Abouzekri, O. A., & Karageorghis, C. I. (2010). Effects of precompetition state anxiety interventions on performance time and accuracy among amateur soccer players: Revisiting the matching hypothesis. *European Journal of Sport Science, 10,* 209–221.

Running head: Anxiety, Performance, and the Matching Hypothesis

Effects of Precompetition State Anxiety Interventions on Performance Time and Accuracy among Amateur Soccer Players: Revisiting the Matching Hypothesis

3rd revision submitted: 21 September 2009

Abstract

In this study, we tested the matching hypothesis, which contends that administration of a cognitive or somatic anxiety intervention should be matched to a participant's dominant anxiety response. Sixty-one male soccer players (mean. age 31.6 years, $s = 6.3$) were assigned to one of four groups based on their responses to the Competitive State Anxiety Inventory-2 which was modified to include a directional scale. Interventions were randomly administered in a counterbalanced order 10 min before each performance trial on a soccer skill test. The dominantly cognitive anxious group ($n = 17$), the dominantly somatic anxious group ($n = 17$), and the non-anxious control intervention group ($n = 14$) completed a baseline performance trial. The second and third trials were completed with random administration of brief cognitive and somatic interventions. The non-anxious control group ($n = 13$) completed three trials with no intervention. A mixed-model, Group x Treatment multivariate analysis of variance indicated significant ($P < 0.05$) changes in cognitive anxiety intensity and somatic anxiety intensity, but not in state anxiety direction ($P > 0.05$), or performance time or accuracy ($P > 0.05$). The present findings did not provide support for the matching hypothesis for state anxiety intensity and direction, or for performance.

Keywords: Cognitive anxiety, somatic anxiety, intervention.

Introduction

Anxiety is an emotion that has been proposed to have a considerable bearing upon an athlete's performance (Hanton & Jones, 1999). In early sport-related work aimed at enhancing understanding of this phenomenon, there was a distinct focus on the *intensity* of anxiety symptoms (i.e., how much anxiety was experienced; Burton, 1988) while subsequent research placed strong emphasis on the *direction* of anxiety symptoms (i.e., whether the interpretation was facilitative or debilitative to performance; Jones & Hanton, 2001). Athletes with debilitative anxiety were hypothesized to have negative expectancies in their ability to cope, which might impair their performance, whereas athletes with facilitative anxiety would have positive expectancies, which might enhance their performance (Jones, 1995).

The most commonly used state anxiety measurement tool has been the Competitive State Anxiety Inventory-2 (CSAI-2; see Craft, Magyar, Becker, & Feltz, 2003 for review). However, due primarily to weaknesses identified by Lane, Sewell, Terry, Bartram, and Nesti (1999), the revised CSAI-2 was developed by Cox and colleagues (Cox, Martens, & Russell, 2003), and this exhibited stronger psychometric properties than its predecessor (Lundqvist & Hassmen, 2005; Raudsepp & Kais, 2008). Anxiety direction emerged as a stronger predictor of anxiety performance than anxiety intensity, with elite athletes reporting similar anxiety intensity but more facilitative anxiety direction than their non-elite counterparts (Jones & Swain, 1995).

Researchers have differed greatly in their conceptualizations of facilitative anxiety (Burton & Naylor, 1997; Hanton, Neil, & Mellalieu, 2008; Hardy, 1996; Mellalieu & Lane, 2009). In addressing this debate, Jones and Hanton (2001) investigated anxiety feeling states to determine whether a facilitative anxiety state exists or whether facilitative anxiety is a different emotion that has been mislabeled (e.g. excited or motivated). Although support for both arguments was found with some athletes exhibiting complex facilitative and debilitative feeling states, their position was that anxiety is a negative feeling state. Additionally, a negative direction score in the modified CSAI-2 signifies anxiety, whilst a positive direction score points to a feeling state previously mislabeled as anxiety.

To address the various cognitive and somatic anxiety symptoms, researchers’ choice of intervention has varied (Maynard, Hemmings, Greenlees, Warwick-Evans, & Stanton, 1998; Terry, Coakley, & Karageorghis, 1995). Davidson and Schwartz (1976) identified that different interventions can engender differential responses in each anxiety component. Accordingly, it has been suggested that directing interventions at specific components of anxiety is potentially more advantageous than using them indiscriminately to control the symptoms of anxiety (Borkovec, 1976; Davidson & Schwartz, 1976). This proposition has become known as *the matching hypothesis*. To illustrate this, an athlete who is experiencing a stream of negative thoughts might be administered a cognitive relaxation technique, such as “The Quiet Place” (Syer & Connolly, 1987, pp. 94–96), to reduce their anxiety. Conversely, an athlete who experiences shortness of breath and excessive perspiration from being highly somatically anxious might be administered a somatic relaxation technique such as progressive muscular relaxation (Jacobson, 1938).

It has been documented that a *crossover effect* is possible wherein an intervention directed at one anxiety component facilitates anxiety reduction in another, suggesting an interaction between both components (Davidson & Schwartz, 1976). Researchers and practitioners need to question whether to apply multimodal interventions that are targeted at different anxiety components. The occurrence of crossover effects during unimodal interventions indicates that anxiety reduction in either component (cognitive or somatic) would result in an anxiety reduction in the other component. Notably, studies that have compared unimodal compatible, unimodal incompatible and multimodal interventions have reported inconclusive findings (Maynard, Hemmings et al., 1998; Terry et al., 1995). Maynard et al. (1998) found that the multimodal intervention was more effective at reducing cognitive intensity and facilitating cognitive direction in the cognitive group. However, Terry et al. (1995) found incompatible brief interventions to be more effective at reducing the anxiety intensity component.

Although cognitive restructuring has been used to improve the debilitative interpretations of competitive swimmers (Hanton & Jones, 1999), most matching hypothesis studies have used anxiety-reduction interventions. In particular, two soccer-related studies (Maynard, Hemmings, & Warwick-Evans, 1995a; Maynard, Smith, & Warwick-Evans, 1995b) found that anxiety-reduction techniques increased facilitative interpretations of precompetition symptoms and self-confidence. Neil and colleagues (Neil, Mellalieu, & Hanton, 2006) indicated that elite athletes adopt strategies that include thought-stopping, mental rehearsal, and positive self-talk to protect against debilitative interpretations, whereas nonelite athletes employ anxiety-reduction techniques. Accordingly, Neil et al. recommended that practitioners should implement anxiety reduction for non-elite groups. It has also been argued that some contact sports (e.g., rugby union) require a high level of activation, thus anxiety reduction techniques may be wholly inappropriate. Approaches that aid the interpretation of anxiety symptoms, such as *individual zones of optimal functioning* (Hanin, 2000) and *cognitive restructuring* (Hanton & Jones, 1999) are potentially advantageous.

We identified a few fairly dated sport-related studies examining the matching hypothesis. Five of these investigated anxiety intensity and found support for the matching hypothesis (Maynard & Cotton, 1993; Maynard et al., 1998; Maynard, Hemmings, & Warwick-Evans, 1995a; Maynard, MacDonald, & Warwick-Evans, 1997; Maynard, Smith, & Warwick-Evans, 1995b), while Terry et al. (1995) studied anxiety intensity but did not support the hypothesis due to significant crossover effects. Terry et al. employed brief interventions that took up to 25 min, as such brief interventions can be advantageous for sports where the time available for administration is limited; however, the other studies used interventions practiced over 6–12 weeks (e.g. Maynard et al., 1997). It is thus unclear whether the use of brief interventions is a factor in finding support for the matching hypothesis. Brief interventions have been adopted in this study owing to their applicability and convenience in applied settings (see Giges & Petitpas, 2000). Moreover, the techniques used in the present study can be self-administered under the auspices of a trained practitioner and incorporated into a precompetition preparation routine.

The two studies examining anxiety direction using the directionally-modified CSAI-2 both supported the matching hypothesis (Maynard et al., 1995a, 1997). However, those using the CSAI-2 without directional modification (e.g., Maynard & Cotton, 1993) may have been measuring emotions other than anxiety, as participants' interpretation of anxiety symptoms may have been facilitative. The anxiety and performance relationship in sport did not support the matching hypothesis (e.g. Maynard & Cotton, 1993; Maynard et al., 1995b). Maynard et al. (1995b) made a credible attempt to split the performance criteria into separate cognitive and physical components in order to test the matching hypothesis. Nonetheless, use of subjective performance measures may be improved upon through use of objective measures obtained from match analysis techniques (see Parfitt, Jones, & Hardy, 1990).

Differences also emerged in terms of the performance level of participants and the sport in which they engaged (e.g., Maynard & Cotton, 1993; Maynard et al., 1997). A further limitation in past research is that no criteria had been established for assigning participants to experimental groups. For example, Maynard et al. (1995a) placed soccer players in the somatic group if their somatic anxiety was more debilitative than their cognitive anxiety. However, Maynard et al. (1997) placed climbers in the somatic group if their somatic intensity score was 5 points higher than their cognitive intensity score. Additionally, participants with a facilitative score have generally been allocated to control groups. Moreover, these participants had never previously been administered any intervention, which suggests that non-anxious participants might not derive any benefit.

We identified three perspectives that have been employed in testing the matching hypothesis. Using the first perspective, the matching hypothesis would be supported for participants in the cognitive group if an intervention directed at a reduction in cognitive intensity resulted in a greater reduction in cognitive intensity than a somatic intervention. This principle can be applied in a similar way to somatic intensity and the cognitive and somatic direction components; the compatible treatment would elicit the most benefit. This perspective has not been adopted in any of the previous studies which tested the matching hypothesis in sport.

Using the second perspective, the matching hypothesis would be supported for participants in the cognitive group if an intervention directed at a reduction in cognitive intensity resulted in a greater reduction in cognitive intensity than for somatic intensity (Maynard & Cotton, 1993). This can be applied in a similar way to somatic intensity and the cognitive and somatic direction components; the compatible anxiety component would derive the most benefit.

Using the third perspective, the matching hypothesis would be supported if a cognitive intervention directed at reducing cognitive intensity was most effective in reducing cognitive intensity for participants in a cognitive group when compared to those in a somatic group. Once again, this can be applied in a similar way for cognitive direction; however, to elicit any benefit in somatic intensity and direction, a compatible somatic treatment is required. In this instance, the greatest benefit would be derived by participants in the somatic group. The third perspective is generally applied in conjunction with the second perspective (e.g., Maynard et al., 1995b; Maynard et al., 1997).

None of the previous studies adopted Maynard and Cotton's (1993) advice to test the matching hypothesis thoroughly, such that cognitive interventions were also aimed at somatic populations and somatic interventions at cognitive populations. For this reason, the three perspectives have not appeared previously in a single study. If it is possible to find support using one perspective and a lack of support using a different perspective in the same study, then this would question whether past researchers would have supported the matching hypothesis had they adopted the three perspectives.

The purpose of this study was to test the matching hypothesis using both brief cognitive and somatic anxiety reduction interventions to reduce the anxiety of participants and, in turn, improve the skill test performance of amateur soccer players. To examine the aforementioned three perspectives, the following research hypotheses were tested:

H_1 There will be a greater reduction in cognitive intensity for participants in the cognitive anxiety group being administered a cognitive intervention.

H_2 There will be a greater reduction in somatic intensity for participants in the somatic anxiety group being administered a somatic intervention.

H_3 Cognitive direction will be perceived to be more facilitative for participants in the cognitive anxiety group being administered a cognitive intervention.

H_4 Somatic direction will be perceived to be more facilitative for participants in the somatic anxiety group being administered a somatic intervention.

H_5 Participants assigned to a cognitive group receiving a cognitive intervention will have a significantly greater reduction in performance time than participants in a cognitive group administered a somatic intervention, and greater reduction than participants in the somatic group administered a cognitive intervention.

H_6 Participants assigned to a somatic group receiving a somatic intervention will have a significantly greater reduction in performance time than participants in a somatic group administered a cognitive intervention, and greater reduction than participants in the cognitive group administered a somatic intervention.

H_7 Participants assigned to a cognitive group receiving a cognitive intervention will have a significantly greater increase in performance accuracy than participants in a cognitive group administered a somatic intervention, and greater increase than participants in the somatic group administered a cognitive intervention.

H_8 Participants assigned to a somatic group receiving a somatic intervention will have a significantly greater increase in performance accuracy than participants in a somatic group administered a cognitive intervention, and greater increase than participants in the cognitive group administered a somatic intervention.

Method

Ethics

Institutional ethical approval was granted for the study and participants provided written informed consent.

Power analysis

A power analysis was conducted to determine an appropriate sample size. With alpha set at 0.05 and power at 0.8 to protect beta at four times the level of alpha (Cohen, 1988), based on an estimated large effect size (Δ = 1.0) for the Group x Treatment interaction across all anxiety dimensions (see Maynard & Cotton, 1993; Maynard et al., 1995a, 1995b; Terry et al., 1995), we calculated that approximately 12 participants would be required for each experimental group.

Participants

The participants comprised 61 male soccer players aged 18–50, (mean = 31.6, *s* = 6.3) from the southeast of England. All were relatively homogeneous in terms of ability and had competed for a number of years (mean = 13.6, s = 7.1). It should be noted that a slightly more participants were recruited than indicated by the power analysis to ensure a minimum of 12 participants in each of four groups (two experimental and two control: dominantly cognitive anxious; dominantly somatic anxious; non-anxious control; and non-anxious control intervention).

Instruments

Concentration Grid (CG; Harris & Harris, 1984). The CG has been proposed to require considerable attentional control without acting as an anxiety-reduction technique

(Harris & Harris). Accordingly, it was used as a “filler” in the present study to guard against possible carryover effects (Ashford, Karageorghis, & Jackson, 2005). It contains a 10 x 10 grid of randomly located numbers between 00 and 99, and starting with a randomly assigned number, participants had 5 min to cross off as many consecutive numbers as possible in ascending order.

Skill test trial. The authors designed a soccer skill test based broadly on the Modified Loughborough Soccer Passing Test (mLSPT; Ali et al., 2003) and a sequence of movements common to the game (Reilly, 1998, p. 42). Although the mLSPT is deemed to be both valid and reliable, it has the limitation of allowing participants to turn in one direction only during the dribbling component and provides just three levels of differentiation for the accuracy component. Each trial of the present skill test required participants to complete six circuits that comprised of a ball dribbling task, an accuracy task comprising of 10 levels of accuracy, and a running task without the ball (see Figure 1). The apparatus used included 27 marker cones, a tape measure to facilitate accurate positioning of the cones, and a hand-held stopwatch to measure trial time. The test was conducted on a flat, grassed area.

Performance time was taken as the time expended by each participant to complete six circuits of the skill test. Performance accuracy was calculated as the sum of the accuracy points obtained from the six kicks attempted from a distance of 20 m; kicking the ball through the central cones earned 10 points while a kick through the outer cones earned one point. So performance accuracy scores ranged from 0 to 60. Thus, as recommended by Parfitt et al. (1990), an objective measure of performance was taken.

Measures

Modified CSAI-2R. To assess multidimensional state anxiety, a directional scale was added to the revised CSAI-2 (CSAI-2R: Cox et al., 2003) to distinguish between anxiety (that is, debilitative) and other emotional states (Jones & Swain, 1992). The modified CSAI-2R contained 17 items which tapped the three subscales of cognitive anxiety (5 items), somatic anxiety (7 items), and self-confidence (5 items). Each item was scored on a 4-point Likert-type scale ranging from 1 (*not at all*) to 4 (*very much so*) while direction was scored on a 7-point bipolar scale ranging from -3 to +3 with a negative score representing debilitative anxiety. The directional component was adjusted to score from 1 to 7 (i.e., 4 being equivalent to 0 in the –3 to +3 range) to facilitate mathematical transformations. Additionally, as the three anxiety components contained a different number of items, each component score was divided by the number of items and multiplied by 10 to aid cross-component comparison. Thus, intensity component scores ranged from 10 to 40 and direction component scores ranged from 10 to 70 (a score of 40 represented "no direction").

Cronbach alpha values for the CSAI-2R were $\geq$ 0.80 for all anxiety intensity components while Confirmatory Factor Analysis (CFA) results indicated that the CSAI-2R has greater psychometric integrity than the original CSAI-2: comparative fit index = 0.95, non-normed fit index = 0.94, RMSEA = 0.054 (Cox et al., 2003). Jones and Hanton (2001) reported Cronbach alpha values $\geq$ 0.80 for the directionally modified CSAI-2 for the anxiety directional components.

Intervention Evaluation Questionnaire (IEQ). A post-test questionnaire was constructed by the authors to evaluate how well participants responded to and adopted the interventions. This was administered to a subsample of the main sample comprising 12 participants (mean age 32.6 years, s = 5.9). There were three items were used to assess responses to Brief Progressive Muscular Relaxation and three equivalent items responses for the Quiet Place Technique. Each item was scored on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Examples of items included: "The Progressive Muscular Relaxation calmed my mind"; "The Quiet Place Technique eased the tension I had in my body"; and "I felt I was fairly competent in using Progressive Muscular Relaxation". There was also an open-ended question for each of the two interventions which asked participants to comment on how they felt the interventions impacted on their physical and mental state.

Procedure

Interventions. Cognitive and somatic interventions were edited from an unpublished audiocassette of relaxation interventions set to relaxing music. The Quiet Place Technique (QPT), which entails using each sense to immerse oneself in a ‘an imagined place where you are alone and relaxed’ (Syer & Connolly, 1998, p. 94), was the brief 6 min cognitive intervention expected to have anxiety reducing qualities. Brief Progressive Muscular Relaxation (bPMR) was a three-stage 7 min somatic intervention also expected to have anxiety-reducing qualities. Jacobson’s (1938) PMR entails lying down then progressively tensing and relaxing each major muscle group of the body to make one aware of areas of tension. Participants engaging in bPMR were taught the difference between tension and relaxation of specific muscle groups (Stage 1) and instructed to relax specific muscle groups from the upper to the lower extremities of the body (Stage 2). During the intervention, the word “relax” was used to elicit a relaxation response while participants focused on their breathing (Stage 3).

Anxiety inducement. The authors assumed that the experimental task would not have the same anxiety-inducing qualities as a game; therefore, drawing upon Endler’s (1978) antecedents of anxiety as a guiding framework, we attempted to induce anxiety using a variety of methods. First, participants were informed that the study entailed a competition in which prize money would be given to those who recorded the top three performances (Murray & Janelle, 2003; Wilson, Vine, & Wood, 2009). Additionally, they were informed that their performance scores would be given to all other participants and that no participant would be given access to their scores or scores for other participants until all trials were completed (Behan & Wilson, 2008).

Experimental study. Participants completed three stages. In Stage 1, they completed the modified CSAI-2R 10 min prior to the soccer skill test and were allocated to one of four groups based on their scores. Participants who scored greater (i.e. more negative) debilitative cognitive anxiety direction were placed in the cognitive group (CD_G). Participants who scored greater debilitative somatic anxiety direction were placed in the somatic group (SD_G). Those who scored non-debilitative (i.e. zero or positive) cognitive anxiety direction and non-debilitative somatic anxiety direction were allocated equally to either the control group (C_G) or the control intervention group (CI_G). Participants were then administered the Concentration Grid in order to minimize any possible anxiety-priming effects emanating from completion of the modified CSAI-2R. They then completed the first of three skill test trials during which performance time and accuracy were recorded. This was followed by a 3 min rest period prior to Stage 2.

In Stage 2, participants from all four groups were administered the Concentration Grid to guard against possible carryover effects. Participants in the cognitive group, somatic group, and the control intervention group were randomly administered the cognitive intervention or the somatic intervention via a personal stereo. Participants from the control group were not exposed to any intervention. For participants in all four groups, the second modified CSAI-2R was administered immediately to assess any anxiety intensity and anxiety direction changes, and completed 10 min prior to the second trial of the soccer skill test. Following a 3-min rest period, in Stage 3, participants followed the same procedure as in Stage 2, with one exception: participants from the cognitive group, somatic group, and the control intervention group were administered the opposite intervention to that in Stage 2. Finally, the Intervention Evaluation Questionnaire was administered to a subsample of the main sample.

Data analysis

This study contained many dependent variables (k = 24; eight across three repeated measures) and 61 participants with a minimum of n = 13 for each cell. The eight dependent variables were: cognitive, somatic, and self-confidence intensity; cognitive, somatic, and self-confidence direction; and performance time and accuracy. Cronbach alpha values for the CSAI-2R were in the range 0.69–0.95, with all but two $\geq$ 0.80. Univariate outliers ($z \geq \pm$ 2.58) were screened for, and normality in each cell of each analysis was examined using standard skewness and kurtosis ($z < \pm$ 2.58). Between- and within-group differences for all DVs were calculated using a mixed-model, Group x Treatment multivariate analysis of variance (MANOVA) ($P < 0.05$). Step-down F tests and pairwise comparisons were used to identify where differences lay. In accordance with Huck and colleagues (Huck, Cormier, & Bounds, 1974), where significant interactions occurred, analyses of main effects were deemed inappropriate. Where violations of sphericity were identified using Mauchly's W, the degrees of freedom were rounded up or down to the nearest integer following Greenhouse-Geisser adjustment (Vincent, 2005, p. 190). The mean values of the Intervention Evaluation Questionnaire and responses to open-ended questions were assessed to monitor participants' perceived impact of the interventions.

Results

Data screening

No multivariate outliers were found. However, some univariate outliers (19 out of 1464) were reduced by modifying the extreme raw scores toward the mean, to a unit below the next less extreme raw score (Tabachnick & Fidell, 2007, p. 77). The data satisfactorily met the assumption of normality while less than 5% (50 out of 1464) of raw scores were out of range ($z \leq \pm$ 1.96), which was deemed acceptable (Field, 2005, p. 76). Thus data transformation was not required to reduce normality violations (Tabachnick & Fidell, 2007, p. 87).

Descriptive statistics are presented in Table I for each anxiety dependent variable from the modified CSAI-2R for each of the four groups, and for each treatment. Additionally, anxiety and performance data were rearranged to facilitate an examination of fatigue and possible learning effects via performance time and accuracy. Using one-way repeated-measures (ANOVA), no significance differences were observed in performance time ($F_{2,\,98}$ = 0.61, $P > 0.05$, $W = 0.774$, $\varepsilon = 0.816$, $P = 0.001$, $\eta^2 = 0.01$) or performance accuracy ($F_{2,\,120}$, 2.88, $P > 0.05$, $\eta^2 = 0.05$). Finally, participants' anxiety intensity means were checked against the means from Cox and colleagues' (2003) calibration sample. Collectively, the experimental groups from the present sample reported slightly higher cognitive intensity (20.0 vs 17.4) but slightly lower somatic intensity (14.2 vs 15.6) than the Cox et al. participants.

Results of multivariate analysis of variance

A summary of the Group x Treatment MANOVA is presented in Table II. Box's test of equality of covariance matrices could not be computed, as there were fewer than two non-singular cell covariance matrices. Accordingly, the Pillai's Trace omnibus statistic was used in preference to Wilks' lambda (Tabachnick & Fidell, 2007, p. 269). The omnibus statistic indicated a significant interaction effect (Pillai's Trace = 0.61, $F_{48,\,672} = 1.57$, $P < 0.05$, η^2 = 0.10), with 10% of the variance in anxiety and performance measures being accounted for by the experimental manipulations.

For cognitive intensity, the Group x Treatment interaction (Figure 2) was significant, ($F_{5,\,91} = 4.22$, $P < 0.05$, $\eta^2 = 0.18$); however, sphericity was violated ($W = 0.745$, $\varepsilon = 0.797$, $P < 0.001$). Pairwise comparisons indicated a significant difference ($P < 0.05$) in the cognitive group (CD_G) between participants receiving no treatment (CI_B) and the cognitive treatment (CI_C), with a 20.54% reduction in cognitive intensity. In addition, there was a significant difference ($P < 0.05$) between participants receiving no treatment (CI_B) versus the somatic treatment (CI_S), with a 28.63% reduction in cognitive intensity. Moreover, pairwise comparisons in the somatic group (SD_G) indicated differences between participants receiving no treatment (CI_B) versus the cognitive treatment (CI_C), with a 23.71% reduction in cognitive intensity. There was also a significant difference ($P < 0.05$) between participants receiving no treatment (CI_B) versus the somatic treatment (CI_S), with a 22.40% reduction in cognitive intensity.

For somatic intensity, the Group x Treatment interaction (Figure 3) was significant, ($F_{4, 73} = 5.47$, $p < 0.05$, $\eta^2 = 0.22$); however, sphericity was violated ($W = 0.434$, $\varepsilon = 0.638$, $P < 0.001$). Pairwise comparisons indicated a significant difference ($P < 0.05$) in the somatic group (SD_G) between participants receiving no treatment (SI_B) versus the cognitive treatment (SI_C), with a 26.16% reduction in somatic intensity. In addition, there was a significant difference ($P < 0.001$) between participants receiving no treatment (SI_B) versus the somatic treatment (SI_S), with a 26.16% reduction in somatic intensity. Furthermore, pairwise comparisons indicated a significant difference ($P < 0.05$) in the control intervention group (CI_G) between participants receiving no treatment (SI_B) versus the cognitive treatment (SI_C), with a 23.80% reduction in somatic intensity. There was also a significant difference ($P < 0.05$) between participants receiving no treatment (SI_B) versus the somatic treatment (SI_S), with a 25.87% reduction in somatic intensity.

For self-confidence intensity, the Group x Treatment interaction was not significant, ($F_{6, 114} = 1.26$, $P > 0.05$, $\eta^2 = 0.06$). There were no significant treatment effects ($F_{2, 114} = 2.98$, $P > 0.05$, $\eta^2 = 0.05$) or group effects ($F_{3, 57} = 2.18$, $P > 0.05$, $\eta^2 = 0.10$).

For cognitive direction, the Group x Treatment interaction was not significant ($F_{6, 114} = 1.71$, $P > 0.05$, $\eta^2 = 0.08$). There were no significant treatment effects ($F_{2, 114} = 0.50$, $P > 0.05$, $\eta^2 = 0.01$), but there were significant group effects ($F_{3, 57} = 15.82$, $P < 0.001$, $\eta^2 = 0.42$). Pairwise comparisons indicated a significant difference ($P < 0.001$) in cognitive direction between the cognitive group (CD_G), and the control group (C_G). A significant difference ($P <$

0.05) in cognitive direction was also found between the cognitive group (CD_G) and the control intervention group (CI_G). A significant difference ($P < 0.05$) in cognitive direction was also observed between the cognitive group (CD_G) and the control intervention group (CI_G). Further significant group differences were found between the somatic group (SD_G) and the control intervention group (CI_G).

For somatic direction, the Group x Treatment interaction was not significant, ($F_{4, 78}$ = 2.19, $P > 0.05$, $\eta^2 = 0.10$) and sphericity was violated ($W = 0.533$, $\varepsilon = 0.682$, $P < 0.001$). There were no significant treatment effects ($F_{1, 78} = 1.63$, $P > 0.05$, $\eta^2 = 0.03$), but there were significant group effects ($F_{3, 57} = 16.12$, $P < 0.001$, $\eta^2 = 0.46$). Pairwise comparisons indicated a significant difference ($P < 0.001$) between the cognitive group (CD_G) and the control intervention group (CI_G), between the somatic group (SD_G) and the control group (CD_G), and between the somatic group (SD_G) and the control intervention group (CI_G).

For self-confidence direction, the Group x Treatment interaction was not significant ($F_{6, 114} = 1.61$, $P > 0.05$, $\eta^2 = 0.08$), and there were no significant treatment effects, ($F2, 114$ = 0.90, $P > 0.05$, $\eta^2 = 0.00$) or group effects, ($F_{3, 57} = 2.05$, $P > 0.05$, $\eta^2 = 0.10$).

For performance time, the Group x Treatment interaction was not significant ($F_{5, 90}$ = 0.57, $P > 0.05$, $\eta^2 = 0.03$), and sphericity was violated ($W = 0.740$, $\varepsilon = 0.794$, $P < 0.001$). There were no significant treatment effects ($F_{2, 87} = 1.24$, $P > 0.05$, $\eta^2 = 0.02$) or group effects ($F3, 57 = 1.30$, $P > 0.05$, $\eta^2 = 0.06$).

For performance accuracy, the Group x Treatment interaction was not significant ($F_{6, 114} = 0.46$, $P > 0.05$, $\eta^2 = 0.02$). There were no significant treatment effects ($F_{2, 114} = 2.72$, $P >$ 0.05, $\eta^2 = 0.04$) or group effects ($F_{3, 57}$ = 2. 21, $P > 0.05$, $\eta^2 = 0.10$).

Intercorrelations between Anxiety and performance dependent variables

Intercorrelations between the modified CSAI-2R anxiety subscales and the performance scales (Table III) showed that, in general, there were more significant correlations for anxiety direction than for anxiety intensity components. Furthermore, self-confidence intensity, self-confidence direction, and cognitive direction yielded more significant relationships. For all participants prior to intervention, performance time (PT_B) had weak significant negative correlations with self-confidence intensity (SCI_B), and self-confidence direction (SCD_B). After the cognitive intervention, performance time (PT_C) correlated negatively with cognitive direction (CD_C). After the somatic intervention, performance time (PT_S) correlated negatively with cognitive direction (CD_S) and self-confidence direction (SCD_S). Performance accuracy had a weak correlation with self-confidence intensity (SCI_B) before the intervention (PA_B). After the cognitive intervention (PA_C), performance accuracy had a weak correlation with self-confidence intensity (SCI_C) and a weak negative correlation with performance time (PT_C). Performance accuracy after a somatic intervention (PA_S) had no significant correlations with any of the other dependent variables.

Manipulation check: Intervention Evaluation Questionnaire

All but one of the mean scores from the Intervention Evaluation Questionnaire were in the range 3.10–3.58, suggesting that participants were engaging with the task appropriately and fairly competent in using the two interventions. However, the mean score for the effect of the somatic intervention on calming the mind (3.00) was relatively low. Responses to open-ended questions did not provide strong support for the matching hypothesis. For example, with reference to the Brief Progressive Muscular Relaxation one participant wrote, “Helped me relax my body and relaxed me mentally a bit”, while for the impact of the Quiet Place Technique another participant commented, “This was very effective at relaxing my mind and my body. It left me very relaxed, confident, and ready for the football”.

Discussion

The aim of this study was to re-examine the matching hypothesis by applying a cognitive and somatic brief relaxation intervention to a cognitive group (CD_G), a somatic group (SD_G), a control group (C_G), and a control intervention group (CI_G). Three perspectives were adopted to identify the greatest change in each anxiety component and performance outcome. Overall, the statistical findings did not provide support for the matching hypothesis among soccer players. The manipulation check confirmed that participants engaged with the task, although the open-ended questions elicited answers that also did not provide support for the matching hypothesis. Accordingly, there was some agreement between the quantitative and qualitative data indicating the incidence of a crossover effect with brief cognitive and somatic interventions.

Experimental hypotheses

The most effective reduction in the cognitive intensity component was exhibited for participants in the compatible group being administered an incompatible intervention. Additionally, both treatments resulted in an equal reduction in somatic intensity (see Table I and Table II). The results did not support the matching hypothesis as advocated by Davidson and Schwartz (1976) or the first and second hypotheses due to the emergence of crossover effects. Application of the compatible intervention specifically aimed at reducing one component of anxiety intensity facilitated relaxation through the incompatible component.

In contrast to most studies examining the matching hypothesis (e.g. Maynard & Cotton, 1993), the brief interventions in this study were intentionally not practiced over weeks and it is possible that this contributed to the lack of support. The fact that Terry et al. (1995) also found a dominant crossover effect with brief interventions may suggest that the matching hypothesis might require weeks of intervention practice in order to be supported. Maynard et al. (1995b) further suggested that if an incompatible intervention can cause significant crossover effects at the targeted intensity or direction component, this could negate the need for multimodal stress packages.

The third and fourth hypotheses stating that the anxiety direction component would be perceived to be more facilitative in the compatible group being administered a compatible intervention were not supported. Changes in cognitive and somatic direction were nonsignificant ($P > 0.05$). The brief interventions applied did not change anxiety significantly. Again, this may be due to the brevity of the interventions, which were intentionally not practiced over a period of weeks. However, the greatest facilitative change (20.29%) occurred in cognitive direction due to application of a somatic intervention to the cognitive group. This would support the presence of a crossover effect in the directional components of anxiety. The present results do not support previous matching hypothesis research into anxiety direction (e.g. Maynard, Smith et al., 1995), which found that significant reductions in anxiety intensity are accompanied by a greater increase in the equivalent direction component.

Anxiety and performance relationship. The greater reduction in performance time (2.32 s) was achieved for participants in the cognitive group being administered either the cognitive or somatic intervention. However, the improvement in performance time was nonsignificant ($P > 0.05$), thus the fifth and sixth hypotheses were not supported. Similarly, the seventh and eighth hypotheses stating that the greater increase in performance accuracy would be achieved for participants in the anxiety group being administered the compatible intervention were also not supported. Nonetheless, application of the cognitive intervention improved accuracy in the cognitive group (8.88%) and the somatic group (4.45%). This suggests a link between the application of the cognitive intervention and the increase of performance accuracy, but these results need to be interpreted with caution.

The lack of any significant support for performance time or accuracy may be attributed to three plausible explanations. First, Maynard et al. (1995b) proposed that using precompetition measures to investigate actual competition performance may be inaccurate owing to varying anxiety levels during competition. Second, we employed brief interventions which had not been practiced. Although they have shown significant anxiety intensity improvements, it is feasible that practiced interventions (e.g. Maynard et al., 1995b) may result in additional improvements (e.g. in anxiety direction) which may, in turn, have an effect on certain aspects of performance. Finally, it is possible that there may have been floor or ceiling effects for performance, thus making improvements somewhat difficult to achieve.

Intercorrelations between the modified CSAI-2R anxiety-related and performance components indicated that self-confidence intensity and direction and cognitive direction exhibited the largest number of significant correlations (see Table II). The top-performing participants were in the control intervention group (CI_G), who exhibited greater self-confidence and more facilitative interpretations of anxiety symptoms. Although these participants did not exhibit debilitative interpretations, somatic intensity exhibited a 23.80% reduction with a cognitive intervention and 25.87% reduction with a somatic intervention, while the control group exhibited a 20.21% and 18.29% increase respectively (see Table I). Accordingly, practitioners working with athletes who exhibit facilitative interpretations of anxiety symptoms might consider a brief intervention that appears likely to elicit significant benefits.

Close inspection of the means (Table I) reveals that participants in the experimental groups (CD_G and SD_G) were generally slower than those in the control intervention group (CI_G). This finding supports the notion that participants with a more facilitative interpretation of anxiety symptoms tend to outperform their debilitative interpretation counterparts (Hanton et al., 2008; Jones & Swain, 1995). Accordingly, practitioners should consider the application of cognitive restructuring techniques (Hanton & Jones, 1999; Mallalieu & Lane, 2009) to induce a facilitative outlook and the possible performance improvements that would ensue. However, a consequence of random assignment to the control groups may have resulted in the control intervention group being comprised of better performers. Future research may consider control group assignment in order to ensure parity in ability.

It's all a matter of perspective

This is the first study to apply a cognitive intervention and a somatic intervention to both a cognitive and somatic group. For this reason, three perspectives were identified which could be used for supporting the matching hypothesis. This study considered all perspectives to identify the most effective change for an anxiety component, whereas previous matching hypothesis studies used either the second perspective (e.g., Maynard & Cotton, 1993), or the second and third perspectives in combination (e.g., Maynard et al., 1997).

If this study had used similar perspectives as previous studies, support for the matching hypothesis would have been dependent upon which perspective was being adopted; consequently, there would have been a risk of a type I or type II error. For cognitive and somatic intensity components, adopting the second perspective in this study would find support for the matching hypothesis. However, adopting the second and third perspective would not find support for the same components. Therefore, there is a similar possibility that previous studies that found support without adopting all three perspectives may have failed to accept the matching hypothesis if they had adopted all three. Furthermore, there is a question concerning whether it is appropriate to compare results between studies that adopt different perspectives. It is not believed that there is a function for adopting a perspective over another, rather that all perspectives should be considered to ensure the correct conclusion. Future studies which are not able to adopt all perspectives (e.g. owing to the large sample and variable size of the study) should highlight which perspective they are using so that appropriate comparisons can be made.

Conclusions and recommendations

The present findings indicate that practitioners with only a limited timeline available (e.g. 7 min) can achieve significant reductions in cognitive and somatic intensity among athletes when using brief interventions. Although the findings did not lend support to the matching hypothesis, studies using interventions practiced over a number of weeks did support it (e.g. Maynard & Cotton, 1993; Maynard et al., 1997). Thus, practitioners who have contact with athletes over a number of weeks may find the use of interventions that embrace the matching hypothesis more effective in reducing cognitive and somatic intensity. The crossover effects experienced for participants receiving brief interventions suggest that their use may be just as adequate as a multimodal or a compatible intervention.

Practitioners need to be mindful of the fact that possible detrimental effects of the crossover phenomenon may occur due to changes in anxiety levels that could inhibit an athlete from attaining their optimal performance state. Thus, the present authors do not advocate the adoption of brief interventions indiscriminately; however, such interventions are capable of facilitating the relaxation of amateur athletes and would be suited to circumstances in which time is limited (e.g. precompetition routine).

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Table I. Descriptive statistics for anxiety dependent variables.

	CD_G		SD_G		C_G		CI_G	
	mean	*s*	mean	*s*	mean	*s*	mean	*s*
CI_B	21.76	7.24	18.35	5.40	13.69	2.43	15.71	7.18
SI_B	13.53	2.48	14.79	5.20	11.43	2.18	15.00	5.76
SCI_B	24.59	5.42	24.12	8.01	28.00	5.77	30.86	6.69
CI_C	17.29	7.07	14.00	5.00	15.23	3.70	13.86	5.29
SI_C	12.52	2.23	10.92	1.33	13.74	2.51	11.43	1.94
SCI_C	26.59	7.24	26.59	8.51	27.54	5.30	31.14	6.69
CI_S	15.53	5.81	14.24	4.18	15.69	5.28	14.14	4.61
SI_S	12.69	3.03	10.92	1.51	13.52	3.23	11.12	1.87
SCI_S	27.65	4.70	26.35	8.50	27.38	6.24	31.43	7.58
CD_B	30.71	5.24	39.88	7.92	46.31	6.32	52.29	9.11
SD_B	39.75	6.78	33.11	4.61	48.13	6.89	53.27	9.03
SCD_B	48.59	7.44	53.41	8.54	53.54	6.79	58.29	9.07
CD_C	34.00	10.44	39.29	11.40	46.46	5.95	51.86	10.00
SD_C	37.06	7.22	35.88	10.98	44.40	6.61	51.63	9.82
SCD_C	51.76	8.63	54.24	11.00	51.85	4.93	57.14	8.90
CD_S	36.94	11.12	39.06	12.45	45.69	9.41	51.43	9.56
SD_S	39.66	6.95	34.29	11.78	42.42	4.82	51.84	12.41
SCD_S	52.82	6.71	53.41	10.83	51.08	9.37	58.00	10.58
PT_B	183.06	32.03	180.76	21.65	174.31	16.52	167.79	18.05
PA_B	39.06	6.83	42.24	6.08	41.54	7.1	43.36	5.77
PT_C	178.82	28.19	180.24	19.48	172.85	16.95	167.07	20.86
PA_C	42.53	7.19	44.12	6.42	42.77	5.25	45.14	8.95
PT_S	178.82	27.95	181.53	16.72	173.31	16.21	167.43	18.17
PA_S	38.59	7.63	43.71	4.81	42.77	6.81	44.5	5.6

Note. CD_G = cognitive group, SD_G = somatic group, C_G = control group, CI_G = control intervention group, CI = cognitive intensity, SI = somatic intensity, SCI = self-confidence intensity, CD = cognitive direction, SD = somatic direction, SCD = self-confidence direction, PT = performance time, PA = performance accuracy, $_B$ = no treatment baseline condition, $_C$ = cognitive treatment, $_S$ = somatic treatment.

Table II. Summary of mixed-model MANOVA results.

Dependent variables		*F*(d.f)	*P*	η^2	OP
Cognitive intensity (CI)	Group x Treatment	4.22(5, 91)†	0.002	0.18	0.94
	Group	1.97(3, 57)	0.130	0.09	0.48
	Treatment	9.19(2, 91)†	0.001	0.14	0.95
Somatic intensity (SI)	Group x Treatment	5.47(4, 73)†	0.001	0.22	0.96
	Group	0.38(3, 57)	0.766	0.02	0.12
	Treatment	7.12(1, 73)†	0.006	0.11	0.82
Self-confidence intensity (SCI)	Group x Treatment	1.26(6, 114)	0.281	0.06	0.48
	Group	2.18(3, 57)	0.100	0.10	0.53
	Treatment	2.98(2, 114)	0.055	0.05	0.57
Cognitive direction (CD)	Group x Treatment	1.71(6, 114)	0.126	0.08	0.63
	Group	13.52(3, 57)	0.000	0.42	0.99
	Treatment	0.50(2, 114)	0.607	0.01	0.13
Somatic direction (SD)	Group x Treatment	2.19(4, 78)†	0.077	0.10	0.65
	Group	16.12(3, 57)	0.000	0.46	0.99
	Treatment	1.63(1, 78)†	0.207	0.03	0.28
Self-confidence direction (SCD)	Group x Treatment	1.61(6, 114)	0.150	0.08	0.60
	Group	2.05(3, 57)	0.118	0.10	0.50
	Treatment	0.11(2, 114)	0.900	0.00	0.07
Performance time (PT)	Group x Treatment	0.57(5, 90) †	0.714	0.03	0.20
	Group	1.30(3, 57)	0.282	0.06	0.33
	Treatment	1.24(2, 90) †	0.288	0.02	0.24
Performance accuracy (PA)	Group x Treatment	0.46(6, 114)	0.837	0.02	0.18
	Group	2.21(3, 57)	0.097	0.10	0.53
	Treatment	2.27(2, 114)	0.108	0.04	0.45

omnibus statistic: Pillai's Trace = 0.606, $F_{48,672} = 1.57$, $P < 0.05$, $\eta^2 = 0.101$, OP = 0.99

Note. Alpha level was $P < 0.05$, η^2 = Effect size, OP = Observed Power.

† = degrees of freedom have been rounded up or down to the nearest integer following Greenhouse-Geisser adjustment.

Table III. Intercorrelations between the modified CSAI-2R subscales and performance scores.

Dependent variables	Treatment	CI	SI	SCI	CD	SD	SCD	PT
SI	None	0.456**						
	Cognitive	0.425**						
	Somatic	0.145						
SCI	None	–0.136	–0.124					
	Cognitive	–0.128	–0.158					
	Somatic	–0.049	–0.219					
CD	None	–0.173	0.052	0.422**				
	Cognitive	–0.133	–0.009	0.314*				
	Somatic	–0.246	–0.082	0.246				
SD	None	–0.178	–0.093	0.376**	0.626**			
	Cognitive	–0.060	–0.120	0.135	0.721**			
	Somatic	–0.138	–0.137	0.042	0.615**			
SCD	None	–0.202	–0.128	0.713**	0.501**	0.244		
	Cognitive	–0.207	–0.251	0.794**	0.339**	0.106		
	Somatic	–0.176	–0.375**	0.793**	0.368**	0.144		
PT	None	0.120	–0.008	–0.322*	–0.246	–0.251	0.352**	
	Cognitive	0.084	0.086	–0.218	–0.285*	–0.201	–0.191	
	Somatic	0.066	0.061	–0.187	–0.275*	–0.236	–0.284*	
PA	None	–0.086	0.102	0.310*	0.148	0.128	0.181	–0.075
	Cognitive	–0.117	–0.167	0.272*	0.167	0.051	0.180	–0.328**
	Somatic	0.070	0.010	0.208	0.035	–0.115	0.091	–0.107

Note. CI = cognitive intensity, SI = somatic intensity, SCI = self-confidence intensity, CD = cognitive direction, SD = somatic direction, SCD = self-confidence direction, PT = performance time, PA = performance accuracy.

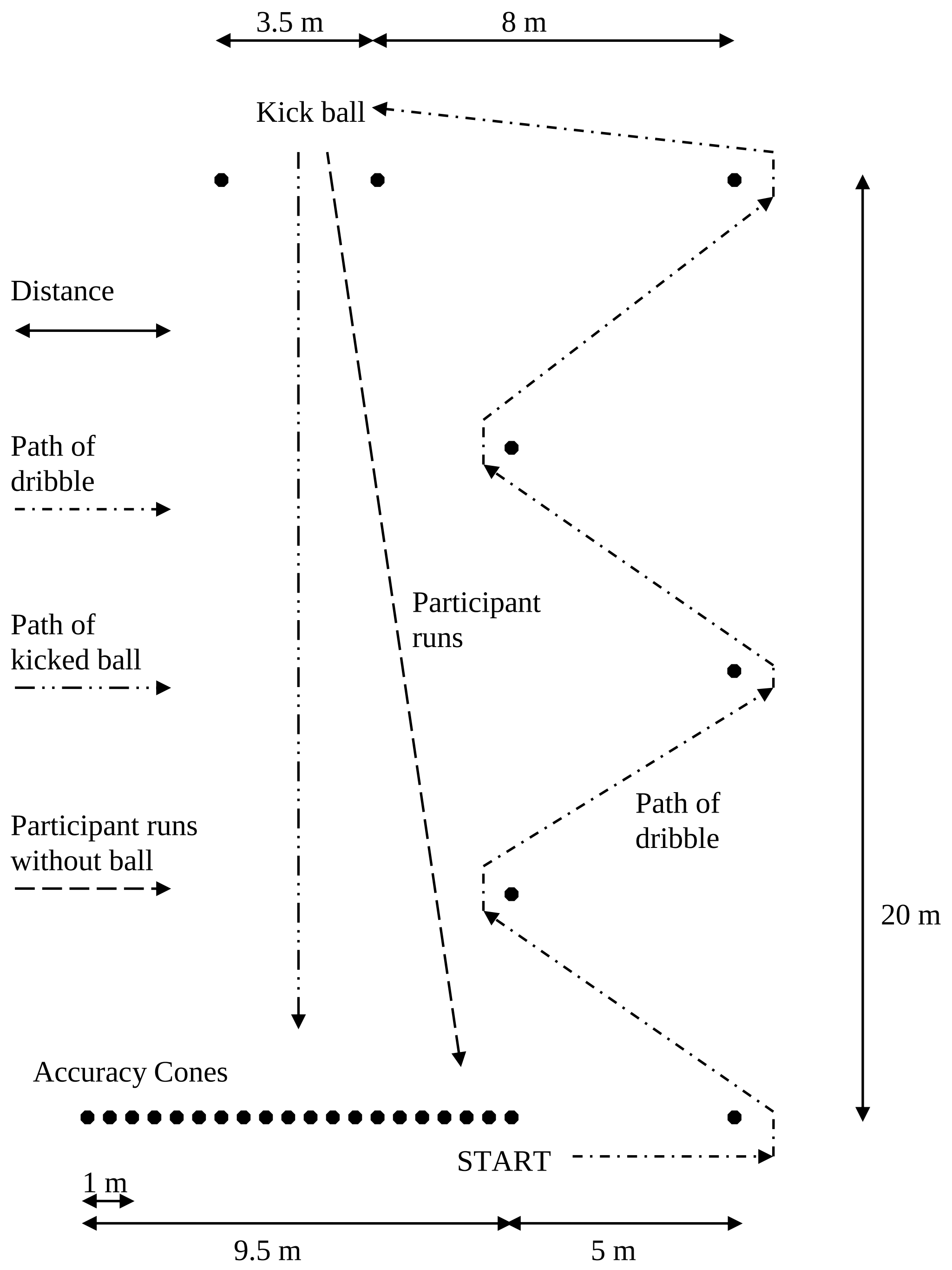
*$P < 0.05$, ** $P < 0.01$, ***$P < 0.001$.

Figure Captions

Figure 1. Soccer field test.

Figure 2. Group x Treatment means for cognitive intensity.

Figure 3. Group x Treatment means for somatic intensity.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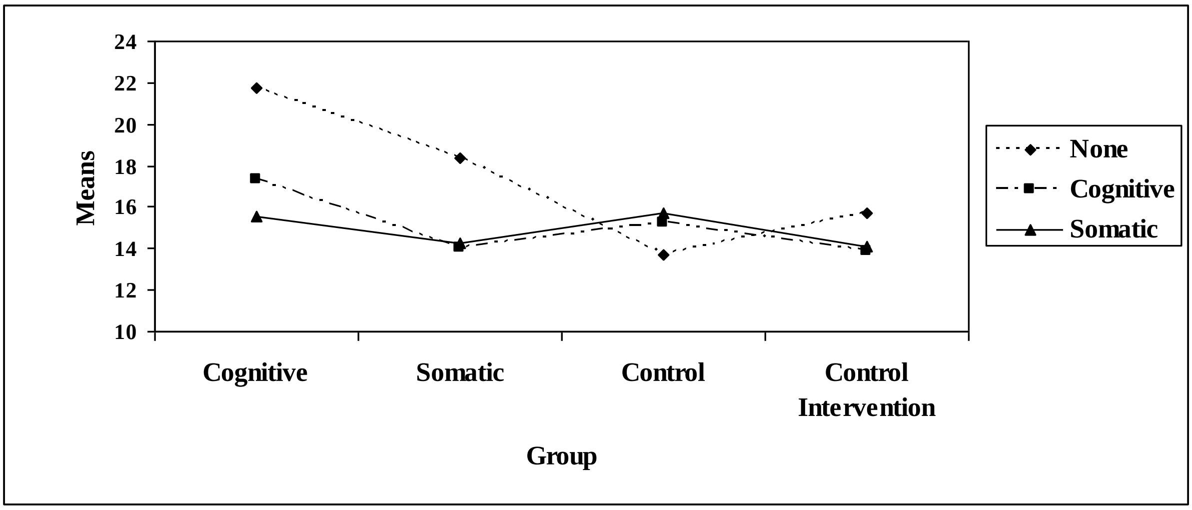
Means
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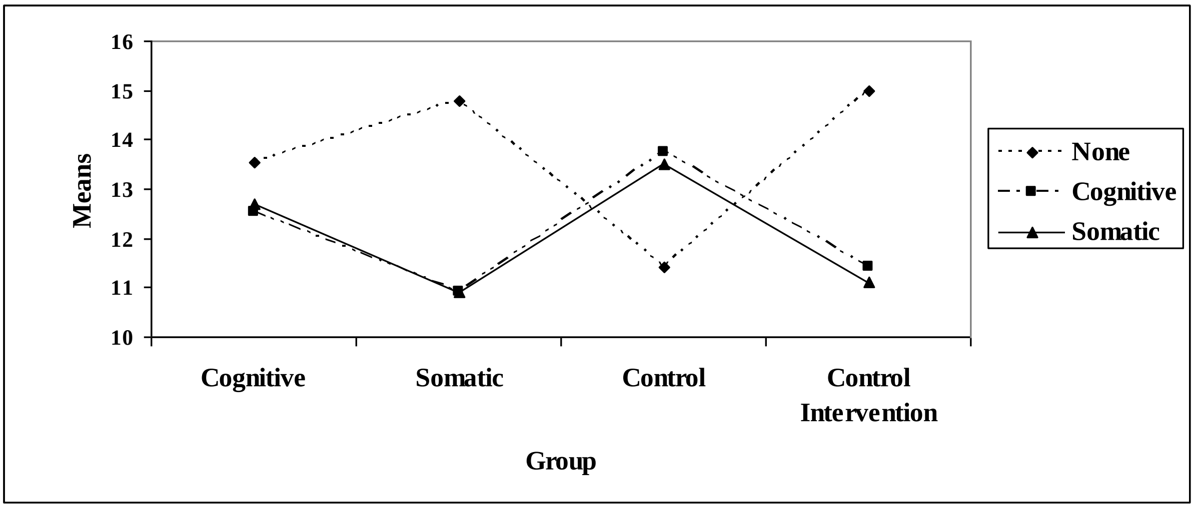
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