Evolutionary Psychology
human-nature.com/ep – 2003. 1: 42-69

Original Article

Are there nonverbal cues to commitment? An exploratory study using the zero-acquaintance video presentation paradigm

William Michael Brown*, Boris Palameta and Chris Moore

*Corresponding author: William Michael Brown, Department of Psychology, Dalhousie University, Life Sciences Centre, 1355 Oxford Street, Halifax, Nova Scotia, B3H 4J1 CANADA. E-mail: wmbrown@dal.ca. Web: http://www.dal.ca/~esg/WilliamMBrown.htm.

Abstract: Altruism is difficult to explain evolutionarily if subtle cheaters exist in a population (Trivers, 1971). A pathway to the evolutionary maintenance of cooperation is nonverbal altruist-detection. One adaptive advantage of nonverbal altruist-detection is the formation of trustworthy division of labour partnerships (Frank, 1988). Three studies were designed to test a fundamental assumption behind altruistic partner preference models. In the first experiment perceivers (blind with respect to target altruism level) made assessments of video-clips depicting self-reported altruists and self-reported non-altruists. Video-clips were designed with attempts to control for attractiveness, expressiveness, role-playing ability, and verbal content. Overall perceivers rated altruists as more "helpful" than non-altruists. In a second experiment manipulating the payoffs for cooperation, perceivers (blind with respect to payoff condition and altruism level) assessed altruists who were helping others as more "concerned" and "attentive" than non-altruists. However perceivers assessed the same altruists as less "concerned" and "attentive" than non-altruists when the payoffs were for self. This finding suggests that perceivers are sensitive to nonverbal indicators of selfishness. Indeed the self-reported non-altruists were more likely than self-reported altruists to retain resources for themselves in an objective measure of cooperative tendencies (i.e. a dictator game). In a third study altruists and non-altruists' facial expressions were analyzed. The smile emerged as a consistent cue to altruism. In addition, altruists exhibited more expressions that are under involuntary control (e.g., *orbicularis oculi*) compared to non-altruists. Findings

suggest that likelihood to cooperate is signaled nonverbally and the putative cues may be under involuntary control as predicted by Frank (1988).

Keywords*:* Altruist-Detection; Cheater-Detection; Emotions; Nonverbal Behaviour; Reliable Signalling; Smile Asymmetries; Facial Expressions; Cooperation.

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1. Introduction

Darwin (1872) speculated that a selfish character may be detectable from nonverbal cues: "Slyness is also, I believe, exhibited chiefly by movements about the eyes; for these are less under the control of the will, owing to the force of long-continued habit, than are the movements of the body" (Page 484). Trivers (1971) extended this speculation regarding reliable cues to cheating in his theory of reciprocal altruism. Specifically Trivers (1971) suggested that altruism not motivated by prosocial motivation and/or emotions may be less likely to occur in the future. Therefore selection should have designed perceiver psychology to scrutinize the presence and/absence of emotional cues committing future cooperation (Trivers, 1971; Hirshleifer, 1987; Frank, 1988).

The central assumption of Hirshleifer's (1987) and Frank's (1988) models for the evolution of cooperation is that prosocial emotions help solve commitment problems (i.e. a cheating partner in a division of labour relationship) because the presence of these emotions can be reliably discerned by others. In other words, the nonverbal cues associated with emotion-based altruism are honest signals that cannot be faked easily (Zahavi, 1987; Grafen, 1990; Zahavi and Zahavi, 1997). Ekman (1985) has reported that facial expressions, body language, pitch and timbre of the voice, rate of respiration, and the cadence of speech are systematically linked to underlying emotional states. Since the relevant neural and musculature linkages in emotional expression are physiologically constrained, it is difficult to conceal or falsely manifest these behavioural cues (Ekman and Freisen, 1982; Ekman, Levenson and Freisen, 1985; Gazzaniga and Smylie, 1990; Brown and Moore, 2002).

Few empirical studies have investigated the altruist-detection hypothesis. Frank et al. (1993) showed that after a 30-minute interaction, participants could predict with significantly higher than chance accuracy whether a person would cooperate or defect in a Prisoner's Dilemma game. However, it is difficult to conclude whether perceivers' assessments were based on nonverbal cues, as participants were able to talk openly with each other. In another study Brown and Moore (2000) tested the altruist-detection hypothesis using the Wason selection task. Participants were good at solving altruist-detection Wason problems compared to control tasks. However,

Brown and Moore (2000) did not investigate whether perceivers could detect altruists based on non-verbal / paralinguistic signals.

Is there evidence for the existence of reliable nonverbal cues to altruistic character? Research suggests that humans may trust smiling individuals more than non-smiling individuals (Tidd and Lockard, 1978; Otta, Lira, Delevati, Cesar and Pires, 1994; LaFrance and Hecht, 1995). For example, smiles are positively correlated with tips given to waitresses (Tidd and Lockard, 1978). Recently Scharlemann, Eckel, Kacelnik, and Wilson (2001) found in extensive form bargaining games that photographs of smiling individuals are trusted more than non-smiling individuals. Smiling newscasters may influence political candidate choice (Mullen et al., 1986). Interestingly in 50 randomly collected media photographs of George W. Bush and Al Gore taken during the 2000 US Presidential race, Bush produced significantly more genuine smiles (Brown and Moore, unpublished data). According to a Gallup Poll (www.gallup.com) before Election Day, Bush was rated trustworthier than Al Gore. However, since evolution has also provided humans with the ability to manifest a posed smile, simply trusting smiles could be costly. Genuine smiles (i.e. emotion-based) may be more reliable indicators of likelihood to cheat. A spontaneous emotion-based smile has greater displacement of left-hand corner of the mouth than a posed smile due to right-hemisphere involvement (Wylie and Goodale, 1988). Smile asymmetry may be a putative cue to underlying cooperative intentions. Brown and Moore (2002) found that an iconic representation of a posed smile (slightly asymmetrical with the left-corner of mouth less displaced than the right-corner of the mouth) was given significantly less resources than an icon with greater left-corner displacement. Not surprisingly humans scrutinize the left side of the face more than the right side when assessing facial expressions (Burt and Perrett, 1997).

How may experiments be designed to test whether or not perceivers can detect altruists based on nonverbal cues? In everyday situations humans interact with strangers briefly and make character assessments. However, when people interact freely it is difficult to test whether or not assessments of altruism are based on nonverbal cues (as the interactants could give verbal information regarding altruism). A method is needed that can control for potential confounds and still be analogous to how people meet for the first time. One methodology that is ideal for controlling for promises to cooperate and verbal information is the "zero-acquaintance video presentation paradigm". By moving away from actual face-to-face encounters a variety of potentially confounding factors can be minimized. Research in social psychology has used the "zero-acquaintance video presentation paradigm" to investigate whether or not naïve perceivers can detect 'tell-tale' cues to personality or lying from video segments (Ekman, 1985; Frank, 1988). The zero-acquaintance video presentation paradigm in nonverbal behaviour experiments (see Ekman, 1985) entails presenting a large group of perceivers a small number of

video-clips depicting target individuals performing a particular task. Perceivers then assess the videotaped individuals on a variety of attributes (e.g. job suitability, physical attractiveness, lying etc.). There are several advantages to using this methodology to test the altruist-detection hypothesis. For example, length of 'interaction' with the video-clip, physical attractiveness, emotional expressiveness, and verbal information can be controlled. The paradigm is similar to meeting several individuals for the first time and making character assessments. There is an additional theoretical advantage to this method if evidence consistent with altruist-detection is found. Most studies using the zero-acquaintance video presentation paradigm (for review see DePaulo, 1994) have shown that detection accuracy of lying and personality are no better than chance among individuals (Ekman, O'Sullivan and Frank, 1999; Lippa and Dietz, 2000). Specifically, most individuals cannot detect lying unless they have been trained (Ekman et al., 1999). Furthermore, the accurate assessment of individual differences in personality is trait-specific. That is "sociability" and "extraversion" (which are both correlates of altruism) are the only Big Five personality traits accurately decoded from nonverbal cues (Albright, Kenny and Malloy, 1988; Borkenau and Liebler, 1993; Funder and Colvin, 1988; Funder and Dobruth, 1987; Kenny, Horner, Kashy and Chu, 1992; Levesque and Kenny, 1993; Lippa and Dietz, 2000; Watson, 1989). Evidence for altruist detection may suggest that natural selection specifically shaped such a capacity since most personality traits (and lying) cannot be accurately decoded.

The present experiments were designed in an attempt to control for verbal information regarding cooperative tendencies without removing paralinguistic information (e.g. pitch and timbre of the voice). Small numbers of video-clips of altruists and non-altruists were presented to a large group of perceivers' naïve with respect to altruism level.

In Experiment One the reliable and valid self-report altruism scale (Rushton, Chrisjohn, and Frekken, 1981; Johnson et al., 1989; Chau et al., 1990) was used to select four altruists and four non-altruists. Altruists and non-altruists were filmed telling the "Little Red Riding Hood Story". The Little Red Riding Hood Story was used in an attempt to control for verbal content. In addition, variables such as physical attractiveness, role-playing ability and expressiveness were measured. Perceivers viewed 4 altruist / non-altruist pairs and judged which individual in the pair was more helpful. It was predicted that perceivers would differentiate altruists from non-altruists based on cues provided in short video-segments.

2. Methods – Experiment One

2.1 Targets and perceivers

Seventy-three second- and third-year female Psychology students, with a mean age of 21.10 (*SD* = 2.22) participated in the study to select altruists and non-

altruists for videotaping.

Perceivers were from Introductory Psychology classes (n = 143 students) with a mean age of 20.16 (SD = 5.28). Perceivers participated in exchange for 1% toward class grade.

2.2 Altruism scale used for target selection

The Altruism Scale contains 56 items measuring the amount of instances that an individual has given up time, effort, goods, status, and safety to help others (Johnson et al., 1989). Since the Altruism Scale asks subjects to recall the amount of helpful behaviours performed in the past, it is less susceptible to deceptive responding than a scale asking one to report whether or not he/she would help in a hypothetical situation (Romer, Gruder and Lizzadro, 1986). Participants are asked to indicate how often they have performed each act described in the 56 statements from 1 (never) to 5 (very often). This measure showed high internal consistency with coefficient alpha ranging from 0.89 to 0.94 across seven different cultures (English and non-English speaking). Johnson et al. (1989) found that the scale had a test-retest reliability of 0.94 after a two-week period.

It is reasonable to suspect that even self-reported instances of helping behaviour in the past could be correlated with trying to deceive experimenters. This was not the case. In the current sample the Altruism Scale was not significantly correlated with the Marlowe-Crowne Social Desirability Scale (Crowne and Marlowe, 1960; a measure of deceptive responding): r (141) = 0.10. The reason that this finding provides validity for the Altruism Scale is that the participants who are attempting to mislead the experimenter by appearing "perfect" (e.g. always investigating the credentials of every candidate before an election or never swearing even when extremely angry) are not also reporting that they were more altruistic in the past. The Altruism Scale (Johnson et al., 1989) includes 20 items from the "Self-Report Altruism Scale" (Rushton, Chrisjohn, and Frekken, 1981) that were shown to be internally consistent across 5 samples (Cronbach's alphas ranged from 0.78 to 0.87) and showed good discriminant validity from 20 personality tests. Discriminant and convergent validity was demonstrated for the full 56-item altruism scale (Chau et al., 1990). More specifically, self-reported altruism is positively associated with intrinsic religiosity (genuine religious involvement for its own sake), but negatively correlated with extrinsic religiosity (e.g. religious involvement simply to meet people at church). Importantly, peer ratings of altruism were significantly positively correlated with individual's self-reports. Rushton et al. (1981) found that whether or not an individual signed the organ donation card on driver's licence was significantly positively correlated with the self-reports on the Altruism Scale.

2.3 Self-report instrument behavioural validity check

High scorers (i.e. top 10th percentile) on the Altruism Scale were selected to represent 'altruists'. Extreme scorers were chosen because it is more likely that these individuals consistently perform helpful behaviours at high frequency relative to lower scorers (i.e. bottom 10th percentile). Also it reduced the number of video stimuli that perceivers must view (therefore avoiding the potential of observer fatigue).

Concerned about whether the entire 56-item self-report altruism scale is a valid measure of actual altruistic behaviour, a different sample of 88 subjects were selected to participate in a one-shot Prisoner's Dilemma-like scenario called the "dictator game" (Eckel and Grossman, 1996). The dictator game asks subjects to divide up a valued resource (i.e. 40 lottery tickets for a 150 dollar draw) anonymously between themselves and a stranger. The prediction is that altruists (individuals who scored in the top 10th percentile) should give more lottery tickets away to strangers than non-altruists (individuals who scored in the bottom 10th percentile). Results conformed to the prediction: Altruists gave 24.50 tickets on average (SD = 7.79) while non-altruists gave 17.33 tickets (SD = 7.18). This significant mean difference [t (22) = 2.34, $p < .05$] suggests that the Altruism Scale is a valid measure for altruistic tendencies in humans.

2.4 Selecting altruists and non-altruists for video-taping

The 73 participants' altruism scores were transformed into percentiles. The 90th percentile and above on the Altruism Scale represented altruists, while the 10th percentile and below represented non-altruists. Using this criterion eleven students were chosen (5 altruists and 6 non-altruists). This video-taping procedure was completed in a blind fashion, as the experimenter who was filming the targets was unaware of each person's self-report altruism score. The 11 were called and asked to participate in the second part of the study (the filming of the altruist and non-altruist targets). Two non-altruists declined the offer to participate.

The remaining 9 individuals were brought to the laboratory one at a time. Targets were given a general outline of the events in the "Little Red Riding Hood" story and asked to familiarize themselves with the plot. Participants were instructed that they would be retelling the story to the camera without the aid of the plot outline. Once again, a children's story was used to keep the verbal content relatively constant. Close-up headshots of targets were videotaped.

2.5 Measuring Physical Attractiveness, Role-Playing and Expressiveness

The 9 video-clips were presented to 11 Psychology faculty and honours

students to rate each target on physical attractiveness, role-playing ability and expressiveness using 7-point Likert scales. One altruist was rated extremely high on physical attractiveness (M = 5.45), role-playing ability (M = 5.73) and expressiveness (M = 5.73) and was therefore discarded from the study. The physical attractiveness, role-playing ability, and expressiveness ratings of the four remaining altruists and non-altruists can be found in Table 1. Overall altruists were similar to the non-altruists on the combined ratings of these three measures (M = 3.06 vs. M = 3.11).

Table 1

Eleven judges' mean ratings of physical attractiveness, role-playing ability and expressiveness of the 4 altruists and 4 non-altruists in Experiment One.

	Physical attractiveness	Role-playing ability	Expressiveness
Altruist 1	2.55	1.64	1.82
Altruist 2	4.18	1.82	2.36
Altruist 3	2.82	3.27	4.36
Altruist 4	4.00	3.55	4.36
Overall (altruists)	3.39	2.57	3.23
Non-altruist 1	2.91	1.55	1.55
Non-altruist 2	3.18	2.27	2.73
Non-altruist 3	4.64	2.82	3.55
Non-altruist 4	4.91	3.45	3.82
Overall (non-altruists)	3.91	2.52	2.91

2.6 Presenting altruists to perceivers

The 143 perceivers (tested in groups of 15 to 17) were told that they would be viewing pairs of videotaped people telling the "Little Red Riding Hood" story and making personality judgments of the individuals shown. It was explained to the perceivers that targets filled out a questionnaire measuring altruism before being videotaped and that one of the individuals in the pair had reported being more altruistic than the other in a variety of situations. Five altruistic behaviours were then presented to the perceivers as examples of what was meant by "altruism". The items with the greatest effect sizes for distinguishing altruism were selected from the Altruism Scale (see Table 2).

Table 2

Five items that best differentiated the mean self-reports of altruists and non-altruists in Experiment One.

Questionnaire Item	$F(1,14)$	*Mse*	n^2	Altruists	Non-altruists
Looked after a neighbor's pets without being asked and without being paid for it.	37.80	20.25	73%	3.25	1.00
Helped someone you didn't know get up when (s)he slipped or tripped and fell down.	52.32	27.56	79%	4.25	1.63
Helped an acquaintance obtain something important that (s) he needed (e.g. a job, a place to live, etc.).	38.96	16.00	74%	3.38	1.38
Shared credit for an accomplishment when you could have easily taken it all.	40.00	25.00	74%	4.37	1.88
'Bent the rules' to help someone she didn't know that well.	114.33	12.25	89%	3.00	1.25

All F values are significant at $p < .0001$

Perceivers were then asked to judge whom they thought the more helpful person was and whether or not they had met the person before. Each video pair was presented once, rewound, and then presented a second time. Altogether, perceivers were presented with four altruist/non-altruist pairs. All groups saw the same eight targets (4 altruists and 4 non-altruists), but the pair-orders were randomised and the altruist/non-altruist order within the pair was counterbalanced.

3. Results – Experiment One

Thirty-seven perceivers were discarded because they knew at least one out of the eight targets and were therefore unsuitable for a zero-acquaintance experiment.[1] No order effects were revealed for any of the eight targets, all χ^2 's were non-significant. Thus, the order in which the targets were viewed did not affect the participants' perception of which target was more helpful. In addition

pair-orders were counter-balanced. A one-way ANOVA was used to investigate whether participants' altruist-detection accuracy varied depending on the pair-order observed. There was no significant effect of the four different pair-orders upon helpfulness ratings, F (4, 102) = .75, $p > .05$. Data were collapsed for further analysis. The effect of gender on nonverbal decoding of altruism was not investigated because only females participated in Study One.

The prediction that participants could detect altruists was confirmed. Recall that perceivers were presented four altruist/non-altruist pairs. Therefore chance accuracy (2.00) was compared to observed altruist-detection accuracy. A one-sample t-test[2] was significant, t (105) = 2.52, $p < .013$, suggesting that altruist-detection accuracy was significantly better than chance. Mean altruist-detection accuracy was 55% (2.21 / 4.00). The effect size for altruist-detection was small. That is, target altruism level accounted for 5 percent of the variation in number of correct choices. See Figure 1 for the variation in perceivers' altruist-detection accuracy.

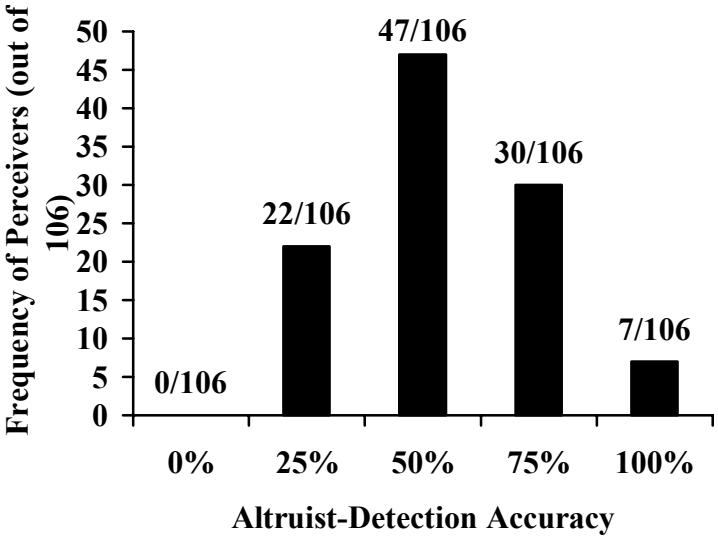


Fig. 1. Frequency distribution of perceivers' altruist-detection accuracy in Experiment One.

Spearman correlations were performed upon the number of hits (i.e. number of times a target was thought to be an altruist) by physical attractiveness, role-playing ability and expressiveness. As can be observed in Table 3, both role-playing ability and expressiveness significantly and positively correlated with the number of hits. Specifically, the targets that were rated as better role-players and more expressive were also more likely to be judged as an altruist. The large

significant positive correlation between role-playing ability and expressiveness suggests that these two measures are tapping into the same factor.

Table 3

Spearman correlations between mean physical attractiveness, role-playing ability, expressiveness and hit number (i.e. the number of times target was thought to be an altruist) in Experiment One (n = 8).

	Attractiveness	Expressiveness	Role-playing	Hit number
Attractiveness		0.30	0.48	-0.05
Expressiveness			0.96**	0.74*
Role-Playing				0.74*

* Significant at .01; ** Significant at .001

4. Discussion – Experiment One

Results suggest that humans can detect altruists at higher than chance accuracy based on information provided in 1-minute video-clips. Specifically, altruists were assessed as the more helpful individual in the pair significantly more often than non-altruists. This is an impressive result (despite the expected small effect size[3]) because the nonverbal information was limited (i.e. One-minute clips of individuals retelling a story unrelated to helping behaviour). Since order of presentation was controlled it did not appear to mediate the altruist-detection effect. In addition, declarations of helpfulness were excluded and therefore did not tip perceivers off to whom the altruists were. There was no correlation between target physical attractiveness and the number of perceivers who thought the target was an altruist. However, role-playing ability and expressiveness were potentially confounding variables. That is, the number of times an individual was judged to be an altruist was related to an increase in role-playing abilities and expressiveness.

The results are consistent with Frank's (1988) hypothesis that humans can detect altruists. While the main result supported the prediction that perceivers can detect altruists in zero-acquaintance contexts, this finding is preliminary. First, only four altruists and four non-altruists were used in this experiment, and all were female. In Experiment Two, a further five altruists and five non-altruists from both sexes were represented. Second, as noted earlier, discriminability was strongly correlated with expressiveness and role-playing ability as rated by independent observers. This correlation may be due to altruists being generally more expressive and better at role-playing. It is possible that such characteristics

provide the basis for nonverbal altruist-detection. However, it may be that our experimental situation was particularly artificial and that altruists, being altruists, were better at responding to the experimenter's invitation to retell the fairy tale. Whether altruists and non-altruists would exhibit these differences in other contexts is unknown.

Experiment Two was designed with these limitations in mind. One purpose of Experiment Two was to provide a more social context for observing altruists and non-altruists. The new context was cooperative game playing (two targets playing the colour code elimination game called "Mastermind"). The cooperative game context allows for a manipulation that can isolate helpfulness from other components of the targets' nonverbal behavior. In the current experiment, pairs of targets played a cooperative game and points were awarded to one of the players based on the success of the pair. One member of the pair provided instructions to the other member of the pair. The individual to whom the points were awarded varied across games. The point manipulation was used to influence the expression of self and other interest in targets. Specifically altruists are expected to express more nonverbal interest when helping others gain points. Points were 'meaningless' (i.e. no credit or monetary value). However games like Mastermind are designed by manufacturers to elicit competitive interest in the game players. Thus making good choices may be a sufficient reward for participants in this experimental context.

Targets were videotaped under these conditions when playing the role of the instructor and the video-clips were played to perceivers in the same manner as Experiment One. Perceivers were asked to rate helpfulness, concern, attentiveness, and expressiveness. It was predicted that altruists and non-altruists would still be differentiable to perceivers with respect to helpfulness. However, the manipulation of payoffs would reveal differences in how targets were rated by perceivers. In particular, it was predicted that perceivers (blind with respect to altruism level and payoff conditions) would distinguish between altruists and non-altruists' non-verbal behaviour depending upon whether or not they were helping others receive a payoff. It was hypothesized that perceivers would detect altruists' signals of other-interest more easily when altruists were helping others. Likewise it was predicted that perceivers would detect altruists' lack of selfishness relative to non-altruists when the payoffs were for self. It was expected that these differences in self- and other-interest should be revealed in perceivers' ratings of concern, attentiveness and expressiveness.

5. Methods – Experiment Two

5.1 Targets and perceivers

Introductory Psychology students (n = 113; 93 females and 20 males) with a

mean age of 19.08 (*SD* = 4.22) participated in the study to select altruists and non-altruists in exchange for 1% credit toward grade. Perceivers of the video-stimuli were recruited from Introductory Psychology students (*n* = 168; 126 females and 42 males). Perceivers mean age of 20.68 (*SD* = 4.51) participated in exchange for 1% credit toward grade.

5.2 Selecting altruists

One hundred and thirteen participants (93 females and 20 males) completed the Altruism Scale (Johnson et al., 1989) and Impression Management Scale (Paulhus, 1984). Responses on the Altruism Scale were not correlated with the Impression Management Scale (Paulhus, 1984): r (113) = - 0.10, $p > 0.10$. The impression management scale measures the degree to which a participant is attempting to deceive the experimenter in their self-reports. This result lends further validity to the Altruism Scale.

Participants' scores were transformed into percentiles. The 90th percentile and above were categorised as altruists while the 10th percentile and below were categorised as non-altruists. Five altruists (3 females, 2 males) and 5 non-altruists (3 females, 2 males) were contacted (by an experimenter blind to altruism level) and agreed to participate for additional credit. The 10 individuals were brought into the lab in pairs. Each pair consisted of an altruist and a non-altruist. All pairs were taught "Mastermind" (an elimination game where players try to solve a colour code created by the 'mastermind', in this case the experimenter). The rules were modified so that the pair played together against the experimenter. In addition the rules were adjusted so that, for each game, one member of the pair would receive points for game performance while the other would help. In addition, for each game, one member of the pair acted as the 'instructor', giving verbal commands and advice, while the other person, the 'mover' would silently put the game pieces in place. This manipulation allowed for only one target making utterances during taping.

Each pair played 4 games so that the altruists and non-altruists within the pairs could be instructors under two different 'payoff' conditions in the cooperative game - "points for self" and "points for other". Therefore, each altruist and non-altruist in the pair was an instructor twice: 1) instructing when the payoff was for self; and 2) instructing when the payoff was for other. This manipulation was made possible by telling the pair that points would only be assigned to one member of the dyad based on the amount of time and number of turns required to solve the colour code. The 'payoff' in points in this experiment carried no monetary value. Close-up headshots of targets were videotaped using a different camera for each member of the pair.

5.3 Presenting altruists to perceivers

Only video-clips of instructors giving verbal advice (i.e. suggesting what particular colour to choose) were used. Video-clips of instructors were used so that perceivers would have access to paralinguistic information (e.g. pitch and timbre of the voice), which is presumably important in altruist-detection (Frank, 1988). In total, there were 10 video-clips of targets (5 altruists and 5 non-altruists) instructing while receiving payoffs for self and 10 video-clips of targets (the same 5 altruists and 5 non-altruists) instructing while payoffs were for other.

To standardise the length of the video-clips, event sampling was used (Martin and Bateson, 1993). The most expressive minute was the event sampled. Two blind raters selected the minute with the highest frequency of the instructor talking and looking at the other person. The raters' highest frequency minutes matched for all clips. The 1-minute video clips were edited so that each altruist was randomly paired with every non-altruist at least once. The same sex and same payoff condition (points for self or points for other) were paired together.

Perceivers were tested in groups of 15 to 17. Perceivers were told that they would view 10 video-clips of 10 individuals playing "Mastermind" with an off-camera partner against an off-camera opponent. Blind to payoff condition, half of the sample (n = 84) viewed video-clips of altruists and non-altruists 'working for other', while the remaining perceivers (n = 84) viewed video-clips of altruists and non-altruists 'working for self'. All perceivers viewed 5 altruist / non-altruist pairs and rated each individual within each pair sequentially before moving to the next pair.

After viewing each video clip twice, perceivers were asked to judge on 89 *mm* ruler scales the degree of helpfulness, concern, attentiveness, and expressiveness of the target. Concern and attentiveness were derived from Izard's (1977) "Differential Emotions Scale" as measures of "interest". The perceivers marked a vertical line along the ruler where it was judged that aspect of the target's demeanour to be (e.g. The left side of the ruler bar would read "Unhelpful" while the right side would read "Helpful"). The distance from the left side of the ruler scale to the marked line represented a quantitative measure of the degree to which each target was thought be helpful, concerned, attentive, and expressive.

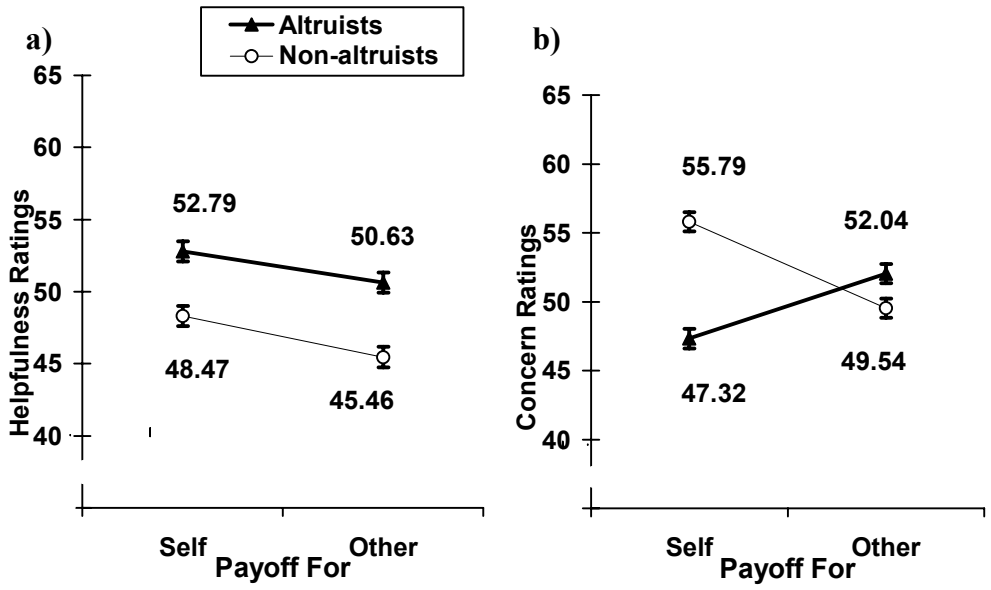
6. Results – Experiment Two

6.1 Detecting altruism

Perceivers' helpfulness, concern, attentiveness, and expressiveness assessments were analyzed using a multivariate analysis of variance (MANOVA) with target altruism (non-altruists vs. altruists) as a within-subject variable. This analysis indicated that the effect of target altruism was significant, F (4, 161) =

23.11, $p < .001$ using Wilks' lambda statistic. Calculation of ω^2 indicated that different levels of target altruism accounted for 37% of the variability in perceivers' discriminability of altruists and non-altruists. There was no significant effect of gender of target or perceiver on the detection of altruism.

The univariates were examined to yield descriptive information with special priority given to the hypothesis that altruists will be perceived as more helpful than non-altruists. To reduce the chances of a spurious result, Keppel's modified Bonferroni was used to reduce the alpha level required for statistical significance (Cohen, 1977; Keppel, 1982). The corrected alpha for all remaining analyses was 0.0375. Analyses of variances indicate that target altruism had significant effects on all perceivers' assessments, *F*'s (1, 164) > 7.86, $p < .007$, except attentiveness *F* (1, 164) = 1.27, $p > .10$. In particular, altruists were judged to be more helpful, less concerned, and more expressive [*M*'s (*SD* 's) = 51.65 (11.53); 49.58 (11.45); 49.62 (9.98)] than non-altruists [*M*'s (*SD* 's) = 46.97 (10.84); 52.63 (10.55); 47.15 (9.51)]. See Figures 2a to 2d for the perceivers' helpfulness, concern, attentiveness, and expressiveness assessments of altruists and non-altruists across payoff condition.



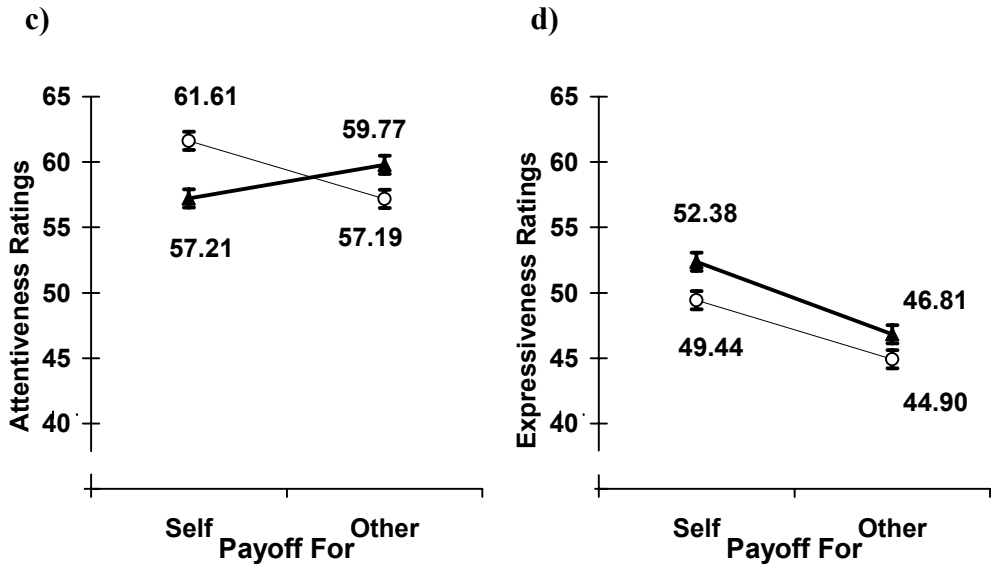


Fig. 2 (a-d). Means and standard errors for perceivers' ratings (i.e. helpfulness, concern, attentiveness, and expressiveness) of video-targets (altruists and non-altruists) by payoff condition (payoff for self vs. payoff for other) in Experiment Two.

Figure 2a and 2d reveal that regardless of point condition, altruists were rated as more helpful and expressive. Calculation of ω^2 indicated that the different levels of target altruism accounted for 17.8%, 6.5%, and 4.6% of the variability in perceivers' helpfulness, concern, and expressiveness judgments respectively.

In Experiment One expressiveness was a potential confound. Perhaps perceivers' helpfulness ratings of altruists and non-altruists are explained by the variance in expressiveness. An analysis of covariance (ANCOVA) was performed to investigate whether or not expressiveness solely accounted for the increased helpfulness ratings given to altruists. Findings are consistent with the altruist-detection hypothesis. Specifically, varying levels of expressiveness did not account for perceivers' helpfulness ratings of altruists and non-altruists. When expressiveness was held constant as a covariate, altruists were still rated by perceivers as more helpful than non-altruists: $F(1, 166) = 28.35$, $p < .0001$.

6.2 Effect of payoff

Judgments of helpfulness, concern, attentiveness, and expressiveness were analyzed using a MANOVA with payoff condition (payoff for self vs. payoff for

other) as a between-subject variable. This analysis indicated that the effect of payoff condition was significant, F (4, 161) = 4.90, $p < .005$ using Wilks' lambda statistic. Calculation of ω^2 revealed that different levels of payoff condition accounted for 11% of the variability in perceivers' ratings. Separate analyses of variances found that payoff condition had a significant effect on expressiveness, F (1,164) = 17.31, $p < .001$. Specifically, both altruists and non-altruists were judged more expressive when the payoff was for self (M = 50.92), compared to when the payoff was for other (M = 45.86). Calculation of ω^2 indicated that the different levels of payoff condition accounted for 9.5% of the variability in expressiveness ratings. All other perceivers' assessments were not significantly impacted by payoff condition. There was no significant effect of gender of target or perceiver on the influence of payoff condition.

6.3 Detecting selfishness and other-interest

Perceivers' ratings of helpfulness, concern, attentiveness, and expressiveness were analyzed using a MANOVA with target altruism (non-altruists vs. altruists) as a within-subject variable, and payoff condition (payoff for self vs. payoff for other) as a between-subject variable. This analysis indicated that the interaction between target altruism and payoff condition was significant, F (4, 161) = 12.44, $p < .001$ using Wilks' lambda statistic. Calculation of ω^2 indicated that the interaction between target altruism and payoff condition accounted for 24% of the variability in perceivers' discriminability of altruists and non-altruists. There was no significant effect of gender of target or perceiver on the detection of self or other interest.

Separate ANOVA's found that the interaction between target altruism and payoff condition had a significant effect on concern ratings, F (1, 164) = 37.91, $p < .001$, and attentiveness ratings, F (1, 164) = 18.58, $p < .001$. No other significant interactions were found. Calculation of ω^2 indicated that the interaction between target altruism and payoff condition accounted for 19% and 10% of the variability in perceivers' concern and attentiveness assessments respectively.

Figure 2b demonstrates the statistically significant interaction upon perceivers' concern ratings. The mean concern ratings of altruists and non-altruists are plotted by payoff condition. Figure 2b depicts graphically that perceivers rated altruists as more concerned than non-altruists when helping in the cooperative game: this difference of 2.50 was statistically significant; [t (83) = 2.23, $p < .03$]. Conversely, perceivers assessed non-altruists as significantly more concerned than altruists when the payoff was for self: the difference of 8.47 was statistically significant; [t (83) = -6.12, $p < .001$]. An analogous pattern was found with perceivers' attentiveness ratings (see Figure 2c). Specifically, perceivers judged altruists as more attentive than non-altruists when helping in the cooperative game: mean difference of 2.58

was statistically significant; [t (83) = 2.63, $p < .02$]. Figure 2c also reveals that perceivers' assessed non-altruists as more attentive than altruists when the payoff in the game was for self. This difference of -4.40 was statistically significant; [t (83)= -3.39, $p < .005$].

7. Discussion – Experiment Two

Consistent with the primary hypothesis, perceivers rated altruists as more helpful than non-altruists based on the information provided in 1-minute video-clips. This was a stable result across payoff condition.[4] Likewise perceivers rated altruists as more expressive than non-altruists. Paradoxically, altruists were rated as less concerned than non-altruists. This result was not stable across payoff condition. Specifically, perceivers judged altruists who were helping others in the cooperative game as more concerned than non-altruists in the same payoff condition. However, non-altruists were assessed as more concerned than altruists when the payoff in the game was for self[5]. Analogously, perceivers rated altruists who were helping others as more attentive than non-altruists. Finally, as predicted, perceivers assessed non-altruists as more attentive than altruists when the payoff in the game was for self. Despite research suggesting females are better at decoding nonverbal expressions of emotion (Hall, 1984) gender of target or perceiver did not influence altruist detection.

Results are consistent with Frank's (1988) altruist-detection assumption in the "commitment model." However, it is also possible that perceivers are basing helpfulness, concern and attentiveness assessments upon something besides nonverbal and paralinguistic displays of underlying altruism. Although it cannot be concluded that there are reliable nonverbal and/or paralinguistic signals associated with altruism, it can be asserted that perceivers can distinguish between individuals on altruism, or likelihood to cooperate (Frank et al., 1993; Brown and Moore, 2000). It is important to note that unlike Experiment One, Experiment Two found medium to large effect sizes (Cohen, 1977) for altruist-detection. A possible explanation for the increased effect sizes in Experiment Two may be that the targets were filmed in a cooperative rather than a story-telling context (as in Experiment One). These substantial effect sizes found in Experiment Two suggest that the consensus reached by perceivers regarding targets' altruism and selfishness may be an important biological phenomenon. In ancestral environments natural selection could have favoured information-processing capacities designed for the detection of altruistic demeanor. The adaptive benefit of altruist-detection depends upon whether the cues are reliable indicators of the likelihood to perform altruistic behaviours in the future. Perceivers may believe the cues are reliable, but it remains to be empirically demonstrated the degree to which the signals are honest (Grafen, 1990).

A potential criticism of Experiment One and Two is that we test the altruism-

signalling hypothesis only from the point of view of the perceivers where we had substantial power to detect an altruist-detection effect. In response to this legitimate criticism we decided to investigate the altruism-signalling hypothesis from the point of view of the targets' emotional displays. Specifically nonverbal behaviours of 10 altruists and 10 non-altruists were analyzed. This nonverbal behaviour analysis is exploratory. However based on Frank's (1988) theory predicting altruist detection certain nonverbal differences can be expected. For example Frank (1988) suggested that involuntary facial expressions should be more reliable indicators of future altruism. Four items that are under involuntary control were selected and expected to correlate with altruism level of the target and perceivers' assessments of altruism, these were: (a) Degree of felt smile (or the Duchenne smile), (b) Concern furrows; (c) Time / smile; and (d) Smile symmetry. Frank's (1988) survey (as well as our own) of the nonverbal literature suggests that these nonverbal behaviours are under involuntary control. For example few individuals can manipulate the facial muscles (i.e., the *corrugator supercilii*) to produce a concern furrow voluntarily (Frank, 1988). Therefore one would expect these nonverbal cues to be expressed by altruists if they are transmitting index signals to others designed to indicate that they are an ideal partner for social dilemmas requiring trust. Alternatively Frank's (1988) hypothesis regarding commitment signaling does not necessarily suggest that voluntary nonverbal cues should exist for altruism. Three voluntary nonverbal behaviours were assessed: (a) Eyebrow flashes and raises; (b) Head nods; and (c) Open smiles.

8. Methods – Experiment Three

8.1 Altruist and non-altruist target selection

Introductory Psychology students (n = 123; 73 females and 50 males) with a mean age of 19.18 (SD = 4.11) participated in the study to select altruists and non-altruists in exchange for 1% credit toward grade. Participants completed the Altruism Scale (Johnson et al., 1989). Participants' scores were transformed into percentiles. The 90th percentile and above were categorised as altruists while the 10th percentile and below were categorised as non-altruists.

Ten altruists (5 females, 5 males) and 10 non-altruists (5 females, 5 males) were contacted (by an experimenter blind to altruism level) and participated in the study for additional credit. The 20 individuals were each brought into the lab separately. Each target was asked to make a self-presentation (i.e. stating name, likes and dislikes). Close-up headshots of targets were video-taped.

"Concern for others" was assessed on a 6-point likert scale by a group of thirty perceivers (13 males and 17 females; mean age = 21.08; SD = 4.41). Specifically 1 represented "extremely unconcerned for others" and 6 represented "extremely

concerned for others". Mean scores for each target were aggregated from perceivers' ratings. It is expected that perceivers' ratings of "concern for others" would correlate with the nonverbal behaviours under involuntary control (but not the nonverbal behaviours under voluntary control).

8.2 Coding nonverbal expressions

Two observers blind with respect to nature of study independently coded video targets. Observers coded nonverbal expressions with the audio portion of the tape turned off. Facial expressions were coded using items gathered from several non-verbal behaviour studies based on applicability to involuntary signalling hypothesis and conceptual links to affiliative behaviour (Grant, 1969; Rime et al., 1978; Shrout and Fiske, 1981; Ekman and Friesen, 1982; Noller and Gallois, 1986; Simpson, Gangestad and Biek, 1993). Items, definitions and inter-observer reliabilities can be seen in Table 4.

Table 4

Nonverbal items, definitions and inter-observer reliabilities (all p's < 0.001).

Item	Definition	Inter-observer reliability
Degree of felt smile	6-point likert-scale rating of orbicularis oculi activity	0.83
Eyebrow flashes and raises	Frequency of occurrence	0.84
Concern furrows	Frequency of occurrence	0.89
Head nods	Frequency of occurrence	0.85
Open smiles	Frequency of occurrence	0.86
Time per smile	Duration in seconds	0.92
Smile Symmetry	6-point likert-scale rating	0.83

Degree of felt smile (i.e. *orbicularis oculi* muscle activity – the eye muscles that produce crow's feet) and smile symmetry were assessed on 6-point likert scales. For example 1 would represent "extremely asymmetrical" and 6 would represent "extremely symmetrical". Smile asymmetry was defined as the left-side of the mouth being lower than the right-side. The remaining nonverbal behaviours were in frequencies or duration (in seconds). As seen in Table 3 inter-observer agreement for all items was greater than the .80 criteria for good reliability recommended by Martin and Bateson (1993). A target's nonverbal behaviour rating was aggregated by calculating the mean of the two observers' assessments.

9. Results – Experiment Three

To test whether or not altruists and non-altruists express different nonverbal behaviours during a self-presentation, point biserial correlation coefficients[6] were calculated. Altruism level (altruist vs. non-altruist) was entered as a dichotomous independent variable. Results are consistent with the altruism-signalling hypothesis. Specially altruists during a self-presentation produced significantly greater *orbicularis oculi* activity, more concern furrows, more head nods, shorter smiles and more symmetrical smiles than non-altruists (all r's (20) > 0.26, all p's < .05). Perceivers' ratings of target concern appear to be tapping into the same factor as target altruism level as these two variables were highly correlated [point biserial r (20) = .81, p < .05]. As seen in Table 5, as perceivers' ratings of targets' "concern for others" increased, *orbicularis oculi* activity increased, concern furrows frequency increased, head nod frequency increased, smile duration decreased and the degree of target smile symmetry increased (all r's (20) > 0.23, all p's < .05). All other correlations were non-significant.

Table 5

Correlations between target altruism level, target nonverbal behaviour, and perceivers' ratings of target's "concern for others."

Nonverbal behaviour of target	Targets' altruism level	Perceivers' concern rating
Degree of felt smile	0.30*	0.61*
Eyebrow flashes and raises	0.12	0.20
Concern furrows	0.26*	0.23*
Head nods	0.51*	0.40*
Open smiles	0.14	0.10
Time per smile	-0.44*	-0.52*
Smile Symmetry	0.72*	0.63*

* Significant at < .05

10. Discussion – Experiment Three

As expected there were significant nonverbal differences between altruists and non-altruists. Furthermore, these nonverbal differences correlate with concern ratings. Four nonverbal differences are of particular theoretical interest; felt smiling, concern furrows, smile duration, and smile symmetry. These four nonverbal behaviours are particularly difficult to fake since they are linked to spontaneous emotional expression (Ekman and Freisen, 1982; Gazzaniga and Smylie, 1990). Heartfelt smiles have extremely short durations (Ekman and

Freisen, 1982). However phony smiles are significantly longer duration (Ekman and Freisen, 1982). Furthermore, the putative cues corresponded to increased concern for others ratings by a separate group of perceivers. Therefore it could be that altruists who are perceived as more concerned for others are expressing these facial expressions during social encounters. Head nodding correlated with altruism level unexpectedly. This may be a Type I error or perhaps the head nod is part of the display sequence of honesty. It has been suggested that that unwillingness to mirror other's head movements could indicate an unwillingness to cooperate (Wainwright, 1999). However, in this particular case the experimenter was not moving and behind a video camera.

Interestingly altruists produced a greater degree of smile symmetry than non-altruists. The effect size was large. Specifically 52 percent of variance in smile symmetry was accounted for by altruism level. This result is consistent with the idea that altruists are genuinely interested in helping others and one way this interest is signaled is via smile symmetry. Research in neuroscience has shown that posed smiles (smiles without an underlying emotional basis) are less intense on the left-side (Gazzaniga and Smylie, 1990). If non-altruists are less emotionally concerned for helping non-kin, it is predicted that non-altruists' smiles will be less intense on the left-side. Such right-sided asymmetrical smiles when cooperating may be a reliable indicator of underlying intentions due to physiological constraints in neural architecture determining emotional expression (Wylie and Goodale, 1988; Gazzaniga and Smylie, 1990; Brown and Moore, 2002).

Do smile asymmetries influence resource allocations? That is, from an evolutionary perspective, do more symmetrical smiles gain tangible inclusive fitness benefits for the signaler? Interestingly, previous empirical findings suggest that smiling individuals are trusted and receive more resources than non-smiling individuals (Tidd and Lockard, 1978; LaFrance and Hecht, 1995). Brown and Moore (2002) have found that cartoon icons with asymmetrical smiles receive fewer resources (e.g. lottery tickets for 120 dollar draw) than symmetrically smiling cartoon icons.

11. General Discussion

The current study shows that humans can reach a consensus regarding an individual's level of altruism and selfishness based on non-verbal and/or paralinguistic information. It is difficult to know whether the self-reported altruists are really altruists – thus perceivers' consensus of who the altruist was could be false. Perhaps the altruists in this study are simply better at bragging about past helpful behaviour relative to the non-altruists. However, it is important to note that altruists were not always rated higher than non-altruists. That is, as predicted, altruists were judged as less concerned and less attentive than non-

altruists when the payoff was for self. Since this study was based on self-reports the conclusions regarding the accuracy of perceivers' judgments must be tentative. Future research should use different methods for determining altruism level (e.g. archival measures, naturalistic observations over extended periods, peer and family ratings, etc.). Another alternative interpretation for the results in this study is that perceivers are not detecting altruism per se but have some general capacity at detecting lying or personality. This is possible, however several well-controlled studies suggest that only correlates of altruism (e.g. "sociability" and "extraversion") are detectable nonverbally (Funder and Dobruth, 1987; Albright, Kenny, and Malloy, 1988; Funder and Colvin, 1988; Watson, 1989; Kenny, Horner, Kashy and Chu, 1992; Borkenau and Liebler, 1993; Levesque and Kenny, 1993;). Furthermore, the consensus is that untrained individuals are poor at detecting lying (Ekman et al., 1999). It is difficult to know from the current study whether or not we have tapped into domain-specific cognitive architecture designed for altruist-detection. Future studies may be able to begin exploring the important question of domain specificity. An interesting possibility suggested by an anonymous reviewer is that if targets in Study Two knew that their payoffs could influence whether or not they were perceived as altruistic by raters, then mimics may be particular adept at tricking perceivers. Perhaps Machiavellians (individuals who are primarily motivated by social manipulation) are particular good at mimicry under such conditions.

Interestingly, altruists were rated more expressive than non-altruists regardless of payoff condition. Perhaps non-altruists benefit more by concealing intentions than revealing them. Since altruists are more likely to behave cooperatively in the future they may benefit by signaling likelihood to cooperate via expressive displays.

The nonverbal behaviours distinguishing altruists and non-altruists in study three is consistent with past research and theoretical expectations. Specifically, Frank (1988) predicted that the cues to altruism should be under involuntary control. In study three most of the cues that altruists displayed (except for head nods) are under involuntary control (i.e. smile duration, smile asymmetries, concern furrow, and *orbicularis oculi* activity). The smile asymmetry (left-side lower than right-side) is of particular interest since it is known that human perceivers scrutinize the left-side of the face when assessing facial expression (Burt and Perrett, 1997). In addition voluntary expressions of general affiliation used in greetings (e.g. eyebrow flashes) did not distinguish altruists and non-altruists. This finding is consistent with Frank's (1988) theory of altruism signalling. Finally, the result that the involuntarily controlled *orbicularis oculi* region (i.e. eye muscles that produce crow's feet) used in genuine emotion-based smiling showed greater activity in altruists than non-altruists is also consistent with Frank's (1988) model. Interestingly recent work on emotion-based smiling suggests that perceivers spend more time (measured by foveal fixations)

scrutinizing the *orbicularis oculi* region (Williams et al., 2001). In a recent study Brown and Fetchenhauer (in prep) have found that the nonverbal cues used by Canadian self-reported altruists are also displayed by Dutch self-reported altruists.

Theoretical work on the evolution of reliable signaling could inform researchers on how natural selection would design nonverbal signals of altruism (Frank, 1988; Cronk, 1994). Dawkins and Krebs (1979) suggested that animal signaling functions to manipulate rather than to inform others. However, it is important to note that some signals can be truthful. Honest signaling can be favoured when the high costs of being deceived lead to the selection of skeptical perceivers who only respond to "intrinsically unfalsifiable signals" (Semple and McComb, 1996). However, it should be pointed out that signals of altruism could be reliable for a number of different evolutionary reasons (Brown and Moore, 2002).

Signalling may best be characterized as an asymmetric arms race between signaler and receiver. Arms races are asymmetrical when one actor has more to lose. In the case of accurately decoding altruism, the cost to an altruist of being exploited is greater than the cost to a cheater who fails to exploit a conspecific. It is possible that this asymmetry has selected for altruists to be better decoders of selfishness than non-altruists. This fitness asymmetry may be exacerbated for emotionally expressive altruists whose intentions are easily decoded. Further work should explore this possibility.

In conclusion, Experiments One to Three are consistent with Frank's (1988) theory that humans have cognitive architecture designed by natural selection to assess altruism and selfishness in others. Furthermore it appears that the putative nonverbal cues that perceivers base assessments upon are not under the voluntary control of the signaler. If altruists assort into mutually supportive networks based on reliable signals they may be protected from free-rider exploitation (Wright, 1945; Eshel and Cavalli-Sforza, 1982; Frank, 1988; Peck, 1993; Wilson and Dugatkin, 1997; Michod, 1999; Brown & Moore, 2000; Brown & Moore, 2002).

Acknowledgments

The authors would like to thank Natasha Crewdson, Martin Daly, Margo Wilson, Rick Wilson and Rob Kurzban for constructive comments. Natural Sciences and Engineering Research Council of Canada (NSERC) and Isaak Walton Killam Memorial Trust supported the first author. Research funding was from a Social Sciences and Humanities Research Council of Canada grant 410-98-0462 to Chris Moore.

Received 2nd October, 2002; Revision received 10th February, 2003; Accepted 11th February, 2003.

Notes

1. When the untainted data were kept in the analysis there was still a significant altruist detection effect. However for the formal analysis the data from the 37 perceivers were not included. This is because it could be argued that the 37 perceivers who knew at least one or more targets could have generalized to unknown targets what cues indicate altruism based on the nonverbal expressions of the known person who was also telling the Red Riding Hood story.
2. A non-parametric binomial test was also used to test whether the observed frequency correct was greater than chance levels. Results remain significant with even when a less powerful test was used to test the altruist detection hypothesis. After consultation with a behavioural scientist who studies statistics (Dr. Barry Spinner, University of New Brunswick) it was suggested that we report the findings from the one-sample t-test.
3. The small effect size could be interpreted as the lack of biological importance of altruist detection. Since the most extreme scorers on the Altruism Scale were selected as targets, one may predict a much stronger effect. Study Two can address the alternative speculation that the small effect size is due to the limited information provided in the context of telling the Red Riding Hood story (not necessarily the context in which we would expect nonverbal cues to altruism to be displayed).
4. In Figure 2a altruists appear to be viewed as less helpful when working on the their partner's behalf. However this finding was not statistically significant. It may have been expected that altruists would be rated as a significantly less helpful when working for their own benefit. However the adjective "helpful" may be associated with helping others for the perceivers in this study. Unfortunately it is difficult to know why altruists were not assessed as significantly less helpful when working for their own benefit compared to working for their partner's benefit.
5. In Figure 2b the findings may appear counter-intuitive. However "concern" is a measure of nonverbal interest (Izard, 1977) and it makes sense that non-altruists who are intrinsically motivated by selfish interests would be particular keen on working to receive points for themselves. Altruists who are presumably not intrinsically motivated by selfishness would nonverbally display a lack of interest or concern when they are working on their own behalf. This signal of lacking interest in payoffs is consistent with Romer et al's (1986) study suggesting that altruists help less when there is money involved. However when there is NO monetary reward altruists give more help to a stranger.
6. Point biserial correlations were used over the t-test because this nonparametric test is less powerful (and subsequently less likely to make a Type I statistical error).

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