care', *Atencion primaria*, 41(5), pp.240-245.

Howard, M.O. and Jenson, J.M. (1999) 'Clinical practice guidelines: Should social work develop them?', Research *on Social Work Practice*, 9(3), pp.283-301.

Hox, J. J. and Bechger, T. M. (1998). An introduction to structural equation modeling. *Family Science Review*, 11, pp.354-373.

Hsu, S.C., Liu, C.F., Weng, R.H. and Chen, C.J. (2013) 'Factors influencing nurses' intentions toward the use of mobile electronic medical records', *Computers, Informatics, Nursing*, 31(3), pp.124-132.

Hudon, A., Gervais, M.J. and Hunt, M. (2015) 'The contribution of conceptual frameworks to knowledge translation interventions in physical therapy', *Physical Therapy*, 95(4), pp.630-639.

Hurtubise, K., Rivard, L., Héguy, L., Berbari, J. and Camden, C. (2016) 'Virtual knowledge brokering: describing the roles and strategies used by knowledge brokers in a pediatric physiotherapy virtual community of practice', Journal *of Continuing Education in the Health Professions*, *36*(3), pp.186-194.

Iles, R. and Davidson, M. (2006) 'Evidence based practice: A survey of physiotherapists' current practice', *Physiotherapy research international: the journal for researchers and clinicians in physical therapy*, 11(2), pp. 93–103.

Jaap, Van der, Bijl and Shortridge-Baggett, L.M. (2001) 'The theory and measurement of the self-efficacy construct', in Elizabeth R. Lenz and Lillie M. Shortridge-Baggett (eds) *Self-efficacy in nursing: Research and measurement perspectives*. Broadway, New York:Springer Publishing Company, pp.9-26

Jain, A. and Cifu, A.S. (2017) 'Antithrombotic therapy for venous thromboembolic disease', *JAMA*, 317(19), pp.2008-2009.

Janssens, W., De Pelsmacker, P. and Van Kenhove, P. (2008) *Marketing research with SPSS*. Essex, England: Pearson Education Limited.

Jeon, J. (2015) 'The strengths and limitations of the statistical modeling of complex social phenomenon: Focusing on SEM, path analysis, or multiple regression models', *International Journal of Social, Behavioural, Educational, Economic, Business and Industrial Engineering*,9 (5), pp.1559-1567.

Jette, D.U., Bacon, K., Batty, C., Carlson, M., Ferland, A., Hemingway, R.D., Hill, J.C., Ogilvie, L. and Volk, D. (2003) 'Evidence-based practice: beliefs, attitudes, knowledge, and behaviours of physical therapists', *Physical Therapy*, 83(9), pp.786-805.

Jewell, D.V. (2018) *Guide to evidence-based physical therapist practice*. 4th edn. Burlington, MA: Jones & Bartlett Publishers.

Jha, A.K., Li, Z., Orav, E.J. and Epstein, A.M. (2005) 'Care in US hospitals—the Hospital Quality Alliance program', *New England Journal of Medicine*, 353(3), pp.265-274.

Johanson, G.A. and Brooks, G.P. (2010) 'Initial scale development: sample size for pilot studies', *Educational and Psychological Measurement*, 70(3), pp.394-400.

Johnson, B. and Christensen, L. (2012) *Educational Research, Qualitative, Quantitative and Mixed Approach.* 4th edn. California: SAGE Publication.

Johnson, E.G., Gowda, C.A.C. and Alharbi, A.A. (2017) 'Differential diagnosis and clinical decision-making in physical therapy: Case report of a complex dizzy patient', *Physical Therapy and Rehabilitation*, 4(1), p.2.

Johnson, M.J. and May, C.R. (2015) 'Promoting professional behaviour change in healthcare: what interventions work, and why? A theory-led overview of systematic reviews', *BMJ open*, *5*(9), p.e 008592.

Jones, C.A., Roop, S.C., Pohar, S.L., Albrecht, L. and Scott, S.D. (2014) 'Translating knowledge in rehabilitation: Systematic review', *Physical Therapy*, 95(4), pp. 663–677.

Jones, S.R., Carley, S. and Harrison, M. (2003) 'An introduction to power and sample size estimation', Emergency *Medicine Journal*, 20(5), pp.453-458.

Jöreskog, Karl G. 1977. Structural Equation Models in the Social Sciences: Specification, Estimation and Testing. In P. R. Krishnaiah (Ed.) *Applications of Statistics*. Amsterdam: North Holland. pp. 265–87.

Kale, M.S., Bishop, T.F., Federman, A.D. and Keyhani, S. (2013) 'Trends in the overuse of ambulatory health care services in the United States', *JAMA internal medicine*, 173(2), pp.142-148.

Karbach, U., Schubert, I., Hagemeister, J., Ernstmann, N., Pfaff, H. and Höpp, H.W. (2011) 'Physicians' knowledge of and compliance with guidelines: an exploratory study in cardiovascular diseases', Deutsches *Ärzteblatt International*, 108(5), p.61.

Kastner, M., Estey, E., Perrier, L., Graham, I.D., Grimshaw, J., Straus, S.E., Zwarenstein, M. and Bhattacharyya, O. (2011) 'Understanding the relationship between the perceived characteristics of clinical practice guidelines and their uptake: protocol for a realist review', *Implementation Science*, 6(1), p.69.

Kathiresan, J. and Patro, B.K. (2013) 'Case vignette: a promising complement to clinical case presentations in teaching', *Education for Health*, 26(1), p.21.

Keiffer, M.R. (2015) 'Utilization of clinical practice guidelines: barriers and facilitators', *Nursing Clinics*, 50(2), pp.327-345.

Kerssens, J.J., Sluijs, E.M., Verhaak, P.F., Knibbe, H.J. and Hermans, I.M. (1999) 'Educating patient educators: enhancing instructional effectiveness in physical therapy for low back pain patients', *Patient education and counseling*, 37(2), pp.165-176.

Ketelaar, M., Russell, D.J. and Gorter, J.W. (2008) 'The challenge of moving evidence-based measures into clinical practice: lessons in knowledge translation', *Physical and occupational therapy in pediatrics*, 28(2), pp.191-206.

Kim, Y.-K., Lee, S.-H., Seo, J.-H., Kim, J.-H., Kim, S.-D. and Kim, G.-K. (2010) 'A comprehensive model of factors affecting adoption of clinical practice guidelines in Korea', *Journal of Korean Medical Science*, 25(11), pp.1568-1573.

Kitson, A., Harvey, G. and McCormack, B. (1998) 'Enabling the implementation of evidence based practice: a conceptual framework', *Quality and Safety in Health Care*, 7(3), pp.149-158.

Kline, R. B. (1998) 'Software programs for structural equation modeling: Amos, EQS, and LISREL', Journal *of Psychoeducational Assessment,* 16, pp. 343-364.

Kline, R. B. (2005) *Principles and Practice of Structural Equation Modelling.* 2nd edn ed. New York: Guilford Press.

Kline, R. B., 2011. Convergence of structural equation modelling and multilevel modelling. In M. Williams and W. P. Vogt. (eds.) *Handbook of methodological innovation.* Thousand Oaks, California, USA: Sage Publications Inc. pp. 562-589.

Kline, R.B. (2015) *Principles and practice of structural equation modelling*. 4th edn. New York, USA: Guilford Publications.

Koes, B.W., van Tulder, M., Lin, C.W.C., Macedo, L.G., McAuley, J. and Maher, C. (2010) 'An updated overview of clinical guidelines for the management of non-specific low back pain in primary care', *European Spine Journal*, *19*(12), pp.2075-2094.

Komajda, M., Lapuerta, P., Hermans, N., Gonzalez-Juanatey, J.R., van Veldhuisen, D.J., Erdmann, E., Tavazzi, L., Poole-Wilson, P. and Le Pen, C. (2005) 'Adherence to guidelines is a predictor of outcome in chronic heart failure: the MAHLER survey', *European heart journal*, *26*(16), pp.1653-1659.

Kortteisto, T., Kaila, M., Komulainen, J., Mäntyranta, T. and Rissanen, P. (2010) 'Healthcare professionals' intentions to use clinical guidelines: a survey using the theory of planned behaviour', *Implementation Science*, *5*(1), p.51.

Koutsavlis, A.T. and Bergeron, P. (2001) '*Disseminating practice guidelines to physicians*. Canada, Quebec: Institut national de santé publique du Québec.

Kraus, E.M., Pelzl, S., Szecsenyi, J. and Laux, G. (2017) 'Antibiotic prescribing for acute lower respiratory tract infections (LRTI)–guideline adherence in the German primary care setting: An analysis of routine data', *Public Library of Science ONE*, *12*(3), p.e 0174584.

Kredo, T., Bernhardsson, S., Machingaidze, S., Young, T., Louw, Q., Ochodo, E. and Grimmer, K. (2016) 'Guide to clinical practice guidelines: the current state of play', *International Journal for Quality in Health Care*, *28*(1), pp.122-128.

Kripanont, N. (2007). *Examining a technology acceptance model of internet usage by academics within Thai business schools.* Doctoral dissertation, Victoria University, Melbourne, Australia.

Kristensen, N., Nymann, C. and Konradsen, H. (2015) 'Implementing research results in clinical practice-the experiences of healthcare professionals', *BioMed Central Health Services Research*, *16*(1), p.48.

Kunnan, A.J. (1998) 'An introduction to structural equation modelling for language assessment research', *Language Testing*, 15(3), pp.295-332.

Ladeira, C.E. (2011) 'Evidence based practice guidelines for management of low back pain: physical therapy implications', *Brazilian Journal of Physical Therapy*, *15*(3), pp.190-199.

Ladeira, C.E., Cheng, M.S. and da Silva, R.A. (2017) 'Clinical Specialization and Adherence to Evidence-Based Practice Guidelines for Low Back Pain Management: A Survey of US Physical Therapists', *Journal of orthopaedic and sports physical therapy*, *47*(5), pp.347-358.

Lai, E. R. (2011) 'Critical thinking: A literature review', Pearson Research Report [online]. Available at https://images.pearsonassessments.com/images/tmrs/Motivation_Review_final.pdf (Accessed: 11 July 2016)

Lavis, J.N., Oxman, A.D., Moynihan, R. and Paulsen, E.J. (2008) 'Evidence-informed health policy 3–Interviews with the directors of organizations that support the use of research evidence', *Implementation Science*, *3*(1), p.55

Learman, K.E., Ellis, A.R., Goode, A.P., Showalter, C. and Cook, C.E. (2014) 'Physical therapists' clinical knowledge of multidisciplinary low back pain treatment guidelines', *Physical Therapy*, *94*(7), pp.934-946.

Leedy, P. and Ormrod, J. E. (2014) *Practical Research Planning and Design*. 10th edn. Edinburgh: Pearson Educational Inc.

Légaré, F., Robitaille, H., Gane, C., Hébert, J., Labrecque, M. and Rousseau, F. (2016) 'Improving Decision Making about Genetic Testing in the Clinic: An Overview of Effective Knowledge Translation Interventions', *Public Library of Science ONE*, 11(3), p.e 0150123.

Leite, W. and Beretvas, S.N. (2010) 'The performance of multiple imputation for Likert-type items with missing data', *Journal of Modern Applied Statistical Methods*, *9*(1), p.8.

Leys, C., Klein, O., Dominicy, Y. and Ley, C. (2018) 'Detecting multivariate outliers: Use a robust variant of the Mahalanobis distance', *Journal of Experimental Social Psychology*, *74*, pp.150-156.

Li, L.C., Grimshaw, J.M., Nielsen, C., Judd, M., Coyte, P.C. and Graham, I.D. (2009) 'Use of communities of practice in business and health care sectors: a systematic review', *Implementation science*, 4(1), p.27.

Liang, L., Bernhardsson, S., Vernooij, R.W., Armstrong, M.J., Bussières, A., Brouwers, M.C. and Gagliardi, A.R. (2017) 'Use of theory to plan or evaluate guideline implementation among physicians: a scoping review', *Implementation Science*, *12*(1), p.26.

Lichtman, M. (2013). *Qualitative Research in Education: A User's Guide.* 3rd edn. USA: SAGE Publication.

Linda, Joy Lee. (2011) 'Knowledge, Science and Clinical Practice: what do we need to know, how do we know what we know and what can, and can't science tell us about how to treat our patients?', *In touch*, Summer (135), pp. 1-9. Available at: https://ljlee.ca/wp-content/uploads/2014/12/LJLee_Knowledge.pdf. Accessed: 5 July 2017.

Lizarondo, L., Grimmer-Somers, K. and Kumar, S. (2011) 'A systematic review of the individual determinants of research evidence use in allied health', *Journal of multidisciplinary healthcare*, *4*, p.261.

Lizarondo, L.M., Grimmer-Somers, K., Kumar, S. and Crockett, A. (2012) 'Does journal club membership improve research evidence uptake in different allied health disciplines: a pre-post study', *BioMed Central research notes*, *5*(1), p.588.

Llor, C., Cots, J.M., Hernández, S., Ortega, J., Arranz, J., Monedero, M.J., de Dios Alcántara, J., Pérez, C., García, G., Gómez, M. and Guerra, G. (2014) 'Effectiveness of two types of intervention on antibiotic prescribing in respiratory tract infections in primary care in Spain. Happy Audit Study; *Atencion primaria*, *46*(9), pp.492-500.

Logan, J. and Graham, I.D. (1998) 'Toward a comprehensive Interdisciplinary model of health care research use', *Science Communication*, 20(2), pp. 227–246.

Lohr, K.N. and Field, M.J. (1992) (eds.) *Guidelines for clinical practice: from development to use*. Institute of Medicine, Washington, DC: National Academies Press. P.8.

Lugtenberg, M., Zegers-van Schaick, J.M., Westert, G.P. and Burgers, J.S. (2009) 'Why don't physicians adhere to guideline recommendations in practice? An analysis of barriers among Dutch general practitioners', *Implementation Science*, *4*(1), p.54.

Luker, K.A. and Kenrick, M. (1992) 'An exploratory study of the sources of influence on the clinical decisions of community nurses', *Journal of advanced nursing*, *17*(4), pp.457-466.

Maas, M.J., van der Wees, P.J., Braam, C., Koetsenruijter, J., Heerkens, Y.F., van der Vleuten, C.P. and Nijhuis-van der Sanden, M.W. (2015) 'An innovative peer assessment approach to enhance guideline adherence in physical therapy: single-masked, cluster-randomized controlled trial', *Physical Therapy*, *95*(4), pp.600-612.

Mairs, K., McNeil, H., McLeod, J., Prorok, J.C. and Stolee, P. (2013) 'Online strategies to facilitate health-related knowledge transfer: a systematic search and review', *Health Information and Libraries Journal*, *30*(4), pp.261-277.

Manchikanti, L., Singh, V., Derby, R., Helm, S., Trescot, A.M., Staats, P.S., Prager, J.P. and Hirsch, J.A. (2008) 'Review of occupational medicine practice guidelines for interventional pain management and potential implications', *Pain Physician*, *11*(3), pp.271-289.

Mareno, N. (2015) 'Applying Middle-Range Concepts and Theories to the Care of Vulnerable Populations. In De. Chesnay. M. and Barbara A. (Eds.) *Caring for the Vulnerable: Perspectives in Nursing Theory, Practice, and Research.* 4th edn. Burlington, Massachusetts, USA: Jones and Bartlett Learning. p.117-140.

Marshall, G.R. (2000) 'Participative Planning and Informal Self-Governance of Agri-Environmental Conflicts: Lessons from a Survey of Australian Farmers Facing Irrigation Salinity', paper presented in the 7th Ulvon Conference on Environmental Economics Ulvön, Sweden, 19-21 June 2000, (pp. 19-21). Available at: https://www.researchgate.net/publication/228883916_Participative_Planning_and_Informal_Self-Governance_of_Agri-Environmental_Conflicts_Lessons_from_a_Survey_of_Australian_Farmers_Facing_Irrigation_Salinity (Accessed: 14 March 2018)

Maxwell, J. A. (2013) *Qualitative Research Design: An Interactive Approach.* 3rd edn. London: SAGE Publication.

McCrae, R.R., Zonderman, A.B., Costa Jr, P.T., Bond, M.H. and Paunonen, S.V. (1996) 'Evaluating replicability of factors in the Revised NEO Personality Inventory: Confirmatory factor analysis versus Procrustes rotation', *Journal of Personality and Social Psychology*, *70*(3), pp.552-566.

Mccreesh, K., Larkin, L. and Lewis, J. (2017) 'Shouldering the burden of evidence-based practice: The experiences of physiotherapists partaking in a community of practice', *Musculoskeletal Science and Practice*, *28*, p.e 4.

McEvoy, M.P., Williams, M.T. and Olds, T.S. (2010a) 'Development and psychometric testing of a trans-professional evidence-based practice profile questionnaire', *Medical teacher*, *32*(9), pp. e373-e380.

McEvoy, M.P., Williams, M.T. and Olds, T.S. (2010b) 'Evidence based practice profiles: differences among allied health professions', *BioMed Central Medical education*, *10*(1), p.69.

McEwen, M. and Wills, E. (2011) Overview of selected middle range nursing theories. In *Theoretical Basis for Nursing.* 3rd edn. Philadelphia: Wolters Kluwer Health/Lippincott Williams and Wilkins. pp.220-248.

McGinnis, P.Q., Hack, L.M., Nixon-Cave, K. and Michlovitz, S.L. (2009) 'Factors that influence the clinical decision making of physical therapists in choosing a balance assessment approach', *Physical Therapy*, *89*(3), pp.233-247.

McGrew, A.G. and Wilson, M.J. (1982) (Eds.) *Decision making: approaches and analysis: a reader*. Manchester: Manchester University Press.

McLoughlin, C., Patel, K.D., O'Callaghan, T. and Reeves, S. (2018) 'The use of virtual communities of practice to improve interprofessional collaboration and education: findings from an integrated review', *Journal of interprofessional care*, *32*(2), pp.136-142.

Mellon, D. (2015) 'Evaluating evidence aid as a complex, multicomponent knowledge translation intervention', *Journal of Evidence-Based Medicine*, 8(1), pp. 25–30.

Menon, A., Korner-Bitensky, N., Kastner, M., McKibbon, K. and Straus, S. (2009) 'Strategies for rehabilitation professionals to move evidence-based knowledge into practice: a systematic review', *Journal of Rehabilitation Medicine*, *41*(13), pp.1024-1032.

Menon-Nair, A., Korner-Bitensky, N. and Ogourtsova, T. (2007) 'Occupational therapists' identification, assessment, and treatment of unilateral spatial neglect during stroke rehabilitation in Canada', *Stroke*, *38*(9), pp.2556-2562.

MERCK MANUAL (2015) Introduction to Clinical Decision making. [Online]. Available at: https://www.merckmanuals.com/professional/special-subjects/clinical-decision-making/introduction-to-clinical-decision-making (Accessed: 9 March 2017)

Michie, S., Fixsen, D., Grimshaw, J.M. and Eccles, M.P. (2009) 'Specifying and reporting complex behaviour change interventions: the need for a scientific method', *Implementation Science*, *4*(1), p.40.

Michie, S., van Stralen, M.M. and West, R. (2011) 'The behaviour change wheel: a new method for characterising and designing behaviour change interventions', *Implementation science*, *6*(1), p.42.

Mohd, R., Kamaruddin, B.H., Hassan, S., Muda, M. and Yahya, K.K. (2014) 'The Important Role of Self-Efficacy in Determining Entrepreneurial Orientations of Malay Small Scale Entrepreneurs in Malaysia', *International Journal of Management Studies*, 20(1), pp.61-82.

Montero, A.J. (2015) 'Guidelines are essential to improving clinical outcomes in breast cancer patients', *Breast Cancer Research and Treatment, 1*(153), pp.1-2.

Mosavianpour, M., Collet, J.P., Sarmast, H. and Kissoon, N. (2016) 'Barriers to the implementation of sepsis guideline in a Canadian pediatric tertiary care centre', *Journal of Nursing Education and Practice, 6*(12), p.34.

Munteanu, M.C. and Jordan, J.C. (2017) 'A view into clinical practice guidelines: who uses them, who doesn't and possibly, why', *Qualitative Research in Medicine and Healthcare, 1*(2).

Murad, M.H. (2017) 'Clinical practice guidelines: a primer on development and dissemination' *Mayo Clinic Proceedings* (Vol. 92, No. 3, pp. 423-433). Elsevier.

National health services (NHS), Education for Scotland. (2011) 'Effective practitioner, Clinical decision making', [online]. Available at: http://www.effectivepractitioner.nes.scot.nhs.uk/media/341195/to%20upload%20clinical%20decision%20making%2012%20feb%2015.pdf (Accessed: 12 June 2017)

National institute for Health and Clinical Excellence (NICE), 2007. National health services (NHS), UK. How to change practice, Understand, identify and overcome barriers to change [online]. Available at: https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/Support-for-service-improvement-and-audit/How-to-change-practice-barriers-to-change.pdf(Accessed:11 November 2015)

National institute of clinical studies (NICS) (2006). *Identifying barriers to evidence uptake*. Melbourne VIC: NICS

Neuman, L. W. (2014) *Social Research Methods: Qualitative and Quantitative Approaches*. 7th edn. UK: Pearson.

Nichol, M.B., Knight, T.K., Priest, J.L., Wu, J. and Cantrell, C.R. (2010) 'Nonadherence to clinical practice guidelines and medications for multiple chronic conditions in a California Medicaid population', *Journal of the American Pharmacists Association, 50*(4), pp.496-507.

Nies, M.A. and Kershaw, T.C. (2002) 'Psychosocial and environmental influences on physical activity and health outcomes in sedentary women', *Journal of Nursing Scholarship, 34*(3), pp.243-249.

Nikopoulou-Smyrni, P. and Nikopoulos, C.K. (2007) 'A new integrated model of clinical reasoning: development, description and preliminary assessment in patients with stroke', *Disability and rehabilitation, 29*(14), pp.1129-1138.

Nilsagård, Y. and Lohse, G. (2010) 'Evidence-based physiotherapy: a survey of knowledge, behaviour, attitudes and prerequisites', *Advances in Physiotherapy, 12*(4), pp.179-186.

Nilsen, P. (2015) 'Making sense of implementation theories, models and frameworks', *Implementation Science, 10*(1), p.53.

Nilsen, P. and Bernhardsson, S. (2013) 'Towards evidence-based physiotherapy – research challenges and needs', *Journal of Physiotherapy*, 59(3), pp. 143–144.

Nishida, Y., Suzuki, H., Wang, D.H. and Kira, S. (2003) 'Psychological determinants of physical activity in Japanese female employees', *Journal of occupational health, 45*(1), pp.15-22.

Nowell, L. (2015) 'Pragmatism and integrated knowledge translation: exploring the compatabilities and tensions', *Nursing open, 2*(3), pp.141-148.

Nulty, D.D. (2008) 'The adequacy of response rates to online and paper surveys: what can be done?', *Assessment and evaluation in higher education, 33*(3), pp.301-314.

Nunnally, J. C. and Bernstein, I. H. (1978) *Psychometric Theory*. 2nd edn. New York: McGraw Hill.

Otterman, N.M., van der Wees, P.J., Bernhardt, J. and Kwakkel, G. (2012) 'Physical therapists' guideline adherence on early mobilization and intensity of practice at Dutch acute stroke units', *Stroke, 43*(9), pp.2395-2401.

Pallant, J. (2016) *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS Program*. 6th edn. London, UK: McGraw-Hill Education

Parboosingh, J.I., Reed, V.A., Palmer, J.C. and Bernstein, H.H. (2011) 'Enhancing practice improvement by facilitating practitioner interactivity: new roles for providers of continuing medical education', *Journal of Continuing Education in the Health Professions*, *31*(2), pp.122-127.

Perez, X., Wisnivesky, J.P., Lurslurchachai, L., Kleinman, L.C. and Kronish, I.M. (2012) 'Barriers to adherence to COPD guidelines among primary care providers', *Respiratory medicine*, *106*(3), pp.374-381.

Plackett, T.P., Cherry, D.C., Delk, G., Satterly, S., Theler, J., McVay, D., Moore, J. and Shackelford, S.A. (2017) 'Clinical practice guideline adherence during Operation Inherent Resolve', *Journal of Trauma and Acute Care Surgery*, *83*(1), pp. S66-S70.

Plüddemann, A., Wallace, E., Bankhead, C., Keogh, C., Van der Windt, D., Lasserson, D., Galvin, R., Moschetti, I., Kearley, K., O'Brien, K. and Sanders, S. (2014) 'Clinical prediction rules in practice: review of clinical guidelines and survey of GPs', *British Journal General Practice*, *64*(621), pp.e233-e242.

Posnanski, T.J. (2002) 'Professional development programs for elementary science teachers: An analysis of teacher self-efficacy beliefs and a professional development model', *Journal of Science Teacher Education*, *13*(3), pp.189-220.

Possa, S.S., Amador, C.B., Costa, A.M., Sakamoto, E.T., Kondo, C.S., Vasconcellos, A.M., de Brito, C.M. and Yamaguti, W.P. (2014) 'Implementation of a guideline for physical therapy in the postoperative period of upper abdominal surgery reduces the incidence of atelectasis and length of hospital stay', *Revista portuguesa de pneumologia*, 20(2), pp.69-77.

Prochaska, J.O. and Velicer, W.F. (1997) 'The transtheoretical model of health behaviour change', American *journal of health promotion*, *12*(1), pp.38-48.

PTNow, American Physical Therapy Association (APTA). *Clinical practice Guidelines* (2018a) [online]. Available at: https://www.ptnow.org/clinical-practice-guidelines (Accessed: 17 March 2018)

Queiroz, P.S. and Santos, M.J.D. (2013) 'Easiness and skillfulness of physical therapists in searching, interpreting and applying scientific knowledge in clinical practice: a pilot study', *Fisioterapia em Movimento,* 26(1), pp.13-23.

Quiros, D., Lin, S. and Larson, E.L. (2007) 'Attitudes toward practice guidelines among intensive care unit personnel: a cross-sectional anonymous survey', *Heart and Lung: The Journal of Acute and Critical Care*, 36(4), pp.287-297.

Rahi, S. (2017) 'Research design and methods: A systematic review of research paradigms, sampling issues and instruments development', *International Journal of Economics and Management Sciences*, 6(2), pp.1-5.

Ramírez-Vélez, R., Bagur-Calafat, M.C., Correa-Bautista, J.E. and Girabent-Farrés, M. (2015) 'Barriers against incorporating evidence-based practice in physical therapy in Colombia: current state and factors associated', *BMC medical education*, *15*(1), p.220.

Ranmuthugala, G., Plumb, J.J., Cunningham, F.C., Georgiou, A., Westbrook, J.I. and Braithwaite, J. (2011) 'How and why are communities of practice established in the healthcare sector? A systematic review of the literature', *BMC health services research*, *11*(1), p.273.

Rao, T.S. and Tandon, A. (2017) 'Clinical Practice Guidelines: Principles for Clinical Practice', *Indian journal of psychiatry*, *59*(1), p. S5.

Raykov, T. (1998) 'On the use of confirmatory factor analysis in personality research', *Personality and Individual Differences*, *24*(2), pp.291-293.

Rea, B.L., Marshak, H.H., Neish, C. and Davis, N. (2004) 'The role of health promotion in physical therapy in California, New York, and Tennessee', *Physical Therapy*, *84*(6), pp.510-523.

Rebbeck, T., Macedo, L.G. and Maher, C.G. (2013) 'Compliance with clinical guidelines for whiplash improved with a targeted implementation strategy: a prospective cohort study', *BioMed Central Health Services Research*, *13*(1), p.213.

Rebbeck, T., Maher, C. and Refshauge, K. (2006) 'Evaluating two implementation strategies for whiplash guidelines in physiotherapy: A cluster randomised trial', *The Australian journal of physiotherapy*, 52(3), pp. 165–74.

Rebbeck, T., Maher, C.G. and Refshauge, K.M. (2006) 'Evaluating two implementation strategies for whiplash guidelines in physiotherapy: a cluster-randomised trial', *Australian Journal of Physiotherapy*, *52*(3), pp.165-174.

Rice, S., Winter, S.R., Doherty, S. and Milner, M. (2017) 'Advantages and Disadvantages of Using Internet-Based Survey Methods in Aviation-Related Research', *Journal of Aviation Technology and Engineering*, *7*(1), p.5.

Rice, T.W., Morris, S., Tortella, B.J., Wheeler, A.P. and Christensen, M.C. (2012) 'Deviations from evidence-based clinical management guidelines increase mortality in critically injured trauma patients', *Critical care medicine*, 40(3), pp.778-786.

Roberts, S.H. and Lawrence, S.M. (2017) 'Venous Thromboembolism: Updated Management Guidelines', *The American Journal of Nursing*, 117(5), pp.38-47.

Robinson, J. P., Shaver, P. R. and Wrightsman, L. S. (1991a) Criteria for scale selection and Evaluation, *In Measures of personality and social psychological attitudes.* San Diego, USA: Academic Press Inc.

Robinson, J. P., Shaver, P. R. and Wrightsman, L. S. (1991b) *Measures of personality and social psychological attitudes.* San Diego, USA: Academic Press Inc.

Roelens, K., Verstraelen, H., and Temmerman, M. (2009) 'Intimate Partner Violence. The gynaecologist's perspective', *Facts, views and vision in ObGyn*, *1*(2), p.88.

Roelens, K., Verstraelen, H., Van Egmond, K. and Temmerman, M. (2006) 'A knowledge, attitudes, and practice survey among obstetrician-gynaecologists on intimate partner violence in Flanders, Belgium', *BioMed Central Public Health*, *6*(1), p.238.

Rogers, E.M. (1995) *Diffusion of innovations*. 4th edn. New York, NY: Free Press.

Roshanov, P.S., You, J.J., Dhaliwal, J., Koff, D., Mackay, J.A., Weise-Kelly, L., Navarro, T., Wilczynski, N.L. and Haynes, R.B. (2011) 'Can computerized clinical decision support systems improve practitioners' diagnostic test ordering behaviour? A decision-maker-researcher partnership systematic review', *Implementation Science*, *6*(1), p.88.

Rothstein, J.M. (2003) 'Autonomy or professionalism?', *Physical Therapy*, 83(3), pp. 206–207.

Rousseau, D.M. and Gunia, B.C. (2016) 'Evidence-based practice: the psychology of EBP implementation', *Annual review of psychology*, 67, pp.667-692.

Rubin, A. and Parrish, D.E. (2011) 'Validation of the evidence-based practice process assessment scale', *Research on Social Work Practice*, *21*(1), pp.106-118.

Russell, D.J., Rivard, L.M., Walter, S.D., Rosenbaum, P.L., Roxborough, L., Cameron, D., Darrah, J., Bartlett, D.J., Hanna, S.E. and Avery, L.M. (2010) 'Using knowledge brokers to facilitate the uptake of pediatric measurement tools into clinical practice: a before-after intervention study', *Implementation science*, *5*(1), p.92.

Rutten, G.M., Degen, S., Hendriks, E.J., Braspenning, J.C., Harting, J. and Oostendorp, R.A. (2010) 'Adherence to clinical practice guidelines for low back pain in physical therapy: do patients benefit?', *Physical Therapy*, *90*(8), pp.1111-1122.

Rutten, G.M., Harting, J., Bartholomew, L.K., Schlief, A., Oostendorp, R.A. and De Vries, N.K. (2013) 'Evaluation of the theory-based Quality Improvement in Physical Therapy (QUIP) programme: a one-group, pre-test post-test pilot study', *BioMed Central Health Services Research*, *13*(1), p.194.

Rutten, G.M., Harting, J., Rutten, S.T., Bekkering, G.E. and Kremers, S.P. (2006) 'Measuring physiotherapists' guideline adherence by means of clinical vignettes: a validation study', *Journal of evaluation in clinical practice*, *12*(5), pp.491-500.

Ryan, R.M. and Deci, E.L. (2000) 'Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being', *American Psychologist*, 55(1), pp. 68–78.

Sackett, D.L., Rosenberg, W.M.C., Gray, J.A.M., Haynes, R.B. and Richardson, W.S. (1996) 'Evidence based medicine: What it is and what it isn't', *British Medical Journal*, 312(7023), pp. 71–72.

Salbach, N.M., Guilcher, S.J., Jaglal, S.B. and Davis, D.A. (2010) 'Determinants of research use in clinical decision making among physical therapists providing services post-stroke: a cross-sectional study', *Implementation science*, *5*(1), p.77.

Salbach, N.M., Jaglal, S.B., Korner-Bitensky, N., Rappolt, S. and Davis, D. (2007) 'Practitioner and organizational barriers to evidence-based practice of physical therapists for people with stroke', *Physical Therapy*, 87(10), pp. 1284–1303.

Salbach, N.M., Veinot, P., Rappolt, S., Bayley, M., Burnett, D., Judd, M. and Jaglal, S.B. (2009) 'Physical therapists' experiences updating the clinical management of walking rehabilitation after stroke: a qualitative study', *Physical Therapy*, *89*(6), pp.556-568.

Sales, A., Smith, J., Curran, G. and Kochevar, L. (2006) 'Models, strategies, and tools', *Journal of General Internal Medicine*, 21(S2), pp. S43–S49.

Sanchez, G.V., Roberts, R.M., Albert, A.P., Johnson, D.D. and Hicks, L.A. (2014) 'Effects of knowledge, attitudes, and practices of primary care providers on antibiotic selection, United States', *Emerging infectious diseases*, *20*(12), p.2041.

Sangoseni, O., Hellman, M. and Hill, C. (2013) 'Development and validation of a questionnaire to assess the effect of online learning on behaviours, attitudes, and clinical practices of physical therapists in the United States regarding evidenced-based clinical practice', *The Internet Journal of Allied Health Sciences and Practice*, 11(2), p.7.

Sapsford, R. and Jupp, V. (2006) *Data Collection and Analysis.* 2nd edn. London: Sage Publications.

Saunders, M.N.K., Lewis, P. and Thornhill, A. (2015) *Research methods for business students.* Essex, England: Pearson Education Limited.

Schell, B. A. (2013). Professional reasoning in practice. In E. B. Crepeau, E. S. Cohn and B. A. Schell. (eds.) *Willard and Spackman's occupational therapy*.11th edn. Philadelphia: Lippincott Williams and Wilkins. pp. 314–327.

Schermelleh-Engel, K., Moosbrugger, H. and Müller, H. (2003) 'Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures', *Methods of Psychological Research Online*, 8(2), pp.23-74.

Schleifer Taylor, J., Verrier, M.C. and Landry, M.D. (2014) 'What do we know about knowledge brokers in paediatric rehabilitation? A systematic search and narrative summary', *Physiotherapy Canada*, *66*(2), pp.143-152.

Schreiber, J. and Dole, R.L. (2012) 'The effect of knowledge translation procedures on application of information from a continuing education conference', *Pediatric Physical Therapy*, *24*(3), pp.259-266.

Schreiber, J. and Stern, P. (2005) 'A review of the literature on evidence-based practice in physical therapy', *Internet Journal of Allied Health Sciences and Practice*, *3*(4), p.9.

Schreiber, J., Marchetti, G.F., Racicot, B. and Kaminski, E. (2015) 'The use of a knowledge translation program to increase use of standardized outcome measures in an outpatient pediatric physical therapy clinic: administrative case report', *Physical Therapy*, *95*(4), pp.613-629.

Schreiber, J., Stern, P., Marchetti, G. and Provident, I. (2009) 'Strategies to promote evidence-based practice in pediatric physical therapy: a formative evaluation pilot project', *Physical Therapy*, *89*(9), pp.918-933.

Schuster, M.A., McGlynn, E.A. and Brook, R.H. (1998) 'How good is the quality of health care in the United States?', *The Milbank Quarterly, 76*(4), pp.517-563.

Scott, S.D., Albrecht, L., O'Leary, K., Ball, G.D., Hartling, L., Hofmeyer, A., Jones, C.A., Klassen, T.P., Burns, K.K., Newton, A.S. and Thompson, D. (2012) 'Systematic review of knowledge translation strategies in the allied health professions', *Implementation Science*, 7(1), p.70.

Scott-Findlay, S. and Estabrooks, C.A. (2006) 'Knowledge translation and pain management. In Bringing pain relief to children', in Finley, G.A. (ed.) (2007). *Bringing pain relief to children: Treatment approaches.* New Jersey, USA: Humana Press. pp. 199-227.

Scurlock-Evans, L., Upton, P. and Upton, D. (2014) 'Evidence-based practice in physiotherapy: a systematic review of barriers, enablers and interventions', *Physiotherapy, 100*(3), pp.208-219.

Sehl, J., O'Doherty, J., O'Connor, R., O'Sullivan, B. and O'Regan, A. (2017) 'Adherence to COPD management guidelines in general practice? A review of the literature', *Irish Journal of Medical Science, 187(2),* pp. 403–407

Sekaran, U. and Bougie, R. (2016) Research methods for business: A skill building approach. 7th edn. West Sussex, UK: John Wiley and Sons.

Shank, G. and Brown, L. (2007) Exploring *Educational Research Literacy*. New York: Routledge.

Shea, B.J. (2011) 'A decade of knowledge translation research—what has changed?', *Journal of clinical epidemiology, 64*(1), pp.3-5.

Sheatsley, P. B. (1983) 'Questionnaire construction and item writing. In P. H. Rossi, J. D. Wright, and A. B. Anderson (eds.) *Handbook of Survey Research*. New York: Academic Press, pp.195-230.

Shekelle, P.G., Ortiz, E., Rhodes, S., Morton, S.C., Eccles, M.P., Grimshaw, J.M. and Woolf, S.H. (2001) 'Validity of the Agency for Healthcare Research and Quality clinical practice guidelines: how quickly do guidelines become outdated?', *JAMA, 286*(12), pp.1461-1467.

Shepherd, N.G. and Rudd, J.M. (2014) 'The influence of context on the strategic decision-making process: A review of the literature', *International Journal of Management Reviews*, *16*(3), pp.340-364.

Sheringham, J., Solmi, F., Ariti, C., Baim-Lance, A., Morris, S. and Fulop, N.J. (2017) 'The value of theory in programmes to implement clinical guidelines: Insights from a retrospective mixed-methods evaluation of a programme to increase adherence to national guidelines for chronic disease in primary care', *Public Library of Science ONE*, 12(3), p.e 0174086 - e0174086.

Shojania, K.G., Jennings, A., Mayhew, A., Ramsay, C.R., Eccles, M.P. and Grimshaw, J. (2009) 'The effects of on-screen, point of care computer reminders on processes and outcomes of care', *Cochrane Database of Systematic Reviews,* Issue 3. Art. No.: CD001096

Shuval, K., Berkovits, E., Netzer, D., Hekselman, I., Linn, S., Brezis, M. and Reis, S. (2007) 'Evaluating the impact of an evidence-based medicine educational intervention on primary care doctors' attitudes, knowledge and clinical behaviour: A controlled trial and before and after study', *Journal of Evaluation in Clinical Practice*, 13(4), pp. 581–598.

Sibley, K.M. and Salbach, N.M. (2015) 'Applying knowledge translation theory to physical therapy research and practice in balance and gait assessment: case report', *Physical Therapy, 95*(4), pp.579-587.

Siering, U., Eikermann, M., Hausner, E., Hoffmann-Eßer, W. and Neugebauer, E.A. (2013) 'Appraisal tools for clinical practice guidelines: a systematic review', *Public Library of Science ONE, 8*(12), p.e 82915.

Silva, T.M. and Costa, L.C.M. (2015) 'Evidence-based practice: A survey regarding behaviour, knowledge, skills, resources, opinions and perceived barriers of Brazilian physical therapists from São Paulo state', *Brazilian Journal of Physical Therapy*, 19(4), pp. 294–303.

Silva, T.M., Costa, L.D.C.M., Garcia, A.N. and Costa, L.O.P. (2014) 'What do physical therapists think about evidence-based practice? A systematic review', *Manual therapy, 20*(3), pp.388-401.

Sim, L.L.W., Ban, K.H.K., Tan, T.W., Sethi, S.K. and Loh, T.P. (2017) 'Development of a clinical decision support system for diabetes care: A pilot study', *Public Library of Science ONE, 12*(2), p.e 0173021.

Sinnenberg, L.E., Wanner, K.J., Perrone, J., Barg, F.K., Rhodes, K.V. and Meisel, Z.F. (2017) 'What Factors Affect Physicians' Decisions to Prescribe Opioids in Emergency Departments?', *MDM Policy and Practice*, *2*(1), p.2381468316681006.

Smedslund, J. (1978) 'Bandura's theory of self-efficacy: A set of common sense theorems', Scandinavian *Journal of Psychology*, *19*(1), pp.1-14.

Smith, M., Higgs, J. and Ellis, E. (2008). Factors Influencing Clinical Decision Making. In J. Higgs, M. Jones, S. Loftus, and N. Christensen. (Eds.) *Clinical Reasoning in the Health Professions.* Sydney: Butterworth-Heinemann. pp. 89-100.

Soumerai, S.B. and Avorn, J. (1990) 'Principles of educational outreach ('academic detailing') to improve clinical decision making', *JAMA, 263*(4), pp.549-556.

Southern, W.N., Drainoni, M.L., Smith, B.D., Koppelman, M.E., McKee, M.D., Christiansen, C.L., Gifford, A.L., Weinbaum, C.M. and Litwin, A.H. (2014) 'Physician nonadherence with a hepatitis C screening program', *Quality management in health care*, 23(1), p.1.

Squires, J.E., Hutchinson, A.M., Boström, A.M., O'Rourke, H.M., Cobban, S.J. and Estabrooks, C.A. (2011a) 'To what extent do nurses use research in clinical practice? A systematic review', Implementation science, 6(1), p.21.

Squires, J.E., Estabrooks, C.A., O'Rourke, H.M., Gustavsson, P., Newburn-Cook, C.V. and Wallin, L. (2011b) 'A systematic review of the psychometric properties of self-report research utilization measures used in healthcare', Implementation Science, 6(1), p.83.

Squires, J.E., Sullivan, K., Eccles, M.P., Worswick, J. and Grimshaw, J.M. (2014) 'Are multifaceted interventions more effective than single-component interventions in changing health-care professionals' behaviours? An overview of systematic reviews', *Implementation Science, 9*(1), p.152.

Sridharan, B., Deng, H., Kirk, J. and Corbitt, B. (2010) 'Structural Equation Modeling for evaluating the user perceptions of E-learning effectiveness in Higher Education', In ECIS 2010: Proceedings of the 18th European Conference on Information Systems (pp. 1-13) Available at: AIS Electronic Library (AISeL) (Accessed: 14 March 2018)

Stander, J., Grimmer, K. and Brink, Y. (2018) 'Training programmes to improve evidence uptake and utilisation by physiotherapists: a systematic scoping review', *BMC medical education, 18*(1), p.14.

Stevenson, K., Lewis, M. and Hay, E. (2006) 'Does physiotherapy management of low back pain change as a result of an evidence-based educational programme?', *Journal of Evaluation in Clinical practice, 12*(3), pp.365-375.

Stewart, R.E., Vroegop, S., Kamps, G.B., Van Der Werf, G.T. and Meyboom-de Jong, B. (2003) 'Factors influencing adherence to guidelines in general practice', *International journal of technology assessment in health care, 19*(3), pp.546-554.

Straub-Morarend, C.L., Marshall, T.A., Holmes, D.C. and Finkelstein, M.W. (2011) 'Informational resources utilized in clinical decision making: common practices in dentistry', *Journal of dental education, 75*(4), pp.441-452.

Straus, S.E., Tetroe, J.M. and Graham, I.D. (2011) 'Knowledge translation is the use of knowledge in health care decision making', *Journal of clinical epidemiology, 64*(1), pp.6-10.

Sudman, S. (1983) 'The network polls: A critical review', Public *Opinion Quarterly, 47*(4), pp.490-496.

Sudsawad, P. (2005) 'A conceptual framework to increase usability of outcome research for evidence-based practice', *American Journal of Occupational Therapy,* 59(3), pp. 351–355.

Sudsawad, P. (2013) *Knowledge translation: Introduction to models, strategies, and measures*. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research.

Suman, A., Dikkers, M.F., Schaafsma, F.G., van Tulder, M.W. and Anema, J.R. (2015) 'Effectiveness of multifaceted implementation strategies for the implementation of back and neck pain guidelines in health care: a systematic review', *Implementation Science*, *11*(1), p.126.

Sunstein, C.R. and Thaler, R.H. (2003) 'Libertarian paternalism is not an oxymoron', *The University of Chicago Law Review*, 70 (4). Pp.1159-1202.

Sunthonwutinun, W. and Chooprayoon, V. (2017) 'A Causal Relationship Model of the Influence of Information Technology Governance Processes on the Benefits Received by Thai Public Companies', *The Electronic Journal of Information Systems in Developing Countries*, *80*(1), pp.1-24.

Svenson, O. (1992) 'Differentiation and consolidation theory of human decision making: A frame of reference for the study of pre-and post-decision processes', *Acta Psychologica*, *80*(1), pp.143-168.

Swift, Lynn. (2014) 'Online communities of practice and their role in educational development: a systematic appraisal', *Community Practitioner* 87 (4), pp.28-32.

Swinkels, R.A., Meerhoff, G.M., Custers, J.W., van Peppen, R.P., Beurskens, A.J. and Wittink, H. (2015) 'Using Outcome Measures in Daily Practice: Development and Evaluation of an Implementation Strategy for Physiotherapists in the Netherlands', *Physiotherapy Canada*, *67*(4), pp.357-364.

Te Boveldt, N., Vernooij-Dassen, M., Besse, K., Vissers, K. and Engels, Y. (2015) 'Adaptation of an evidence-based clinical practice guideline in cancer pain management by medical oncologists: a case vignette study', *Supportive Care in Cancer*, *23*(5), pp.1409-1420.

Thistle, V.G., Basskin, A.L., Shamus, E. and Jeffreys-Heil, R. (2016) 'Clinical decision making regarding the use of vital signs in physical therapy', *Physical Therapy and Rehabilitation*, *3*(1), p.7.

Thompson, C. and Stapley, S. (2011) 'Do educational interventions improve nurses' clinical decision making and judgement? A systematic review', *International journal of nursing studies*, *48*(7), pp.881-893.

Thompson, C., Aitken, L., Doran, D. and Dowding, D. (2013) 'An agenda for clinical decision making and judgement in nursing research and education', *International journal of nursing studies*, *50*(12), pp.1720-1726.

Thompson, C., Cullum, N., McCaughan, D., Sheldon, T. and Raynor, P. (2004) 'Nurses, information use, and clinical decision making—the real world potential for evidence-based decisions in nursing', Evidence-*Based Nursing*, *7*(3), pp.68-72.

Ticehurst, G. W. and Veal, A. J. (2000) *Business research methods: a managerial approach.* 2nd edn. Frenchs Forest, NSW: Longman

Tiffen, J., Corbridge, S.J. and Slimmer, L. (2014) 'Enhancing clinical decision making: development of a contiguous definition and conceptual framework', *Journal of Professional Nursing*, *30*(5), pp.399-405.

Tilson, J.K., Mickan, S., Howard, R., Sum, J.C., Zibell, M., Cleary, L., Mody, B. and Michener, L.A. (2016) 'Promoting physical therapists' use of research evidence to inform clinical practice: part 3–long term feasibility assessment of the PEAK program', *BioMed Central Medical Education*, *16*(1), p.144.

Tilson, J.K., Mickan, S., Sum, J.C., Zibell, M., Dylla, J.M. and Howard, R. (2014) 'Promoting physical therapists' use of research evidence to inform clinical practice: part 2-a mixed methods evaluation of the PEAK program', *BioMed Central Medical Education*, *14*(1), p.126.

Traeger, A.C., Moynihan, R.N. and Maher, C.G. (2017) 'Wise choices: making physiotherapy care more valuable', *Journal of Physiotherapy*, *63*(2), pp.63-65.

Travaglia, J., Debono, D., Thoms, D., Hilman, K., Middleton, S., Hughes, C. and Braithwaite, J. (2011) *Change management strategies and practice development in nursing: a review of the literature*. Sydney: Centre for Healthcare Resilience and Implementation Science, Australian Institute of Health Innovation, Faculty of Medicine, University of New South Wales.

Treweek, S., Oxman, A.D., Alderson, P., Bossuyt, P.M., Brandt, L., Brożek, J., Davoli, M., Flottorp, S., Harbour, R., Hill, S. and Liberati, A. (2013) 'Developing and evaluating communication strategies to support informed decisions and practice based on evidence (DECIDE): protocol and preliminary results', *Implementation Science, 8*(1), p.6.

Triandis, H.C. (1989) 'The self and social behaviour in differing cultural contexts', *Psychological review, 96,* p.506.

Tricco, A.C., Ashoor, H.M., Cardoso, R., MacDonald, H., Cogo, E., Kastner, M., Perrier, L., McKibbon, A., Grimshaw, J.M. and Straus, S.E. (2015) 'Sustainability of knowledge translation interventions in healthcare decision-making: a scoping review', *Implementation Science,* 11(1), p.55.

Ullman, J. B. (2001). Structural equation modeling. In B. G. Tabachnick and L. S. Fidell (Eds.), *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn and Bacon. pp. 653–771)

Ullman, J. B. (2006) 'Structural Equation Modeling: Reviewing the Basics and Moving Forward'; *Journal of personality assessment,* 87(1), p. 35–50.

Ullman, J. B. and Bentler, P. M. (2003) Structural equation modeling. In J. A. Schinka and W. F. Velicer. (eds.) *Handbook of Psychology, Volume 2. Research Methods in Psychology*. New York: Wiley. pp. 607-634.

Usher, A. and Kober, N. (2012) '*Student Motivation: An Overlooked Piece of School Reform. Summary'*. Washington, DC: Center on Education Policy

Uy, R.C., Sarmiento, R.F., Gavino, A. and Fontelo, P. (2014) 'Confidence and Information Access in Clinical Decision-Making: An Examination of the Cognitive Processes that affect the Information-seeking Behaviour of Physicians'. *Annual Symposium Proceedings,* American Medical Informatics Association Annual Symposium (AMIA 2014). 15-19 November 2014, Washington DC. American Medical Informatics Association. pp. 1134-40

Van Bodegom-Vos, L., Verhoef, J., Dickmann, M., Kleijn, M., Van Vliet, I., Hurkmans, E., Van Der Wees, P. and Vliet Vlieland, T. (2012) 'A qualitative study of barriers to the implementation of a rheumatoid arthritis guideline among generalist and specialist physical therapists', *Physical Therapy, 92*(10), pp.1292-1305.

Van der Wees, P.J., Jamtvedt, G., Rebbeck, T., de Bie, R.A., Dekker, J. and Hendriks, E.J.M. (2008) 'Multifaceted strategies may increase implementation of physiotherapy clinical guidelines: A systematic review', *Australian Journal of Physiotherapy,* 54(4), pp. 233–241

Van der Wees, P.J., Zagers, C.A., De Die, S.E., Hendriks, E.J., Nijhuis-van der Sanden, M.W. and De Bie, R.A. (2013) 'Developing a questionnaire to identify perceived barriers for implementing the Dutch physical therapy COPD clinical practice guideline', *BioMed Central Health Services Research, 13*(1), p.159.

Van Dulmen, S.A., Maas, M., Staal, J.B., Rutten, G., Kiers, H., Nijhuis-van der Sanden, M. and van der Wees, P. (2014) 'Effectiveness of peer assessment for implementing a Dutch physical therapy low back pain guideline: cluster randomized controlled trial', *Physical Therapy, 94*(10), pp.1396-1409.

Van Tassel, K. (2012) 'Using Clinical Practice Guidelines and Knowledge Translation Theory to Cure the Negative Impact of the National Hospital Peer Review Hearing System on Healthcare Quality, Cost, and Access', *Pepperdine Law Review,* 40, p.911.

Vander Schaaf, E.B., Seashore, C.J. and Randolph, G.D. (2015) 'Translating Clinical Guidelines into Practice Challenges and Opportunities in a Dynamic Health Care Environment', North *Carolina medical journal, 76*(4), pp.230-234.

VanDevanter, N., Kumar, P., Nguyen, N., Nguyen, L., Nguyen, T., Stillman, F., Weiner, B. and Shelley, D. (2017) 'Application of the Consolidated Framework for Implementation Research to assess factors that may influence implementation of tobacco use treatment guidelines in the Viet Nam public health care delivery system', *Implementation Science,* 12(1), p.27.

Venkatesh, A.K., Savage, D., Sandefur, B., Bernard, K.R., Rothenberg, C. and Schuur, J.D. (2017) 'Systematic review of emergency medicine clinical practice guidelines: Implications for research and policy', *Public Library of Science ONE*, 12(6), p.e 0178456.

Verhoef, J., Oosterveld, F.G.J., Hoekman, R., Munneke, M., Boonman, D.C.G., Bakker, M., Otten, W., Rasker, J.J., de Vries-Vander Zwan, H.M. and Vlieland, T.V. (2004) 'A system of networks and continuing education for physical therapists in rheumatology: a feasibility study', *International journal of integrated care*, *4*(3).

Visser, P. S., Krosnick, J. A. and Lavrakas, P. (2000). 'Survey research'. In H. T. Reis and C. M. Judd (Eds.), *Handbook of research methods in social psychology*. New York: Cambridge University Press.

Visser, P.S., Krosnick, J.A. and Norris, C.J. (2016) 'Attitude importance and attitude-relevant knowledge Motivator and enabler'. in Krosnick, J.A., Chiang, I.C.A. and Stark, T.H. (eds.) *Political Psychology: New Explorations*. New York: Routledge

Wallin, L. (2009) 'Knowledge translation and implementation research in nursing', *International journal of nursing studies*, *46*(4), pp.576-587.

Walston, J., Redford, J. and Bhatt, M.P. (2017) '*Workshop on Survey Methods in Education Research: Facilitator's Guide and Resources*'. (REL 2017–214). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Midwest.

Ward, V.L., House, A.O. and Hamer, S. (2009) 'Knowledge brokering: exploring the process of transferring knowledge into action', *BMC health services research*, *9*(1), p.12.

Weng, Y.H., Kuo, K.N., Yang, C.Y., Lo, H.L., Chen, C. and Chiu, Y.W. (2013) 'Implementation of evidence-based practice across medical, nursing, pharmacological and allied healthcare professionals: a questionnaire survey in nationwide hospital settings', *Implementation Science*, *8*(1), p.112.

Wenger, E., McDermott, R.A. and Snyder, W. (2002) *Cultivating communities of practice: A guide to managing knowledge*. Cambridge, USA: Harvard Business School Press.

Wenger, E., Trayner, B. and De Laat, M. (2011) 'Promoting and assessing value creation in communities and networks: A conceptual framework', *Rapport 18*, Ruud de Moor Centrum, Open University of the Netherlands.

West, R. (2005) 'Time for a change: putting the Transtheoretical (Stages of Change) Model to rest', *Addiction*, 100(8), pp.1036-1039.

White, N.T., Delitto, A., Manal, T.J. and Miller, S. (2015) 'The American Physical Therapy Association's top five choosing wisely recommendations', *Physical Therapy*, *95*(1), pp.9-24.

Willett, G.M., Johnson, G.C. and Jones, K. (2011) 'The effect of a hybrid continuing education course on outpatient physical therapy for individuals with low back pain', *Internet Journal of Allied Health Sciences and Practice*, *9*(1), p.11.

Williams, C. (2007) 'Research methods', *Journal of Business and Economics Research*, 5(3), pp.65-72

Williams, C. (2011) 'Research methods', *Journal of Business and Economics Research*, *5*(3).

Williams, I. and Brown, H. (2014) 'Factors influencing decisions of value in health care: a review of the literature'. [Online]. Available at: https://pdfs.semanticscholar.org/de4c/8a35f60154ba7d76f623156727098b8c6300.pdf. (Accessed: 25 March 2016).

Willson, M.L., Vernooij, R.W., Gagliardi, A.R., Armstrong, M., Bernhardsson, S., Brouwers, M., Bussières, A., Fleuren, M., Gali, K., Huckson, S. and Jones, S. (2017) 'Questionnaires used to assess barriers of clinical guideline use among physicians are not comprehensive, reliable, or valid: a scoping review', *Journal of clinical epidemiology*, *86*, pp.25-38.

Wilson, I.B. and Cleary, P.D. (1995) 'Linking clinical variables with health-related quality of life: a conceptual model of patient outcomes' *Journal of American Medical Association*, *273*(1), pp.59-65.

Wisnivesky, J.P., Lorenzo, J., Lyn-Cook, R., Newman, T., Aponte, A., Kiefer, E. and Halm, E.A. (2008) 'Barriers to adherence to asthma management guidelines among inner-city primary care providers', *Annals of Allergy, Asthma and Immunology*, *101*(3), pp.264-270.

Wöckel, A., Kurzeder, C., Geyer, V., Novasphenny, I., Wolters, R., Wischnewsky, M., Kreienberg, R. and Varga, D. (2010) 'Effects of guideline adherence in primary breast cancer–a 5-year multicenter cohort study of 3976 patients', *The Breast*, *19*(2), pp.120-127.

Woolf, S.H., Grol, R., Hutchinson, A., Eccles, M. and Grimshaw, J. (1999) 'Clinical guidelines: potential benefits, limitations, and harms of clinical guidelines', *British Medical Journal*, 318(7182), p.527.

Yin, R.K. (2003) *Case Study Research: Design and Methods*. 3rd edn. Thousand Oaks, California, USA: Sage Publications, Inc.

Zidarov, D., Thomas, A. and Poissant, L. (2013) 'Knowledge translation in physical therapy: From theory to practice', *Disability and Rehabilitation*, 35(18), pp. 1571–1577.

Zikmund, W.G. (2003) *Business Research Methods*. 7th edn. Ohio: Thomson South Western.

Zwerver, F., Schellart, A.J., Anema, J.R. and van der Beek, A.J. (2013) 'Changes in insurance physicians' attitudes, self-efficacy, intention, and knowledge and skills regarding the guidelines for depression, following an implementation strategy', *Journal of occupational rehabilitation*, 23(1), pp.148-156.

Appendix

Appendix 2.1

Key action statements of clinical practice guideline (CPG) for Venous Thromboembolism (VTE) in Physical therapy (PT) (Hillegass et al. 2015)

Number	Statement	Key Phrase
1	Physical therapists should advocate for a culture of mobility and physical activity unless medical contraindications for mobility exist. (Evidence Quality: I; Recommendation Strength: A–Strong)	Advocate for a culture of mobility and physical activity
2	Physical therapists should screen for risk of VTE during the initial patient interview and physical examination. (Evidence Quality: I; Recommendation Strength: A–Strong)	Screen for risk of VTE
3	Physical therapists should provide preventive measures for patients who are identified as high risk for LE DVT. These measures should include education regarding signs and symptoms of LE DVT, activity, hydration, mechanical compression, and referral for medication. (Evidence Quality: I; Recommendation Strength: A–Strong)	Provide preventive measures for LE DVT
4	Physical therapists should recommend mechanical compression (eg, IPC, GCS) when individuals are at high risk for LE DVT. (Evidence Quality: I; Recommendation Strength: A–Strong)	Recommend mechanical compression as a preventive measure for LE DVT
5	Physical therapists should establish the likelihood of an LE DVT when the patient has pain, tenderness, swelling, warmth, or discoloration in the lower extremity. (Evidence Quality: II; Recommendation Strength: B–Moderate)	Identify the likelihood of LE DVT when signs and symptoms are present
6	Physical therapists should recommend further medical testing after the completion of the Wells criteria for LE DVT prior to mobilization. (Evidence Quality: I; Recommendation Strength: A–Strong)	Communicate the likelihood of LE DVT and recommend further medical testing
7	When a patient has a recently diagnosed LE DVT, physical therapists should verify whether the patient is taking an anticoagulant medication, what type of anticoagulant medication, and when the anticoagulant medication was initiated. (Evidence Quality: V; Recommendation Strength: D–Theoretical/Foundational)	Verify the patient is taking an anticoagulant
8	When a patient has a recently diagnosed LE DVT, physical therapists should initiate mobilization when therapeutic threshold levels of anticoagulants have been reached. (Evidence Quality: I; Recommendation Strength: A–Strong)	Mobilize patients who are at a therapeutic level of anticoagulation
9	Physical therapists should recommend mechanical compression (eg, IPC, GCS) when a patient has an LE DVT. (Evidence Quality: II; Recommendation Strength: B–Moderate)	Recommend mechanical compression for patients with LE DVT
10	Physical therapists should recommend that patients be mobilized, once hemodynamically stable, following IVC filter placement. (Evidence Quality: V; Recommendation Strength: P–Best Practice)	Mobilize patients after IVC filter placement once hemodynamically stable
11	When a patient with a documented LE DVT below the knee is not treated with anticoagulation and does not have an IVC filter and is prescribed out of bed mobility by the physician, the physical therapist should consult with the medical team regarding mobilizing versus keeping the patient on bed rest. (Evidence Quality: V; Recommendation Strength: P–Best Practice)	Consult with the medical team when a patient is not anticoagulated and without an IVC filter
12	Physical therapists should screen for fall risk whenever a patient is taking an anticoagulant medication. (Evidence Quality: III; Recommendation Strength: C–Weak)	Screen for fall risk
13	Physical therapists should recommend mechanical compression (eg, intermittent pneumatic compression, graduated compression stockings) when a patient has signs and symptoms suggestive of PTS. (Evidence Quality: I; Recommendation Strength: A–Strong)	Recommend mechanical compression when signs and symptoms of PTS are present
14	Physical therapists should monitor patients who may develop long-term consequences of LE DVT (eg, PTS severity) and provide management strategies that prevent them from occurring to improve the human experience and increase quality of life. (Evidence Quality: V; Recommendation Strength: P–Best Practice)	Implement management strategies to prevent future VTE

[a] VTE=venous thromboembolism, LE DVT=lower extremity deep vein thrombosis, IPC=intermittent pneumatic compression, GCS=graduated compression stockings, IVC=inferior vena cava, PTS=postthrombotic syndrome.

Appendix 2.2

Summary of Recommendations of Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health From the Orthopaedic Section of the American Physical Therapy Association (APTA) (Childs et al. 2008)

E PATHOANATOMICAL FEATURES

Although the cause of neck pain may be associated with degenerative processes or pathology identified during diagnostic imaging, the tissue that is causing a patient's neck pain is most often unknown. Thus, clinicians should assess for impaired function of muscle, connective, and nerve tissues associated with the identified pathological tissues when a patient presents with neck pain.

B RISK FACTORS

Clinicians should consider age greater than 40, coexisting low back pain, a long history of neck pain, cycling as a regular activity, loss of strength in the hands, worrisome attitude, poor quality of life, and less vitality as predisposing factors for the development of chronic neck pain.

B DIAGNOSIS/CLASSIFICATION

Neck pain, without symptoms or signs of serious medical or psychological conditions, associated with (1) motion limitations in the cervical and upper thoracic regions, (2) headaches, and (3) referred or radiating pain into an upper extremity are useful clinical findings for classifying a patient into one of the following International Statistical Classification of Diseases and Related Health Problems (ICD) categories: cervicalgia, pain in thoracic spine, headaches, cervicocranial syndrome, sprain and strain of cervical spine, spondylosis with radiculopathy, and cervical disc disorder with radiculopathy; and the associated International Classification of Functioning, Disability, and Health (ICF) impairment-based category neck pain with the following impairments of body function:

Neck pain with mobility impairments (b7101 Mobility of several joints)
Neck pain with headaches (28010 Pain in head and neck)
Neck pain with movement coordination impairments (b7601 Control of complex voluntary movements)
Neck pain with radiating pain (b2804 Radiating pain in a segment or region)

The following physical examination measures may be useful in classifying a patient in the ICF impairment-based category of neck pain with mobility impairments and the associated ICD categories of cervicalgia or pain in thoracic spine.

- Cervical active range of motion
- Cervical and thoracic segmental mobility

The following physical examination measures may be useful in classifying a patient in the ICF impairment-based category of neck pain with headaches and the associated ICD categories of headaches or cervicocranial syndrome.

- Cervical active range of motion
- Cervical segmental mobility
- Cranial cervical flexion test

The following physical examination measures may be useful in classifying a patient in the ICF impairment-based category of neck pain with movement coordination impairments and the associated ICD category of sprain and strain of cervical spine.

- Cranial cervical flexion test
- Deep neck flexor endurance

The following physical examination measures may be useful in classifying a patient in the ICF impairment-based category of neck pain with radiating pain and the associated ICD categories of spondylosis with radiculopathy or cervical disc disorder with radiculopathy.

- Upper limb tension test
- Spurling's test
- Distraction test

B DIFFERENTIAL DIAGNOSIS

Clinicians should consider diagnostic classifications associated with serious pathological conditions or psychosocial factors when the patient's reported activity limitations or impairments of body function and structure are not consistent with those presented in the diagnosis/classification section of this guideline, or, when the patient's symptoms are not resolving with interventions aimed at normalization of the patient's impairments of body function.

A EXAMINATION – OUTCOME MEASURES

Clinicians should use validated self-report questionnaires, such as the Neck Disability Index and the Patient-Specific Functional Scale for patients with neck pain. These tools are useful for identifying a patient's baseline status relative to pain, function, and disability and for monitoring a change in patient's status throughout the course of treatment.

F EXAMINATION – ACTIVITY LIMITATION MEASURES

Clinicians should utilize easily reproducible activity limitation and participation restriction measures associated with their patient's neck pain to assess the changes in the patient's level of function over the episode of care.

A INTERVENTIONS – CERVICAL MOBILIZATION/ MANIPULATION

Clinicians should consider utilizing cervical manipulation and mobilization procedures, thrust and non-thrust, to reduce neck pain and headache. Combining cervical manipulation and mobilization with exercise is more effective for reducing neck pain, headache, and disability than manipulation and mobilization alone.

C INTERVENTIONS – THORACIC MOBILIZATION/ MANIPULATION

Thoracic spine thrust manipulation can be used for patients with primary complaints of neck pain. Thoracic spine thrust manipulation can also be used for reducing pain and disability in patients with neck and neck-related arm pain.

Summary of Recommendations *(continued)*

C **INTERVENTIONS – STRETCHING EXERCISES**

Flexibility exercises can be used for patients with neck symptoms. Examination and targeted flexibility exercises for the following muscles are suggested by the authors: anterior/medial/posterior scalenes, upper trapezius, levator scapulae, pectoralis minor, and pectoralis major.

A **INTERVENTIONS – COORDINATION, STRENGTHENING, AND ENDURANCE EXERCISES**

Clinicians should consider the use of coordination, strengthening, and endurance exercises to reduce neck pain and headache.

C **INTERVENTIONS – CENTRALIZATION PROCEDURES AND EXERCISES**

Specific repeated movements or procedures to promote centralization are not more beneficial in reducing disability when compared to other forms of interventions.

B **INTERVENTIONS – UPPER QUARTER AND NERVE MOBILIZATION PROCEDURES**

Clinicians should consider the use of upper quarter and nerve mobilization procedures to reduce pain and disability in patients with neck and arm pain.

B **INTERVENTIONS – TRACTION**

Clinicians should consider the use of mechanical intermittent cervical traction, combined with other interventions such as manual therapy and strengthening exercises, for reducing pain and disability in patients with neck and neck-related arm pain.

A **INTERVENTIONS – PATIENT EDUCATION AND COUNSELING**

To improve the recovery in patients with whiplash-associated disorder, clinicians should (1) educate the patient that early return to normal, non-provocative pre-accident activities is important, and (2) provide reassurance to the patient that good prognosis and full recovery commonly occurs.

Appendix 2.3

Summary of Recommendations of Clinical Practice Guidelines for neck pain: Revision 2017(APTA) (Blanpied et al. 2017)

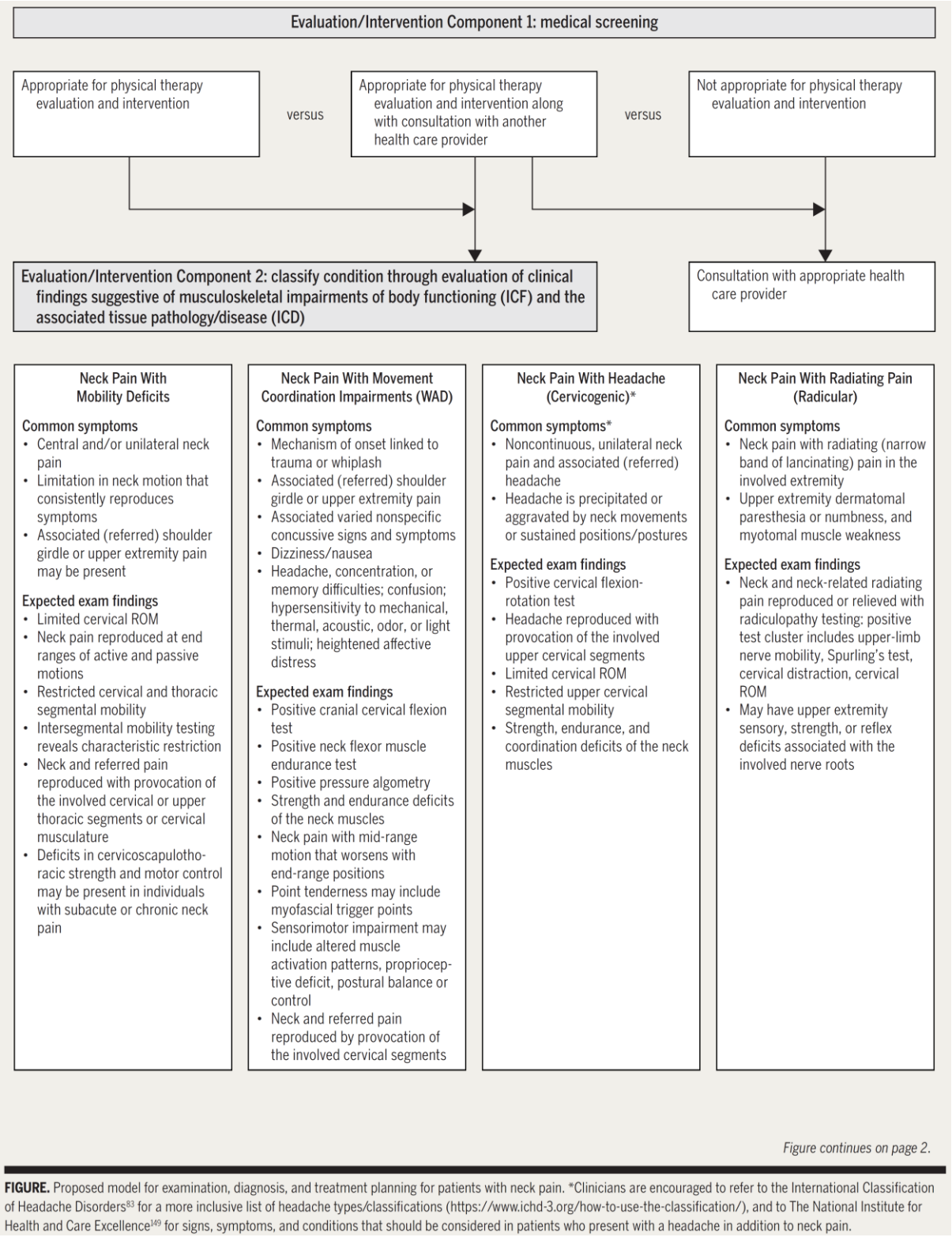


Figure continues on page 2.

FIGURE. Proposed model for examination, diagnosis, and treatment planning for patients with neck pain. *Clinicians are encouraged to refer to the International Classification of Headache Disorders[83] for a more inclusive list of headache types/classifications (https://www.ichd-3.org/how-to-use-the-classification/), and to The National Institute for Health and Care Excellence[149] for signs, symptoms, and conditions that should be considered in patients who present with a headache in addition to neck pain.

Evaluation/Intervention Component 3: determination of condition stage (acute/subacute/chronic)

Acute, subacute, and chronic stages are time-based stages helpful in classifying patient conditions. Time-based stages are helpful in making treatment decisions only in the sense that in the acute phase, the condition is usually highly irritable (pain experienced at rest or with initial to mid-range spinal movements: before tissue resistance); in the subacute phase, the condition often exhibits moderate irritability (pain experienced with mid-range motions that worsen with end-range spinal movements: with tissue resistance); and chronic conditions often have a low degree of irritability (pain that worsens with sustained end-range spinal movements or positions: overpressure into tissue resistance). There are cases where the alignment of irritability and the duration of symptoms does not match accordingly, requiring clinicians to make judgments when applying time-based research results on a patient-by-patient basis

Evaluation/Intervention Component 4: intervention strategies for patients with neck pain

Neck Pain With Mobility Deficits

Acute
- Thoracic manipulation
- Cervical mobilization or manipulation
- Cervical ROM, stretching, and isometric strengthening exercise
- Advice to stay active plus home cervical ROM and isometric exercise
- Supervised exercise, including cervicoscapulothoracic and upper extremity stretching, strengthening, and endurance training
- General fitness training (stay active)

Subacute
- Cervical mobilization or manipulation
- Thoracic manipulation
- Cervicoscapulothoracic endurance exercise

Chronic
- Thoracic manipulation
- Cervical mobilization
- Combined cervicoscapulothoracic exercise plus mobilization or manipulation
- Mixed exercise for cervicoscapulothoracic regions—neuromuscular exercise: coordination, proprioception, and postural training; stretching; strengthening; endurance training; aerobic conditioning; and cognitive affective elements
- Supervised individualized exercises
- "Stay active" lifestyle approaches
- Dry needling, low-level laser, pulsed or high-power ultrasound, intermittent mechanical traction, repetitive brain stimulation, TENS, electrical muscle stimulation

Neck Pain With Movement Coordination Impairments (WAD)

Acute if prognosis is for a quick and early recovery
- Education: advice to remain active, act as usual
- Home exercise: pain-free cervical ROM and postural element
- Monitor for acceptable progress
- Minimize collar use

Subacute if prognosis is for a prolonged recovery trajectory
- Education: activation and counseling
- Combined exercise: active cervical ROM and isometric low-load strengthening plus manual therapy (cervical mobilization or manipulation) plus physical agents: ice, heat, TENS
- Supervised exercise: active cervical ROM or stretching, strengthening, endurance, neuromuscular exercise including postural, coordination, and stabilization elements

Chronic
- Education: prognosis, encouragement, reassurance, pain management
- Cervical mobilization plus individualized progressive exercise: low-load cervicoscapulothoracic strengthening, endurance, flexibility, functional training using cognitive behavioral therapy principles, vestibular rehabilitation, eye-head-neck coordination, and neuromuscular coordination elements
- TENS

Neck Pain With Headache (Cervicogenic)

Acute
- Exercise: C1-2 self-SNAG

Subacute
- Cervical manipulation and mobilization
- Exercise: C1-2 self-SNAG

Chronic
- Cervical manipulation
- Cervical and thoracic manipulation
- Exercise for cervical and scapulothoracic region: strengthening and endurance exercise with neuromuscular training, including motor control and biofeedback elements
- Combined manual therapy (mobilization or manipulation) plus exercise (stretching, strengthening, and endurance training elements)

Neck Pain With Radiating Pain (Radicular)

Acute
- Exercise: mobilizing and stabilizing elements
- Low-level laser
- Possible short-term collar use

Chronic
- Combined exercise: stretching and strengthening elements plus manual therapy for cervical and thoracic region: mobilization or manipulation
- Education counseling to encourage participation in occupational and exercise activity
- Intermittent traction

FIGURE. Proposed model for examination, diagnosis, and treatment planning for patients with neck pain. *Clinicians are encouraged to refer to the International Classification of Headache Disorders[83] for a more inclusive list of headache types/classifications (https://www.ichd-3.org/how-to-use-the-classification/), and to The National Institute for Health and Care Excellence[149] for signs, symptoms, and conditions that should be considered in patients who present with a headache in addition to neck pain.

Appendix 2.4

Advantages of CPGs

CPGs are created by appraisal of scientific evidence (Curtis et al. 2017; Keiffer, 2015; Van Dulmen et al. 2014; Graham et al. 2011). Thus, in complex and uncertain clinical situations (Fischer et al. 2016) where ambiguity prevails, CPGs can aid CDM by providing recommendations that are supported by research evidence (Woolf et al.1999). CPGs help to reduce the underuse; overuse and misuse of the treatment choices (Kale et al. 2013) and thereby encourage optimum patient care and promote EBP (Franke et al. 2008; Woolf et al. 1999). CPGs are expected to improve the quality of patient care (Keiffer, 2015; Van Dulmen et al. 2014; Siering et al. 2013; Rutten et al. 2010; Woolf et al. 1999) while recommending only the treatment choices of proven effectiveness and thereby discouraging obsolete, ineffective and dangerous practices. Some studies have reported improved quality of patient care with CPG adherence (Ajimsha et al. 2018; Van Dulmen et al. 2014; Siering et al. 2013) although the extent of such improvement could not be easily assessed objectively, in clinical practice. For instance, Barth et al. (2016) reports that the longevity of patients with heart attack could be attributed to improved diagnostics and management due to research although, integration of CPG in clinical practice appears to be slow in Sweden. CPGs are expected to reduce variation in clinical practice and to support standardization of patient care (Kredo et al. 2016; Keiffer, 2015; Montero, 2015; Gundersen, 2000). CPGs provide an opportunity to individual practitioners to audit their own performances against the standard given in the CPGs that are essentially evidence-based recommendations with measurable outcomes (Kredo et al. 2016). Some researchers claim that CPGs reduce malpractice claims (Siering et al. 2013) and facilitate cost-effective utilization of healthcare resources and enhance patient safety (APWCA, 2010; Rutten et al. 2010). Hanney et al. (2017) reported that CPG adherence in management of low back pain resulted in decreasing the healthcare utilization and cost, although such claim is not supported by many studies. CPGs could also support the informed decision making of the patients (Graham et al. 2011) and promote patient's autonomy leading to improved patient satisfaction (APWCA, 2010). However, studies that support these claims in the context of PT are far and few. Table 2.3 is an illustration of the studies specifically in the field of PT that investigated CPGs and their impact on either professional practice or patient outcomes.

Table 1 Examples of evidence that integration of CPG could improve patient care and professional practice.

No.	Medical condition	Research knowledge that could support PTs	Effect of research use		Authors
			On patient	On practitioner	
1	Musculoskeletal conditions - whiplash	CPG for whiplash			Rebbeck et al. (2013)
2	Musculoskeletal conditions – low back pain	CPG for Low back pain	Improvement in physical functioning and pain	NA	Bekkering et al. (2006a)
3	Musculoskeletal conditions – low back pain	CPG for Low back pain	NA	Professional practice improvement	Bekkering et al. (2005b)
4	Pediatric PT - Assessment of Pediatric patients in an outpatient clinic	Clinical decision support system (CDSS) for use of Standardized Pediatric Outcome Measures e.g. GMFM-66 / GMFM- 88; GMFCS	NA	Professional practice improvement	Schreiber et al. (2015)
5	Musculoskeletal conditions – low back pain, neck pain & sub acromial pain	CPG	NA	Professional practice improvement	Bernhardsson et al. (2014)
6	Pediatric PT- motor function in children with cerebral palsy (CP)	Evidence based measurement tools	NA	Professional practice improvement	Russel et al. (2010)

It can be seen from Table 1 that CPGs were useful either in enhancing the patient care or improving the professional practice of the PTs. Thus, in this research CPG is considered as an important aspect that needs to be integrated into clinical practice of PTs.

Appendix 2.5

Limitations of CPGs

Notwithstanding their advantages, CPGs are also criticized for their limitations, including certain intrinsic characteristics of CPGs itself that can make it challenging to integrate in clinical practice. For instance, complexity of the CPG and compatibility to the current practice are considered to be critical to the integration for CPG in practice (Fischer et al. 2016; Cabana et al. 1999). Further CPGs are criticized as lengthy documents of written prose with graphical displays that are complex to interpret (Graham et al. 2011). Hence, it is argued that complex CPGS ae not integrated easily in practice. Likewise, the quality of the evidence supporting the recommendations that in turn affect the strength of the CPG recommendations can be a limitation (Siering et al. 2013). For instance, Venkatesh et al. (2017) report that CPG recommendations were largely based on weak evidence and were heavily based on expert opinion, in the field of Emergency medicine reducing its credibility. Furthermore, CPGs published for the same medical condition, but by different entities may have conflicting recommendations (Hoesing, 2016). Likewise, CPGs are only useful for applying in a homogeneous population, whereas in daily clinical practice, practitioners encounter patients who are not homogeneous (Geleris et al. 2011). Further practitioners encounter patients who might be suffering from complex and comorbid conditions, rendering the individual CPG for a specific condition, is not being suitable for application to a patient with comorbid conditions. For instance, it is not possible to apply a single CPG to older patients with several comorbid diseases. For e.g. coronary artery disease, renal failure, diabetes mellitus with respiratory failure have got different CPGs to manage those conditions. However, attempting to integrate, all the recommendations in those CPGs on a single patient could be detrimental to the patient health and may result in undesired effect (Boyd et al. 2005). In another instance, some authors argue that CPGs hinder practitioners' autonomy of practice; an important argument across in the healthcare disciplines (Fischer at al. 2016; Cabana et al. 1999; Cabana et al. 2002).

Appendix 2.6

Table 1 Barriers to EBP & CPG implementation in the context of PT at all levels were classified according to "Knowledge-Attitude- Behaviour Framework" by Cabana et al (1999)

No.	Author/s	Context & Country	Barriers to EBP & CPG implementation in the context of PT	Barriers at practitioner level				
				Knowledge	Attitude			
				Awareness/ familiarity	Agreement	Self - efficacy	Outcome expectancy	Motivation
1	Ramirez –Velez et al. (2015)	EBP in Columbia	"Lack of research skills, lack of understanding of statistical analysis, Inability to apply research findings to individual patients with unique characteristics insufficient time, lack of English language skills, lack of information resources, lack of peer support, lack of interest, poor ability to critically appraise the literature, Lack of generalizability of the literature findings to my patient population"	✓	✓	✓	✓	✓
2	Silva et al. (2015)	EBP in Brazil	"Lack of access to full-text papers, higher cost, language of publication, lack of interest in research, lack of skills to understand and apply research, lack of training, lack of time, lack of familiarity, lack of positive attitude"	✓	✓	✓		✓
3	Bernhardsson et al. (2014)	CPG in Sweden	"Lack of time, don't know where to find guidelines, guidelines are too general/, guidelines take too long to read, no/too few guidelines exist, guidelines are too much "recipe", lack of support from colleagues, lack of interest, other barriers"	✓	✓			✓
4	Queiroz and Santos, 2013 (cited in Silva et al. 2014)	EBP in Brazil	"Lack of time, lack of generalizability of the research findings to specific population, lack of information sources, inability to apply the results to individual patients"	✓	✓	✓		
5	Gorgon, (2012)	EBP in Philippines	"lack of time, lack of dedicated time for EBP, lack of access to EBP resources, lack of policies to support EBP, lack of training, lack of skills related to research, lack of authority in patient's decision-making, lack of skills in applying the search, lack of peer support at work, lack of generalization of data, lack of interest"	✓		✓	✓	✓
6	Nilsagard and Lohse, (2010)	EBP in Sweden	"Lack of time, lack of advisors, lack of knowledge, employers' lack of interest, lack of technological equipment, lack of interest in EBP, colleagues' lack of interest, conflicts generated by EBP between patients and carers"	✓	✓		✓	✓
7	Buchard, (2009)	EBP in France	"Lack of time, no access to full articles, no access to abstracts, few articles on their field of clinical practice, resistance to change, poor English skills, lack of personal skills"	✓	✓	✓		
8	Salbach et al. (2007)	EBP in Canada	"Lack of time, lack of generalizability of research findings, lack of research skills,	✓		✓	✓	✓

			inability to understand statistical data, inapplicability of research to unique patients, inability to critically appraise articles, isolation from peers, lack of information resources, lack of an organisational mandate, lack of support from colleagues, lack of interest"					
9	Iles and Davidson, (2006)	EBP in Australia	"Lack of access to resources, lack of support at workplace, Lack of relevant research, lack of personal skills in search and assessment, lack of access to journals, incomprehensible abstracts, lack of time"	✓		✓		
10	Jette et al. (2003)	EBP in USA	"Lack of time, lack of generalization of the data for the patient, patient peculiarities, inability to understand statistical data, lack of skills in searches, lack of means of information, lack of educational support, inability to critically appraise studies, lack of interest"	✓	✓	✓	✓	✓
Sources: Silva et al. 2014; Ramirez –Velez et al. 2015								

Appendix 2.7

Table 1 Barriers to EBP &CPG implementation in the context of PT at the practitioner level were classified according to "Knowledge-Attitude- Behaviour Framework" by Cabana et al (1999)

Common factors identified as barriers at the practitioner level in the context of PT with reference to EBP classified according to KABF by Cabana et al. (1999)		**Author/s**
Knowledge	Awareness/familiarity	Ramirez –Velez et al. 2015; Silva et al. 2015; Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Gorgon, 2012; Nilsagard and Lohse, 2010; Buchard, 2009; Salbach et al. 2007; Iles and Davidson, 2006; Jette et al. 2003
Attitude	Agreement	Ramirez –Velez et al. 2015; Bernhardsson et al. 2014; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Nilsagard and Lohse, (2010); Buchard, 2009; Iles and Davidson, 2006; Jette et al. 2003
	Self -efficacy	Ramirez –Velez et al. 2015; Silva et al.2015; Queiroz and Santos, 2013 (cited in Silva et al. 2014); Gorgon, 2012; Buchard, 2009; Salbach et al. 2007; Iles and Davidson, 2006; Jette et al. 2003
	Outcome expectancy	Ramirez –Velez et al. 2015; Gorgon, 2012; Nilsagard and Lohse, (2010); Salbach et al. 2007; Jette et al. 2003
	Motivation	Ramirez –Velez et al. 2015; Silva et al.2015; Bernhardsson et al. 2014; Gorgon, 2012; Nilsagard and Lohse, (2010); Salbach et al. 2007; Jette et al. 2003

Appendix 4.1

Survey Questionnaire for Pre-testing

Pre-intervention for both groups (EM & VCoP)

Dear Sir or Madam,

I am a PhD student at Brunel University, UK. My research is in the area of Knowledge Translation. The title of my research is "Role of Knowledge Translation Interventions (KTIs) in bridging the research - practice gap among the Physical Therapists (PTs): A comparative study". This study aims to compare the effectiveness of different interventions in achieving knowledge translation to bridge the research-practice gap.

As part of my research I need to collect data from practicing physical therapists, through a survey using a questionnaire. The questionnaire is self-administered and has been developed, using a predefined (single response) scale that facilitates easiness in completing the questions. Since the study intends to evaluate the effectiveness of a Knowledge Translation intervention, you are requested to complete the questionnaire at two-time points, prior to the intervention and after the intervention. The intervention includes reading of educational material sent to you through email or your participation in one of the online or virtual communities of practice (VCoP) specifically constituted for professional purpose only.

I will be very grateful to you if you would participate in the survey to enable me to complete this important research. Hence, I request you to spare a few moments of your valuable time to participate in this study. Your participation is entirely voluntary; it is up to you to decide whether or not to take part. If you decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. I assure you that the information provided by you, will only be used for the purpose of this research, and will be treated in the strictest confidence and your identity will be kept anonymous. I also guarantee you that all the information provided by you will not be allowed to be used by any third party or entity. The study has obtained ethical approval from Brunel University, London, UK.

If you require any clarification, please do not hesitate to contact me on the telephone and/ or e-mail details provided below. Thanking you for your kind cooperation and support for this important study.

Yours sincerely,

Litty Mathew Shibu
PhD student, Brunel University, UK
Email: litty.Shibu@brunel.ac.uk, Mobile: + 973 36550325
Kingdom of Bahrain.

Section 1: **Demographic questions**; (Please tick "**X**" to whichever applies)

1. Are you a Physical Therapist (PT) currently practicing (for at least past 12 months in the USA)?
   ☐ Yes ☐ No.
2. Do you hold a valid Physical Therapy License in the current country of practice?
   ☐ Yes ☐ No.

If your answer is "No," to any one of the above two questions, please DO NOT proceed further answering the following questions. You do not have to complete the questionnaire.
Thank you.

3. What is your Gender
   ☐ Male ☐ Female
4. Age (years):

20-25 yrs.	26-30 yrs.	31-35 yrs.	36-40 yrs.	40 - 45 yrs.	46-50 yrs.	51-55 yrs.	56-60 yrs.	>60 yrs.

5. Number of years of clinical experience:

Less than 2 yrs.	2- 5 yrs.	6 – 10 yrs.	11 –15 yrs.	16 – 20 yrs.	21 – 25 yrs.	26 – 30 yrs.	>30 yrs.

6. What is your highest qualification in Physiotherapy?
   ☐ Undergraduate University degree ☐ Postgraduate University degree
   ☐ DPT / Doctor of Physical Therapy ☐ PhD ☐ Others
7. Are you a member of American Physical Therapy Association? (APTA)
   ☐ Yes ☐ No.

8. Are you a member of Cardiopt yahoo group (Listserv)?
☐ Yes ☐ No.

Please note:
Evidence-Based Clinical Decision Making (EBCDM) is defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" and ''the integration of best research evidence with clinical expertise and [client] values''.
Clinical Practice Guidelines (CPG) is "systematically developed recommendations with the purpose to facilitate for caregivers and patients to make decisions about suitable treatment in specific situations."
In this survey, "CPG" means "Clinical practice guidelines for **venous thromboembolism (VTE)** in physical therapy' published by APTA (American Physical Therapy Association in 2015)

Section 2: Knowledge

This section of the questionnaire inquires about the knowledge of EBCDM & CPG for VTE in Physical therapy. Knowledge is defined as facts, information, and skills acquired through experience or education related to CPG and EBCDM.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
1	I know the meaning of the term Evidence Based Clinical Decision Making (EBCDM).					
2	I know about Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy.					
3	I have an understanding that CPGs are being used for Evidence Based Clinical Decision Making (EBCDM).					
4	I understand the core elements of the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy that is required for Evidence Based Clinical Decision Making (EBCDM).					
5	I have clear understanding regarding the use of Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy for Evidence Based Clinical Decision Making (EBCDM).					
6	I have sufficient knowledge to implement Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy as part of Evidence Based Clinical Decision Making (EBCDM).					
7	I am familiar with the recommendations given in the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy.					
8	I had no knowledge of Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy and how to integrate it in my practice during my graduate or postgraduate studies. (RC).					
9	I learned the foundations for evidence-based practice as part of my academic preparation.					
10	I received formal training in how to critically evaluate research literature as part of my academic preparation					

RC – Question is reverse coded

Section 3: Attitude

This section of the questionnaire inquires about the attitude towards EBCDM & CPG. Attitude refers to a feeling or opinion about CPG and EBCDM

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
1	I can integrate the patients' preferences with evidence-based Clinical Practice Guidelines (CPG).					
2	Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is important to facilitate my work.					
3	Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is important so that the patients receive the best possible treatment.					
4	Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy help to standardize care and assure that patients are treated in a consistent way.					
5	I consider that using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy will not improve the patient outcomes. (RC)					
6	I consider that using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy restricts the clinical judgment of PTs. (RC)					
7	The judgment of experienced colleagues or supervisors offers a better basis than Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) as research evidence for improving clinical practice. (RC)					
8	Engaging in the evidence-based practice using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy will improve PTs clinical practice.					
9	Experienced PTs should disregard research evidence such as Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy when it conflicts with their intuition. (RC)					
10	Engaging in evidence-based practice Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy makes clinical practice too mechanistic and rigid. (RC)					
11	Trying to engage in evidence-based practice using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is more ethical than refusing to engage in it.					
12	Evidence based practice using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy allows enough room for considering unique client circumstances or preferences.					

RC – Question is reverse coded

Section 4: Self – efficacy

This section of the questionnaire inquires about the self-efficacy towards EBCDM & CPG. Self-efficacy is defined as a judgment of one's ability to organize and execute activities in a specific domain.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
1	I have the ability to identify gaps in my knowledge required for managing Venous thromboembolism (VTE).					
2	I understand how to formulate questions about clinical practice managing Venous thromboembolism (VTE) that can be answered with research evidence including the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					
3	I know how to use the Internet to facilitate my search for research evidence including electronic databases (e.g. PEDro, PubMed)					
4	I understand how to appraise the research evidence pertaining to my clinical practice question.					
5	I have the ability to determine how useful (clinically applicable) the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy for EBCDM.					
6	I have the ability to apply Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy to individual patients in my clinical practice.					
7	I know what factors to consider in addition to Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy for EBCDM (i.e. integrating CPG with patient preferences, values, concerns, expectations).					
8	I feel confident in my ability to use Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy to guide clinical practice decisions.					
9	I understand how to evaluate the outcomes of my practice decisions using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					

Section 5: Motivation

This section of the questionnaire inquires about motivation towards EBCDM & CPG. Motivation can be defined as the processes that account for an individual's intensity, direction and persistence of effort toward attaining a goal.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	**For the following items, place a mark 'x' in the appropriate box that indicates your response.**	**1**	**2**	**3**	**4**	**5**
1	I think integrating Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice is interesting.					
2	I do not think that Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is a good thing to pursue in my clinical practice. (RC)					
3	I am integrating Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice for my own good (professional development).					
4	I am integrating Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice because I am supposed to do it (organisational requirement) (RC)					
5	I do not wish to change my clinical practice, regardless of the recommendations given in Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy. (RC)					
6	I don't have time to use this Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy. (RC)					
7	I am interested in learning or improving the skills necessary to incorporate Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice.					

RC – Question is reverse coded

Section 6: Evidence based clinical decision making (EBCDM)

This section of the questionnaire inquires about the use of CPG for Clinical decision-making which is synonymous with EBCDM.Clinical decision-making refers to the process of deciding what information to gather, which tests to order, how to interpret and integrate this information to draw diagnostic conclusions, and which treatments to give is known as clinical decision making.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
1	I ask my patients about their preferences and I consider them in my clinical decision making in regard to management of Venous thromboembolism (VTE).					
2	I inform my patients of their treatment options and involve their options in my clinical decision making in regard to management of Venous thromboembolism (VTE).					
3	I use the research evidence from peer reviewed journals, RCTs, and systematic reviews in my clinical decision making in regard to management of Venous thromboembolism (VTE).					
4	Currently much of my clinical decision-making in regard to management of Venous thromboembolism (VTE) incorporates recommendation in the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					
5	An expert's opinion in my field is the most important factor in my clinical decision making in regard to management of Venous thromboembolism (VTE). (RC)					
6	My clinical decision making for VTE is influenced by Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					
7	I have confidence in clinical decision-making that is based on Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					

RC – Question is reverse coded

Thank You!

Appendix 4.2

Survey Questionnaire for Pre-testing

Post-intervention for EM group

Dear Sir or Madam,

Appreciate your participation in the pre-intervention survey of this knowledge translation study. This survey is designed to collect post-intervention data. The title …….
The intervention phase of this study requires reading of educational materials that are already sent to you through email. After reading the educational materials, kindly participate in the post intervention survey using a questionnaire. ……Thanking you for your kind cooperation and support for this important study.

Yours sincerely,
Litty Mathew Shibu
PhD student, Brunel University, UK
Email: litty.Shibu@brunel.ac.uk, Mobile: + 973 36550325
Kingdom of Bahrain.

Please note: All the sections of this questionnaire are same as Appendix 4.1 except Section 8

Section 8: Relative advantage of Intervention

A. Relative advantage of using educational material as intervention

This section of the questionnaire inquires about the 'Relative advantage' of the intervention that you have received as a part of this research (either educational material or participation in Virtual communities of practice/ VCoP). Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factor.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
1	Using the intervention (Educational material) for learning about the CPG for VTE was better than not using it.					
2	Using the intervention (Educational material) was more interesting for learning about the CPG for VTE than without it.					
3	Using the intervention (Educational material) made learning about CPG for VTE a better experience than I would have otherwise.					
4	I learned about CPG for VTE more quickly and easily using the intervention (Educational material).					
5	I had more fun learning about CPG for VTE using the intervention (Educational material).					
6	The intervention (Educational material) about CPG for VTE offered me real advantages over the way I usually learn about CPGs.					

Thank You!

Appendix 4.3

Survey Questionnaire for Pre-testing

Post-intervention for VCoP group

Dear Sir or Madam,

Appreciate your participation in the pre-intervention survey of this knowledge translation study. This survey is designed to collect post-intervention data. The title …….

The intervention phase of this study requires your participation interactions in the VCoP. After completing the participation in the VCoP, kindly complete in the post intervention survey using a questionnaire. ……..Thanking you for your kind cooperation and support for this important study.

Yours sincerely,

Litty Mathew Shibu
PhD student, Brunel University, UK
Email: litty.Shibu@brunel.ac.uk, Mobile: + 973 36550325
Kingdom of Bahrain

Please note: All the sections of this questionnaire are same as Appendix 4.1 except Section 8

Section 8: Relative advantage of Intervention

B. Relative advantage of interacting in Virtual communities of practice (VCoP) as intervention

This section of the questionnaire inquires about the 'Relative advantage' of interacting in VCoP together over educational material alone. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factor.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
1	Using the intervention (interactions in the VCoP) for learning about the CPG for VTE was better than not using it.					
2	Using the intervention (interactions in the VCoP) was more interesting for learning about the CPG for VTE than without it.					
3	Using the intervention (interactions in the VCoP) made learning about CPG for VTE a better experience than I would have otherwise.					
4	I learned about CPG for VTE more quickly and easily using the intervention (interactions in the VCoP).					
5	I had more fun learning about CPG for VTE using the intervention (interactions in the VCoP).					
6	The intervention (interactions in the VCoP) about CPG for VTE offered me real advantages over the way I usually learn about CPGs.					

Thank You!

Appendix 4.4

Section 7: CPG Specific Knowledge (KNW) & Clinical Decision-making behaviour (CDMB)

This section of the questionnaire inquiries about the knowledge specific to the CPG for VTE in Physical therapy & Clinical decision-making behaviour of the Physical therapist.

1= Yes; 2= No

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2
KNW 1	A busy practicing Physical therapist finds it less important to provide educational programs and preventive measures to people with risk for lower extremity DVT. (RC)	Yes	No
CDMB 1	Physical therapists should use mechanical compression using Intermittent pneumatic compression (IPC) and or Graded compression stockings (GCS) only for patients with a confirmed diagnosis of lower extremity DVT. (RC)	Yes	No
KNW 2	Pain, tenderness, swelling, warmth or discolorations of lower extremity are warning signs for the Physical therapists to assess the risk of likelihood of lower extremity DVT.	Yes	No
CDMB 2	Patient with complaints of calf pain & swelling and is tested positive for a D- dimer test. Physician suspect likelihood of DVT and patient is scheduled for Doppler Ultrasound. Meanwhile he is referred to Physical therapy department. PT can initiate mobilization and later conduct a risk assessment using the Wells Criteria©. (RC)	Yes	No
KNW 3	Knowledge and awareness about anticoagulants, what type of anticoagulants, and when the anticoagulant started etc. is not important for PT management of VTE. (RC)	Yes	No
CDMB 3	A 56-year-old patient with calf pain, swelling and edema of the right lower extremity and with a positive test for Deep vein thrombosis (DVT) in Doppler ultrasound. Physician started the anticoagulant (Low Molecular Weight Heparin - LMWH) and patient was referred for Physical therapy management after an hour. Physical therapist can initiate mobilization. (RC)	Yes	No
CDMB 4	Mechanical compression using intermittent pneumatic compression (IPC) and or Graded compression stockings (GCS) is contraindicated when anticoagulation therapy is contraindicated for patients with a diagnosis of lower extremity DVT. (RC)	Yes	No
CDMB 5	Physical therapists should emphasize that patients diagnosed with acute lower extremity DVT and are on anticoagulants and Inferior vena cava (IVC) filter to have early ambulation preferred over initial bed rest.	Yes	No
CDMB 6	Patient is diagnosed with lower extremity DVT & and is not on anticoagulants and no IVC filter. Physician prescribed for out of bed mobility & the physical therapist can initiate mobilization without further consultation with the medical team. (RC)	Yes	No
CDMB 7	It is the responsibility of the physical therapist to conduct 'Fall risk assessment' for patients with lower extremity DVT receiving anticoagulation therapy.	Yes	No
KNW 4	The cornerstone in the treatment of post thrombotic syndrome (PTS) is mechanical compression using intermittent pneumatic compression (IPC) and or Graded compression stockings (GCS) with or without taking anticoagulant medications.	Yes	No
KNW 5	Physical therapists should continuously monitor patients with lower extremity DVT and should implement strategies for preventing post thrombotic syndrome (PTS)	Yes	No
CDMB 8	During the initial PT assessment, patient scored 2, using the Wells Criteria © Score. Physical therapist should refer the patient back to the Physician immediately.	Yes	No
KNW 6	Homans sign is a valuable clinical assessment technique for a patient with suspected DVT (RC)	Yes	No
KNW 7	Signs & symptoms of DVT + Wells Criteria © Score have significant predictive value for initial Physical therapy clinical assessment of a case suspected of DVT.	Yes	No
CDMB 9	A 63 y/o man underwent surgical repair of fracture shaft of the humerus one month earlier. He was not on anticoagulants after the surgery. Currently, he is complaining of shoulder pain and moderate left calf pain for a week. He is ambulatory & has no history of DVT, leg trauma, or unusual physical activity. The left calf measures 2 cm larger than the right. Upon palpation there was tenderness along the back of the left calf and thigh. Physical therapist assesses the risk using Wells Criteria © and assigned a Score	Yes	No

	of 2 and recommend for further medical tests.		
CDMB 10	A 52-year-old woman with complaint of right calf pain for one week is referred to the Physical therapist. Patient underwent a L5 discectomy for Low Back Pain & radiating right lower extremity pain 2 months ago. She did not take anticoagulants after the surgery. She resumed walking for small distance on second post-operative day and has been gradually walking longer distances after the surgery. There is tenderness on palpation along the back of right lower limb and there is some mild edema seen in the feet. Risk assessment using Wells Criteria © will have a Score that would indicate 'DVT Unlikely'. (RC)	Yes	No
KNW 8	Mechanical compression using Graded compression stockings (GCS) are contraindicated for diabetic patients diagnosed with risk of LE DVT. (RC)	Yes	No
KNW 9	DVT in the proximal veins like popliteal & iliac veins have increased risk for PE.	Yes	No
KNW 10	Proximal deep vein thrombosis in the lower extremity is more likely to be associated with a pulmonary embolus	Yes	No

RC – Question is reverse coded

Appendix 4.5

Section 7: CPG specific knowledge – Key answers

Question No.	Question code	Correct Answer
1	KNW 1	No
2	KNW 2	Yes
3	KNW 3	No
4	KNW 4	Yes
5	KNW 5	Yes
6	KNW 6	No
7	KNW 7	Yes
8	KNW 8	No
9	KNW 9	Yes
10	KNW 10	Yes

Section 7: CDM behaviour vignette – Key answers

Question No.	Question code	Correct Answer
1	CDMB 1	No
2	CDMB 2	No
3	CDMB 3	No
4	CDMB 4	No
5	CDMB 5	Yes
6	CDMB 6	No
7	CDMB 7	Yes
8	CDMB 8	Yes
9	CDMB 9	Yes
10	CDMB 10	Yes

Appendix 4.6

Main Survey Questionnaire

Pre-intervention for both groups (EM & VCoP)

Dear Sir or Madam,
I am a PhD student at Brunel University, UK. My research is in the area of Knowledge Translation. The title of my research is …….
…..... Thanking you for your kind cooperation and support for this important study.
Yours sincerely,
Litty Mathew Shibu
PhD student, Brunel University, UK
Email: litty.Shibu@brunel.ac.uk, Mobile: + 973 36550325
Kingdom of Bahrain.

Section 1: **Demographic questions**; (Please tick "**X**" to whichever applies)

1. Are you a Physical Therapist (PT) currently practicing (for at least past 12 months in the USA)?
   ☐ Yes ☐ No.
2. Do you hold a valid Physical Therapy License in the current country of practice?
   ☐ Yes ☐ No.

   If your answer is "No," to any one of the above two questions, please DO NOT proceed further answering the following questions. You do not have to complete the questionnaire. Thank you.
3. What is your Gender
   ☐ Male ☐ Female
4. Age (years):

20-25 yrs.	26-30 yrs.	31-35 yrs.	36-40 yrs.	40 - 45 yrs.	46-50 yrs.	51-55 yrs.	56-60 yrs.	>60 yrs.

5. Number of years of clinical experience:

Less than 2 yrs.	2- 5 yrs.	6 – 10 yrs.	11 –15 yrs.	16 – 20 yrs.	21 – 25 yrs.	26 – 30 yrs.	>30 yrs.

6. What is your highest qualification in Physiotherapy?
   ☐ Undergraduate University degree ☐ Postgraduate University degree
   ☐ DPT / Doctor of Physical Therapy ☐ PhD ☐ Others
   _____
7. Are you a member of American Physical Therapy Association? (APTA)
   ☐ Yes ☐ No.
8. Are you a member of Cardiopt yahoo group (Listserv)?
   ☐ Yes ☐ No.

Please note:
Evidence-Based Clinical Decision Making (EBCDM) is defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" and ''the integration of best research evidence with clinical expertise and [client] values''.
Clinical Practice Guidelines (CPG) is "systematically developed recommendations with the purpose to facilitate for caregivers and patients to make decisions about suitable treatment in specific situations."
In this survey, "CPG" means "Clinical practice guidelines for **venous thromboembolism (VTE)** in physical therapy' published by APTA (American Physical Therapy Association in 2015)

Section 2: Knowledge

This section of the questionnaire inquires about the knowledge of EBCDM & CPG for VTE in Physical therapy. Knowledge is defined as facts, information, and skills acquired through experience or education related to CPG and EBCDM.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
K 1	I understand the core elements of the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy that is required for Evidence Based Clinical Decision Making (EBCDM).					
K 2	I have clear understanding regarding the use of Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy for Evidence Based Clinical Decision Making (EBCDM).					
K 3	I have sufficient knowledge to implement Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy as part of Evidence Based Clinical Decision Making (EBCDM).					
K 4	I am familiar with the recommendations given in the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in physical therapy.					

Section 3: Attitude

This section of the questionnaire inquires about the attitude towards EBCDM & CPG. Attitude refers to a feeling or opinion about CPG and EBCDM.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
A1	Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is important to facilitate my work.					
A2RC	I consider that using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy will not improve the patient outcomes.					
A3RC	I consider that using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy restricts the clinical judgment of PTs.					
A4RC	The judgment of experienced colleagues or supervisors offers a better basis than Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) as research evidence for improving clinical practice.					
A5RC	Experienced PTs should disregard research evidence such as Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy when it conflicts with their intuition.					
A6RC	Engaging in evidence-based practice Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy makes clinical practice too mechanistic and rigid.					

RC – Question is reverse coded

Section 4: Self – efficacy

This section of the questionnaire inquires about the self-efficacy towards EBCDM & CPG. Self-efficacy is defined as a judgment of one's ability to organize and execute activities in a specific domain.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
SE 1	I have the ability to identify gaps in my knowledge required for managing Venous thromboembolism (VTE).					
SE 2	I have the ability to determine how useful (clinically applicable) the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy for EBCDM.					
SE 3	I have the ability to apply Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy to individual patients in my clinical practice.					
SE 4	I feel confident in my ability to use Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy to guide clinical practice decisions.					
SE 5	I understand how to evaluate the outcomes of my practice decisions using Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					

Section 5: Motivation

This section of the questionnaire inquires about motivation towards EBCDM & CPG. Motivation can be defined as the processes that account for an individual's intensity, direction and persistence of effort toward attaining a goal.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
M1	I think integrating Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice is interesting.					
M2RC	I do not think that Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy is a good thing to pursue in my clinical practice.					
M3RC	I do not wish to change my clinical practice, regardless of the recommendations given in Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					
M4	I am interested in learning or improving the skills necessary to incorporate Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy in my clinical practice.					

RC – Question is reverse coded

Section 6: Evidence based clinical decision making (EBCDM)

This section of the questionnaire inquires about the use of CPG for Clinical decision-making which is synonymous with EBCDM.Clinical decision-making refers to the process of deciding what information to gather, which tests to order, how to interpret and integrate this information to draw diagnostic conclusions, and which treatments to give is known as clinical decision making.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
CDM 1	I ask my patients about their preferences and I consider them in my clinical decision making in regard to management of Venous thromboembolism (VTE).					
CDM 2	Currently much of my clinical decision-making in regard to management of Venous thromboembolism (VTE) incorporates recommendation in the Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					
CDM 3	My clinical decision making for VTE is influenced by Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					
CDM 4	I have confidence in clinical decision-making that is based on Clinical Practice Guideline (CPG) for Venous thromboembolism (VTE) in Physical therapy.					

Appendix 4.7

Main Survey Questionnaire

Post-intervention for EM group

Dear Sir or Madam,

Appreciate your participation in the pre-intervention survey ……
The intervention phase of this study requires reading of educational materials that are already sent to you through email. After reading the educational materials, kindly participate in the post intervention survey using a questionnaire. ……..Thanking you for your kind cooperation and support for this important study.

Yours sincerely,
Litty Mathew Shibu
PhD student, Brunel University, UK
Email: litty.Shibu@brunel.ac.uk, Mobile: + 973 36550325
Kingdom of Bahrain.

Please note: All the sections of this questionnaire are same as Appendix 4.6 except Section 8

Section 8: Relative advantage of Intervention

A. Relative advantage of using educational material as intervention

This section of the questionnaire inquires about the 'Relative advantage' of the intervention that you have received as a part of this research (either educational material or participation in Virtual communities of practice/ VCoP). Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factor.

1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
RAEM1	Using the intervention (Educational material) for learning about the CPG for VTE was better than not using it.					
RAEM2	Using the intervention (Educational material) was more interesting for learning about the CPG for VTE than without it.					
RAEM3	Using the intervention (Educational material) made learning about CPG for VTE a better experience than I would have otherwise.					
RAEM4	I learned about CPG for VTE more quickly and easily using the intervention (Educational material).					
RAEM5	I had more fun learning about CPG for VTE using the intervention (Educational material).					
RAEM6	The intervention (Educational material) about CPG for VTE offered me real advantages over the way I usually learn about CPGs.					

Appendix 4.8

Main Survey Questionnaire

Post-intervention for VCoP group

Dear Sir or Madam,

Appreciate your participation in the pre-intervention survey …….
The intervention phase of this study requires your participation interactions in the VCoP. After completing the participation in the VCoP, kindly complete in the post intervention survey using a questionnaire. ……Thanking you for your kind cooperation and support for this important study.
Yours sincerely,
Litty Mathew Shibu
PhD student, Brunel University, UK
Email: litty.Shibu@brunel.ac.uk, Mobile: + 973 36550325

Kingdom of Bahrain.

Please note: All the sections of this questionnaire are same as Appendix 4.6 except Section 8

Section 8: Relative advantage of Intervention

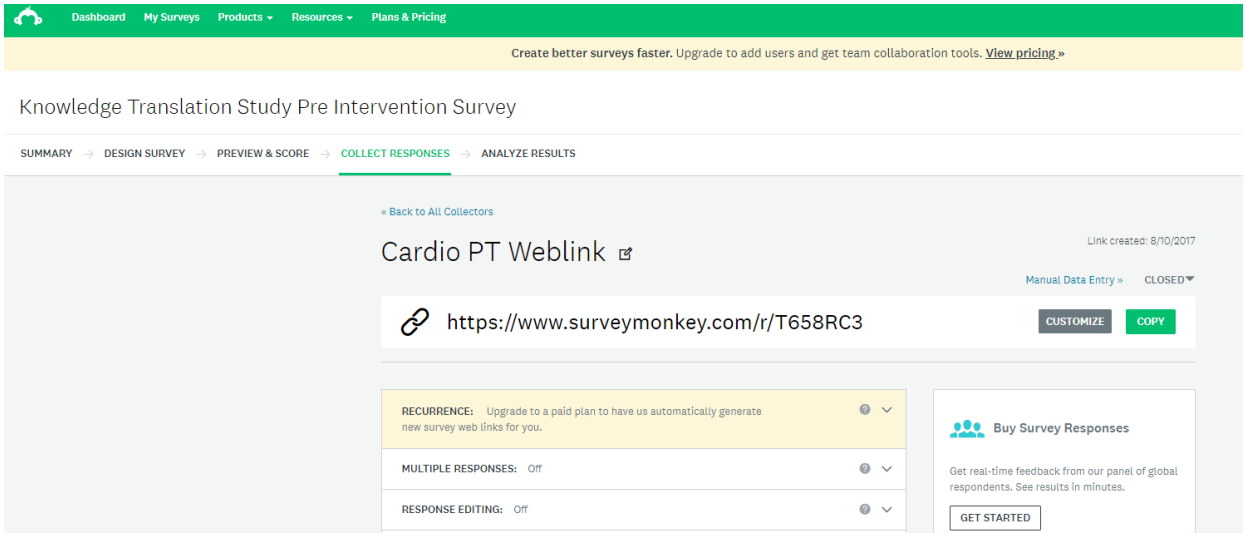
A. Relative advantage of interacting in Virtual communities of practice VCoP as intervention

This section of the questionnaire inquires about the 'Relative advantage' of interacting in VCoP together over educational material alone. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factor.
1-Strongly Disagree, 2- Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

No.	For the following items, place a mark 'x' in the appropriate box that indicates your response.	1	2	3	4	5
RAVCoP1	Using the intervention (interactions in the VCoP) for learning about the CPG for VTE was better than not using it.					
RAVCoP2	Using the intervention (interactions in the VCoP) was more interesting for learning about the CPG for VTE than without it.					
RAVCoP3	Using the intervention (interactions in the VCoP) made learning about CPG for VTE a better experience than I would have otherwise.					
RAVCoP4	I learned about CPG for VTE more quickly and easily using the intervention (interactions in the VCoP).					
RAVCoP5	I had more fun learning about CPG for VTE using the intervention (interactions in the VCoP).					
RAVCoP6	The intervention (interactions in the VCoP) about CPG for VTE offered me real advantages over the way I usually learn about CPGs.					

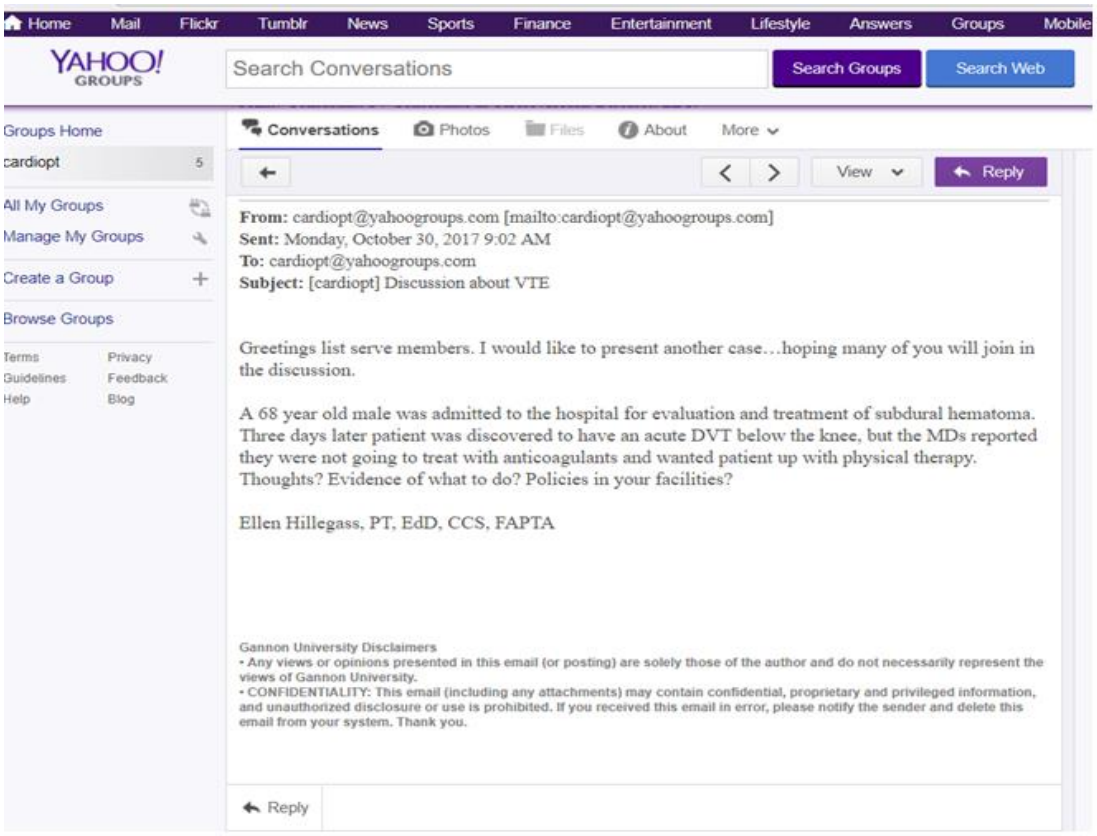
Appendix 4.9

Screenshot of URL for Preintervention survey questionnaire on Survey Monkey



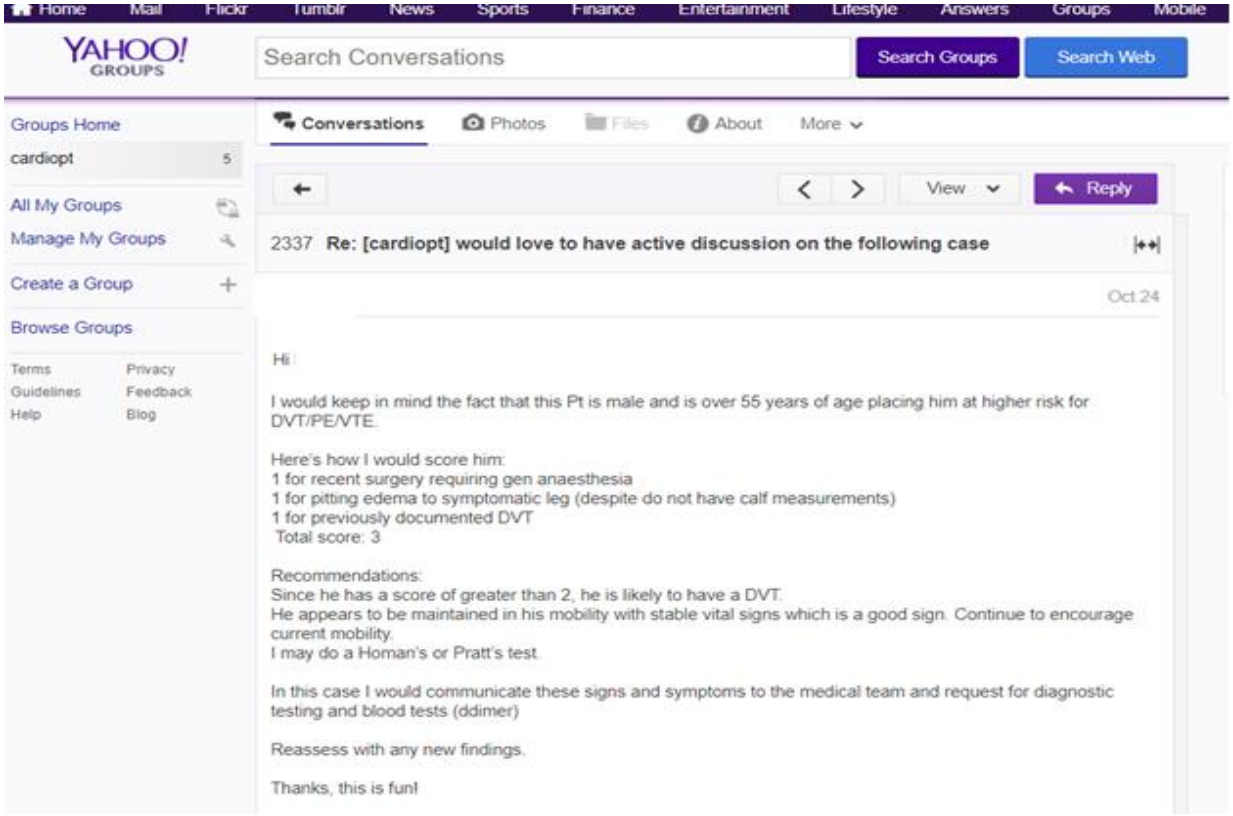
Appendix 4.10

Example of a case scenario posted by Knowledge broker on the VCoP



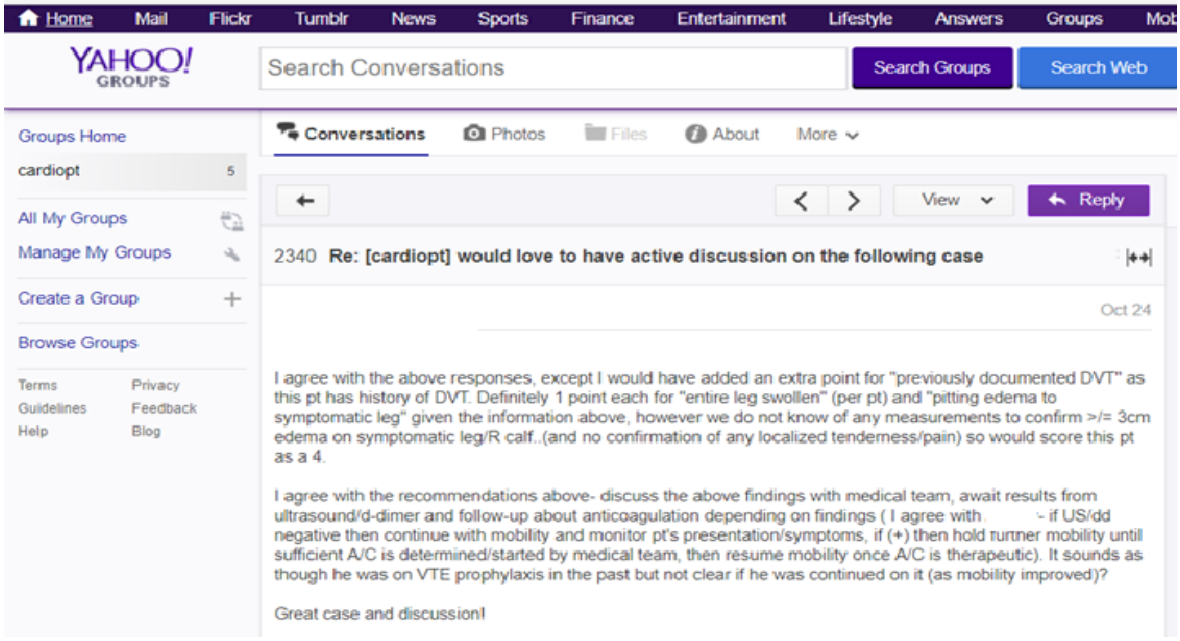
Appendix 4.11

Screenshot of the discussions in the VCoP group



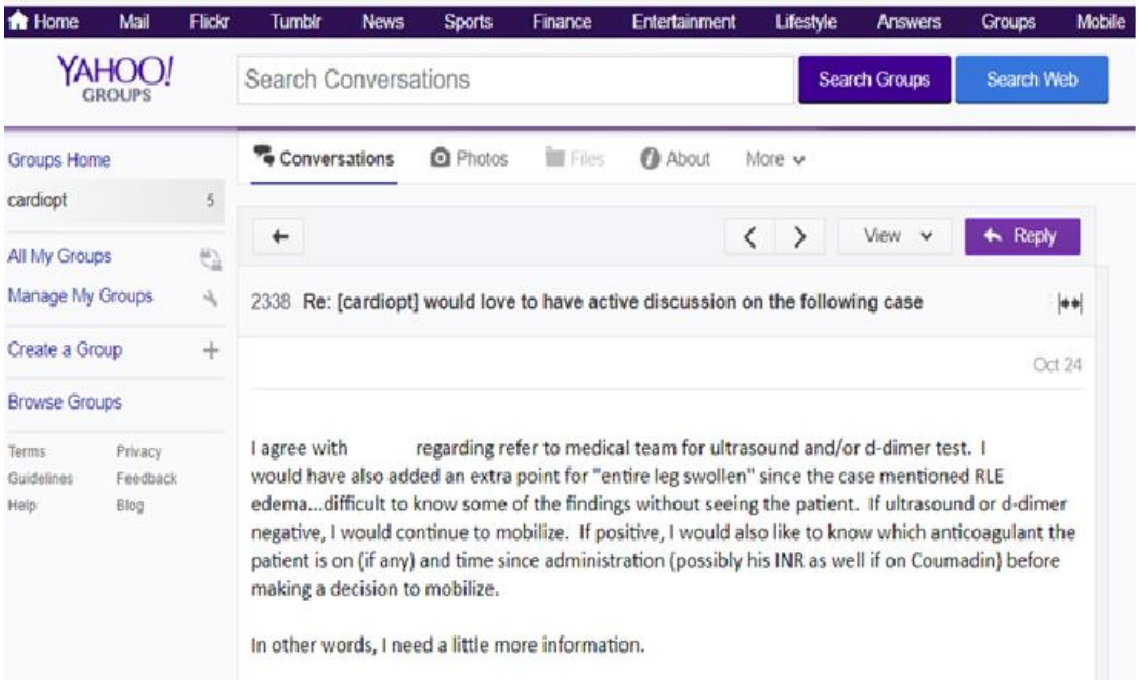
Appendix 4.12

Screenshot of the discussions in the VCoP group



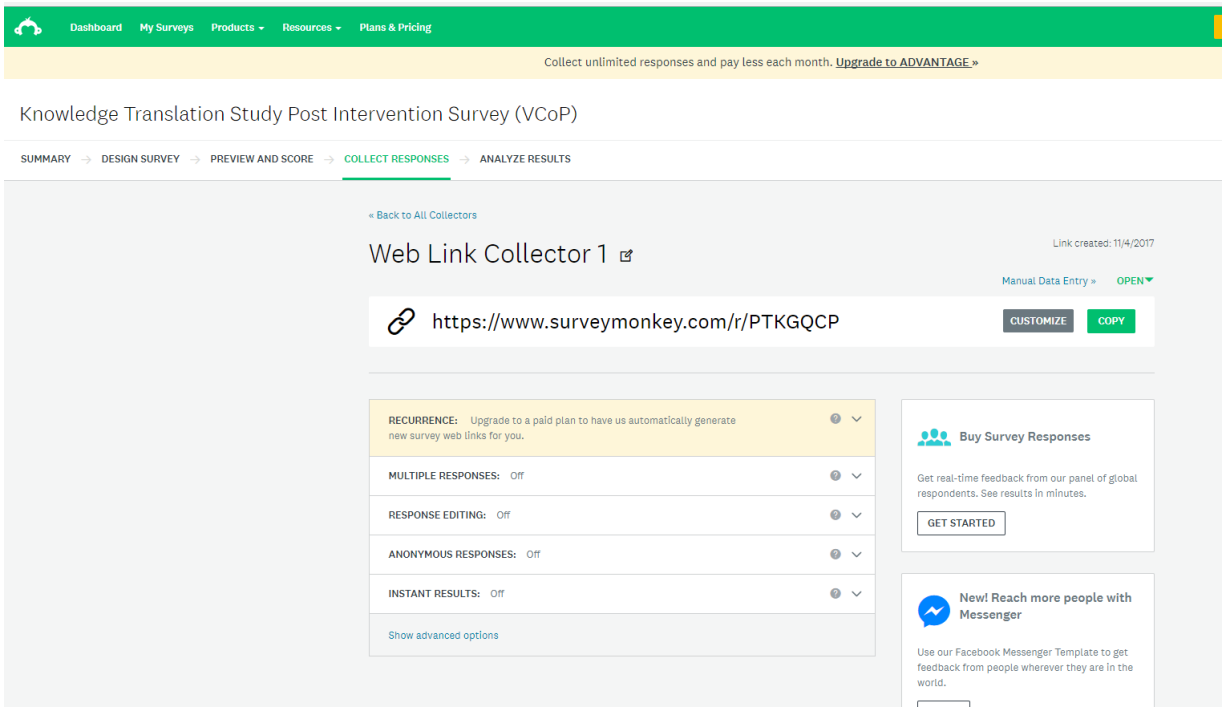
Appendix 4.13

Screenshot of the discussions in the VCoP group



Appendix 4.14

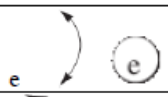
Screenshot of URL for Post- intervention survey questionnaire for VCoP group on Survey Monkey



Appendix 4.15

SEM Glossary

Glossary of Structural Equation Modelling terms (Weston & Gore Jr. 2006; Arbuckle & Wothke, 1999; Byrne, 2001; Kline, 1998; Ullman, 2001; Baron & Kenny, 1986)

Term Used	Alternative Term(s)	Definition	Symbol
Latent variable	Factor, construct	Unobserved hypothetical variable (e.g., occupational interests).	
Indicator	Measured or manifest variable	Observed variable (e.g., Strong Interest Inventory).	
Factor loading	Path loading	Correlation between latent variable and indicator.	→
Direct effect	Path coefficient, path	Correlation between two latent variables.	→
Non-directional association	Covariance, correlation	Correlation between two latent variables.	↔
Indicator error	Predictor error, measurement error	Error in indicator that is not accounted for by latent variable. Indicator error is also considered a latent variable.	
Disturbance	Predictor error	Error in dependent latent variable not accounted for by predictors.	
Explained		Percentage of variance in dependent latent variable accounted for by predictor(s).	R^2
Parameter	Path	Hypothesized association between two variables.	→, ↔
Independent variable	Exogenous variable, predictor	Variable that is not dependent on or predicted by other latent variables or indicators.	------
Dependent variable	Endogenous variable, criterion	Variable that is predicted by other latent variables or indicators.	------
Set parameter	Constrained parameter; Fixed path	Parameter that is set at a constant and not estimated. Parameters fixed at 1.0 reflect an expected 1:1 association between variables. Parameters set at 0 reflect the assumption that no relationship exists.	Parameters set at nonzero values should be labeled: 1.0→ Parameters set at 0 are omitted.
Free parameter	Estimated parameter	Parameter that is not constrained and is to be estimated using observed data.	Represented with an asterisk or simply unlabeled.
Covariance matrix	Sample matrix	Unstandardized associations between all pairs of variables.	Σ; S
Skewness	Asymmetry	Degree of asymmetry observed in the distribution for a variable.	
Kurtosis	Flatness or peakedness	Degree of the peakedness of the distribution for a variable.	
Mediating variable	-----	Variables that affect the relationship between two other variables	
Recursive model		Recursive models have unidirectional "causal" relationships.	
Non-recursive model	-----	Non-recursive models have bidirectional "causal" relationships, that is, feedback loops, correlated error terms, or both.	

Appendix 4.16

Ethical approval from Brunel University, London.

College of Business, Arts and Social Sciences Research Ethics Committee
Brunel University London
Kingston Lane
Uxbridge
UB8 3PH
United Kingdom

www.brunel.ac.uk

13 June 2017

LETTER OF APPROVAL

Applicant: Mrs Litty Mathew Shibu

Project Title: Knowledge translation in the field of PT

Reference: 5188-LR-Jun/2017- 7390-1

Dear Mrs Litty Mathew Shibu

The Research Ethics Committee has considered the above application recently submitted by you.

The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
- The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.
- Approval to proceed with the study is granted subject to receipt by the Committee of satisfactory responses to any conditions that may appear above, in addition to any subsequent changes to the protocol.
- The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the study.
- You may not undertake any research activity if you are not a registered student of Brunel University or if you cease to become registered, including abeyance or temporary withdrawal. As a deregistered student you would not be insured to undertake research activity. Research activity includes the recruitment of participants, undertaking consent procedures and collection of data. Breach of this requirement constitutes research misconduct and is a disciplinary offence.

Professor James Knowles

Chair

College of Business, Arts and Social Sciences Research Ethics Committee
Brunel University London

Appendix 5.1

Descriptive statistics pertaining to EM group at the pre-intervention stage

Item Code	N		Mean	Median	Std. Deviation	Skewness	Kurtosis
	Valid	Missing					
K1	92	0	3.8261	4.0000	0.8970	-1.3280	2.6150
K2	92	0	3.8261	4.0000	0.8595	-1.2470	2.5070
K3	92	0	3.7717	4.0000	0.8400	-0.9090	1.5410
K4	92	0	3.7717	4.0000	0.8784	-1.1240	1.9250
A1	92	0	4.0109	4.0000	0.7774	-0.8800	1.8030
A2RC	92	0	3.8696	4.0000	0.8149	-0.6260	0.2010
A3RC	92	0	3.7391	4.0000	0.8237	-0.3230	-0.3060
A4RC	92	0	3.2065	3.0000	1.1535	-0.7230	-0.1080
A5RC	92	0	3.9783	4.0000	0.7409	-0.2970	-0.2610
A6RC	92	0	3.5109	4.0000	0.7186	-0.0390	-0.2060
SE1	92	0	3.8696	4.0000	0.5783	-0.6900	1.7950
SE2	92	0	3.8913	4.0000	0.6539	-1.0920	3.9220
SE3	92	0	3.9565	4.0000	0.7250	-1.1720	3.2110
SE4	92	0	3.9130	4.0000	0.8073	-0.9920	2.3470
SE5	92	0	3.8152	4.0000	0.7974	-0.8500	1.3320
M1	92	0	4.1304	4.0000	0.5783	-0.3550	1.5220
M2RC	92	0	3.9891	4.0000	0.7186	-0.5290	0.5180
M3RC	92	0	3.9239	4.0000	0.7877	-0.5530	0.1820
M4	92	0	4.2609	4.0000	0.5906	-0.1350	-0.4770
CDM1	92	0	3.9783	4.0000	0.8117	-0.9680	1.6530
CDM2	92	0	3.9565	4.0000	0.6447	-0.2120	0.2060
CDM3	92	0	3.9239	4.0000	0.6831	-0.3260	0.2780
CDM4	92	0	3.9457	4.0000	0.6690	-0.6130	1.1600

Appendix 5.2

Descriptive statistics pertaining to VCoP group at the pre-intervention stage

Code	N		Mean	Median	Std. Deviation	Skewness	Kurtosis
	Valid	Missing					
K1	72	0	4.3194	4.0000	0.5772	-0.6040	2.1180
K2	72	0	4.2639	4.0000	0.5812	-0.5390	2.0190
K3	72	0	4.3056	4.0000	0.6198	-0.6730	1.3970
K4	72	0	4.1806	4.0000	0.6986	-0.7730	1.1980
A1	72	0	4.3750	4.0000	0.5919	-0.3340	-0.6640
A2RC	72	0	4.2361	4.0000	0.6816	-0.8840	1.6960
A3RC	72	0	4.2917	4.0000	0.6152	-0.2680	-0.5870
A4RC	72	0	4.0694	4.0000	0.7185	-0.1040	-1.0220
A5RC	72	0	4.3472	4.0000	0.6316	-0.4320	-0.6360
A6RC	72	0	4.2500	4.0000	0.5503	0.0650	-0.3050
SE1	72	0	4.2083	4.0000	0.5018	0.3640	0.1480
SE2	72	0	4.1944	4.0000	0.4639	0.6620	0.4720
SE3	72	0	4.2500	4.0000	0.5241	0.2260	-0.2550
SE4	72	0	4.2500	4.0000	0.5241	0.2260	-0.2550
SE5	72	0	3.9444	4.0000	0.6690	-0.2270	0.1110
M1	72	0	4.1806	4.0000	0.6353	-0.1660	-0.5480
M2RC	72	0	4.5139	5.0000	0.6050	-1.2320	2.5340
M3RC	72	0	4.5972	5.0000	0.5731	-1.0870	0.2310
M4	72	0	4.2222	4.0000	0.6103	-0.5370	1.4510
CDM1	72	0	3.5139	4.0000	0.8557	-0.5300	0.1480
CDM2	72	0	4.0139	4.0000	0.6390	-0.3450	0.6680
CDM3	72	0	4.1667	4.0000	0.5567	0.0560	0.0350
CDM4	72	0	4.1528	4.0000	0.5480	0.0860	0.1630

Appendix 5.3

Descriptive statistics pertaining to EM group at the post-intervention stage

	N		Mean	Median	Std. Deviation	Skewness	Kurtosis
Code	**Valid**	**Missing**					
K1	66	0	4.182	4.000	0.991	-1.944	4.347
K2	66	0	4.106	4.000	0.914	-1.713	4.176
K3	66	0	3.970	4.000	0.928	-1.369	2.856
K4	66	0	3.985	4.000	0.936	-1.477	3.010
A1	66	0	4.273	4.000	0.869	-1.728	4.362
A2RC	66	0	3.985	4.000	1.045	-1.137	0.845
A3RC	66	0	3.939	4.000	0.975	-1.109	1.285
A4RC	66	0	3.333	3.500	1.317	-0.606	-0.559
A5RC	66	0	3.970	4.000	0.877	-0.788	0.220
A6RC	66	0	3.682	4.000	0.862	-0.514	-0.256
SE1	66	0	4.046	4.000	0.509	0.083	1.034
SE2	66	0	4.167	4.000	0.543	0.110	0.158
SE3	66	0	4.167	4.000	0.571	0.009	-0.065
SE4	66	0	4.061	4.000	0.630	-0.044	-0.393
SE5	66	0	4.046	4.000	0.643	-0.398	0.796
M1	66	0	4.303	4.000	0.525	0.203	-0.638
M2RC	66	0	4.182	4.000	0.677	-0.544	0.526
M3RC	66	0	4.091	4.000	0.696	-0.124	-0.882
M4	66	0	4.349	4.000	0.511	0.291	-1.109
CDM1	66	0	4.167	4.000	0.543	0.110	0.158
CDM2	66	0	4.000	4.000	0.608	0.000	-0.173
CDM3	66	0	4.030	4.000	0.656	-0.031	-0.595
CDM4	66	0	4.136	4.000	0.523	0.173	0.499
RAEM1	66	0	4.182	4.000	0.763	-0.966	1.247
RAEM2	66	0	4.273	4.000	0.646	-0.678	1.139
RAEM3	66	0	4.242	4.000	0.583	-0.082	-0.380
RAEM4	66	0	4.182	4.000	0.677	-0.544	0.526
RAEM5	66	0	4.136	4.000	0.605	-0.064	-0.266
RAEM6	66	0	4.106	4.000	0.636	-0.089	-0.473

Appendix 5.4

Descriptive statistics pertaining to VCoP group at the post-intervention stage

	N		Mean	Median	Std. Deviation	Skewness	Kurtosis
Code	Valid	Missing					
K1	53	0	4.3208	4.0000	0.5468	0.0360	-0.6530
K2	53	0	4.2264	4.0000	0.5765	-0.0370	-0.2770
K3	53	0	4.2453	4.0000	0.5853	-0.0890	-0.3760
K4	53	0	4.2264	4.0000	0.6090	-0.6830	2.2990
A1	53	0	4.3208	4.0000	0.4712	0.7910	-1.4300
A2RC	53	0	4.3019	4.0000	0.6675	-0.8360	1.3760
A3RC	53	0	4.0377	4.0000	0.6493	-0.0350	-0.5240
A4RC	53	0	3.8113	4.0000	0.7610	-0.2090	-0.2190
A5RC	53	0	4.2453	4.0000	0.7313	-0.7280	0.3460
A6RC	53	0	4.0755	4.0000	0.5494	-0.6720	3.7210
SE1	53	0	4.1509	4.0000	0.4556	0.6190	1.1920
SE2	53	0	4.0566	4.0000	0.5340	-0.7250	4.2400
SE3	53	0	4.2642	4.0000	0.4864	0.5690	-0.4310
SE4	53	0	4.2642	4.0000	0.5933	-0.1420	-0.4550
SE5	53	0	3.9811	4.0000	0.6931	-0.3350	0.2350
M1	53	0	4.2642	4.0000	0.5933	-0.1420	-0.4550
M2RC	53	0	4.6038	5.0000	0.4938	-0.4370	-1.8820
M3RC	53	0	4.4717	5.0000	0.5753	-0.5160	-0.6830
M4	53	0	3.9057	4.0000	0.5969	0.0270	-0.1020
CDM1	53	0	3.9434	4.0000	0.6018	-0.5310	1.6460
CDM2	53	0	4.1509	4.0000	0.7441	-0.8350	1.0730
CDM3	53	0	4.2264	4.0000	0.6398	-0.6920	1.6540
CDM4	53	0	4.1509	4.0000	0.6012	-0.0640	-0.2360
RAVCoP1	53	0	4.0755	4.0000	0.6155	-0.5560	1.8250
RAVCoP2	53	0	3.8302	4.0000	0.5455	-0.8450	2.0900
RAVCoP3	53	0	3.7547	4.0000	0.6767	-0.0450	-0.1420
RAVCoP4	53	0	3.3585	3.0000	0.7363	-0.3880	1.1900
RAVCoP5	53	0	3.2264	3.0000	0.6090	-0.6830	2.2990
RAVCoP6	53	0	3.6792	4.0000	0.6437	-0.4880	0.4360

Appendix 5.5

Mahalanobis Distance (D^2) readings generated by SPSS for all questionnaires

The following table was generated by SPSS when independent variables (referred as the items used to measure knowledge, attitude, Self-efficacy, motivation of PTs towards integrating CPG into CDM, relative advantage and clinical decision making) were regressed with a dependent variable namely highest qualification of respondents. The reported figures were identified as D^2. The distance is defined as (D^2/df). The value of 'df' is computed using the formula (number of items used – 1). At the pre-intervention stage both EM and VCoP groups answered the same survey questionnaire where the total number of independent variables used to regress was 23. Thus 'df' was = (23-1) = 22. Similarly at the post-intervention stage both EM and VCoP groups answered the same survey questionnaire where the total number of independent variables used to regress was 29. Thus 'df' was = (29-1) = 28.

EM Pre – intervention df = 22		**EM Post – intervention df = 28**		**VCoP Pre – intervention df = 22**		**VCoP Post – intervention df = 28**	
D2	**(D2/df)**	**D2**	**(D2/df)**	**D2**	**(D2/df)**	**D2**	**(D2/df)**
16.96	0.77	31.61	1.13	21.20	0.96	32.94	1.18
23.82	1.08	38.38	1.37	24.03	1.09	35.21	1.26
30.15	1.37	26.02	0.93	11.62	0.53	34.55	1.23
22.11	1.00	37.87	1.35	22.00	1.00	37.82	1.35
24.05	1.09	21.47	0.77	6.05	0.27	20.35	0.73
18.33	0.83	10.14	0.36	36.06	1.64	28.84	1.03
16.07	0.73	9.88	0.35	17.71	0.81	27.15	0.97
7.59	0.34	42.22	1.51	15.91	0.72	24.38	0.87
7.78	0.35	36.7	1.31	19.26	0.88	25.43	0.91
9.97	0.45	44.36	1.58	10.79	0.49	39.61	1.41
35.26	1.60	13.9	0.50	26.68	1.21	20.67	0.74
6.87	0.31	33.61	1.20	32.11	1.46	26.64	0.95
23.87	1.09	8.6	0.31	45.26	2.06	40.80	1.46
24.24	1.10	43.32	1.55	33.07	1.50	25.88	0.92
6.29	0.29	23.72	0.85	21.48	0.98	29.52	1.05
19.01	0.86	20.2	0.72	29.86	1.36	28.61	1.02
10.59	0.48	38.43	1.37	35.75	1.63	30.00	1.07
17.27	0.78	36.43	1.30	15.69	0.71	32.34	1.16
48.81	2.22	10.14	0.36	40.30	1.83	23.43	0.84
17.25	0.78	17.92	0.64	27.80	1.26	32.33	1.15
46.41	2.11	32.3	1.15	12.00	0.55	28.06	1.00
21.14	0.96	16.77	0.60	22.55	1.03	28.86	1.03
20.65	0.94	21.73	0.78	10.52	0.48	28.61	1.02
30.11	1.37	21.83	0.78	11.64	0.53	30.50	1.09
1.37	0.06	42.52	1.52	21.17	0.96	33.18	1.18
26.65	1.21	14.16	0.51	30.04	1.37	10.24	0.37
10.47	0.48	38.37	1.37	24.88	1.13	35.70	1.28
8.28	0.38	43.77	1.56	10.22	0.46	37.40	1.34
17.04	0.77	35.51	1.27	19.92	0.91	9.28	0.33
10.22	0.46	31.08	1.11	13.17	0.60	20.82	0.74
1.37	0.06	32.61	1.16	14.06	0.64	32.70	1.17
1.52	0.07	35.2	1.26	25.14	1.14	33.94	1.21

15.69	0.71	14.23	0.51	18.72	0.85	23.18	0.83
11.46	0.52	26.81	0.96	25.85	1.18	27.70	0.99
7.78	0.35	16.33	0.58	25.13	1.14	29.72	1.06
41.39	1.88	26.87	0.96	16.19	0.74	37.24	1.33
18.56	0.84	6.58	0.24	31.83	1.45	27.69	0.99
10.72	0.49	28.28	1.01	38.08	1.73	17.34	0.62
23.18	1.05	26.29	0.94	20.21	0.92	18.94	0.68
31.94	1.45	38.11	1.36	27.70	1.26	18.23	0.65
18.12	0.82	10.2	0.36	35.06	1.59	18.23	0.65
36.22	1.65	47.15	1.68	30.78	1.40	28.11	1.00
22.71	1.03	27.38	0.98	11.97	0.54	38.37	1.37
10.77	0.49	39.19	1.40	16.30	0.74	31.57	1.13
29.59	1.34	39.21	1.40	9.40	0.43	31.73	1.13
7.71	0.35	32.7	1.17	21.84	0.99	39.78	1.42
1.52	0.07	31.68	1.13	25.42	1.16	26.76	0.96
8.22	0.37	32.86	1.17	32.21	1.46	14.85	0.53
14.93	0.68	43.58	1.56	25.13	1.14	25.75	0.92
1.52	0.07	42.11	1.50	21.24	0.97	31.62	1.13
22.32	1.01	18.14	0.65	27.96	1.27	36.85	1.32
7.71	0.35	32.47	1.16	12.93	0.59	31.10	1.11
21.54	0.98	8.3	0.30	27.90	1.27	27.43	0.98
6.47	0.29	37.19	1.33	10.34	0.47		
24.93	1.13	26.77	0.96	21.85	0.99		
34.00	1.55	19.4	0.69	7.21	0.33		
17.01	0.77	28.41	1.01	20.42	0.93		
15.55	0.71	33.54	1.20	33.52	1.52		
44.57	2.03	43.23	1.54	31.35	1.42		
23.22	1.06	26.45	0.94	13.23	0.60		
10.49	0.48	25.28	0.90	20.98	0.95		
26.67	1.21	34.41	1.23	28.40	1.29		
48.25	2.19	33.46	1.20	13.83	0.63		
22.29	1.01	24.99	0.89	25.86	1.18		
21.67	0.99	14.31	0.51	8.72	0.40		
11.07	0.50	38.34	1.37	37.07	1.68		
21.50	0.98			30.02	1.36		
14.55	0.66			6.66	0.30		
40.68	1.85			21.32	0.97		
12.65	0.57			28.01	1.27		
33.43	1.52			34.99	1.59		
18.54	0.84			29.44	1.34		
22.61	1.03						
26.97	1.23						
9.35	0.43						
36.28	1.65						
22.54	1.02						
37.23	1.69						
25.26	1.15						
5.01	0.23						
13.20	0.60						
12.23	0.56						
30.56	1.39						
5.94	0.27						
12.62	0.57						

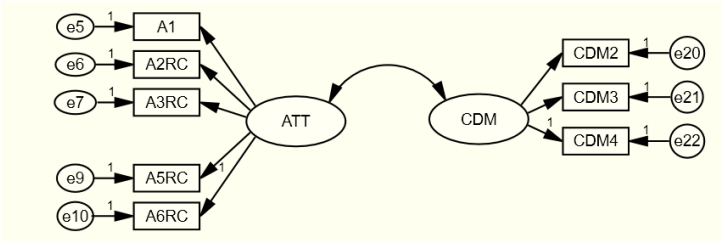
1.37	0.06						
18.17	0.83						
7.41	0.34						
4.69	0.21						
7.71	0.35						
28.43	1.29						
8.76	0.40						

Appendix 5.6

SEM for the relationship between ATT and CDM (EM-PRE)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.389
A6RC	.499
A5RC	.466
A1	.464
A2RC	.539
A3RC	.701
CDM2	.767
CDM3	.925
CDM4	.703

Sample Correlations (Group number 1)

	A6RC	A5RC	A1	A2RC	A3RC	CDM2	CDM3	CDM4
A6RC	1.000							
A5RC	.475	1.000						
A1	.501	.477	1.000					
A2RC	.453	.523	.419	1.000				
A3RC	.618	.531	.537	.702	1.000			
CDM2	.452	.458	.527	.324	.413	1.000		
CDM3	.438	.496	.602	.357	.414	.841	1.000	
CDM4	.310	.352	.508	.350	.353	.733	.808	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	A6RC	A5RC	A1	A2RC	A3RC	CDM2	CDM3	CDM4
A6RC	.000							
A5RC	-.059	.000						
A1	.174	.106	.000					
A2RC	-.556	.186	-.697	.000				
A3RC	.215	-.338	-.282	.708	.000			
CDM2	.590	.764	1.388	-.682	-.383	.000		
CDM3	.129	.765	1.705	-.727	-.756	-.010	.000	
CDM4	-.530	-.040	1.367	-.303	-.740	-.005	.015	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.036	.908	.825	.479
Saturated model	.000	1.000		
Independence model	.242	.348	.162	.271

Baseline Comparisons

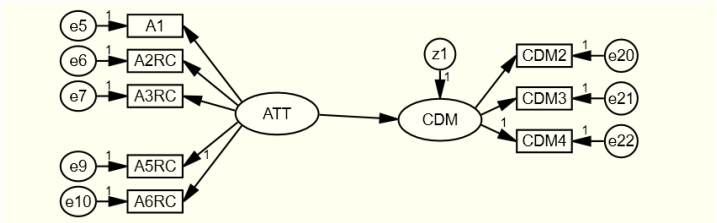
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.921	.884	.961	.941	.960
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

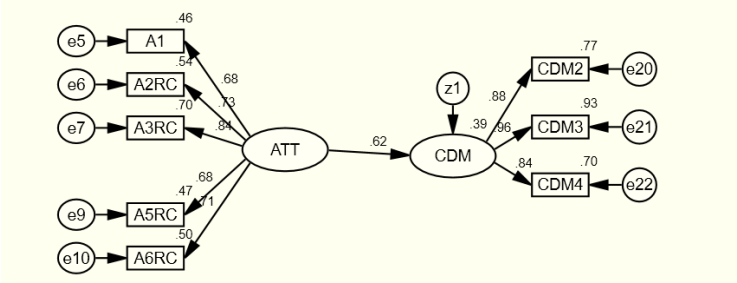
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.100	.048	.149	.056
Independence model	.411	.378	.445	.000

B. Structural equation modelling

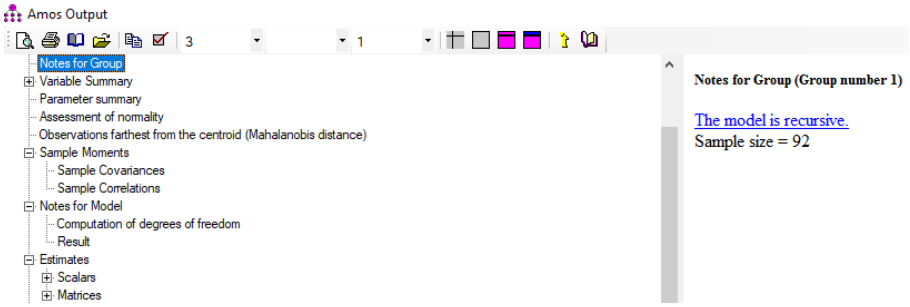
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.679	.625	.652
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	17	36.152	19	.010	1.903
Saturated model	36	.000	0		
Independence model	8	458.451	28	.000	16.373

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.036	.908	.825	.479
Saturated model	.000	1.000		
Independence model	.242	.348	.162	.271

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.921	.884	.961	.941	.960
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.100	.048	.149	.056
Independence model	.411	.378	.445	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	ATT	.689	.138	4.983	***	par_7
*** A p-value is statistically significant at 0.001 level (two-tailed)							

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate (SMC)
CDM	.389

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	ATT	.623

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

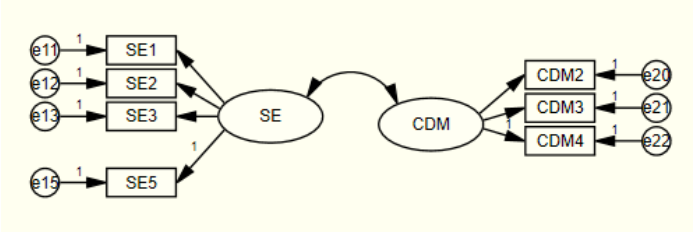
			Estimate	S.E.	C.R.	P	Label
CDM	←	ATT	.689	.138	4.983	***	par_7
CDM4	←	CDM	1.000				
CDM3	←	CDM	1.172	.097	12.043	***	par_1
CDM2	←	CDM	1.007	.093	10.773	***	par_2
A3RC	←	ATT	1.359	.192	7.079	***	par_3
A2RC	←	ATT	1.179	.186	6.348	***	par_4
A1	←	ATT	1.044	.176	5.924	***	par_5
A5RC	←	ATT	.997	.168	5.934	***	par_6
A6RC	←	ATT	1.000				

Appendix 5.7

SEM for the relationship between SE and CDM (EM-PRE)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate (SMC)
SE5	.582
SE1	.644
SE2	.796
SE3	.771
CDM2	.778
CDM3	.911
CDM4	.709

Sample Correlations (Group number 1)

	SE5	SE1	SE2	SE3	CDM2	CDM3	CDM4
SE5	1.000						
SE1	.591	1.000					
SE2	.657	.747	1.000				
SE3	.670	.668	.801	1.000			
CDM2	.583	.456	.406	.490	1.000		
CDM3	.579	.503	.350	.459	.841	1.000	
CDM4	.599	.379	.263	.426	.733	.808	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	SE5	SE1	SE2	SE3	CDM2	CDM3	CDM4
SE5	.000						
SE1	-.177	.000					
SE2	-.192	.238	.000				
SE3	.001	-.287	.133	.000			
CDM2	1.820	.514	-.323	.471	.000		
CDM3	1.494	.631	-1.109	-.108	-.008	.000	
CDM4	2.130	-.009	-1.406	.084	-.069	.036	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.040	.880	.741	.408
Saturated model	.000	1.000		
Independence model	.237	.321	.095	.241

Baseline Comparisons

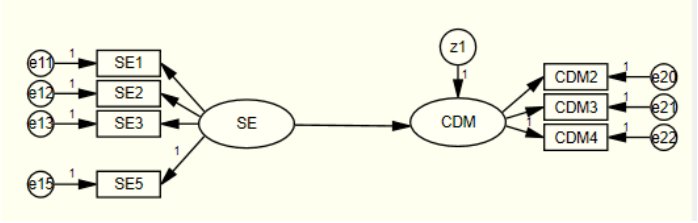
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.907	.850	.931	.886	.930
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

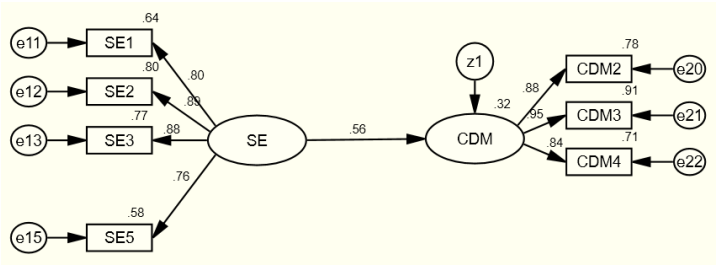
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.172	.121	.225	.000
Independence model	.510	.472	.548	.000

B. Structural Equation Modelling

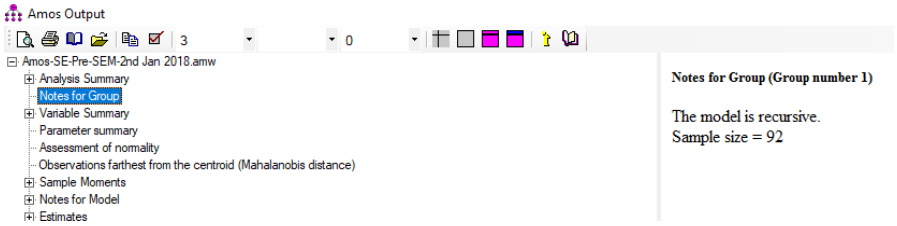
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.619	.562	.575
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	47.975	13	.000	3.690
Saturated model	28	.000	0		
Independence model	7	517.660	21	.000	24.650

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.040	.880	.741	.408
Saturated model	.000	1.000		
Independence model	.237	.321	.095	.241

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.907	.850	.931	.886	.930
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.172	.121	.225	.000
Independence model	.510	.472	.548	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	SE	.521	.106	4.892	***	par_6

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate (SMC)
CDM	.317

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	SE	.563

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

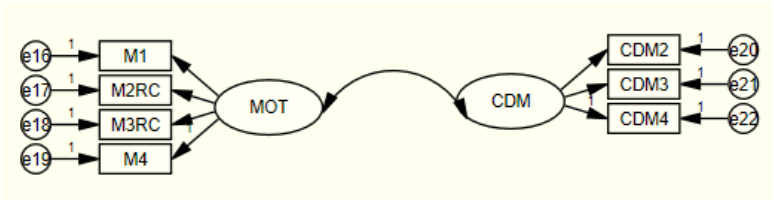
			Estimate	S.E.	C.R.	P	Label
CDM	←	SE	.521	.106	4.892	***	par_6
CDM4	←	CDM	1.000				
CDM3	←	CDM	1.158	.097	11.995	***	par_1
CDM2	←	CDM	1.010	.092	10.927	***	par_2
SE3	←	SE	1.046	.119	8.820	***	par_3
SE2	←	SE	.959	.107	8.960	***	par_4
SE1	←	SE	.763	.096	7.965	***	par_5
SE5	←	SE	1.000				

Appendix 5.8

SEM for the relationship between MOT and CDM (EM-PRE)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
M1	.439
M2RC	.818
M3RC	.863
M4	.395
CDM2	.761
CDM3	.929
CDM4	.704

Sample Correlations (Group number 1)

	M1	M2RC	M3RC	M4	CDM2	CDM3	CDM4
M1	1.000						
M2RC	.559	1.000					
M3RC	.601	.853	1.000				
M4	.543	.551	.563	1.000			
CDM2	.487	.426	.426	.405	1.000		
CDM3	.582	.468	.479	.431	.841	1.000	
CDM4	.445	.410	.409	.426	.733	.808	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	M1	M2RC	M3RC	M4	CDM2	CDM3	CDM4
M1	.000						
M2RC	-.329	.000					
M3RC	-.115	.093	.000				
M4	1.116	-.147	-.171	.000			
CDM2	1.442	-.190	-.291	.859	.000		
CDM3	1.967	-.227	-.247	.787	-.001	.000	
CDM4	1.176	-.178	-.288	1.156	.014	-.002	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.028	.930	.848	.432
Saturated model	.000	1.000		
Independence model	.220	.344	.126	.258

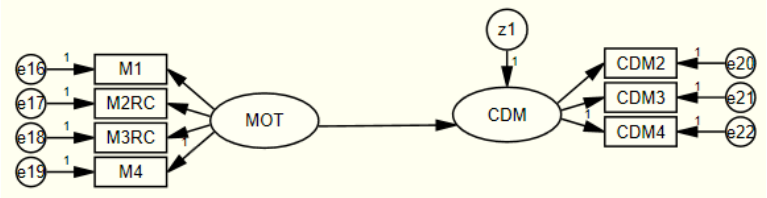
Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.950	.919	.977	.962	.977
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

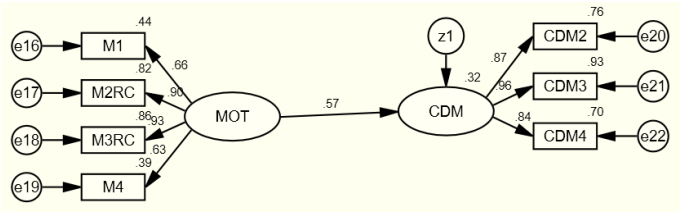
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.094	.022	.154	.119
Independence model	.481	.444	.520	.000

Model specification

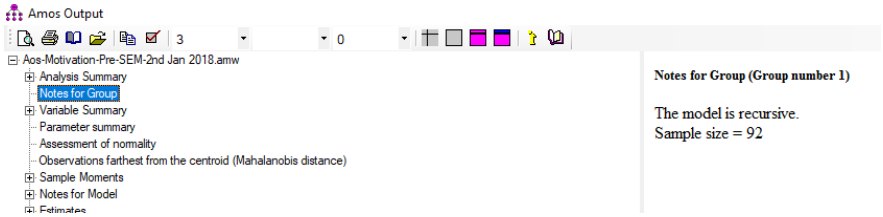


B. Structural Equation Modeling

Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.619	.588	.605
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness (table)

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	23.348	13	.038	1.796
Saturated model	28	.000	0		
Independence model	7	463.294	21	.000	22.062

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.028	.930	.848	.432
Saturated model	.000	1.000		
Independence model	.220	.344	.126	.258

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.950	.919	.977	.962	.977
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.094	.022	.154	.119
Independence model	.481	.444	.520	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.858	.192	4.462	***	par_6

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.322

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	MOT	.568

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.858	.192	4.462	***	par_6
CDM3	←	CDM	1.174	.097	12.055	***	par_1
CDM2	←	CDM	1.002	.093	10.733	***	par_2
M4	←	MOT	1.000				
M3RC	←	MOT	1.972	.286	6.896	***	par_3
M2RC	←	MOT	1.751	.256	6.829	***	par_4
M1	←	MOT	1.032	.189	5.450	***	par_5
CDM4	←	CDM	1.000				

Appendix 5.9

SEM for the relationship between KNOW, ATT, SE, MOT and CDM (VCoP-PRE) (Figure 3.5 & equations 3.1 to 3.10 and 3.4.1)

Figure 1: CFA model for figure 3.5, equations 3.1 to 3.10 and 3.4.1

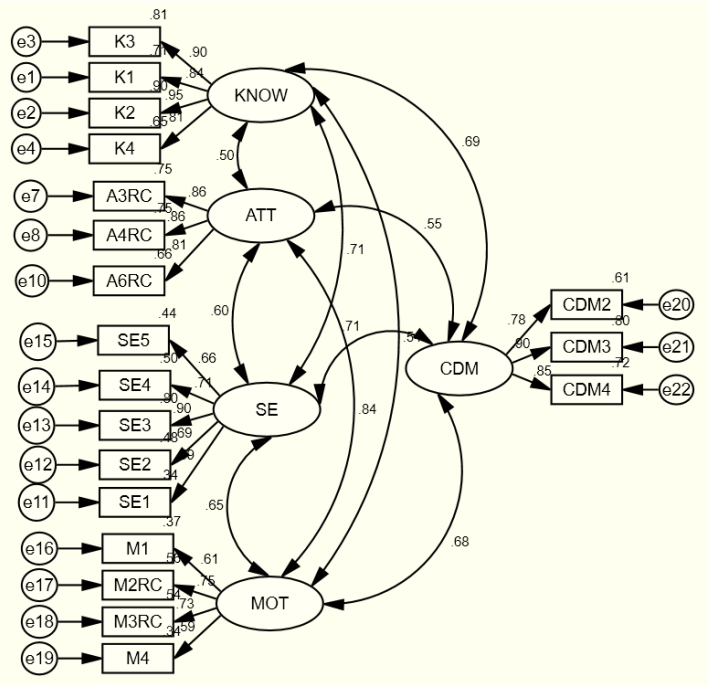


Table 1: Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
SE5	.435
K4	.652
K2	.899
K1	.708
SE4	.502
A6RC	.660
M1	.369
M2RC	.556
M3RC	.539
M4	.343
SE1	.343
SE2	.483
SE3	.804
A3RC	.747
A4RC	.747
K3	.810
CDM2	.615
CDM3	.802
CDM4	.724

Table2: Sample Correlations (Group number 1)

	SE5	K4	K2	K1	SE4	A6RC	M1	M2RC	M3RC	M4	SE1	SE2	SE3	A3RC	A4RC	K3	CDM2	CDM3	CDM4
SE5	1.00																		
K4	.414	1.00																	
K2	.473	.748	1.00																
K1	.484	.693	.795	1.00															
SE4	.482	.490	.474	.477	1.00														
A6RC	.383	.430	.363	.366	.415	1.00													
M1	.289	.275	.289	.301	.201	.473	1.00												
M2RC	.246	.444	.490	.249	.300	.497	.378	1.00											
M3RC	.235	.395	.324	.309	.340	.458	.473	.565	1.00										
M4	.376	.268	.229	.275	.352	.377	.585	.411	.340	1.00									
SE1	.329	.414	.340	.351	.388	.268	.234	.060	.394	.215	1.00								
SE2	.444	.412	.434	.396	.435	.359	.262	.241	.405	.392	.671	1.00							
SE3	.603	.529	.613	.570	.641	.513	.370	.433	.434	.396	.495	.608	1.00						
A3RC	.279	.400	.412	.408	.426	.697	.404	.613	.498	.425	.211	.391	.426	1.00					
A4RC	.184	.536	.394	.353	.402	.704	.342	.565	.616	.318	.350	.339	.440	.750	1.00				
K3	.415	.716	.868	.747	.455	.351	.251	.402	.312	.190	.291	.329	.542	.317	.331	1.00			
CDM2	.331	.531	.407	.370	.410	.310	.271	.346	.439	.317	.298	.371	.452	.312	.335	.416	1.00		
CDM3	.441	.610	.559	.533	.435	.460	.352	.453	.390	.387	.277	.418	.579	.391	.428	.463	.746	1.00	
CDM4	.408	.663	.623	.556	.503	.385	.284	.525	.468	.360	.292	.325	.601	.409	.473	.607	.637	.746	1.00

Table 3: Standardized Residual Covariances (Group number 1 - Default model)

	SE5	K4	K2	K1	SE4	A6RC	M1	M2RC	M3RC	M4	SE1	SE2	SE3	A3RC	A4RC	K3	CDM2	CDM3	CDM4
SE5	0.00																		
K4	0.29	0.00																	
K2	0.23	-0.12	0.00																
K1	0.72	0.10	-0.02	0.00															
SE4	0.11	0.67	-0.01	0.43	0.00														
A6RC	0.51	0.83	-0.16	0.20	0.58	0.00													
M1	0.23	0.09	-0.17	0.22	-0.64	0.47	0.00												
M2RC	-0.60	0.96	0.87	-0.70	-0.35	-0.08	-0.57	0.00											
M3RC	-0.64	0.62	-0.40	-0.18	0.02	-0.31	0.21	0.13	0.00										
M4	1.02	0.11	-0.56	0.09	0.67	-0.16	1.82	-0.20	-0.69	0.00									
SE1	-0.45	0.63	-0.41	0.02	-0.21	-0.13	0.02	-1.81	0.93	-0.07	0.00								
SE2	-0.11	0.12	-0.25	-0.14	-0.44	0.18	-0.10	-0.76	0.59	1.04	2.06	0.00							
SE3	0.08	0.13	0.08	0.27	0.04	0.61	0.13	-0.01	0.05	0.44	-0.22	-0.11	0.00						
A3RC	-0.48	0.42	0.03	0.36	0.49	-0.04	-0.27	0.55	-0.25	0.01	-0.73	0.26	-0.27	0.00					
A4RC	-1.24	1.50	-0.11	-0.07	0.30	0.01	-0.75	0.19	0.64	-0.82	0.39	-0.15	-0.17	0.02	0.00				
K3	-0.04	-0.07	0.09	-0.07	0.03	-0.11	-0.34	0.32	-0.35	-0.75	-0.65	-0.87	-0.21	-0.55	-0.44	0.00			
CDM2	-0.27	0.71	-0.81	-0.67	0.14	-0.33	-0.43	-0.42	0.36	0.03	-0.21	-0.11	-0.33	-0.49	-0.30	-0.55	0.00		
CDM3	0.19	0.82	-0.22	0.09	-0.10	0.46	-0.15	-0.02	-0.45	0.23	-0.73	-0.16	0.09	-0.28	0.01	-0.70	0.30	0.00	
CDM4	0.09	1.42	0.47	0.45	0.60	0.03	-0.55	0.71	0.32	0.16	-0.47	-0.72	0.46	0.03	0.53	0.57	-0.21	-0.10	0.00

Goodness of fit

Table 4: Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	48	208.871	142	.000	1.471
Saturated model	190	.000	0		
Independence model	19	1049.011	171	.000	6.135

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.022	.781	.707	.583
Saturated model	.000	1.000		
Independence model	.148	.217	.130	.195

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.081	.057	.104	.022
Independence model	.269	.253	.285	.000

B. Structural equation modelling

Figure 2: Model specification

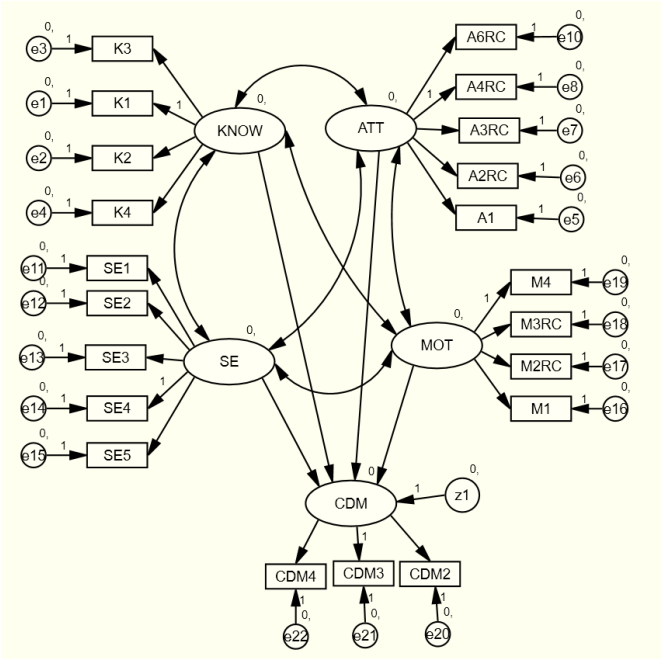


Figure 3: Standardized output

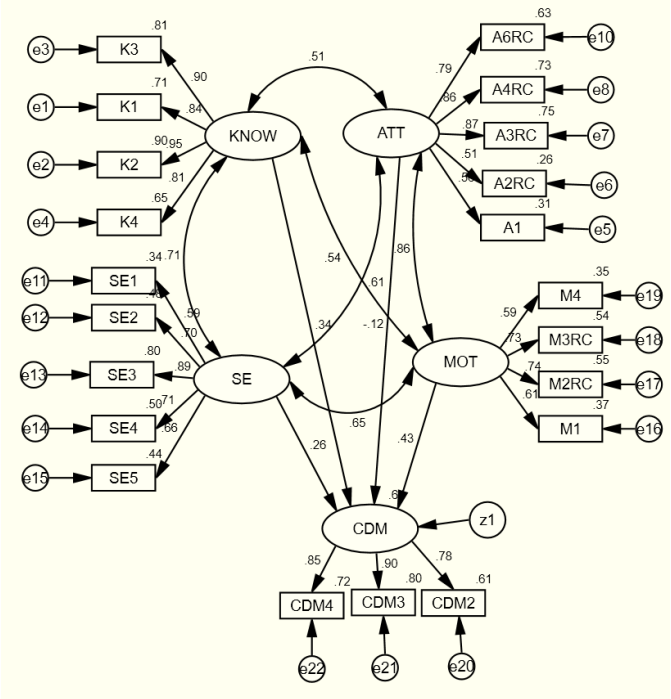


Figure 4: Model identification

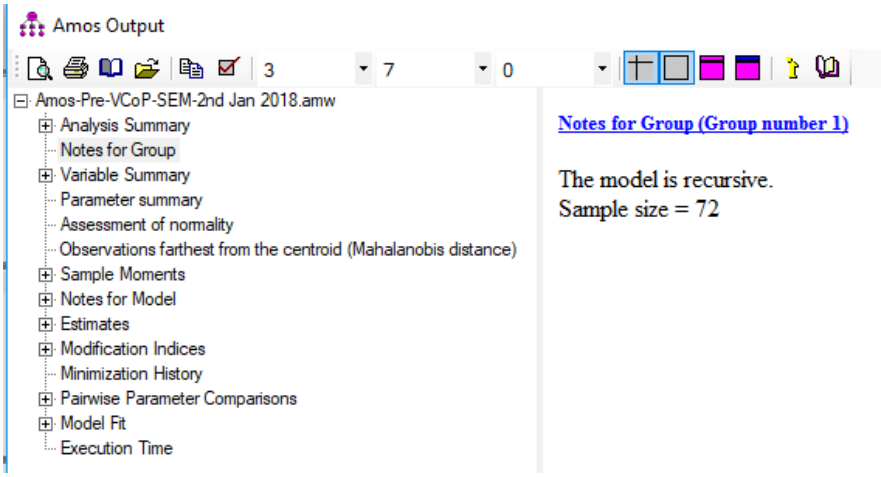


Table 5: Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.852	.658	.778
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Table 6: Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	73	260.163	179	.000	1.453
Saturated model	252	.000	0		
Independence model	42	1141.404	210	.000	5.435

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.772	.733	.916	.898	.913
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.080	.058	.100	.017
Independence model	.250	.236	.264	.000

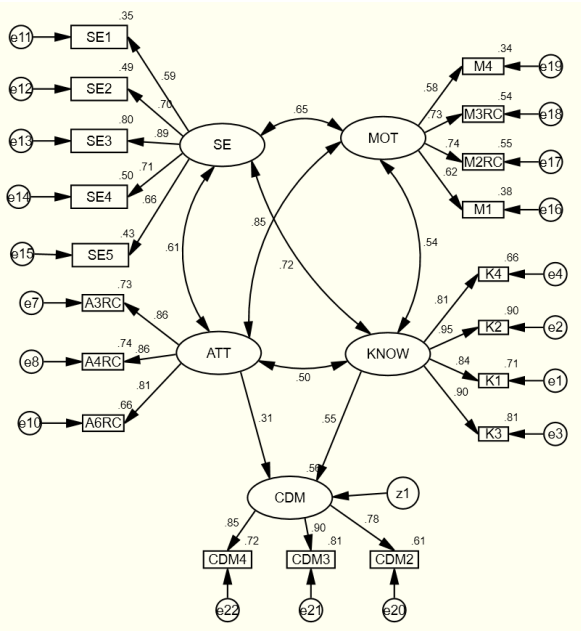
Maximum Likelihood Estimates

Table 7: Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.599	.423	1.415	.157	par_14
CDM	←	SE	.344	.232	1.483	.138	par_15
CDM	←	KNOW	.346	.147	2.357	.018	par_17
CDM	←	ATT	-.094	.215	-.435	.664	par_26

Note: the AMOS output “Regression Weights: (Group number 1 - Default model)” is showing only one relationship namely KNOW→CDM is statistically significant with a p-value less than 0.05. This led to the necessity of respecfication of the model. When respecified the following models emerged

Table 8:

SEM Model	**AMOS report on SMC, Standardised regression weight and covariance**
8 a  SEM for Equation 3.5	**Squared Multiple Correlations: (Group number 1 - Default model)** **Estimate** CDM .561 **Standardized Regression Weights: (Group number 1 - Default model)** **Estimate** CDM ← KNOW .545 CDM ← ATT .309

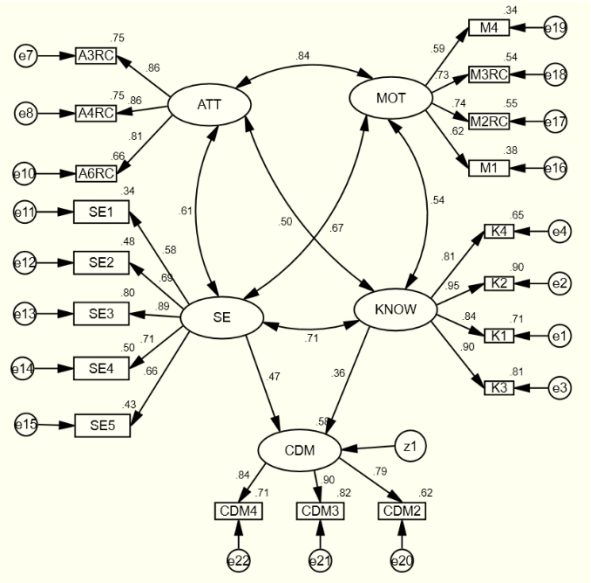
Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
SE	↔	MOT	.084	.027	3.073	.002	par_17
KNOW	↔	ATT	.148	.045	3.315	***	par_18
ATT	↔	SE	.138	.039	3.507	***	par_19
ATT	↔	MOT	.184	.050	3.652	***	par_20
KNOW	↔	SE	.127	.033	3.863	***	par_21
KNOW	↔	MOT	.093	.031	2.980	.003	par_22

SEM Model

AMOS report on SMC, Standardised regression weight and covariance

8b



SEM for Equation 3.6

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.585

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	KNOW	.358
CDM	←	SE	.468

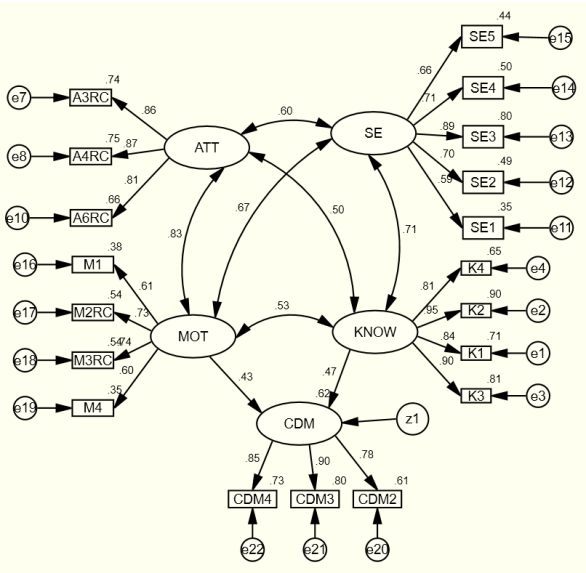
Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
KNOW	↔	MOT	.093	.031	2.982	.003	par_16
KNOW	↔	SE	.126	.033	3.847	***	par_18
ATT	↔	MOT	.183	.050	3.649	***	par_19
KNOW	↔	ATT	.149	.045	3.332	***	par_20
ATT	↔	SE	.138	.039	3.516	***	par_21
SE	↔	MOT	.088	.028	3.137	.002	par_22

SEM Model

AMOS report on SMC, Standardised regression weight and covariance

8 c



SEM for Equation 3.7

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.621

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	KNOW	.468
CDM	←	MOT	.431

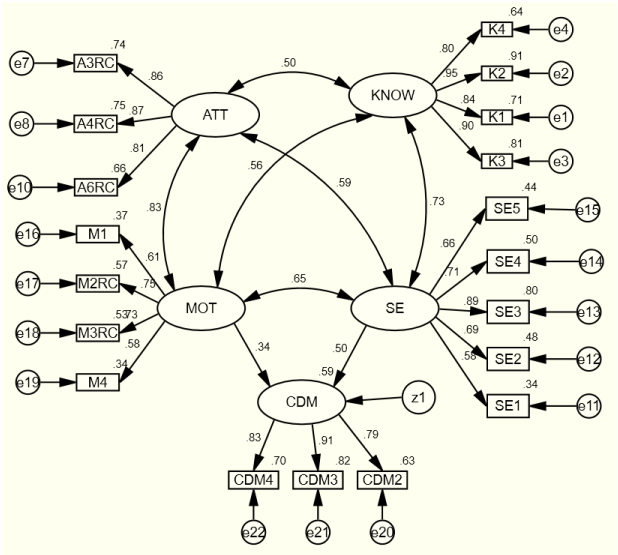
Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
KNOW	↔	MOT	.093	.031	2.978	.003	par_17
ATT	↔	SE	.135	.039	3.466	***	par_18
SE	↔	MOT	.089	.028	3.163	.002	par_19
KNOW	↔	SE	.126	.033	3.853	***	par_20
KNOW	↔	ATT	.148	.045	3.312	***	par_21
ATT	↔	MOT	.184	.050	3.683	***	par_22

SEM Model

AMOS report on SMC, Standardised regression weight and covariance

8d



SEM for Equation 3.10

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.593

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	SE	.502
CDM	←	MOT	.343

Covariances: (Group number 1 - Default model)

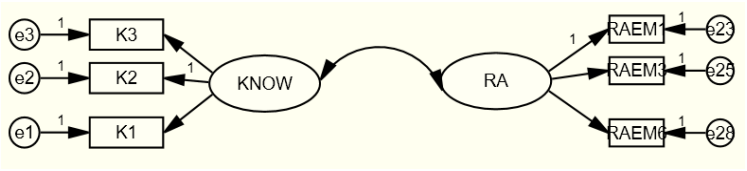
			Estimate	S.E.	C.R.	P	Label
SE	↔	MOT	.084	.027	3.065	.002	par_16
KNOW	↔	ATT	.148	.045	3.308	***	par_17
KNOW	↔	SE	.129	.033	3.900	***	par_18
ATT	↔	SE	.135	.039	3.465	***	par_19
KNOW	↔	MOT	.095	.031	3.030	.002	par_20
ATT	↔	MOT	.180	.050	3.621	***	par_21

Appendix 5.10

SEM for the relationship between RA and KNOW (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
RAEM6	.567
RAEM3	.912
RAEM1	.479
K1	.845
K2	.949
K3	.775

Sample Correlations (Group number 1)

	RAEM6	RAEM3	RAEM1	K1	K2	K3
RAEM6	1.000					
RAEM3	.718	1.000				
RAEM1	.531	.660	1.000			
K1	.140	.215	.118	1.000		
K2	.192	.269	.149	.896	1.000	
K3	.214	.298	.204	.809	.857	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	RAEM6	RAEM3	RAEM1	K1	K2	K3
RAEM6	.000					
RAEM3	-.005	.000				
RAEM1	.071	-.004	.000			
K1	-.430	-.243	-.477	.000		
K2	-.108	.057	-.323	.004	.000	
K3	.223	.486	.258	.000	-.006	.000

Goodness fit

Model Fit Summary

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.017	.987	.966	.376
Saturated model	.000	1.000		
Independence model	.311	.440	.216	.315

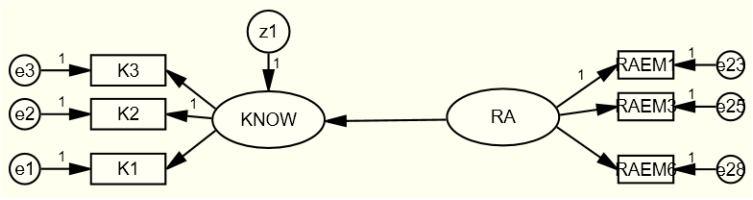
Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.991	.983	1.020	1.038	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

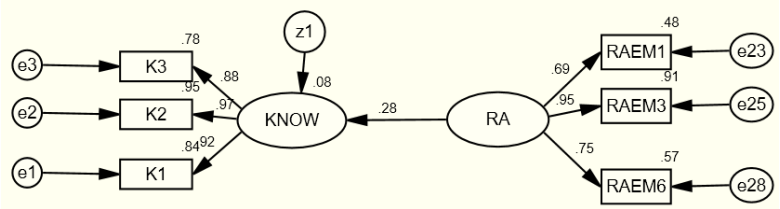
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.000	.000	.000	.976
Independence model	.527	.475	.582	.000

Model specification

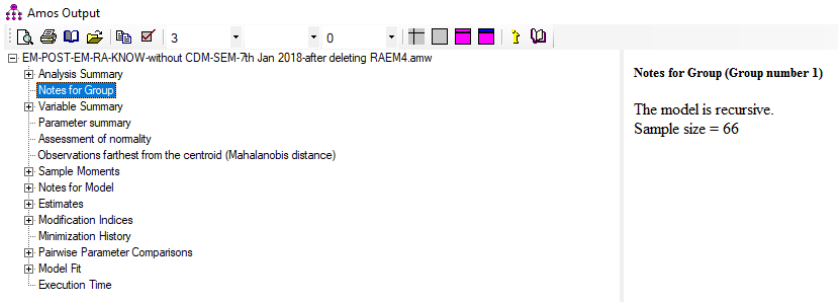


B. Structural Equation Modeling

Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.533	.529	.533
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	13	2.538	8	.960	.317
Saturated model	21	.000	0		
Independence model	6	286.230	15	.000	19.082

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.017	.987	.966	.376
Saturated model	.000	1.000		
Independence model	.311	.440	.216	.315

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.991	.983	1.020	1.038	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.000	.000	.000	.976
Independence model	.527	.475	.582	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
KNOW	←	RA	.473	.222	2.129	.033	par_5
K3	←	KNOW	.918	.072	12.672	***	par_1
K2	←	KNOW	1.000				
K1	←	KNOW	1.023	.070	14.620	***	par_2
RAEM1	←	RA	1.000				
RAEM3	←	RA	1.055	.185	5.711	***	par_3
RAEM6	←	RA	.906	.160	5.656	***	par_4

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
KNOW	.079

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
KNOW	←	RA	.281

Uni-dimensionality
Regression Weights: (Group number 1 - Default model)

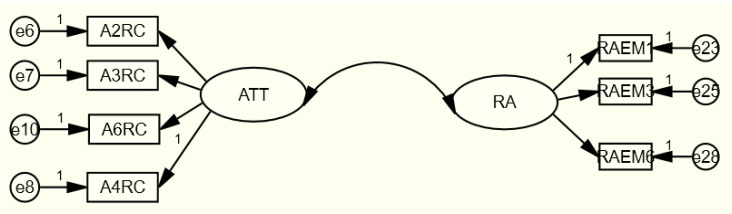
			Estimate	S.E.	C.R.	P	Label
KNOW	←	RA	.473	.222	2.129	.033	par_5
K3	←	KNOW	.918	.072	12.672	***	par_1
K2	←	KNOW	1.000				
K1	←	KNOW	1.023	.070	14.620	***	par_2
RAEM1	←	RA	1.000				
RAEM3	←	RA	1.055	.185	5.711	***	par_3
RAEM6	←	RA	.906	.160	5.656	***	par_4

Appendix 5.11

SEM for the relationship between RA and ATT (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
RAEM6	.591
RAEM3	.869
RAEM1	.499
A4RC	.361
A6RC	.355
A2RC	.528
A3RC	.698

Sample Correlations (Group number 1)

	RAEM6	RAEM3	RAEM1	A4RC	A6RC	A2RC	A3RC
RAEM6	1.000						
RAEM3	.718	1.000					
RAEM1	.531	.660	1.000				
A4RC	.270	.474	.352	1.000			
A6RC	.231	.370	.276	.556	1.000		
A2RC	.489	.460	.409	.317	.336	1.000	
A3RC	.408	.459	.346	.472	.489	.664	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	RAEM6	RAEM3	RAEM1	A4RC	A6RC	A2RC	A3RC
RAEM6	.000						
RAEM3	.008	.000					
RAEM1	-.085	.011	.000				
A4RC	-.264	.798	.568	.000			
A6RC	-.546	.029	-.006	1.500	.000		
A2RC	.916	.105	.542	-.883	-.719	.000	
A3RC	-.112	-.386	-.318	-.217	-.064	.389	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.063	.906	.797	.421
Saturated model	.000	1.000		
Independence model	.310	.440	.253	.330

Baseline Comparisons

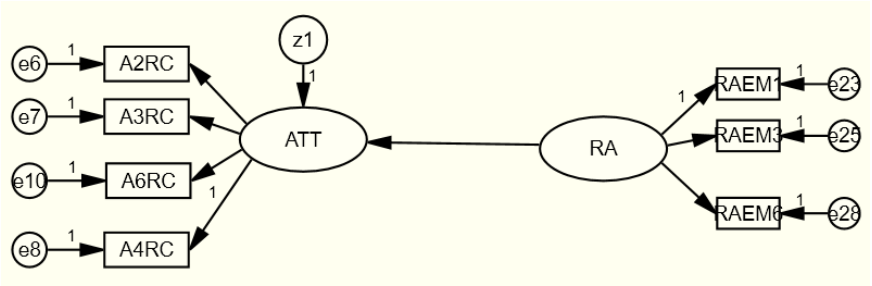
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.895	.830	.955	.925	.954
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

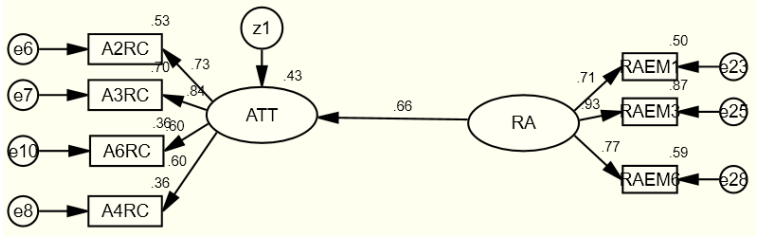
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.100	.000	.173	.137
Independence model	.367	.322	.413	.000

B. Structural equation modelling

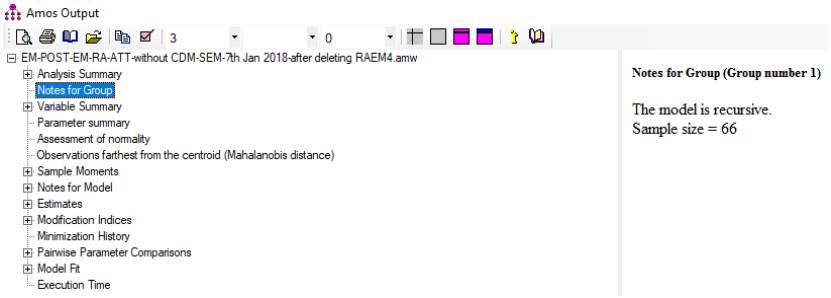
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.619	.554	.590
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	21.529	13	.063	1.656
Saturated model	28	.000	0		
Independence model	7	204.531	21	.000	9.740

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.063	.906	.797	.421
Saturated model	.000	1.000		
Independence model	.310	.440	.253	.330

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.895	.830	.955	.925	.954
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.100	.000	.173	.137
Independence model	.367	.322	.413	.000

Maximum Likelihood Estimates
Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
ATT	←	RA	.966	.272	3.547	***	par_6
*** A p-value is statistically significant at 0.001 level (two-tailed)							

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
ATT	.433

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
ATT	←	RA	.658

Uni-dimensionality
Regression Weights: (Group number 1 - Default model)

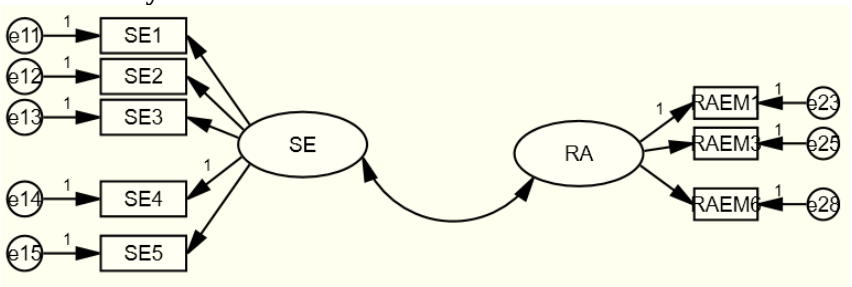
			Estimate	S.E.	C.R.	P	Label
ATT	←	RA	.966	.272	3.547	***	par_6
A3RC	←	ATT	1.030	.222	4.642	***	par_1
A2RC	←	ATT	.961	.220	4.369	***	par_2
A6RC	←	ATT	.650	.170	3.814	***	par_3
A4RC	←	ATT	1.000				
RAEM1	←	RA	1.000				
RAEM3	←	RA	1.010	.161	6.286	***	par_4
RAEM6	←	RA	.907	.156	5.800	***	par_5

Appendix 5.12

SEM for the relationship between RA and SE (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
RAEM6	.576
RAEM3	.875
RAEM1	.509
SE5	.776
SE4	.847
SE1	.438
SE2	.539
SE3	.541

Sample Correlations (Group number 1)

	RAEM6	RAEM3	RAEM1	SE5	SE4	SE1	SE2	SE3
RAEM6	1.000							
RAEM3	.718	1.000						
RAEM1	.531	.660	1.000					
SE5	.252	.421	.391	1.000				
SE4	.368	.504	.457	.829	1.000			
SE1	.270	.428	.374	.604	.615	1.000		
SE2	.483	.550	.557	.595	.645	.473	1.000	
SE3	.290	.339	.353	.650	.657	.397	.703	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	RAEM6	RAEM3	RAEM1	SE5	SE4	SE1	SE2	SE3
RAEM6	.000							
RAEM3	.051	.000						
RAEM1	-.075	-.048	.000					
SE5	-1.062	-.457	.162	.000				
SE4	-.316	-.014	.538	.117	.000			
SE1	-.196	.487	.753	.147	.040	.000		
SE2	1.190	1.097	1.921	-.352	-.205	-.096	.000	
SE3	-.294	-.490	.348	.013	-.135	-.652	1.158	.000

Goodness fit

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	17	33.387	19	.022	1.757
Saturated model	36	.000	0		
Independence model	8	330.893	28	.000	11.818

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.027	.894	.798	.472
Saturated model	.000	1.000		
Independence model	.170	.341	.153	.265

Baseline Comparisons

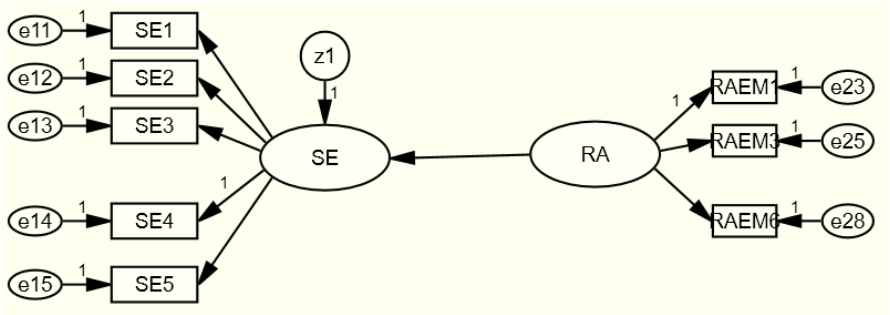
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.899	.851	.954	.930	.953
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

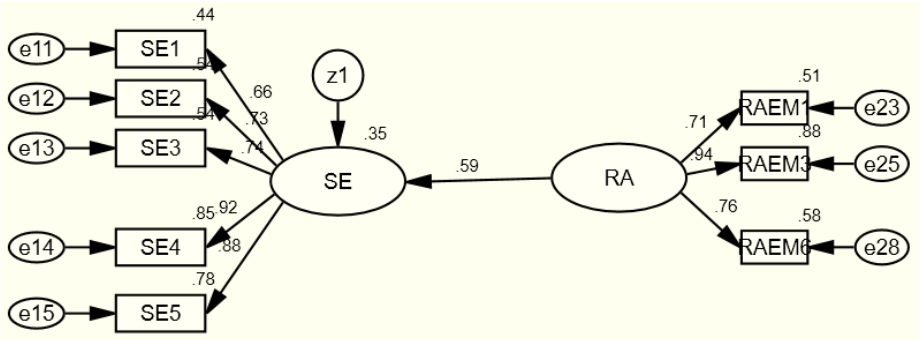
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.108	.041	.167	.069
Independence model	.408	.369	.448	.000

B. Structural equation modelling

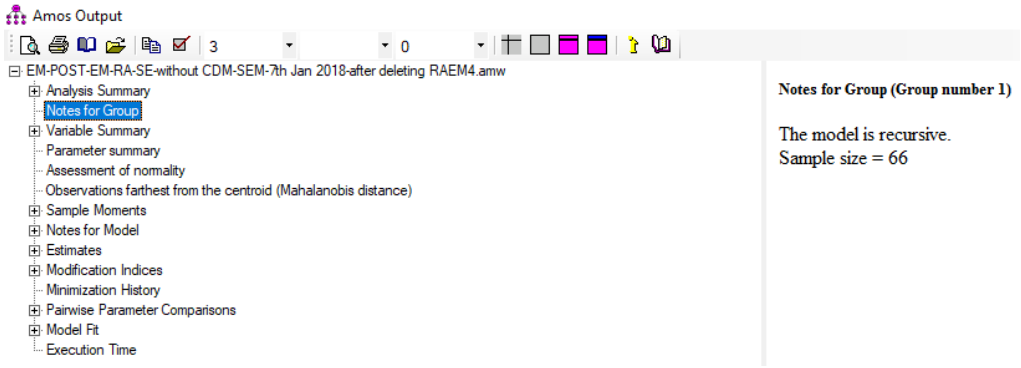
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.679	.610	.646
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	17	33.387	19	.022	1.757
Saturated model	36	.000	0		
Independence model	8	330.893	28	.000	11.818

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.027	.894	.798	.472
Saturated model	.000	1.000		
Independence model	.170	.341	.153	.265

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.899	.851	.954	.930	.953
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.108	.041	.167	.069
Independence model	.408	.369	.448	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
SE	←	RA	.626	.147	4.256	***	par_7
*** A p-value is statistically significant at 0.001 level (two-tailed)							

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
SE	.345

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
SE	←	RA	.588

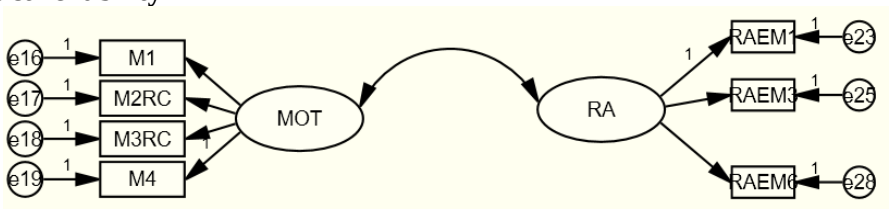
Uni-dimensionality
Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
SE	←	RA	.626	.147	4.256	***	par_7
SE3	←	SE	.725	.097	7.438	***	par_1
SE2	←	SE	.688	.093	7.416	***	par_2
SE1	←	SE	.582	.092	6.295	***	par_3
SE4	←	SE	1.000				
SE5	←	SE	.978	.094	10.429	***	par_4
RAEM1	←	RA	1.000				
RAEM3	←	RA	1.003	.159	6.314	***	par_5
RAEM6	←	RA	.887	.153	5.806	***	par_6

Appendix 5.13

SEM for the relationship between RA and MOT (EM-POST)

A. CFA
Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
RAEM6	.572
RAEM3	.892
RAEM1	.494
M1	.597
M2RC	.734
M3RC	.465
M4	.621

Sample Correlations (Group number 1)

	RAEM6	RAEM3	RAEM1	M1	M2RC	M3RC	M4
RAEM6	1.000						
RAEM3	.718	1.000					
RAEM1	.531	.660	1.000				
M1	.363	.359	.321	1.000			
M2RC	.419	.549	.441	.664	1.000		
M3RC	.291	.400	.374	.555	.585	1.000	
M4	.311	.538	.387	.632	.658	.515	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	RAEM6	RAEM3	RAEM1	M1	M2RC	M3RC	M4
RAEM6	.000						
RAEM3	.021	.000					
RAEM1	-.007	-.026	.000				
M1	-.088	-.794	-.205	.000			
M2RC	.028	.215	.417	.014	.000		
M3RC	-.303	-.097	.518	.198	.003	.000	
M4	-.538	.441	.246	.156	-.113	-.159	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.013	.951	.895	.442
Saturated model	.000	1.000		
Independence model	.169	.394	.192	.296

Baseline Comparisons

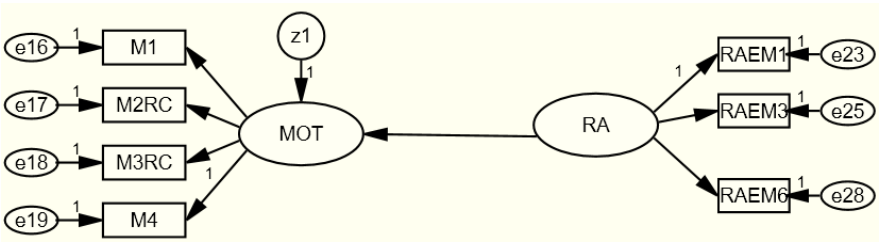
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.944	.909	.998	.996	.998
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

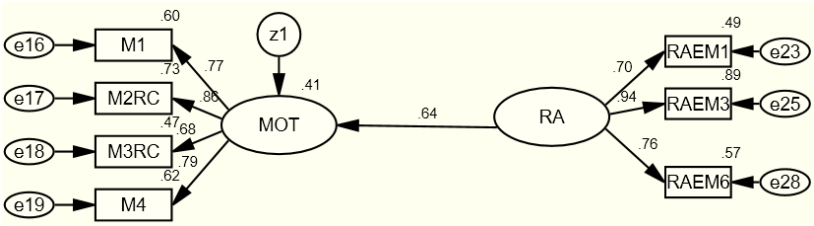
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.024	.000	.127	.562
Independence model	.401	.356	.447	.000

B. Structural equation modelling

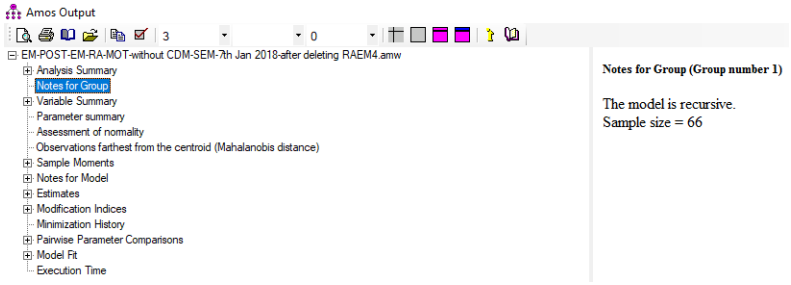
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.619	.584	.618
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	13.491	13	.411	1.038
Saturated model	28	.000	0		
Independence model	7	240.147	21	.000	11.436

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.013	.951	.895	.442
Saturated model	.000	1.000		
Independence model	.169	.394	.192	.296

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.944	.909	.998	.996	.998
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.024	.000	.127	.562
Independence model	.401	.356	.447	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
MOT	←	RA	.482	.115	4.192	***	par_6
*** A p-value is statistically significant at 0.001 level (two-tailed)							

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
MOT	.411

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
MOT	←	RA	.641

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

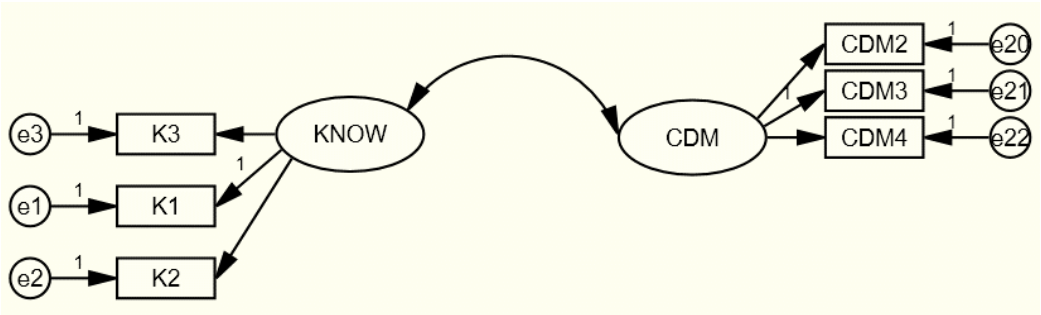
			Estimate	S.E.	C.R.	P	Label
MOT	←	RA	.482	.115	4.192	***	par_6
M4	←	MOT	1.000				
M3RC	←	MOT	1.177	.212	5.548	***	par_1
M2RC	←	MOT	1.440	.203	7.091	***	par_2
M1	←	MOT	1.008	.157	6.401	***	par_3
RAEM1	←	RA	1.000				
RAEM3	←	RA	1.028	.163	6.293	***	par_4
RAEM6	←	RA	.897	.156	5.743	***	par_5

Appendix 5.14

SEM for the relationship between KNOW and CDM (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
K2	.949
K1	.846
K3	.774
CDM2	.702
CDM3	.765
CDM4	.654

Sample Correlations (Group number 1)

	K2	K1	K3	CDM2	CDM3	CDM4
K2	1.000					
K1	.896	1.000				
K3	.857	.809	1.000			
CDM2	-.028	-.051	.000	1.000		
CDM3	.072	.015	.027	.734	1.000	
CDM4	.130	.040	.167	.678	.706	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	K2	K1	K3	CDM2	CDM3	CDM4
K2	.000					
K1	.000	.000				
K3	-.001	.003	.000			
CDM2	-.586	-.754	-.327	.000		
CDM3	.198	-.236	-.125	.006	.000	
CDM4	.700	-.004	1.031	.002	-.009	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.023	.954	.879	.363
Saturated model	.000	1.000		
Independence model	.300	.445	.223	.318

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.968	.940	.994	.988	.994
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

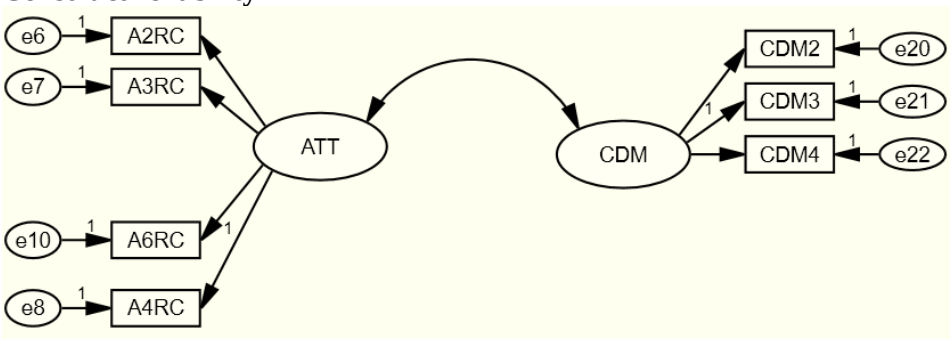
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.060	.000	.165	.389
Independence model	.547	.494	.601	.000

Appendix 5.15

SEM for the relationship between ATT and CDM (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
A4RC	.358
A6RC	.390
A2RC	.488
A3RC	.711

CDM2	.740
CDM3	.701
CDM4	.676

Sample Correlations (Group number 1)

	A4RC	A6RC	A2RC	A3RC	CDM2	CDM3	CDM4
A4RC	1.000						
A6RC	.556	1.000					
A2RC	.317	.336	1.000				
A3RC	.472	.489	.664	1.000			
CDM2	.385	.411	.412	.545	1.000		
CDM3	.380	.426	.338	.340	.734	1.000	
CDM4	.402	.439	.426	.499	.678	.706	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	A4RC	A6RC	A2RC	A3RC	CDM2	CDM3	CDM4
A4RC	.000						
A6RC	1.375	.000					
A2RC	-.755	-.741	.000				
A3RC	-.238	-.264	.517	.000			
CDM2	.211	.294	-.036	.308	.000		
CDM3	.251	.481	-.508	-1.080	.086	.000	
CDM4	.468	.634	.211	.140	-.194	.116	.000

Goodness Fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.058	.898	.780	.417
Saturated model	.000	1.000		
Independence model	.305	.410	.213	.307

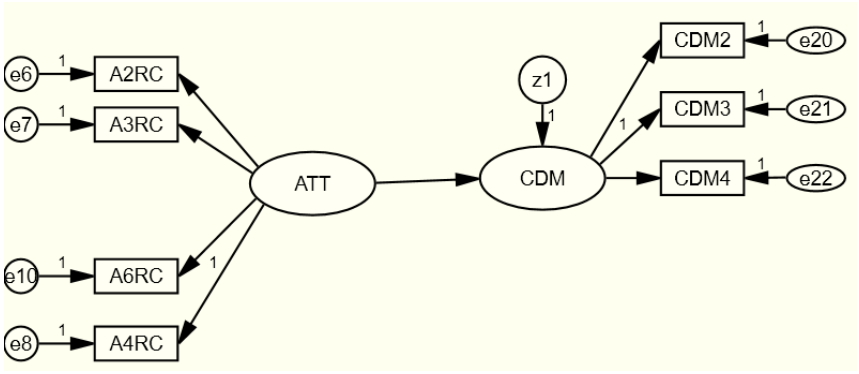
Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.891	.823	.945	.907	.942
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

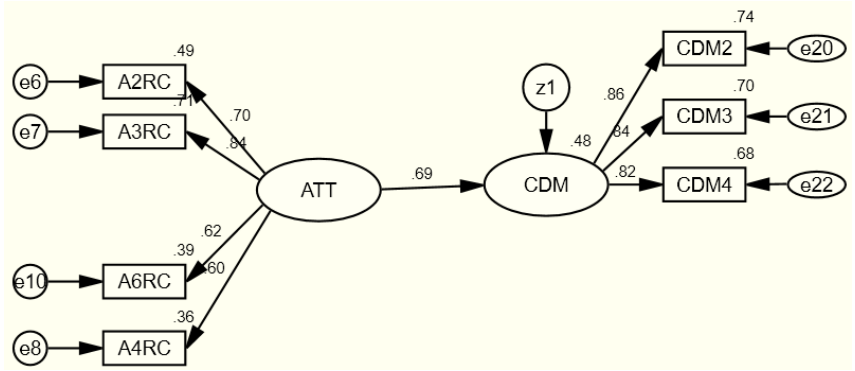
RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.119	.042	.189	.064
Independence model	.389	.344	.435	.000

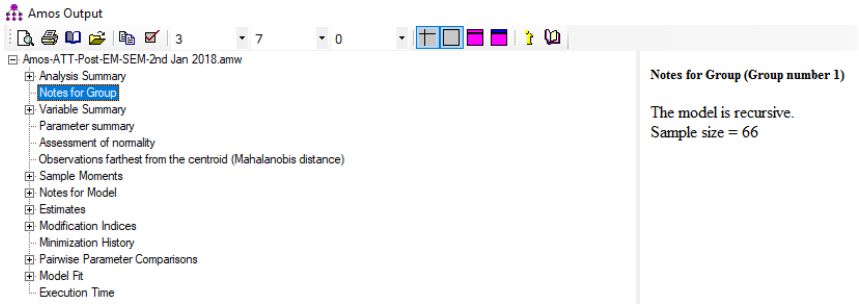
B. Structural equation modelling
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.619	.551	.583
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	24.879	13	.024	1.914
Saturated model	28	.000	0		
Independence model	7	227.564	21	.000	10.836

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.058	.898	.780	.417
Saturated model	.000	1.000		
Independence model	.305	.410	.213	.307

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.891	.823	.945	.907	.942
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.119	.042	.189	.064
Independence model	.389	.344	.435	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	ATT	.483	.124	3.879	***	par_6

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.480

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	ATT	.693

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

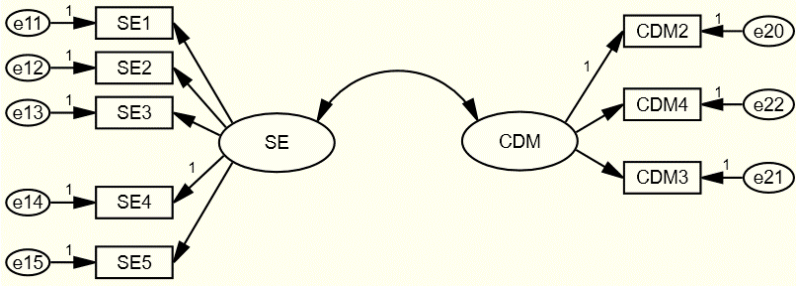
			Estimate	S.E.	C.R.	P	Label
CDM	←	ATT	.483	.124	3.879	***	par_6
CDM4	←	CDM	.783	.105	7.470	***	par_1
CDM3	←	CDM	1.000				
CDM2	←	CDM	.952	.122	7.830	***	par_2
A3RC	←	ATT	1.043	.223	4.666	***	par_3
A2RC	←	ATT	.927	.217	4.269	***	par_4
A6RC	←	ATT	.683	.173	3.950	***	par_5
A4RC	←	ATT	1.000				

Appendix 5.16

SEM for the relationship between SE and CDM (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM3	.676
SE5	.766
SE4	.861
SE1	.417
SE2	.542
SE3	.545
CDM2	.671
CDM4	.755

Sample Correlations (Group number 1)

	CDM3	SE5	SE4	SE1	SE2	SE3	CDM2	CDM4
CDM3	1.000							
SE5	.398	1.000						
SE4	.480	.829	1.000					
SE1	.272	.604	.615	1.000				
SE2	.504	.595	.645	.473	1.000			
SE3	.356	.650	.657	.397	.703	1.000		
CDM2	.734	.473	.563	.249	.513	.355	1.000	
CDM4	.706	.530	.676	.381	.677	.593	.678	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	CDM3	SE5	SE4	SE1	SE2	SE3	CDM2	CDM4
CDM3	.000							
SE5	-.897	.000						
SE4	-.531	.109	.000					
SE1	-.859	.276	.110	.000				
SE2	.469	-.334	-.253	-.018	.000			
SE3	-.629	.028	-.187	-.578	1.134	.000		
CDM2	.403	-.354	.066	-1.028	.544	-.630	.000	
CDM4	-.056	-.165	.614	-.208	1.545	.920	-.225	.000

Goodness Fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.024	.858	.731	.453
Saturated model	.000	1.000		
Independence model	.170	.309	.111	.240

Baseline Comparisons

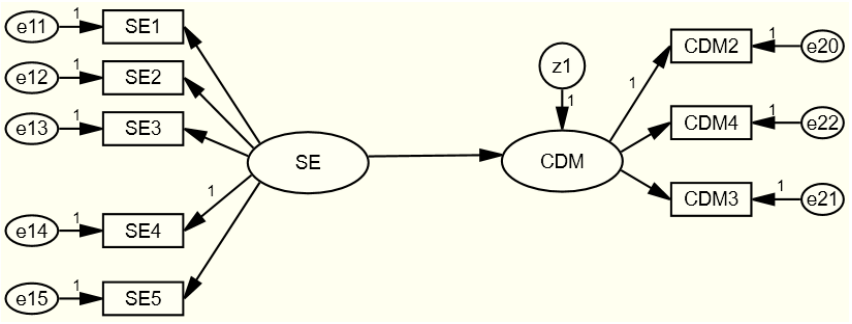
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.876	.817	.923	.883	.921
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

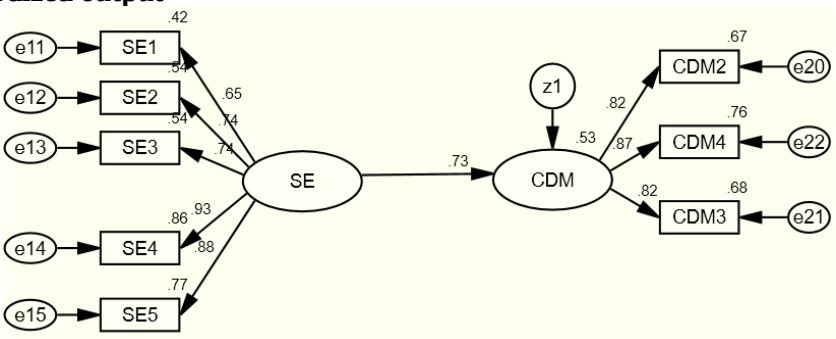
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.149	.095	.204	.003
Independence model	.436	.397	.476	.000

B. Structural equation modelling

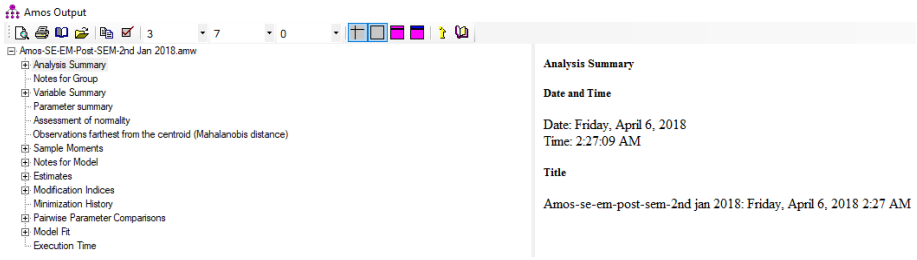
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.679	.594	.625
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	17	46.456	19	.000	2.445
Saturated model	36	.000	0		
Independence model	8	373.428	28	.000	13.337

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.024	.858	.731	.453
Saturated model	.000	1.000		
Independence model	.170	.309	.111	.240

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.876	.817	.923	.883	.921
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.149	.095	.204	.003
Independence model	.436	.397	.476	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	SE	.621	.106	5.831	***	par_7

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.530

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	SE	.728

Uni-dimensionality
Regression Weights: (Group number 1 - Default model)

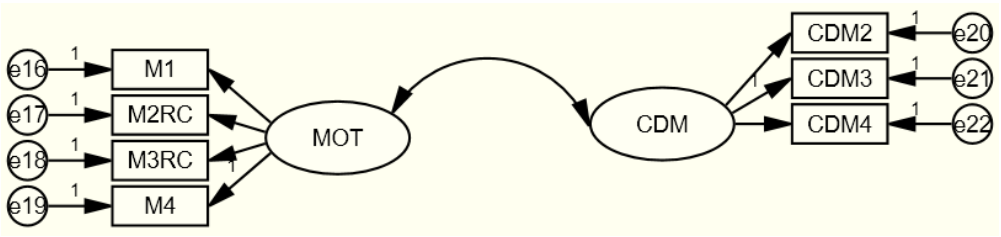
			Estimate	S.E.	C.R.	P	Label
CDM	←	SE	.621	.106	5.831	***	par_7
CDM4	←	CDM	.913	.118	7.768	***	par_1
CDM2	←	CDM	1.000				
SE3	←	SE	.721	.095	7.581	***	par_2
SE2	←	SE	.684	.091	7.549	***	par_3
SE1	←	SE	.563	.092	6.124	***	par_4
SE4	←	SE	1.000				
SE5	←	SE	.963	.091	10.578	***	par_5
CDM3	←	CDM	1.082	.148	7.333	***	par_6

Appendix 5.17

SEM for the relationship between MOT and CDM (EM-POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
M1	.622
M2RC	.672
M3RC	.431
M4	.684
CDM2	.697
CDM3	.741
CDM4	.683

Sample Correlations (Group number 1)

	M1	M2RC	M3RC	M4	CDM2	CDM3	CDM4
M1	1.000						
M2RC	.664	1.000					
M3RC	.555	.585	1.000				
M4	.632	.658	.515	1.000			
CDM2	.530	.561	.400	.644	1.000		
CDM3	.554	.576	.399	.657	.734	1.000	
CDM4	.575	.581	.473	.625	.678	.706	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	M1	M2RC	M3RC	M4	CDM2	CDM3	CDM4
M1	.000						
M2RC	.120	.000					
M3RC	.268	.333	.000				
M4	-.136	-.129	-.193	.000			
CDM2	-.223	-.162	-.490	.382	.000		
CDM3	-.179	-.178	-.605	.340	.096	.000	
CDM4	.137	.019	.076	.296	-.080	-.037	.000

Goodness Fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.012	.968	.930	.449
Saturated model	.000	1.000		
Independence model	.180	.322	.096	.242

Baseline Comparisons

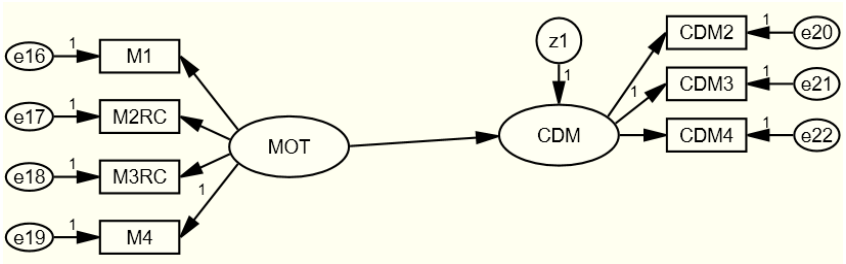
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.976	.961	1.024	1.040	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

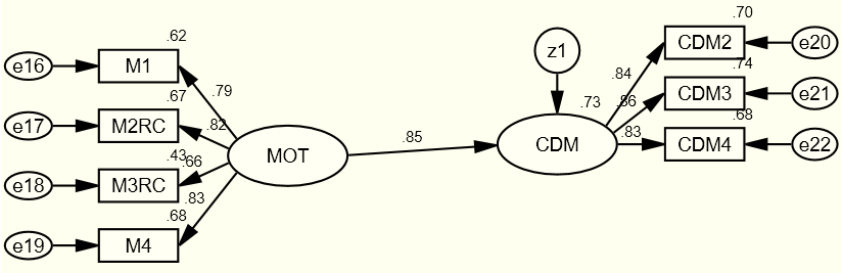
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.000	.000	.045	.956
Independence model	.433	.389	.479	.000

B. Structural equation modelling

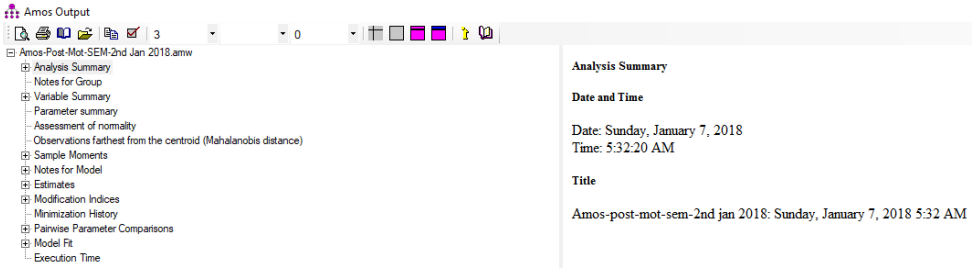
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.619	.604	.619
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model Fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	15	6.703	13	.917	.516
Saturated model	28	.000	0		
Independence model	7	277.122	21	.000	13.196

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.012	.968	.930	.449
Saturated model	.000	1.000		
Independence model	.180	.322	.096	.242

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.976	.961	1.024	1.040	1.000
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.000	.000	.045	.956
Independence model	.433	.389	.479	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	1.140	.174	6.533	***	par_6

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.728

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←-	MOT	.853

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

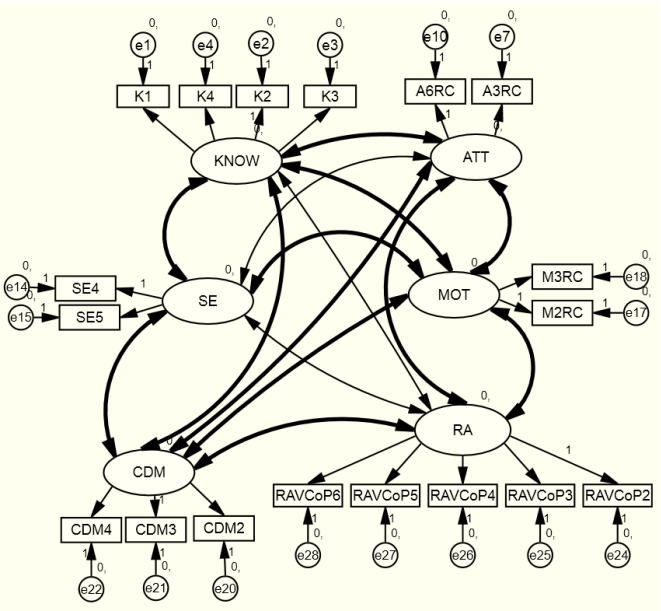
			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	1.140	.174	6.533	***	par_6
CDM4	←	CDM	.765	.096	8.003	***	par_1
CDM3	←	CDM	1.000				
CDM2	←	CDM	.899	.111	8.125	***	par_2
M4	←	MOT	1.000				
M3RC	←	MOT	1.080	.194	5.579	***	par_3
M2RC	←	MOT	1.314	.177	7.426	***	par_4
M1	←	MOT	.980	.139	7.063	***	par_5

Appendix 5.18

SEM for the relationship between RA with KNOW, ATT, SE & MOT (VCoP POST)

A. CFA

Construct reliability



Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
RAVCoP6	.461
RAVCoP5	.586
RAVCoP4	.469
RAVCoP3	.408
RAVCoP2	.258
CDM4	.555
K1	.569
SE5	.498
K4	.662
K2	.852
SE4	.232
A6RC	.405
M2RC	.432
M3RC	.506
A3RC	.337
K3	.672
CDM2	.706
CDM3	.713

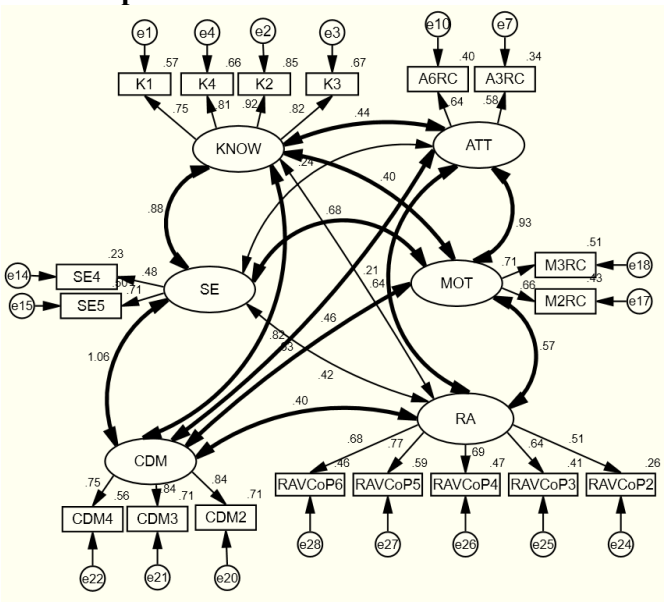
Sample Correlations (Group number 1)

	RAVCoP6	RAVCoP5	RAVCoP4	RAVCoP3	RAVCoP2	CDM4	K1	SE5	K4	K2	SE4	A6RC	M2RC	M3RC	A3RC	K3	CDM2	CDM3
RAVCoP6	1.000																	
RAVCoP5	.532	1.000																
RAVCoP4	.369	.630	1.000															
RAVCoP3	.434	.371	.489	1.000														
RAVCoP2	.390	.350	.250	.510	1.000													
CDM4	.426	.273	.180	.282	.256	1.000												
K1	.189	.124	.043	.113	.186	.435	1.000											
SE5	.159	.101	.240	.277	.195	.561	.321	1.000										
K4	.140	.067	.202	.184	.118	.378	.586	.512	1.000									
K2	.199	.070	.122	.145	.186	.565	.741	.588	.728	1.000								
SE4	.276	.151	.087	.308	.082	.479	.386	.340	.523	.328	1.000							
A6RC	.287	.408	.312	.309	.172	.372	.302	.054	.178	.249	.351	1.000						
M2RC	.500	.304	.240	.222	.174	.464	.266	.315	.304	.321	.364	.325	1.000					
M3RC	.261	.348	.229	.155	.076	.291	.182	.312	.074	.252	.191	.494	.468	1.000				
A3RC	.398	.221	.092	.153	.073	.182	.290	-.041	.221	.234	.173	.369	.347	.363	1.000			
K3	.162	-.051	.060	.203	.013	.494	.531	.486	.758	.744	.474	.181	.276	.107	.178	1.000		
CDM2	.223	.220	.250	.342	.301	.550	.588	.602	.645	.681	.474	.254	.375	.190	.068	.576	1.000	
CDM3	.226	.113	.069	.220	.167	.659	.503	.574	.409	.640	.498	.333	.411	.436	.164	.517	.735	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	RAVCoP6	RAVCoP5	RAVCoP4	RAVCoP3	RAVCoP2	CDM4	K1	SE5	K4	K2	SE4	A6RC	M2RC	M3RC	A3RC	K3	CDM2	CDM3
RAVCoP6	.000																	
RAVCoP5	.080	.000																
RAVCoP4	-.630	.677	.000															
RAVCoP3	.001	-.766	.337	.000														
RAVCoP2	.303	-.265	-.667	1.272	.000													
CDM4	1.587	.322	-.166	.656	.749	.000												
K1	.599	.041	-.451	.099	.772	-.153	.000											
SE5	-.312	-.893	.248	.611	.307	.034	-.965	.000										
K4	.188	-.439	.623	.554	.237	-.755	-.169	.039	.000									
K2	.506	-.533	-.054	.172	.642	.029	.268	.095	-.135	.000								
SE4	.986	-.038	-.374	1.273	-.156	.674	.453	.000	1.214	-.427	.000							
A6RC	.071	.657	.226	.340	-.250	1.088	.656	-.368	-.336	-.050	2.003	.000						
M2RC	1.703	.107	-.132	-.136	-.127	1.082	.488	-.019	.645	.561	1.038	-.430	.000					
M3RC	-.114	.247	-.352	-.739	-.925	-.287	-.218	-.214	-1.099	-.064	-.303	.485	.000	.000				
A3RC	1.013	-.442	-1.140	-.596	-.825	-.117	.705	-.986	.109	.002	.774	.000	-.050	-.137	.000			
K3	.340	-1.285	-.398	.687	-.525	-.026	-.538	-.151	.548	-.071	.863	-.328	.437	-.878	-.209	.000		
CDM2	-.024	-.248	.151	.909	.934	-.465	.454	-.148	.548	.296	.308	.056	.194	-1.250	-1.102	.088	.000	
CDM3	-.011	-1.007	-1.129	.037	-.023	.186	-.103	-.340	-.952	.032	.453	.606	.428	.398	-.429	-.300	.150	.000

Standardized output



Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
ATT	<-->	SE	.023	.025	.908	.364	par_13
MOT	<-->	SE	.062	.028	2.248	.025	par_14
ATT	<-->	MOT	.104	.036	2.903	.004	par_15
RA	<-->	ATT	.061	.028	2.211	.027	par_16
KNOW	<-->	SE	.131	.044	2.963	.003	par_17
KNOW	<-->	MOT	.067	.034	2.005	.045	par_18
KNOW	<-->	ATT	.079	.039	2.042	.041	par_19
RA	<-->	SE	.033	.020	1.658	.097	par_20
CDM	<-->	SE	.160	.052	3.086	.002	par_21
RA	<-->	KNOW	.030	.025	1.194	.232	par_22
CDM	<-->	KNOW	.230	.058	3.972	***	par_23
CDM	<-->	ATT	.085	.041	2.064	.039	par_24
CDM	<-->	MOT	.108	.039	2.734	.006	par_25
RA	<-->	CDM	.058	.030	1.947	.051	par_26
RA	<-->	MOT	.051	.024	2.150	.032	par_27

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.158	.159	7.289	***	par_1
K3	←	KNOW	.902	.111	8.156	***	par_2
A3RC	←	ATT	1.078	.309	3.491	***	par_3
M3RC	←	MOT	1.260	.314	4.007	***	par_4
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
K4	←	KNOW	.931	.116	8.039	***	par_5
SE5	←	SE	1.711	.472	3.622	***	par_6
K1	←	KNOW	.775	.111	6.982	***	par_7
K2	←	KNOW	1.000				
SE4	←	SE	1.000				
CDM4	←	CDM	.829	.136	6.118	***	par_8
RAVCoP2	←	RA	1.000				
RAVCoP3	←	RA	1.559	.506	3.083	.002	par_9
RAVCoP4	←	RA	1.819	.570	3.194	.001	par_10
RAVCoP5	←	RA	1.681	.502	3.347	***	par_11
RAVCoP6	←	RA	1.577	.496	3.180	.001	par_12

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM3	←	CDM	.844
CDM2	←	CDM	.840
K3	←	KNOW	.820
A3RC	←	ATT	.580
M3RC	←	MOT	.711
M2RC	←	MOT	.657
A6RC	←	ATT	.636
K4	←	KNOW	.814
SE5	←	SE	.705
K1	←	KNOW	.754
K2	←	KNOW	.923
SE4	←	SE	.482
CDM4	←	CDM	.745
RAVCoP2	←	RA	.508
RAVCoP3	←	RA	.639
RAVCoP4	←	RA	.685
RAVCoP5	←	RA	.765
RAVCoP6	←	RA	.679

Goodness Fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.031	.759	.657	.533
Saturated model	.000	1.000		
Independence model	.129	.311	.229	.278

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.725	.649	.909	.876	.902
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.083	.046	.113	.065
Independence model	.235	.215	.255	.000

Appendix 5.19

SEM for the relationship between KNOW, ATT and CDM with MOT (for Figure 5.13)

A. CFA

Construct reliability

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.707
K1	.596
K4	.568
K2	.928
CDM4	.530
A6RC	.339
M2RC	.417
M3RC	.525
A3RC	.226
CDM2	.681
CDM3	.774

Sample Correlations (Group number 1)

	K1	K4	K2	CDM4	A6RC	M2RC	M3RC	A3RC	CDM2	CDM3
K1	1.000									
K4	.586	1.000								
K2	.741	.728	1.000							
CDM4	.435	.378	.565	1.000						
A6RC	.302	.178	.249	.372	1.000					
M2RC	.266	.304	.321	.464	.325	1.000				
M3RC	.182	.074	.252	.291	.494	.468	1.000			
A3RC	.290	.221	.234	.182	.369	.347	.363	1.000		
CDM2	.588	.645	.681	.550	.254	.375	.190	.068	1.000	
CDM3	.503	.409	.640	.659	.333	.411	.436	.164	.735	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	K1	K4	K2	CDM4	A6RC	M2RC	M3RC	A3RC	CDM2	CDM3
K1	.000									
K4	.028	.000								
K2	-.015	.010	.000							
CDM4	-.074	-.382	.055	.000						
A6RC	.593	-.245	-.161	.744	.000					
M2RC	.419	.724	.442	1.238	-.547	.000				
M3RC	-.349	-1.074	-.261	-.207	.243	.000	.000			
A3RC	.798	.339	.083	-.244	.644	.105	-.063	.000		
CDM2	.528	.978	.305	-.314	-.326	.352	-1.177	-1.247	.000	
CDM3	-.230	-.749	-.193	.115	.085	.448	.323	-.682	.052	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.026	.876	.772	.478
Saturated model	.000	1.000		
Independence model	.142	.375	.237	.307

Baseline Comparisons

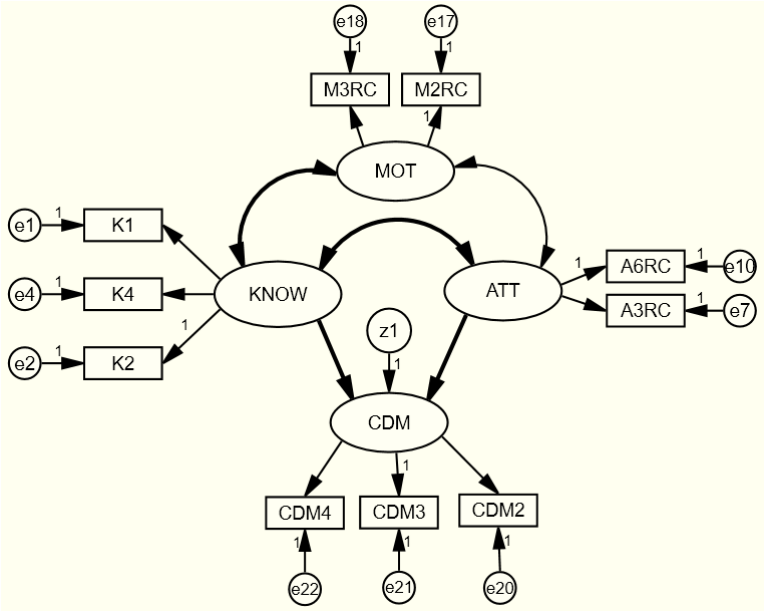
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.857	.785	.959	.934	.956
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

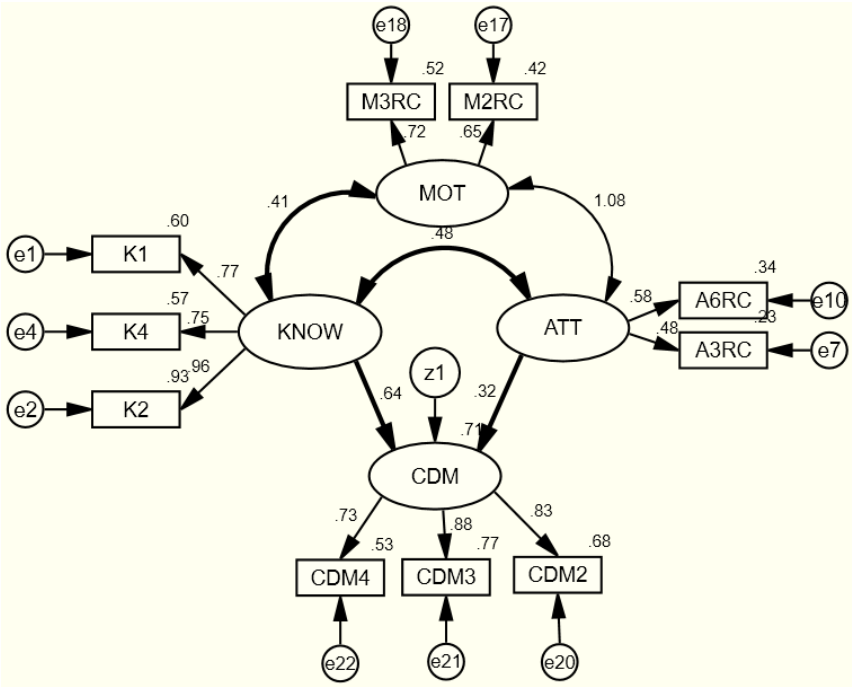
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.081	.000	.141	.216
Independence model	.318	.283	.354	.000

B. Structural equation modelling

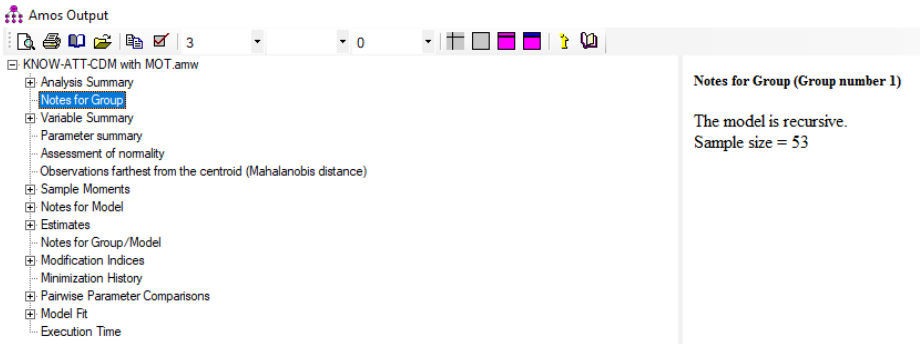
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.667	.571	.637
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	25	40.360	30	.098	1.345
Saturated model	55	.000	0		
Independence model	10	281.472	45	.000	6.255

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.026	.876	.772	.478
Saturated model	.000	1.000		
Independence model	.142	.375	.237	.307

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.857	.785	.959	.934	.956
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.081	.000	.141	.216
Independence model	.318	.283	.354	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	ATT	.557	.262	2.129	.033	par_6
*** A p-value is statistically significant at 0.001 level (two-tailed)							

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.707

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	ATT	.317

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	ATT	.557	.262	2.129	.033	par_6
CDM	←	KNOW	.649	.146	4.442	***	par_11
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.091	.152	7.194	***	par_1
M3RC	←	MOT	1.307	.350	3.739	***	par_2
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
CDM4	←	CDM	.778	.129	6.008	***	par_3
A3RC	←	ATT	.964	.345	2.795	.005	par_4
K2	←	KNOW	1.000				
K4	←	KNOW	.826	.119	6.939	***	par_7
K1	←	KNOW	.760	.105	7.231	***	par_8

Appendix 5.20

SEM for the relationship between KNOW, MOT and CDM with SE <-> KNOW <-> CDM (for Figure 5.14)

A. CFA

Construct reliability

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.872
K3	.744
K2	.758
K4	.716
CDM4	.550
SE5	.403
M2RC	.397
M3RC	.320
SE4	.286
CDM2	.690
CDM3	.742

Sample Correlations (Group number 1)

	K3	K2	K4	CDM4	SE5	M2RC	M3RC	SE4	CDM2	CDM3
K3	1.000									
K2	.744	1.000								
K4	.758	.728	1.000							
CDM4	.494	.565	.378	1.000						
SE5	.486	.588	.512	.561	1.000					
M2RC	.276	.321	.304	.464	.315	1.000				
M3RC	.107	.252	.074	.291	.312	.468	1.000			
SE4	.474	.328	.523	.479	.340	.364	.191	1.000		
CDM2	.576	.681	.645	.550	.602	.375	.190	.474	1.000	
CDM3	.517	.640	.409	.659	.574	.411	.436	.498	.735	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	K3	K2	K4	CDM4	SE5	M2RC	M3RC	SE4	CDM2	CDM3
K3	.000									
K2	-.040	.000								
K4	.166	-.052	.000							
CDM4	-.075	.355	-.763	.000						
SE5	-.304	.318	-.075	.415	.000					
M2RC	.297	.598	.525	.648	-.403	.000				
M3RC	-.729	.281	-.935	-.276	-.165	.753	.000			
SE4	.165	-.824	.546	.407	.000	.335	-.637	.000		
CDM2	.058	.684	.562	-.404	.289	-.252	-1.223	.038	.000	
CDM3	-.440	.297	-1.044	.128	-.019	-.113	.346	.081	.115	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.024	.841	.709	.459
Saturated model	.000	1.000		
Independence model	.169	.318	.166	.260

Baseline Comparisons

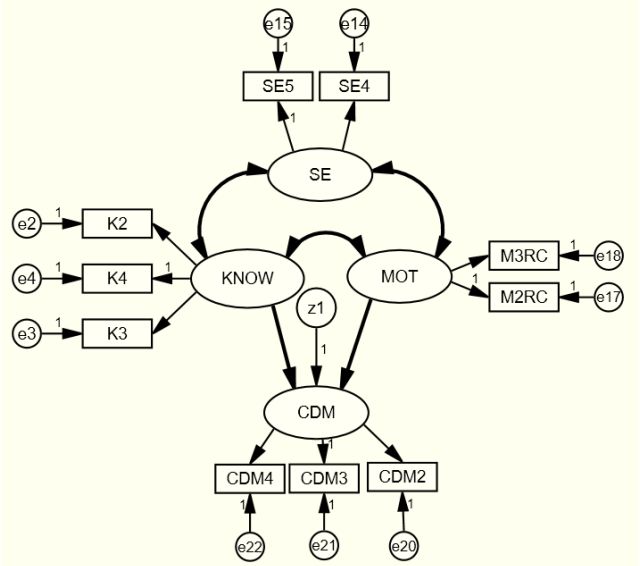
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.826	.739	.909	.856	.904
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

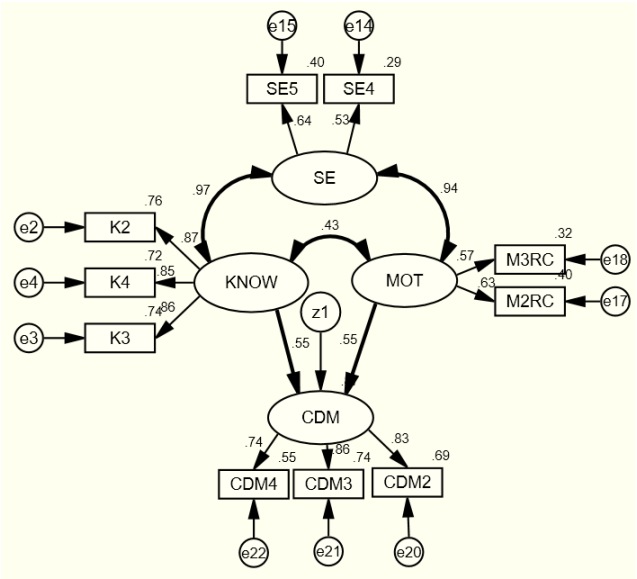
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.133	.079	.184	.010
Independence model	.350	.315	.385	.000

B. Structural equation modelling

Model specification



Standardized output



Model identification

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.667	.551	.603
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	25	57.482	30	.002	1.916
Saturated model	55	.000	0		
Independence model	10	330.924	45	.000	7.354

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.024	.841	.709	.459
Saturated model	.000	1.000		
Independence model	.169	.318	.166	.260

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.826	.739	.909	.856	.904
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.133	.079	.184	.010
Independence model	.350	.315	.385	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	**S.E.**	**C.R.**	**P**	**Label**
CDM	←	MOT	.975	.352	2.774	.006	par_4
CDM	←	KNOW	.592	.163	3.639	***	par_6
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.122	.155	7.245	***	par_1
M3RC	←	MOT	1.046	.345	3.027	.002	par_2
M2RC	←	MOT	1.000				
SE5	←	SE	1.000				
CDM4	←	CDM	.809	.132	6.131	***	par_3
K4	←	KNOW	1.000				
K2	←	KNOW	.974	.126	7.722	***	par_5
SE4	←	SE	.721	.188	3.836	***	par_10
K3	←	KNOW	.980	.129	7.627	***	par_11

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.872

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	MOT	.551
CDM	←	KNOW	.554

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.975	.352	2.774	.006	par_4
CDM	←	KNOW	.592	.163	3.639	***	par_6
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.122	.155	7.245	***	par_1
M3RC	←	MOT	1.046	.345	3.027	.002	par_2
M2RC	←	MOT	1.000				
SE5	←	SE	1.000				
CDM4	←	CDM	.809	.132	6.131	***	par_3
K4	←	KNOW	1.000				
K2	←	KNOW	.974	.126	7.722	***	par_5
SE4	←	SE	.721	.188	3.836	***	par_10
K3	←	KNOW	.980	.129	7.627	***	par_11

Appendix 5.21

SEM for the relationship between KNOW, MOT, and CDM with ATT↔MOT→CDM (for Figure 5.15)

A. CFA

Construct reliability

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.713
K2	.930
K4	.567
K1	.595
CDM4	.531
A6RC	.478
M2RC	.434
M3RC	.552
A3RC	.285
CDM2	.681
CDM3	.773

Sample Correlations (Group number 1)

	K2	K4	K1	CDM4	A6RC	M2RC	M3RC	A3RC	CDM2	CDM3
K2	1.000									
K4	.728	1.000								
K1	.741	.586	1.000							
CDM4	.565	.378	.435	1.000						
A6RC	.249	.178	.302	.372	1.000					
M2RC	.321	.304	.266	.464	.325	1.000				
M3RC	.252	.074	.182	.291	.494	.468	1.000			
A3RC	.234	.221	.290	.182	.369	.347	.363	1.000		
CDM2	.681	.645	.588	.550	.254	.375	.190	.068	1.000	
CDM3	.640	.409	.503	.659	.333	.411	.436	.164	.735	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	K2	K4	K1	CDM4	A6RC	M2RC	M3RC	A3RC	CDM2	CDM3
K2	.000									
K4	.009	.000								
K1	-.014	.036	.000							
CDM4	.049	-.381	-.071	.000						
A6RC	-.174	-.252	.586	.679	.000					
M2RC	.447	.731	.428	1.276	-.460	.000				
M3RC	-.264	-1.074	-.347	-.176	.330	-.142	.000			
A3RC	.157	.399	.862	-.212	.000	.299	.141	.000		
CDM2	.300	.981	.533	-.316	-.396	.394	-1.143	-1.212	.000	
CDM3	-.195	-.743	-.222	.115	.012	.495	.364	-.643	.053	.000

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.026	.877	.774	.478
Saturated model	.000	1.000		
Independence model	.142	.375	.237	.307

Baseline Comparisons

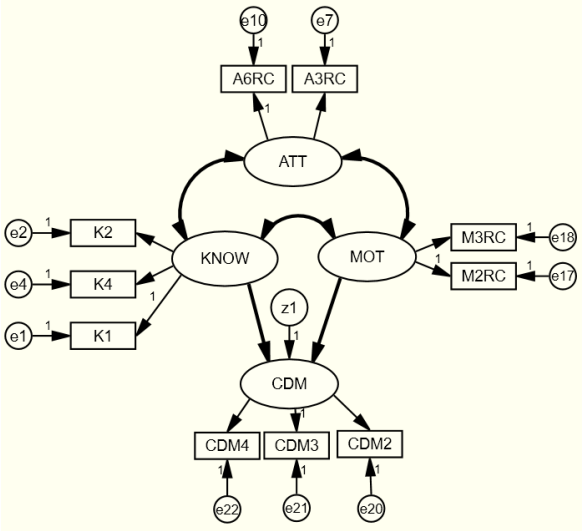
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.858	.787	.961	.937	.958
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

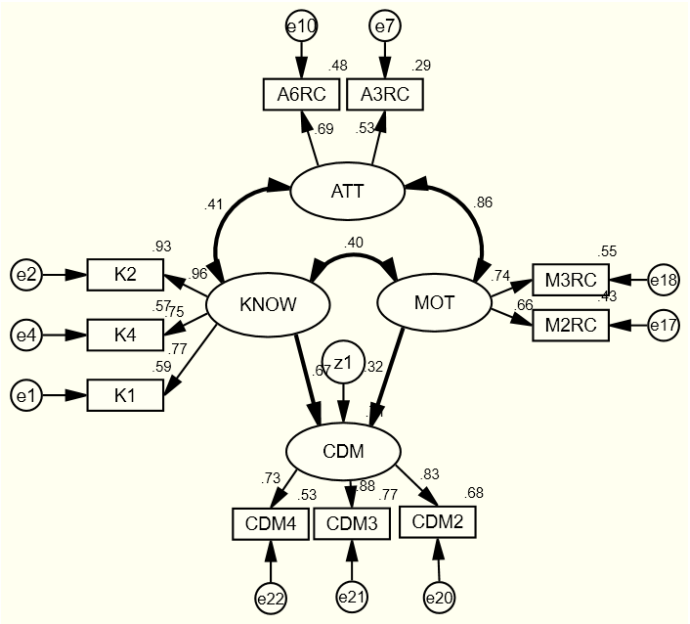
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.080	.000	.140	.230
Independence model	.318	.283	.354	.000

B. Structural equation modelling

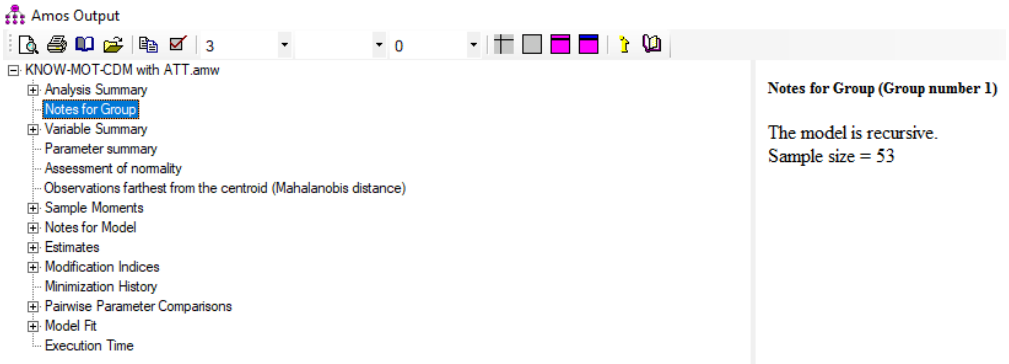
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.667	.572	.639
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	25	39.921	30	.106	1.331
Saturated model	55	.000	0		
Independence model	10	281.472	45	.000	6.255

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.026	.877	.774	.478
Saturated model	.000	1.000		
Independence model	.142	.375	.237	.307

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.858	.787	.961	.937	.958
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.080	.000	.140	.230
Independence model	.318	.283	.354	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.545	.251	2.169	.030	par_4

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.713

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	MOT	.315
CDM	←	KNOW	.666

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.545	.251	2.169	.030	par_4
CDM	←	KNOW	.889	.194	4.590	***	par_7
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.092	.152	7.187	***	par_1
M3RC	←	MOT	1.313	.364	3.606	***	par_2
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
CDM4	←	CDM	.778	.130	6.008	***	par_3
K1	←	KNOW	1.000				
K4	←	KNOW	1.087	.187	5.800	***	par_5
K2	←	KNOW	1.319	.183	7.219	***	par_6
A3RC	←	ATT	.913	.325	2.811	.005	par_11

Appendix 5.22

SEM for the relationship between ATT, SE and CDM with KNOW↔SE, ATT↔MOT, MOT↔SE (for Figure 5.16)

A. CFA

Construct reliability

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.828
CDM4	.598
SE5	.689
K4	.697
K2	.771
SE4	.254
A6RC	.422
M2RC	.393
M3RC	.523
A3RC	.408
K3	.738
CDM3	.707

Sample Correlations (Group number 1)

	CDM4	SE5	K4	K2	SE4	A6RC	M2RC	M3RC	A3RC	K3	CDM3
CDM4	1.000										
SE5	.561	1.000									
K4	.378	.512	1.000								
K2	.565	.588	.728	1.000							
SE4	.479	.340	.523	.328	1.000						
A6RC	.372	.054	.178	.249	.351	1.000					
M2RC	.464	.315	.304	.321	.364	.325	1.000				
M3RC	.291	.312	.074	.252	.191	.494	.468	1.000			
A3RC	.182	-.041	.221	.234	.173	.369	.347	.363	1.000		
K3	.494	.486	.758	.744	.474	.181	.276	.107	.178	1.000	
CDM3	.659	.574	.409	.640	.498	.333	.411	.436	.164	.517	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	CDM4	SE5	K4	K2	SE4	A6RC	M2RC	M3RC	A3RC	K3	CDM3
CDM4	.133										
SE5	.196	.000									
K4	-.552	-.028	.110								
K2	.541	.297	.066	.122							
SE4	1.090	-.524	1.458	-.010	.000						
A6RC	1.410	.392	.192	.646	2.529	.000					
M2RC	.933	.463	1.032	1.096	1.533	-.055	.117				
M3RC	-.619	.181	-.819	.406	.125	.759	.174	.156			
A3RC	.063	-.297	.522	.558	1.250	-.305	.139	-.087	.000		
K3	.135	-.289	.340	.041	1.054	.180	.795	-.617	.178	.117	
CDM3	.171	-.011	-.597	.754	1.024	1.021	.360	.158	-.172	.017	.157

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.031	.855	.742	.480
Saturated model	.000	1.000		
Independence model	.134	.369	.243	.308

Baseline Comparisons

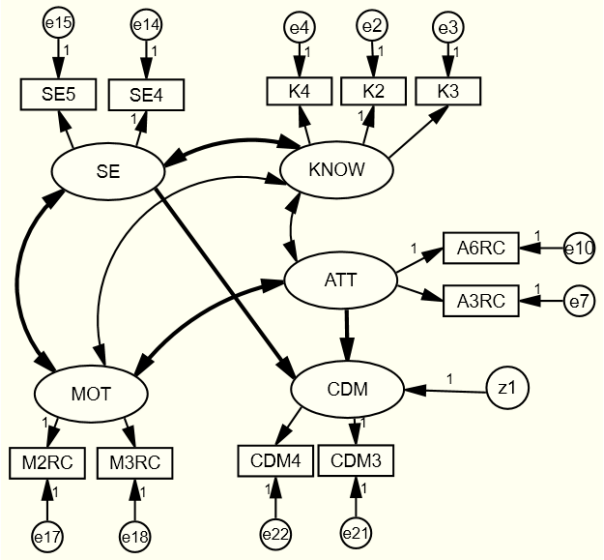
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.813	.722	.921	.874	.915
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

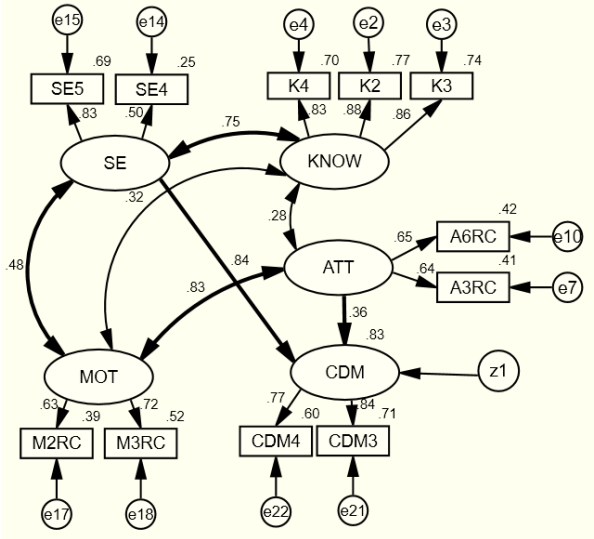
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.107	.051	.156	.049
Independence model	.302	.270	.334	.000

B. Structural equation modelling

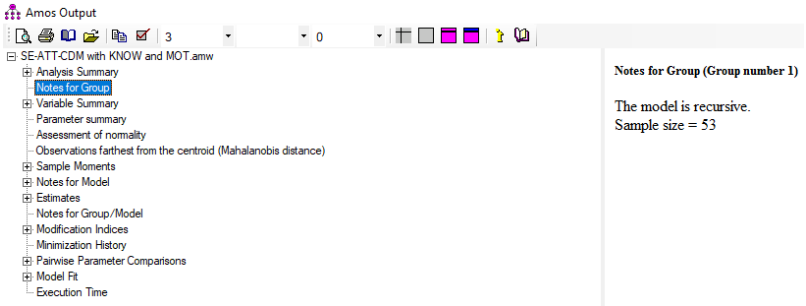
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.673	.547	.616
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	29	59.015	37	.012	1.595
Saturated model	66	.000	0		
Independence model	11	315.096	55	.000	5.729

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.031	.855	.742	.480
Saturated model	.000	1.000		
Independence model	.134	.369	.243	.308

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.813	.722	.921	.874	.915
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.107	.051	.156	.049
Independence model	.302	.270	.334	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	SE	1.483	.448	3.307	***	par_7
CDM	←	ATT	.528	.238	2.218	.027	par_12
CDM3	←	CDM	1.000				
K3	←	KNOW	.994	.126	7.887	***	par_1
A3RC	←	ATT	1.162	.357	3.257	.001	par_2
M3RC	←	MOT	1.338	.349	3.833	***	par_3
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
K4	←	KNOW	1.005	.133	7.552	***	par_4
SE5	←	SE	1.923	.558	3.448	***	par_5
K2	←	KNOW	1.000				
SE4	←	SE	1.000				
CDM4	←	CDM	.866	.148	5.863	***	par_6

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.828

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	SE	.837
CDM	←	ATT	.356

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

			Estimate	**S.E.**	**C.R.**	**P**	**Label**
CDM	←	SE	1.483	.448	3.307	***	par_7
CDM	←	ATT	.528	.238	2.218	.027	par_12
CDM3	←	CDM	1.000				
K3	←	KNOW	.994	.126	7.887	***	par_1
A3RC	←	ATT	1.162	.357	3.257	.001	par_2
M3RC	←	MOT	1.338	.349	3.833	***	par_3
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
K4	←	KNOW	1.005	.133	7.552	***	par_4
SE5	←	SE	1.923	.558	3.448	***	par_5
K2	←	KNOW	1.000				
SE4	←	SE	1.000				
CDM4	←	CDM	.866	.148	5.863	***	par_6

Appendix 5.23

SEM for the relationship between SE, MOT and CDM with KNOW↔SE, ATT↔MOT, MOT↔SE (for Figure 5.17)

A. CFA

Construct reliability

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.915
CDM4	.540
SE5	.595
K4	.709
K2	.764
SE4	.277
A6RC	.355
M2RC	.342
M3RC	.416
A3RC	.384
K3	.731
CDM2	.670
CDM3	.747

Sample Correlations (Group number 1)

	CDM4	SE5	K4	K2	SE4	A6RC	M2RC	M3RC	A3RC	K3	CDM2	CDM3
CDM4	1.000											
SE5	.561	1.000										
K4	.378	.512	1.000									
K2	.565	.588	.728	1.000								
SE4	.479	.340	.523	.328	1.000							
A6RC	.372	.054	.178	.249	.351	1.000						
M2RC	.464	.315	.304	.321	.364	.325	1.000					
M3RC	.291	.312	.074	.252	.191	.494	.468	1.000				
A3RC	.182	-.041	.221	.234	.173	.369	.347	.363	1.000			
K3	.494	.486	.758	.744	.474	.181	.276	.107	.178	1.000		
CDM2	.550	.602	.645	.681	.474	.254	.375	.190	.068	.576	1.000	
CDM3	.659	.574	.409	.640	.498	.333	.411	.436	.164	.517	.735	1.000

Standardized Residual Covariances (Group number 1 - Default model)

	CDM4	**SE5**	**K4**	**K2**	**SE4**	**A6RC**	**M2RC**	**M3RC**	**A3RC**	**K3**	**CDM2**	**CDM3**
CDM4	.113											
SE5	.286	.000										
K4	-.523	-.189	.131									
K2	.616	.174	.062	.141								
SE4	.870	-.444	1.055	-.375	.000							
A6RC	1.750	.392	.250	.723	2.529	.000						
M2RC	1.199	.580	.929	1.005	1.478	-.112	.135					
M3RC	-.236	.394	-.877	.366	.118	.810	.701	.164				
A3RC	.337	-.297	.521	.571	1.250	.000	-.052	-.184	.000			
K3	.209	-.405	.340	.096	.682	.254	.707	-.657	.190	.135		
CDM2	-.235	.178	.907	1.014	.561	.788	.334	-1.187	-.600	.404	.141	
CDM3	.254	-.197	-.813	.558	.575	1.307	.460	.387	.039	-.165	.285	.157

Goodness fit

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.033	.829	.716	.500
Saturated model	.000	1.000		
Independence model	.150	.328	.206	.278

Baseline Comparisons

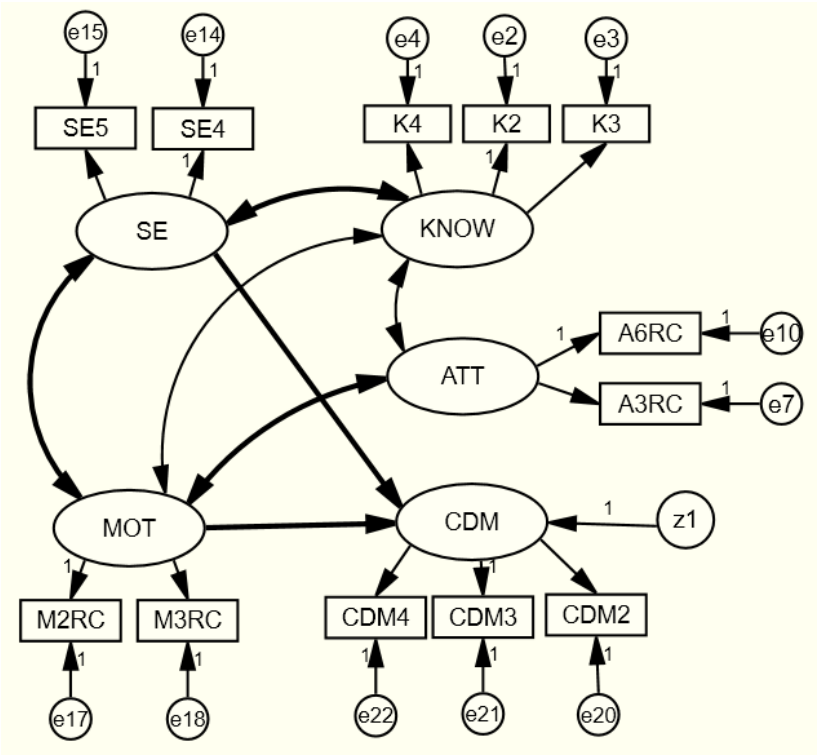
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.793	.710	.905	.858	.899
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

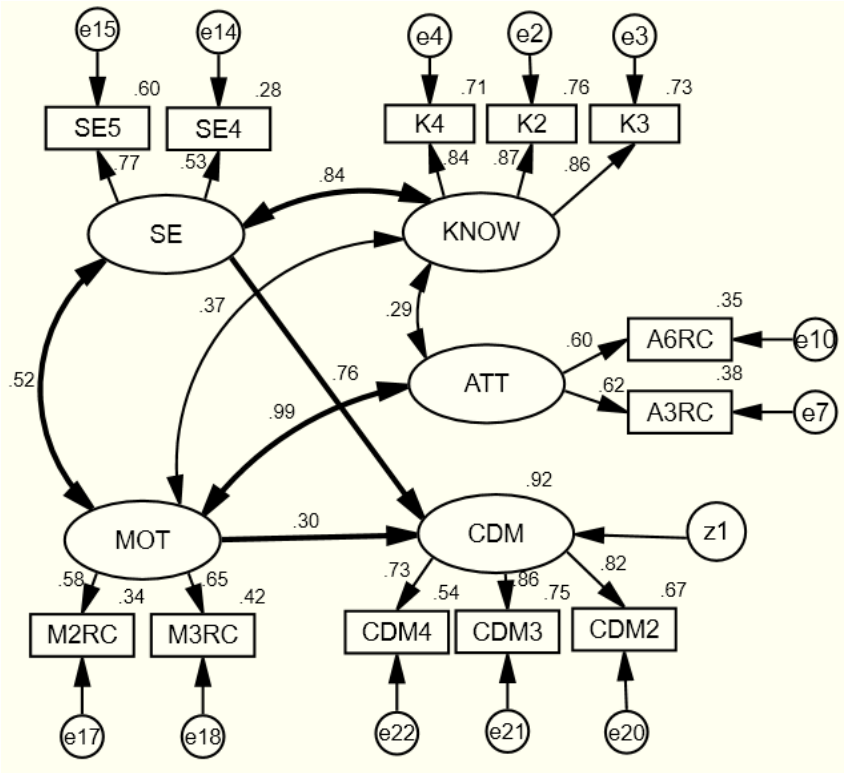
Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.114	.068	.157	.016
Independence model	.303	.274	.333	.000

B. Structural equation modelling

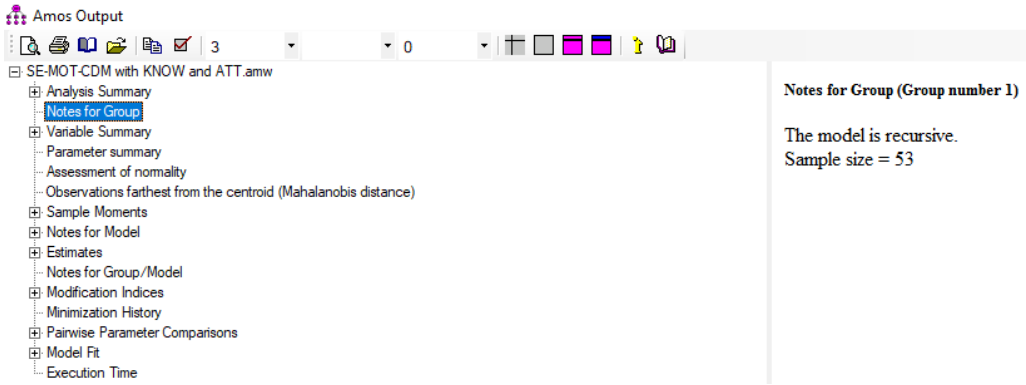
Model specification



Standardized output



Model identification



Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.712	.565	.640
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Model fitness

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	31	78.927	47	.002	1.679
Saturated model	78	.000	0		
Independence model	12	382.125	66	.000	5.790

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.033	.829	.716	.500
Saturated model	.000	1.000		
Independence model	.150	.328	.206	.278

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.793	.710	.905	.858	.899
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.114	.068	.157	.016
Independence model	.303	.274	.333	.000

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.580	.268	2.161	.031	par_8
CDM	←	SE	1.329	.375	3.543	***	par_9
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.103	.156	7.054	***	par_1
K3	←	KNOW	.993	.127	7.841	***	par_2
A3RC	←	ATT	1.229	.379	3.243	.001	par_3
M3RC	←	MOT	1.281	.352	3.640	***	par_4
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
K4	←	KNOW	1.018	.133	7.662	***	par_5
SE5	←	SE	1.712	.456	3.756	***	par_6
K2	←	KNOW	1.000				
SE4	←	SE	1.000				
CDM4	←	CDM	.802	.133	6.034	***	par_7

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
CDM	.915

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
CDM	←	MOT	.303
CDM	←	SE	.762

Uni-dimensionality

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
CDM	←	MOT	.580	.268	2.161	.031	par_8
CDM	←	SE	1.329	.375	3.543	***	par_9
CDM3	←	CDM	1.000				
CDM2	←	CDM	1.103	.156	7.054	***	par_1
K3	←	KNOW	.993	.127	7.841	***	par_2
A3RC	←	ATT	1.229	.379	3.243	.001	par_3
M3RC	←	MOT	1.281	.352	3.640	***	par_4
M2RC	←	MOT	1.000				
A6RC	←	ATT	1.000				
K4	←	KNOW	1.018	.133	7.662	***	par_5
SE5	←	SE	1.712	.456	3.756	***	par_6
K2	←	KNOW	1.000				
SE4	←	SE	1.000				
CDM4	←	CDM	.802	.133	6.034	***	par_7

Appendix 5.24

Levens Test EV Pre Post A2RC

T-Test

Notes		
Output Created		24-FEB-2018 20:49:18
Comments		
Input	Active Dataset	DataSet3
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	187
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=GROUPLEVA2RC(1 2) /MISSING=ANALYSIS /VARIABLES=LEVA2RC /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.02

Group Statistics					
	GROUPLEVA2RC	N	Mean	Std. Deviation	Std. Error Mean
LEVA2RC	1.00	113	3.8938	.85943	.08085
	2.00	74	4.0270	.95046	.11049

Independent Samples Test					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
LEVA2RC	Equal variances assumed	.476	.491	-.994	185
	Equal variances not assumed			-.973	145.006

Independent Samples Test				
		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
LEVA2RC	Equal variances assumed	.322	-.13322	.13406
	Equal variances not assumed	.332	-.13322	.13691

Independent Samples Test			
		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
LEVA2RC	Equal variances assumed	-.39770	.13126
	Equal variances not assumed	-.40382	.13737

Appendix 5.25

Levens Test EV Pre Post Attitude

T-Test

Notes		
Output Created		24-FEB-2018 20:57:21
Comments		
Input	Active Dataset	DataSet3
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	187
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=GROUPLEVA2RC(1 2) /MISSING=ANALYSIS /VARIABLES=LEVA2RC LEVA3RC LEVA4RC LEVA5RC LEVA6RC /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.03

Group Statistics					
	GROUPLEVA2RC	N	Mean	Std. Deviation	Std. Error Mean
LEVA2RC	1.00	113	3.8938	.85943	.08085
	2.00	74	4.0270	.95046	.11049
LEVA3RC	1.00	113	3.7876	.90091	.08475
	2.00	74	3.9459	.93475	.10866
LEVA4RC	1.00	113	3.1416	1.16395	.10949
	2.00	74	3.4054	1.28125	.14894
LEVA5RC	1.00	113	3.9823	.79037	.07435
	2.00	74	3.9595	.88270	.10261
LEVA6RC	1.00	113	3.5398	.75635	.07115
	2.00	74	3.6622	.86447	.10049

Independent Samples Test					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
LEVA2RC	Equal variances assumed	.476	.491	-.994	185
	Equal variances not assumed			-.973	145.006
LEVA3RC	Equal variances assumed	.699	.404	-1.158	185
	Equal variances not assumed			-1.149	152.133
LEVA4RC	Equal variances assumed	1.957	.163	-1.456	185
	Equal variances not assumed			-1.427	145.523
LEVA5RC	Equal variances assumed	.276	.600	.184	185
	Equal variances not assumed			.180	143.920
LEVA6RC	Equal variances assumed	.660	.418	-1.022	185
	Equal variances not assumed			-.994	141.377

Independent Samples Test				
		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
LEVA2RC	Equal variances assumed	.322	-.13322	.13406
	Equal variances not assumed	.332	-.13322	.13691
LEVA3RC	Equal variances assumed	.248	-.15834	.13674
	Equal variances not assumed	.252	-.15834	.13780
LEVA4RC	Equal variances assumed	.147	-.26381	.18119
	Equal variances not assumed	.156	-.26381	.18486
LEVA5RC	Equal variances assumed	.854	.02284	.12383
	Equal variances not assumed	.857	.02284	.12672
LEVA6RC	Equal variances assumed	.308	-.12234	.11975
	Equal variances not assumed	.322	-.12234	.12313

Independent Samples Test			
		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
LEVA2RC	Equal variances assumed	-.39770	.13126
	Equal variances not assumed	-.40382	.13737
LEVA3RC	Equal variances assumed	-.42811	.11144
	Equal variances not assumed	-.43059	.11392
LEVA4RC	Equal variances assumed	-.62127	.09364
	Equal variances not assumed	-.62917	.10154
LEVA5RC	Equal variances assumed	-.22145	.26713
	Equal variances not assumed	-.22763	.27331
LEVA6RC	Equal variances assumed	-.35859	.11391
	Equal variances not assumed	-.36576	.12108

Appendix 5.26

Levens Test VCoP Pre 72 Post 53 All Variable

T-Test

Notes		
Output Created		24-FEB-2018 22:11:21
Comments		
Input	Active Dataset	DataSet12
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	125
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=LEVGROUPS(1 2) /MISSING=ANALYSIS /VARIABLES=LEVK1 LEVK2 LEVK3 LEVK4 LEVA1 LEVA2RC LEVA3RC LEVA4RC LEVA5RC LEVA6RC LEVSE1 LEVSE2 LEVSE3 LEVSE4 LEVSE5 LEVM1 LEVM2RC LEVM3RC LEVM4 LEVCDM1 LEVCDM2 LEVCDM3 LEVCDM4 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Group Statistics					
	LEVGROUPS	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
LEVK1	1.00	72	4.3194	.57718	.06802
	2.00	53	4.3208	.54679	.07511
LEVK2	1.00	72	4.2639	.58123	.06850
	2.00	53	4.2264	.57651	.07919
LEVK3	1.00	72	4.3056	.61983	.07305
	2.00	53	4.2453	.58526	.08039
LEVK4	1.00	72	4.1806	.69862	.08233
	2.00	53	4.2264	.60896	.08365
LEVA1	1.00	72	4.3750	.59191	.06976
	2.00	53	4.3208	.47123	.06473
LEVA2RC	1.00	72	4.2361	.68161	.08033
	2.00	53	4.3019	.66751	.09169
LEVA3RC	1.00	72	4.2917	.61524	.07251
	2.00	53	4.0377	.64933	.08919
LEVA4RC	1.00	72	4.0694	.71850	.08468
	2.00	53	3.8113	.76099	.10453
LEVA5RC	1.00	72	4.3472	.63156	.07443
	2.00	53	4.2453	.73132	.10045
LEVA6RC	1.00	72	4.2500	.55029	.06485
	2.00	53	4.0755	.54944	.07547
LEVSE1	1.00	72	4.2083	.50176	.05913
	2.00	53	4.1509	.45557	.06258
LEVSE2	1.00	72	4.1944	.46387	.05467
	2.00	53	4.0566	.53404	.07336
LEVSE3	1.00	72	4.2500	.52407	.06176
	2.00	53	4.2642	.48639	.06681
LEVSE4	1.00	72	4.2500	.52407	.06176
	2.00	53	4.2642	.59326	.08149
LEVSE5	1.00	72	3.9444	.66901	.07884
	2.00	53	3.9811	.69311	.09521
LEVM1	1.00	72	4.1806	.63526	.07487
	2.00	53	4.2642	.59326	.08149
LEVM2RC	1.00	72	4.5139	.60498	.07130
	2.00	53	4.6038	.49379	.06783
LEVM3RC	1.00	72	4.5972	.57310	.06754
	2.00	53	4.4717	.57525	.07902
LEVM4	1.00	72	4.2222	.61029	.07192
	2.00	53	3.9057	.59692	.08199
LEVCDM1	1.00	72	3.5139	.85569	.10084
	2.00	53	3.9434	.60176	.08266
LEVCDM2	1.00	72	4.0139	.63895	.07530
	2.00	53	4.1509	.74411	.10221
LEVCDM3	1.00	72	4.1667	.55665	.06560
	2.00	53	4.2264	.63976	.08788
LEVCDM4	1.00	72	4.1528	.54797	.06458
	2.00	53	4.1509	.60116	.08258

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
LEVK1	Equal variances assumed	.008	.928	-.013	123	.990	-.00131	.10217
	Equal variances not assumed			-.013	115.417	.990	-.00131	.10133
LEVK2	Equal variances assumed	.003	.958	.357	123	.721	.03747	.10484
	Equal variances not assumed			.358	112.712	.721	.03747	.10471
LEVK3	Equal variances assumed	.385	.536	.550	123	.583	.06027	.10958
	Equal variances not assumed			.555	115.600	.580	.06027	.10862
LEVK4	Equal variances assumed	.529	.468	-.383	123	.703	-.04586	.11985
	Equal variances not assumed			-.391	119.451	.697	-.04586	.11737
LEVA1	Equal variances assumed	7.161	.008	.551	123	.583	.05425	.09849
	Equal variances not assumed			.570	122.203	.570	.05425	.09516
LEVA2RC	Equal variances assumed	.099	.754	-.538	123	.592	-.06578	.12229
	Equal variances not assumed			-.540	113.491	.591	-.06578	.12190
LEVA3RC	Equal variances assumed	1.860	.175	2.227	123	.028	.25393	.11400
	Equal variances not assumed			2.209	108.678	.029	.25393	.11495
LEVA4RC	Equal variances assumed	.396	.530	1.936	123	.055	.25812	.13334
	Equal variances not assumed			1.919	108.438	.058	.25812	.13452
LEVA5RC	Equal variances assumed	.337	.563	.834	123	.406	.10194	.12226
	Equal variances not assumed			.815	102.205	.417	.10194	.12502
LEVA6RC	Equal variances assumed	4.644	.033	1.754	123	.082	.17453	.09953
	Equal variances not assumed			1.754	112.300	.082	.17453	.09951
LEVSE1	Equal variances assumed	1.789	.184	.657	123	.513	.05739	.08738
	Equal variances not assumed			.667	117.633	.506	.05739	.08610
LEVSE2	Equal variances assumed	1.214	.273	1.539	123	.126	.13784	.08954
	Equal variances not assumed			1.507	102.618	.135	.13784	.09149
LEVSE3	Equal variances assumed	.187	.666	-.154	123	.878	-.01415	.09203
	Equal variances not assumed			-.156	116.526	.877	-.01415	.09098
LEVSE4	Equal variances assumed	1.353	.247	-.141	123	.888	-.01415	.10034
	Equal variances not assumed			-.138	103.810	.890	-.01415	.10225
LEVSE5	Equal variances assumed	.001	.978	-.298	123	.766	-.03669	.12295
	Equal variances not assumed			-.297	109.918	.767	-.03669	.12361
LEVM1	Equal variances assumed	.000	.988	-.748	123	.456	-.08360	.11182

	Equal variances not assumed			-.755	116.198	.452	-.08360	.11066
LEVM2RC	Equal variances assumed	2.583	.111	-.886	123	.377	-.08988	.10148
	Equal variances not assumed			-.913	121.636	.363	-.08988	.09841
LEVM3RC	Equal variances assumed	.343	.559	1.208	123	.229	.12552	.10389
	Equal variances not assumed			1.208	111.968	.230	.12552	.10395
LEVM4	Equal variances assumed	.806	.371	2.893	123	.005	.31656	.10944
	Equal variances not assumed			2.902	113.566	.004	.31656	.10907
LEVCDM1	Equal variances assumed	18.471	.000	-3.128	123	.002	-.42951	.13733
	Equal variances not assumed			-3.294	122.780	.001	-.42951	.13039
LEVCDM2	Equal variances assumed	3.101	.081	-1.105	123	.271	-.13705	.12405
	Equal variances not assumed			-1.080	101.801	.283	-.13705	.12695
LEVCDM3	Equal variances assumed	1.342	.249	-.557	123	.579	-.05975	.10736
	Equal variances not assumed			-.545	102.739	.587	-.05975	.10966
LEVCDM4	Equal variances assumed	.492	.484	.018	123	.986	.00183	.10336
	Equal variances not assumed			.017	106.015	.986	.00183	.10483

Independent Samples Test			
		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
LEVK1	Equal variances assumed	-.20356	.20094
	Equal variances not assumed	-.20202	.19940
LEVK2	Equal variances assumed	-.17004	.24499
	Equal variances not assumed	-.16997	.24492
LEVK3	Equal variances assumed	-.15664	.27718
	Equal variances not assumed	-.15488	.27542
LEVK4	Equal variances assumed	-.28309	.19138
	Equal variances not assumed	-.27825	.18653
LEVA1	Equal variances assumed	-.14070	.24920
	Equal variances not assumed	-.13413	.24263
LEVA2RC	Equal variances assumed	-.30784	.17629
	Equal variances not assumed	-.30727	.17572
LEVA3RC	Equal variances assumed	.02827	.47959
	Equal variances not assumed	.02611	.48176
LEVA4RC	Equal variances assumed	-.00582	.52207
	Equal variances not assumed	-.00851	.52476
LEVA5RC	Equal variances assumed	-.14007	.34395
	Equal variances not assumed	-.14604	.34992
LEVA6RC	Equal variances assumed	-.02249	.37154
	Equal variances not assumed	-.02263	.37168
LEVSE1	Equal variances assumed	-.11557	.23035
	Equal variances not assumed	-.11311	.22789
LEVSE2	Equal variances assumed	-.03941	.31509
	Equal variances not assumed	-.04361	.31929
LEVSE3	Equal variances assumed	-.19632	.16801
	Equal variances not assumed	-.19435	.16605
LEVSE4	Equal variances assumed	-.21276	.18446
	Equal variances not assumed	-.21692	.18862
LEVSE5	Equal variances assumed	-.28005	.20668
	Equal variances not assumed	-.28166	.20829
LEVM1	Equal variances assumed	-.30495	.13775
	Equal variances not assumed	-.30277	.13558
LEVM2RC	Equal variances assumed	-.29075	.11098
	Equal variances not assumed	-.28470	.10493
LEVM3RC	Equal variances assumed	-.08012	.33117
	Equal variances not assumed	-.08044	.33149
LEVM4	Equal variances assumed	.09993	.53319
	Equal variances not assumed	.10049	.53263
LEVCDM1	Equal variances assumed	-.70134	-.15767
	Equal variances not assumed	-.68761	-.17140
LEVCDM2	Equal variances assumed	-.38260	.10849
	Equal variances not assumed	-.38887	.11476
LEVCDM3	Equal variances assumed	-.27227	.15277
	Equal variances not assumed	-.27725	.15775
LEVCDM4	Equal variances assumed	-.20275	.20642
	Equal variances not assumed	-.20600	.20967

Appendix 5.27

Levens Test EM Pre 92 Post 66 All Variables

T-Test

Notes		
Output Created		24-FEB-2018 21:58:56
Comments		
Input	Active Dataset	DataSet4
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	158
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=LEVGROUPS(1 2) /MISSING=ANALYSIS /VARIABLES=LEVK1 LEVK2 LEVK3 LEVK4 LEVA1 LEVA2RC LEVA3RC LEVA4RC LEVA5RC LEVA6RC LEVSE1 LEVSE2 LEVSE3 LEVSE4 LEVSE5 LEVM1 LEVM2RC LEVM3RC LEVM4 LEVCDM1 LEVCDM2 LEVCDM3 LEVCDM4 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Group Statistics					
	LEVGROUPS	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
LEVK1	1.00	92	3.8261	.89699	.09352
	2.00	66	4.1818	.99087	.12197
LEVK2	1.00	92	3.8261	.85945	.08960
	2.00	66	4.1061	.91364	.11246
LEVK3	1.00	92	3.7717	.83998	.08757
	2.00	66	3.9697	.92769	.11419
LEVK4	1.00	92	3.7717	.87835	.09157
	2.00	66	3.9848	.93632	.11525
LEVA1	1.00	92	4.0109	.77735	.08104
	2.00	66	4.2727	.86905	.10697
LEVA2RC	1.00	92	3.8696	.81493	.08496
	2.00	66	3.9848	1.04502	.12863
LEVA3RC	1.00	92	3.7391	.82368	.08587
	2.00	66	3.9394	.97474	.11998
LEVA4RC	1.00	92	3.2065	1.15348	.12026
	2.00	66	3.3333	1.31656	.16206
LEVA5RC	1.00	92	3.9783	.74093	.07725
	2.00	66	3.9697	.87653	.10789
LEVA6RC	1.00	92	3.5109	.71858	.07492
	2.00	66	3.6818	.86218	.10613
LEVSE1	1.00	92	3.8696	.57831	.06029
	2.00	66	4.0455	.50935	.06270
LEVSE2	1.00	92	3.8913	.65392	.06818
	2.00	66	4.1667	.54302	.06684
LEVSE3	1.00	92	3.9565	.72496	.07558
	2.00	66	4.1667	.57065	.07024
LEVSE4	1.00	92	3.9130	.80728	.08416
	2.00	66	4.0606	.62950	.07749
LEVSE5	1.00	92	3.8152	.79738	.08313
	2.00	66	4.0455	.64287	.07913
LEVM1	1.00	92	4.1304	.57831	.06029
	2.00	66	4.3030	.52535	.06467
LEVM2RC	1.00	92	3.9891	.71858	.07492
	2.00	66	4.1818	.67730	.08337
LEVM3RC	1.00	92	3.9239	.78773	.08213
	2.00	66	4.0909	.69564	.08563
LEVM4	1.00	92	4.2609	.59058	.06157
	2.00	66	4.3485	.51118	.06292
LEVCDM1	1.00	92	3.9783	.81170	.08463
	2.00	66	4.1667	.54302	.06684
LEVCDM2	1.00	92	3.9565	.64473	.06722
	2.00	66	4.0000	.60764	.07480
LEVCDM3	1.00	92	3.9239	.68314	.07122
	2.00	66	4.0303	.65562	.08070
LEVCDM4	1.00	92	3.9457	.66900	.06975
	2.00	66	4.1364	.52290	.06436

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
LEVK1	Equal variances assumed	.267	.606	-2.353	156	.020	-.35573	.15119
	Equal variances not assumed			-2.315	131.442	.022	-.35573	.15369
LEVK2	Equal variances assumed	.002	.960	-1.967	156	.051	-.27997	.14235
	Equal variances not assumed			-1.947	134.892	.054	-.27997	.14379
LEVK3	Equal variances assumed	.112	.738	-1.398	156	.164	-.19796	.14156
	Equal variances not assumed			-1.376	131.462	.171	-.19796	.14391
LEVK4	Equal variances assumed	.388	.534	-1.463	156	.145	-.21311	.14566
	Equal variances not assumed			-1.448	134.646	.150	-.21311	.14720
LEVA1	Equal variances assumed	3.156	.078	-1.987	156	.049	-.26186	.13176
	Equal variances not assumed			-1.951	130.357	.053	-.26186	.13421
LEVA2RC	Equal variances assumed	1.643	.202	-.779	156	.437	-.11528	.14806
	Equal variances not assumed			-.748	118.039	.456	-.11528	.15416
LEVA3RC	Equal variances assumed	.001	.974	-1.395	156	.165	-.20026	.14353
	Equal variances not assumed			-1.357	125.187	.177	-.20026	.14755
LEVA4RC	Equal variances assumed	2.192	.141	-.642	156	.522	-.12681	.19746
	Equal variances not assumed			-.628	128.471	.531	-.12681	.20180
LEVA5RC	Equal variances assumed	.764	.384	.066	156	.947	.00856	.12908
	Equal variances not assumed			.065	125.216	.949	.00856	.13270
LEVA6RC	Equal variances assumed	1.001	.319	-1.356	156	.177	-.17095	.12609
	Equal variances not assumed			-1.316	123.940	.191	-.17095	.12991
LEVSE1	Equal variances assumed	1.896	.170	-1.980	156	.049	-.17589	.08882
	Equal variances not assumed			-2.022	149.492	.045	-.17589	.08698
LEVSE2	Equal variances assumed	.019	.891	-2.798	156	.006	-.27536	.09843
	Equal variances not assumed			-2.884	152.613	.004	-.27536	.09548
LEVSE3	Equal variances assumed	.011	.916	-1.959	156	.052	-.21014	.10728
	Equal variances not assumed			-2.037	154.609	.043	-.21014	.10318
LEVSE4	Equal variances assumed	1.840	.177	-1.239	156	.217	-.14756	.11912
	Equal variances not assumed			-1.290	154.871	.199	-.14756	.11440
LEVSE5	Equal variances assumed	4.130	.044	-1.937	156	.055	-.23024	.11888
	Equal variances not assumed			-2.006	153.820	.047	-.23024	.11477
LEVM1	Equal variances assumed	1.399	.239	-1.921	156	.057	-.17260	.08983

	Equal variances not assumed			-1.952	147.509	.053	-.17260	.08841
LEVM2RC	Equal variances assumed	.699	.404	-1.702	156	.091	-.19269	.11319
	Equal variances not assumed			-1.719	144.880	.088	-.19269	.11209
LEVM3RC	Equal variances assumed	.105	.746	-1.379	156	.170	-.16700	.12110
	Equal variances not assumed			-1.408	149.330	.161	-.16700	.11865
LEVM4	Equal variances assumed	.319	.573	-.972	156	.333	-.08762	.09015
	Equal variances not assumed			-.995	150.508	.321	-.08762	.08804
LEVCDM1	Equal variances assumed	1.620	.205	-1.640	156	.103	-.18841	.11488
	Equal variances not assumed			-1.747	155.326	.083	-.18841	.10784
LEVCDM2	Equal variances assumed	.457	.500	-.428	156	.669	-.04348	.10155
	Equal variances not assumed			-.432	144.886	.666	-.04348	.10056
LEVCDM3	Equal variances assumed	.095	.758	-.982	156	.328	-.10639	.10837
	Equal variances not assumed			-.988	143.503	.325	-.10639	.10763
LEVCDM4	Equal variances assumed	.414	.521	-1.931	156	.055	-.19071	.09878
	Equal variances not assumed			-2.009	154.808	.046	-.19071	.09491

Independent Samples Test			
		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
LEVK1	Equal variances assumed	-.65437	-.05709
	Equal variances not assumed	-.65976	-.05170
LEVK2	Equal variances assumed	-.56115	.00120
	Equal variances not assumed	-.56435	.00441
LEVK3	Equal variances assumed	-.47759	.08167
	Equal variances not assumed	-.48263	.08671
LEVK4	Equal variances assumed	-.50082	.07460
	Equal variances not assumed	-.50424	.07802
LEVA1	Equal variances assumed	-.52212	-.00159
	Equal variances not assumed	-.52736	.00365
LEVA2RC	Equal variances assumed	-.40774	.17717
	Equal variances not assumed	-.42056	.18999
LEVA3RC	Equal variances assumed	-.48377	.08324
	Equal variances not assumed	-.49227	.09175
LEVA4RC	Equal variances assumed	-.51684	.26322
	Equal variances not assumed	-.52610	.27248
LEVA5RC	Equal variances assumed	-.24642	.26354
	Equal variances not assumed	-.25405	.27118
LEVA6RC	Equal variances assumed	-.42000	.07811
	Equal variances not assumed	-.42807	.08617
LEVSE1	Equal variances assumed	-.35134	-.00044
	Equal variances not assumed	-.34777	-.00401
LEVSE2	Equal variances assumed	-.46978	-.08094
	Equal variances not assumed	-.46399	-.08674
LEVSE3	Equal variances assumed	-.42205	.00176
	Equal variances not assumed	-.41397	-.00632
LEVSE4	Equal variances assumed	-.38285	.08772
	Equal variances not assumed	-.37355	.07843
LEVSE5	Equal variances assumed	-.46505	.00458
	Equal variances not assumed	-.45697	-.00350
LEVM1	Equal variances assumed	-.35003	.00484
	Equal variances not assumed	-.34732	.00213
LEVM2RC	Equal variances assumed	-.41627	.03089
	Equal variances not assumed	-.41422	.02885
LEVM3RC	Equal variances assumed	-.40621	.07221
	Equal variances not assumed	-.40144	.06745
LEVM4	Equal variances assumed	-.26569	.09046
	Equal variances not assumed	-.26156	.08633
LEVCDM1	Equal variances assumed	-.41533	.03852
	Equal variances not assumed	-.40143	.02461
LEVCDM2	Equal variances assumed	-.24407	.15712
	Equal variances not assumed	-.24223	.15528
LEVCDM3	Equal variances assumed	-.32045	.10767
	Equal variances not assumed	-.31914	.10636
LEVCDM4	Equal variances assumed	-.38584	.00441
	Equal variances not assumed	-.37819	-.00323

Appendix 6.1

Correlations: (Group number 1 - Default model)

Correlation between covariants in the analysis of the standardised total effect of KNOW and SE on CDM (related to Table 6.8)

			Estimate
KNOW	↔	ATT	.502
KNOW	↔	SE	.709
KNOW	↔	MOT	.543
ATT	↔	SE	.608
ATT	↔	MOT	.836
SE	↔	MOT	.673

Correlation between covariants in the analysis of the standardised total effect of KNOW and MOT on CDM (related to Table 6.9)

			Estimate
KNOW	↔	ATT	.497
KNOW	↔	SE	.713
KNOW	↔	MOT	.534
ATT	↔	SE	.596
ATT	↔	MOT	.826
SE	↔	MOT	.672

Correlation between covariants in the analysis of the standardised total effect of SE and MOT on CDM (related to Table 6.10)

			Estimate
KNOW	↔	ATT	.497
KNOW	↔	SE	.726
KNOW	↔	MOT	.561
ATT	↔	SE	.593
ATT	↔	MOT	.830
SE	↔	MOT	.646