

Investigations into proximate and ultimate determinants of altruism, heroism and friendship in humans

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor in Philosophy by

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Thesis abstract:

Humans have the capacity to behave altruistically in many different contexts. Not only do individuals form long-lasting, reciprocal friendships with others, but they also cooperate with complete strangers, sometimes risking our lives to save the life of another person. Both ultimate and proximate explanations are important when trying to find reasons for altruism humans, taking into account substantial individual differences in the degree of altruism people exhibit. One of the problems in the ultimate theories of altruism is “subtle cheating” (Trivers, 1971), and the recognition and deterring of free-riders (Dunbar, 2003). The present thesis investigates topics related to altruistic signalling and individual differences in recognition of these signals, as well as the relationship between social cognition, social strategies and manipulateness (namely, the personality trait Machiavellianism). Furthermore, one of the aims are to find explanations for risky rescuing of strangers. A Prisoner’s Dilemma experiment in Chapter 2 found that although cooperativeness was not related to any of the measured behaviours, people did recognise manipulative strangers, and rated them as less trustworthy. Chapter 3 investigated emotional intelligence, self-rated altruism and Theory of Mind in relation to social judgement. It was found that emotional intelligence and altruism both related to an improved ability to judge the character of another person, but only in acquainted females.

In addition, Theory of Mind was related to improved ability to judge relationship strength in 3rd parties. Experiment in Chapter 4 found that high-Machs were found to have poorer social intelligence, indicating that Theory of Mind did not evolve because it gives an advantage in manipulative contexts.

Chapter 5 looked at how manipulateness related to quantity and quality of friendships, and found that Machiavellianism had a negative correlation with the warmth and closeness of friendships. Finally, chapter 6 researched risky rescuing behaviour in newspaper reports, providing some support for the costly signalling theory. Results of the studies are discussed in relation to evolution of altruism, manipulateness and social cognition.

“All men are caught in an inescapable network of mutuality” (Martin Luther King Jr, 1929 – 1968)

1. Introduction

The high degree of cooperation amongst unrelated individuals is an intriguing phenomenon in humans, and presents somewhat of a dilemma to evolutionary theory (Hamilton, 1964). The dilemma of cooperation lies in the fitness benefits to the recipient, and fitness costs to the performer of the act. Genes that promote cooperation should have been selected out, as selfish individuals always fare better than cooperators. Nevertheless, not only do individuals give time and resources to people who they are related to, but they also cooperate extensively with unrelated individuals, sometimes even with complete strangers. Evolutionary theories attempting to find explanations for altruism always look for fitness benefits to the cooperative individual (Lehmann and Keller, 2006).

The need for large scale cooperation has been of paramount importance during human evolution, and might even have been one of the driving forces behind the evolution of human-specific cognitive machinery (Dunbar, 2003, Moll and Tomasello, 2007). According to Dunbar (2003), increasing group sizes in hominids put more pressure on human cognitive capacities, especially in the form of keeping track of freeriders, individuals who are trying to reap the benefits without incurring any costs in cooperative interactions. The need to deter freeriders could explain the existence of language (Dunbar, 2006), some of the pro-social emotions (Price, 2002) and cognitive biases towards detecting cheating (Cosmides and Tooby, 1992).

The importance of identifying and deterring freeriders should have placed selection pressures for mechanisms that aid us in assessing the reliability of others (bearing in mind, they can lie about their intentions) and persuading others to believe that we are cooperative (which we can, of course, lie about as well). Hanley, Orbell and Morikawa (2003) called these issues “perceptiveness” and “persuasiveness”, respectively. According to the authors, during human evolution, there were selection pressures for cognitive mechanisms that facilitate quick and accurate assessment of other’s intentions, and mechanisms that allow us to manipulate information we pass on to others. The cooperative intentions of others are likely to be inferred from nonverbal communication or by assessing the personality characteristics of the potential cooperative partner.

Despite the theoretical advances in trying to solve the puzzle of altruism, many questions still remain unanswered. For example, research has found that people are accurate in recognising potential cooperators (Frank, Gilovich and Regan, 1993, Lyons and Aitken, 2007, Pradel, Euler and Fetchenhauer, 2008), but it is not clear what this recognition ability is based on, and what cues are being used when indicating cooperativeness. Furthermore, individuals differ in how trustworthy they are, and how good they are in perceiving trustworthiness in others. Currently it is unclear what personality factors relate to these abilities, and whether perceptiveness, persuasiveness and trustworthiness have co-evolved together due to the same selection pressures (Vigil, 2009). The aim of this thesis is to bring some light to issues relating to altruism and cooperation in humans.

1.1. Some theoretical considerations

Over the years, there have been major semantic confusions in the use of terminology related to altruism and cooperation. Some researchers use the words “altruism, cooperation

and helping” in an interchangeable manner (Lehmann and Keller, 2006). Others, in turn, promote a distinction, whereby cooperation can be defined by sometimes bringing mutual benefits to the cooperating individual, but altruism is measured by the lifetime consequences for the fitness of the altruist (West, Griffin and Gardner, 2006). In the present thesis, the words “altruism” and cooperation” are used in an interchangeable manner, indicating behaviours that have a cost to the donor and benefits the recipient, both in short-term interactions and in long-term fitness consequences.

Kin Selection

Altruism is a well-demonstrated phenomenon, exhibited by a wide range of species (see Archie et al, 2006 for elephants, Hoogland, 2009 for prairie dogs, and Smith et al, 2007 for social insects). Traditionally, the ultimate causes of cooperation have been explained by kin selection or reciprocal altruism (Hamilton, 1964, Trivers, 1971). Kin selection theory revolves around inclusive fitness. When helping somebody who is related, an individual is, in a way, helping her own genes. Kin selection is a well-demonstrated phenomenon in a wide range of species, and provides a robust explanation for evolution of altruism. For example, the existence of elaborate caste systems in eusocial insects can be explained by inclusive fitness benefits brought by close genetic relatedness (Barnard, 2004). Kin selection has also been used in explaining the existence of cooperative breeding (Hatchwell, 2009). Maynard Smith (1965), in turn, used kin selection theory to model the evolution of alarm calls in social groups. Kin selection has been extensively studied in humans, too. Experiments have shown that humans exhibit nepotistic biases when donating money (Rachlin and Jones, 2008), incurring pain when it benefits relatives (Madsen et al, 2007) and rescuing in life-risking hypothetical scenarios (Burnstein, Crandall and Kitayama, 1994). Furthermore, the “grandmothering hypothesis” poses that grandmaternal help, especially towards the offspring of daughter, has selected for post-menopausal existence in humans (Gibson and Mace, 2005,

Lahdenpera et al, 2004). Research has found that grandmothers have a positive impact on child survival and well-being in traditional societies (Gibson and Mace, 2005, Sear and Mace, 2000). However, other theories will have to be evoked to explain copious findings of helping that is not directed towards related individuals.

Reciprocal altruism

Reciprocity, in turn, explains altruism in unrelated individuals by fitness benefits brought by the reciprocation of help given to another. Reciprocity is related to the ability to recognise altruists and cheats- in order not to be cheated on in reciprocal interactions, an individual should be able to remember who is an altruist and who is a cheat, and refuse any further cooperation with individuals who cheated (Cosmides and Tooby, 1992, Trivers, 1971). Some classic examples of reciprocity in non-human species includes regurgitation of blood in vampire bats (Wilkinson, 1984), alarm-calling in vervet monkeys (Seyfarth and Cheney, 1984) and coalitionary support in olive baboons (Packer, 1977).

According to Trivers (1985), reciprocal altruism has probably played an important role in hominid evolution. Reciprocity is likely to have been an integral part of human social life, and provides powerful explanations for phenomenon such as pro-social emotions (Trivers, 1971), punishment of cheaters (Gintis, 2000, Fehr and Gächter, 2002), and evolution of friendships between unrelated individuals (Peck, 1993). In contemporary hunter-gatherer societies, reciprocity is of major importance in, for example, food transfers (Allen- Arave, Gurven and Hill, 2008, Bliege-Bird et al, 2002).

According to Trivers (1971), reciprocal altruism is underpinned by the capacity to detect subtle cheating. The free-rider issue, or adaptations for detecting and deterring individuals who are trying to reap the benefits without paying any costs, has almost certainly played a large role in the evolution of human-specific cognitive abilities (Dunbar, 1999), and will be

one of the focuses of the thesis.

Other ultimate theories of altruism

However, in the case of humans, kin-selection and reciprocity alone can not explain the frequent occurrences of unconditional help that people offer to unrelated individuals. It is more difficult to try to explain the possible fitness benefits of an act that results in the loss of the life of the altruist when saving, for example, the life of an unrelated stranger. Recently, there has been a surge of theories, some rising from the theoretical framework of Robert Trivers. These theories circle around indirect reciprocity and the role of reputation (Nowak & Sigmund, 1998, Wedekind & Milinski, 2000, Leimar & Hammerstein, 2001), costly signalling (Zahavi, 1995, Lotem et al, 2003), strong reciprocity and the role of altruistic punishment (Gintis, 2000, Fehr & Gächter, 2002) in maintaining altruism and cooperation. It is evident that altruism is not a homogenous phenomenon, explained by a single theory. Different types of altruistic acts warrant different evolutionary explanations- helping relatives, friends and strangers with varying fitness benefits and costs probably stem from different types of evolutionary pressures.

It is important to distinguish between ultimate and proximate explanations, although these both link with each other, and can be used together in providing a coherent account on the evolution of altruism. Reciprocal altruism, for instance, provides an ultimate level explanation on why being altruistic would have been advantageous in terms of fitness benefits from mutual interactions. In proximate terms, being able to identify altruists and signalling altruistic intentions would provide a mechanism that maintains reciprocity. One of the aims of the present thesis is to investigate some of the proximate mechanisms behind reciprocal altruism, such as facial expressions as signals of altruistic intentions. Moreover, sex differences in social styles and social cognition will be under investigation, with a focus

on cognitive adaptations that might account for individual and sex differences in reciprocal altruism. Furthermore, the costly signaling theory will be reviewed as an explanation for a peculiar type of human behaviour, namely, the risky rescuing of strangers.

1.2 Evolution of cooperative signals- facial expressions as adaptations

One of the proximate explanations facilitating reciprocal altruism could be behavioural signals indicating altruistic intentions. Computer simulations have demonstrated that altruism is an evolutionarily stable strategy providing altruists can recognise each other (Riolo, Cohen & Axelrod, 2001). Richard Dawkins (1976) coined this “Green Beard Effect”, indicating that altruism is a viable strategy providing that altruists are carrying a conspicuous phenotypic trait that aids their identification. Several authors have suggested that facial expressions in humans have evolved to facilitate cooperative interactions (Frank, 1988, Frilund, 1994). Although most aspects of human behaviour are geared towards successful facilitation of group living, facial expressions as evolutionary adaptations are surprisingly little studied or understood (Schmidt and Cohn, 2001). Moreover, it is not clear whether facial expressions are involuntary reflections of underlying emotions, signals that are used deliberately in social communication, or a mixture of both (Frilund, 1994, Schmidt and Cohn, 2001).

1.2.1 Behavioural ecology versus emotional read-out of facial expressions

Although earlier research saw facial expressions as an involuntary readout of emotional states, it is more likely that facial displays are social tools, specific to intent and content of the signalling, and have co-evolved with perceptual vigilance to the displays. This

approach is named the “Behavioural Ecology View”, as opposed to the “Emotions View” of the evolution of facial expression (Frilund, 1994). There is robust empirical evidence to suggest that facial expressions are signals that are produced in a social context, aimed at changing the behaviour of the receiver. For example, non-verbal signals, especially signals that convey positive affect, are largely social in nature, produced in the presence of other individuals (Kraut and Johnson, 1979, Frilund, 1994, Manstead, Fischer and Jacobs, 1999). Kraut and Johnson (1979), for example, observed the facial expressions of bowlers in bowling alleys. They concluded that facial displays, such as smiling, occurred when the bowlers knew they were observed by others, rather than when they had their backs turned on the audience. In a similar way, Frilund (1991) discovered that participants in his experiment were more likely to smile when watching a videotape in the presence rather than in the absence of others. It seems that facial expressions such as smiling are elicited by the presence of other people, and probably serve a function of impression management. If the observers are receiving a positive message about the future behaviour of the signaller, they are more likely to behave in a cooperative manner when interacting with the signaller. In this view, facial expressions have evolved as truthful cues of altruism, functioning in affecting the behaviour of the receiver in a way that promotes reciprocity (Schmidt and Cohn, 2001).

There is evidence that facial expressions influence the behaviour and attitudes of the receiver of the signal. Research has shown that smiling, for example, positively affects impressions of trustworthiness, generosity and altruism (Brown, Palameta and Moore, 2000, Mehu, Little and Dunbar, 2008, Scharlemann et al, 2001). It seems that when people produce a facial expression related to positive emotionality, the recipients are more willing to trust the signaller, and share time and resources with the signaller. In fact, the “Emotions” and “Behavioural Ecology” views of the evolution of facial expressions are not mutually exclusive. Preuschoft (2000) suggested that positive expressions of emotions have evolved in

positive social contexts, and by displaying these expressions, an individual is sending a message of enjoying the interaction.

Moreover, Frank (1988) proposed that the underlying moral emotions, which function as a proximate cause for behaving altruistically, could be partly under control of automatic nervous system, and therefore hard to fake. According to this view, moral emotions are reflected in facial expressions, which have a function both as a social tool and an expression of underlying emotions. Altruistic motivations might be fuelled by the strength of emotions, and the emotions might produce visible marks in the behaviour, to such an extent that others can infer the altruistic status of the signaller (Frank, 1988). Interestingly, some facial expressions, such as the so-called Duchenne smile (or the enjoyment smile), involving the muscle *orbicularis oculi* at the eye region, are difficult to produce voluntarily. Signals like these, involving automatic nervous system and extrapyramidal neural circuits, are likely to be honest signals of the psychological state of the signaller, increasing the impressions of trustworthiness (see Mehu, Little and Dunbar, 2007).

1.2.2 Facial expressions as honest signals of intent

It is likely that frequently occurring social signals such as smiling are an adaptive consequence of mutually beneficial interactions between the signaller and the receiver of the signal, something that would greatly benefit reciprocal altruism. Earlier theories by Dawkins and Krebs (1978) saw the evolution of communication systems as a deceptive arms race between the signaller and the receiver, where “communication is said to occur when an animal, the actor, does something which appears to be the result of selection to influence the sense organs of another animal, the reactor, so that the reactor’s behaviour changes to the advantage of the actor” (Dawkins and Krebs 1978, p. 283). The authors later reviewed this

theory to account for differential signalling in situations where there is considerable overlap between the interests of the communicators. According to this view, when individuals have cooperation as their mutual interest, evolution should have produced subtle, low-cost signals, whereas manipulative signals should be more conspicuous and repetitive in nature (Krebs and Dawkins, 1984). Smiling, for example, provides an example of a frequently occurring energy-efficient signal, which facilitates social interactions. In this view, rather than having evolved in exploitative, deceptive context, facial expressions could aid cooperation when mutual benefits can be obtained.

Of course, not all social interactions are mutually beneficial, and the adaptive benefits of being able to deceive others about cooperative intentions should have outweighed the benefits of being truthful about cooperative intentions. If facial expressions are, indeed, honest, low-cost signals of altruism, they should be easy enough to mimic by a non-altruist. Schmidt and Cohn (2001) suggested that rather than being low-cost signals for all actors alike, facial expressions are likely to be low-cost only for signallers who have an honest interest in the interaction. The cost incurred comes in the form of synchronising and timing of the expressions to fit in with the communication of the other. Imagine a party full of interesting people, where an individual is pinned down by a boring person. Trying to maintain an interested pose soon becomes over-bearing, and coordinating facial expressions and speech with the expressions and speech of the other become more effortful.

Being able to detect truthful intentions from dishonest ones should have co-evolved with the ability to sending out these signals, resulting in positive fitness consequences for both the signaller and the receiver (Dawkins, 1974). There is major individual variability in detecting and sending out signals. Some individuals are better in lying and sending out deceitful signals (Gombos, 2006), and detecting lies (Ekman and Sullivan 1991, Vrij and Mann, 2001) than others are. However, it is not known at the moment whether detecting

trustworthiness is related to actual trustworthiness. It is possible that altruistic, cooperative individuals are good in detecting altruism in others. It is equally possible that more manipulative, deceitful individuals excel in detecting trustworthiness. It is likely that human populations consist of a mix of individuals who are playing different cooperative strategies in an evolutionarily stable equilibrium. How these altruistic strategies relate to sending and receiving cooperative signals is still very much an under-researched area of study (Lyons, 2009).

1.2.3 Smiling as a cooperative signal

Smiling in humans is a strong social signal evoking positive emotions in others, and probably has deep roots in our evolutionary history (Brown and Moore, 2000, Freedman, 1964). Chimpanzees, for example, have smile-like facial expressions (silent bared-teeth display), which are used in conveying appeasement and reassurance in dominance-related interactions (e.g. Waller and Dunbar, 2005). Smiling in humans is hard-wired in our neural machinery (Freedman, 1964), emerges early during development (Jones, Collins and Hong, 1991) and is used in many different contexts. Brown and Moore (2000) proposed that facial expressions, especially those conveying positive emotionality, are used when people are trying to appear to be more altruistic. There is some empirical evidence that expressions such as smiling are used cooperative interactions. Brown, Palameta and Moore (2003), for example, found that people who rated themselves as being altruistic smiled more when telling a story that was taped on a videotape. Self-rated altruists in the study also had more symmetrical smiles than people with less altruistic dispositions. In the same study, altruism was related to more frequent head nods, indicating that vertical head movements could also function in signalling altruism.

Smiling has also been related to other positive outcomes in the form of influencing the attitudes of the receiver towards the sender of the signal. For example, Scharleman et al (2001) found that pictures of smiling faces were judged as being more trustworthy than the neutral version of the same face. In a same manner, Mehu, Little and Dunbar (2008) found that smiling affects personality judgements in a way that could be beneficial to the sender of the signal. In their study, smiling faces were rated higher on attributes such as extraversion and generosity. Moreover, in another study, the type of a smile affected the ratings of generosity. Only the honest, Duchenne-smiles were evaluated in a positive manner (Mehu, Little and Dunbar, 2007). It is possible that Duchenne smiles have evolved as honest, cooperative signals- these kind of smiles are more difficult to control voluntarily (Ekman, 1991), and are displayed in situations involving sharing material resources, especially by individuals with self-reported altruistic dispositions (Mehu, Grammer and Dunbar, 2008).

1.2.4. Individual and situational variability in signalling

Even though humans have evolved several facial expressions that are universal in nature (Ekman and Keltner, 1997), there is considerable individual variation between these signals, and also the perceptual sensitivity to these signals. Schmidt and Cohn (2001) named the sources of the individual variation as differences in anatomy and neurobiology, as well as the sex, age, and the cultural background of the individual. Moreover, status, dominance and the strength of the relationship seem to play a large part in sending and receiving signals (Philippot, Feldman and Coats, 1999). Nonverbal communication research has generated interesting results with regards to situational factors in facial expressions, findings that fit well with hypotheses generated by evolutionary theory.

The strength of the relationship between communicators seems to be an important

predictor of how expressive people are. Wagner and Lee (1999), for example, suggested that the strength of relationship between people has a major impact on the frequency of smiling. Studies have found that people are more expressive in the presence of friends than in the presence of strangers (Jakobs, Manstead, and Fischer, 1999, Wagner and Smith, 1991, Yamamoto and Suzuki, 2006). Wagner and Smith (1991), for example, showed that people were more expressive when watching an emotional slide with a friend than with a stranger. In a similar way, Jakobs, Manstead, and Fischer (1999) found that people showed more positive affect when listening to a story told by a friend than a story told by a stranger. These results were supported in a cross-cultural study on a Japanese sample- again, watching a film with a friend elicited more expressive behaviours than watching a film with a stranger (Yamamoto and Suzuki, 2005, 2006). Jacobs, Manstead and Fischer (1999) suggested that the function of smiling is to facilitate communication. As friends have more incentive to communicate with each others than strangers have, they should be more expressive when interacting with each other. Advertising cooperativeness amongst friends, who are in an established reciprocal relationship, is more important than advertising cooperativeness amongst strangers, who might not meet each other again after the initial contact. However, so far, studies have not looked at differences in expressiveness between friends and strangers in a cooperative context. Watching a film or a slideshow with another person (e.g. Jakobs, Manstead, and Fischer, 1999, Wagner and Smith, 1991, Yamamoto and Suzuki, 2006) is a far cry from actively interacting with the person in a cooperative context. It is possible that when strangers have a mutual cooperative goal, they do behave as expressively as friends do. In chapter 2, I will examine cooperation between friends and strangers in a more ecologically relevant setting, namely, looking at the existence of cooperative signalling in face-to-face situations, rather than anonymous interactions via computer screens. Chapter 2 aims to look at cooperative signalling and the strength of relationship in a Prisoner's Dilemma scenario.

1.3. Evolution of perceptiveness to cooperative signals

In order for cooperative signals to evolve, we would expect co-evolution with a perceptual system that recognises these signals (Barnard, 2004). Adolphs (2003) called for more research into individual differences in social perception- it is currently not known whether altruistic individuals possess the cognitive mechanisms needed for identifying altruism in others. Ultimately, if this was the case, it would explain the evolution of cooperation via the Green Beard Effect, which postulates that altruists possess a conspicuous phenotypic behavioural or physical trait, which can easily be identified by others with the same characteristic (Dawkins, 1976). Although there is some evidence that people can recognise potential cooperators (Frank, Gilovich and Regan 1993, Lyons and Aitken, 2008, Pradel, Euler and Fetchenhauer, 2008), not much is known about individual differences in this ability. It is an empirical possibility that altruistic individuals are equipped with superior social intelligence, helping them in identifying the altruistic dispositions in others. There is some evidence that social intelligence in the form of Theory of Mind is related to self-reported cooperativeness (Paal and Bereczkei, 2007), but it is unclear whether social intelligence is used when assessing the honesty of another person.

In a recent review, Fiske, Cuddy and Glick (2007) suggested that people have evolved a special mechanism which makes us attuned to how warm and caring others are. Warmth is, according to the authors, related to important traits such as friendliness, helpfulness, sincerity, trustworthiness and morality. All of these traits should signify the probability of reciprocating altruism, and recognising these traits in others could, potentially, increase the reproductive success of the receiver of the signal. Again, not much is known about the individual differences in the accuracy of perception of warmth. However, people do seem to

differ in how good they are in assessing personality traits in others, and this ability seems to be related to general intelligence (Harris, Vernon and Jang, 1999, Lippa and Dietz, 2000) and emotional stability (Ambady, Hallahan and Rosenthal, 1995). A study by Millet and Dewitte (2007) found that in a public goods game, unconditional altruism was related to a higher IQ, which, together with the personality judgement accuracy and high IQ studies (Harris, Vernon and Jang, 1999, Lippa and Dietz, 2000) would suggest a link between intelligence, altruism and inter-personal perception. It is clear that not all individuals are as perceptive as others when identifying truthfulness and deceitfulness (Ekman and Sullivan, 1991, O'Sullivan, 2005). The importance of social intelligence in assessing the character of others is still not known, and will be one of the themes of chapter 3 of the present thesis.

1.3.1 Theory of mind and perceptiveness

One human-specific adaptation that implies the capacity to read the emotions and intentions of others is Theory of Mind (ToM). Although some argue that non-human species have the capacity to infer mental states to others (Tomasello, Call and Hare, 2003), others maintain that we lack compelling evidence for the existence of ToM in non-verbal organisms (Penn and Povinelli, 2007). ToM has been used inter-changeably with the word social intelligence, indicating that individuals who have a higher ToM are more capable of understanding the behaviour of other people. According to Bosco, Colle and Tirassa (2009) ToM is "... sophisticated mental activity which allows to quickly form and handle local, situated ideas about oneself or the others in a specific moment as well as more general, less transient ideas about how one and the others tend to live and cope across any number of different and possibly hypothetical situations."

All normally functioning adults have the capacity to infer mental states and intentions

to others, however, this ability can be severely impaired or absent in several clinical and developmental disorders, such as autism, schizophrenia and depression (see Baron-Cohen, 1991). Only recently has research started looking at ToM as an individual difference, researching normally functioning adult populations instead of children or clinical populations. These studies have found that people with better social intelligence have larger social networks (Stiller and Dunbar, 2007) and score high on a scale assessing cooperativeness (Paal and Bereczkei, 2007). It is expected that higher scores on ToM also translate to better ability in perceiving honest intentions in other people. Although it still is not clear why ToM in humans initially evolved, or even what modern humans use this capacity for, cooperation is a good candidate for pushing the evolution of social cognition. It is possible that ToM is used when assessing cooperativeness of others and in persuading others to cooperate, however, there are, at present, only a few studies that suggest a link between social cognition and cooperation. One such study was conducted by Paal and Bereczkei (2007), who found that Theory of Mind ability in normally functioning adults was positively related to self-reported cooperative tendencies. This suggests that social intelligence relates to altruism, and could have evolved under same selection pressures.

1.3.2 Emotional Intelligence and perceptiveness

In many ways, Emotional Intelligence (EI) is a construct closely related to ToM, not only dealing with the capacity to understand the emotions of others, but also with understanding and acting upon the emotions of oneself. Salovey and Mayer (1990) defined EI as “the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions.” In a manner similar to ToM, having high EI equips people with the ability to understand others, leading to success

in social relationships. One of the components of EI includes recognising the intentions behind the nonverbal communication of others (Elfbein, 2006), implying that decoding of facial expressions is related to EI ability in a positive way. Although EI in relation to cheater/altruist detection ability is an under-researched area, there are some suggestions that high EI is a predictor of lie-detection capacity (O'Sullivan, 2005). EI is certainly related to social success, as shown by studies on adolescents (Mavroveli et al, 2007) and adults (Fox and Spector, 2000, Lopes, Salovey and Strauss, 2003, Lopes et al, 2004). Moreover, although EI can be improved, a recent study by Vernon et al (2008) suggests a large heritable component to the construct. This implies that EI does have a genetic base, and presents a stable, within-species individual difference in humans.

1.3.3. Machiavellianism and perceptiveness

Another outstanding issue in the evolution of perceptiveness and persuasiveness is the possible co-evolution of the two capacities. On one hand, Hanley, Orbell & Morikawa (2003) suggested that in order for cooperation to be a viable strategy, "...players...have well developed capacities for penetrating lies about cooperative intentions relative to others' capacities for telling persuasive lies" (p.180). On the other hand, the authors speculated that evolution has favoured persuasiveness over perceptiveness, because persuading others to believe one's intentions are truthful can result in significant fitness benefits, whereas being perceptive can only function in minimising losses when encountering a cheat. It is still unclear whether people who are competent in persuading others to cooperate are also competent in recognising the cooperative intentions of others. The Green Beard hypothesis postulates that truthful altruistic intentions go hand in hand with recognising these in others. However, the best outcome for an individual would be the capacity to fake altruism, and still

have the competence to assess the truthfulness of others.

Obviously then, the best adaptive combination is to have both high levels of persuasiveness and perceptiveness. An individual who can accurately assess the honesty of others, and also persuade potential partners about his/her own honesty, would have advantage over others who have not got the same abilities. Individuals with psychopathic, manipulative tendencies seem good in persuading other people for their own benefits, leading to, amongst other things, rapid career progression (Babiak, 1995). Mealey (1995) suggested that psychopathy could be an evolutionary adaptation, maintained through frequency dependent selection. In this view, when callous and manipulative individuals are rare, they do well, because the majority of people are generally cooperative, and are expecting others to be so too. However, if the frequency of psychopaths increases, fitness benefits of the strategy become smaller, as people are more wary about who to cooperate with. Game theory models have provided a useful approach for studying altruistic types. The existence of different types of cooperative personalities will be reviewed at a later stage in this chapter.

Marcus, John and Edens (2004) suggested that rather than psychopaths being qualitatively different from other people, psychopathy is more likely to exist in a continuum. According to McHoskey, Worzel & Szyarto (1998), Machiavellian individuals (or the so-called high-Machs) could be at the non-clinical continuum of psychopathy. Machiavellianism is a social strategy that is associated with manipulateness and deceit, and a generally cynical view about human nature. It is possible that Machiavellianism is related to personality dysfunction (McHoskey, 2001), and could be a manifestation of sub-clinical psychopathy (McHoskey, Worzel & Szyarto, 1998). Machiavellianism seems to vary in a continuum from highly trustworthy and altruistic to manipulative and deceitful, psychopathic individuals being at the lower end of the continuum. Although there is surprisingly little research into the potential adaptiveness of the high-Mach deceitful strategy, some studies have found that

Machiavellianism in males increases mating (Jonason et al, 2008, Linton and Wiener, 2001, McHoskey, 2001) and success in some sales roles (Aziz, 2004, 2005).

In order to be able to successfully play the free-rider strategy, it would be expected that manipulativeness is related to a solid social understanding of others. However, at present, there is not much research into cheat and altruist detection in relation to Machiavellianism. A few studies have found that psychopaths have an impaired recognition of non-verbal (Kosson et al, 2002, Marsh and Blair, 2008) and verbal (Blair, Mitchell and Richell, 2002) emotions. However, it is not clear whether emotion recognition ability is necessary for identifying cooperative dispositions in others. In fact, it is possible that free-riders are successful because they lack the empathy and understanding of other people-perhaps emotional deficits are a necessity when taking advantage of others.

If the high-Machs are successful manipulators of others, as suggested by Christie and Geis (1970), being harnessed with superior ToM ability would certainly be of great benefit. There is some, albeit indirect, empirical evidence that a link between Theory of Mind and Machiavellianism exists. Two studies have found that people with schizophrenia score lower than the control group on a scale that measures Machiavellianism (Mazza et al, 2003, Sullivan & Allen, 1999), leading Mazza et al (2003) to suggest that the low scores of schizophrenic patients in the Machiavellianism scale is a result of poor mentalising ability, related to underlying ToM deficits. If this is the case, it would be expected that the opposite pattern, high Machiavellian scores and high mindreading skills, would be expected too. Chapter 4 will investigate the relationship between ToM and Machiavellianism, in order to find out what the relationship between social intelligence and manipulativeness might be.

1.4. Personality traits as adaptations- are there cooperative/uncooperative personalities?

Humans show consistent individual differences in behaviour. It is possible that some of the personality differences in humans have evolved because of the fitness benefits of different cooperative strategies occupying different ecological niches. The theory of strong reciprocity (e.g. Gintis et al, 2003) postulates that human populations have a mix of individuals with different altruistic pre-dispositions- cooperators, non-cooperators, and punishing cooperators (i.e. strong reciprocators). Indeed, experimental evidence has shown that people seem to fall into three distinct, stable behavioural categories- unconditional cooperators, reciprocal cooperators, and free-riders (Fischbacher, Gächter and Fehr, 2001, Kurzban and Hauser, 2005). In experimental contexts, the unconditional cooperators give money in a public goods dilemma, even at a cost to themselves, whereas the freeriders always try to maximise their own benefits by employing a deceitful strategy. Reciprocal cooperators, in turn, use a conditional strategy by cooperating only if others do so, but refrain from cooperation when interacting with cheats. Interestingly, computer simulations have found similar kinds of behavioural consistencies leading to stable co-existence of different types of altruistic strategies (Bowles and Gintis, 2004, Lomborg, 1996). When these strategies exist in a polymorphic equilibrium, the pay-off for different strategies should be similar. Kurzban and Houser (2005) demonstrated that irrespective of the composition of the experimental groups, different player types earned similar sums of money over the course of their experiment. Furthermore, recent evidence has suggested that cooperative tendencies have a large genetic component (Cesarini et al, 2008, Knafo et al, 2007), complementing the simulation and experimental data on individual differences in cooperativeness.

Traditionally, personality differences have been viewed as nonadaptive variation surrounding the adaptive mean. However, there is increasing evidence that the differences can be adaptive rather than just a product of random genetic variation (Bell, 2007, Dall,

Houston and McNamara, 2004, Nettle, 2006, Wilson, 1998). There is some evidence in both humans (Nettle, 2005) and other species (Dingemanse et al, 2004, Dingemanse and Reale, 2005), that differences in personalities can have direct fitness consequences. Nettle (2005), for example, demonstrated that extraversion, probably one of the most studied individual differences in humans, is adaptive in males, leading to better mating success. Many of the personality traits in humans have substantial genetic influence (Jang, Livesley & Vernon, 1996, Bouchard and Loehlin, 2001, Oers et al, 2004), and are controlled, proximately, by genetic polymorphism in genes controlling for neurotransmitters, such as the serotonin, dopamine and oxytocin receptor genes (Ebstein et al, 1997, Benjamin, Ebstein and Lesch, 1998, Cravchik a& Goldman, 2000, although see Jonsson et al, 1998). For example, Knafo et al (2007) found that polymorphism in the gene AVPR1, which produces vasopressin-detecting receptors in the brain, is associated with cooperative behaviour in the dictator game. Knafo et al discovered that individuals who possessed a shorter version of the gene were more likely to make selfish offers in the game experiment. Interestingly, other studies have found that vasopressin and oxytocin play an important role in trusting behaviours in social dilemma games (Kosfeld et al, 2005, Zak, Kurzban and Matzner, 2005). The role of neurotransmitters in social exchange was also demonstrated by Crockett et al (2008), who, by experimentally manipulating serotonin levels, discovered that diminished serotonin led to more rejections of unfair offers in an ultimatum game. Thus, the existence of cooperative personalities in humans is underpinned by the findings of polymorphism in genes that control for neurotransmitters that regulate social interactions.

The question is, then, how are these different behavioural phenotypes maintained? It is possible that these alternative behavioural strategies (or continuum of strategies) confer adaptive advantages for phenotypes occupying a wide range of niches in an evolutionary equilibrium (Buss, 1991, MacDonald, 1995). Moreover, Penke, Denisser and Miller (2007)

suggested that individual differences are maintained because of heterogeneity in human environments. If the fitness benefits of behaviour (e.g. cooperativeness) vary across space and time, genetic diversity becomes a necessity as different behavioural strategies yield different survival and reproductive rates. It is likely that the different personality traits co-exist in equilibrium, and the success of a strategy depends on the strategies of other individuals in a given population. The importance of frequency-dependent selection has been empirically demonstrated in several species (Gross, 1991, for bluegill sunfish, Johnson, 1982, for snails, Levin, 1988 for bacteria), and it has been suggested that this could also explain some aspects of individual differences in humans (Ding et al, 2002, Faurie and Raymond, 2005, Nettle, 2006). Aviles (2002) suggested that the frequencies of cooperators and free-riders fluctuate in populations, free-riders increasing in frequency when rare, but being selected against when becoming more common. Furthermore, Mealey (1995) speculated that the existence of psychopaths, individuals who callously exploit others, could be a result of negative frequency dependent selection. In this view, playing the “cheater strategy” only pays off when the existence of the phenotype is relatively rare. If the trait becomes more common, the fitness benefits decrease, probably because other individuals would be more aware of the existence of the cheats, and the cheats would also waste time and resources when encountering other individual with a similar strategy. Positive frequency dependent selection, in turn, occurs when the fitness of a phenotype increases the more abundant it becomes. This could explain the evolution of altruism- when altruistic individuals come into contact with increasing numbers of other altruists, the fitness of the altruistic phenotype increases. Although the exact mechanism and fitness benefits of human cooperative strategies are not well known at the moment, it is clear that individuals do differ in their proneness to cooperate (e.g. Hauser and Kurzban, 2005), and that this variability is, at least partly, under genetic influence (Cesarini et al, 2007). One of the aims of the present thesis is to look at how

some individual differences (namely Machiavellianism and Emotional Intelligence) affect cooperation, and how these differences might affect nonverbal behaviour of the individual.

1.5 Ultimate causes of sex differences in social sensitivity

There is an abundance of research evidence showing a sex difference in the capacity to deal with social information. Females, both children and adults, are more expressive than males are (LaFrance, Hecht and Paluck, 2003, Provine, 2000), and perform better in decoding emotional facial expressions (Hall et al, 2000, Rotter and Rotter, 1988, Thayer and Johnsen, 2000). Females score higher on measures of Theory of Mind (Baron Cohen, 2003, Baron-Cohen, Knickmeyer and Belmontel 2005) and Emotional Intelligence (Schutte et al, 1998). Overall, females are better in processing and sending out signals that facilitate social interactions. The proximate causes for the sex differences in the social arena incorporates factors such as brain functioning, neurotransmitters, and pre-natal and circulating hormones (Adkins-Regan, 2009, Knickmeyer, Baron-Cohen and Raggat, 2006, Schulte-Ruther et al, 2008). At a neural level, a recent study found that when processing social information, females recruit areas containing mirror-neurons more than males do (Schulte-Ruther et al, 2008), which could provide a possible proximate mechanism facilitating sex differences in social cognition. Ultimately, the superiority of women in reading and sending out nonverbal messages is probably a result of evolutionary pressures for heightened social sensitivity needed for competing and forming alliances in non-kin based social networks (Vigil, in press).

The evolutionary history behind sex differences in social styles can be explained by male philopatry and female dispersal from natal groups. This kind of social system is characterised by males staying in their place of birth, forming coalition with relatives to

defend their territory. The need for coalitionary defence has probably resulted in prominent sex differences in in-group/out-group behaviours, which Van Vugt (in press) coined as the Male Warrior Hypothesis. According to Van Vugt (in press), coalitions against outsiders brought fitness benefits for males in patrilocal societies, as losing a conflict would have had adverse effects on their inclusive fitness. Interestingly, the same pattern of male coalitional warfare is found in chimpanzees, who are, incidentally, a philopatric species as well (Wrangham and Peterson, 1996), suggesting phylogenetic continuity in social structures leading to sex differences in aggression.

The sex differences in humans are also prevalent in how social relationships are formed and maintained. Males are characterised as forming less close and supportive relationships than females do, basing their friendship in interacting in large, activity-based groups. Males, being the philopatric sex, did not need the social sensitivity when interacting with familiar individuals in their natal group. Ancestral females, instead, avoided inbreeding by dispersal, and settling in a new group consisting of unrelated individuals. Females had the need to evolve more social sensitivity, as the relationships formed with individuals in their new social groups were more fickle in nature than relationships with related individuals.

1.6. Costly signaling theory?

Although the theory of reciprocity explains some of the incidences of altruism in humans, it fails to account for instances where a one-shot risky rescuing is performed, saving the life of a stranger. These extreme altruistic acts might be better explained by theories such as the Costly Signaling Theory (CST). According to the CST, individuals send out a signal about their hidden attributes by exhibiting wasteful behaviours, such as unconditional generosity (Bliege Bird and Smith, 2005). Heroic rescuing could work as an honest signal of

underlying genetic quality, as only good-condition individuals can afford to perform and survive such an act. Interestingly, previous studies have found that it is mainly males who conduct physically risky rescues (Becker and Eagly 2004, Johnson 1996) and that females show a preference for heroic males (Farthing, 2005, Kelly and Dunbar, 2001). According to Farthing (2005) "...a male who has the skill, strength, and vigor to take unnecessary risks would also have the traits necessary for more practical risky activities involved in provisioning and protecting females and their offspring. In addition, such a male presumably has good genes, which would make him a desirable mating partner" (pp.172). It is possible that risky, altruistic rescuing in humans has evolved as a costly signal indicating good genetic quality of a male. One of the aims of the present thesis is to investigate this further by looking at instances of real-life rescuing incidences in more detail.

1.7. Summary and outline

In the light of the literature reviewed above, this thesis will address the following topics:

Chapter 2: The relationship between Machiavellianism, Emotional Intelligence and Nonverbal Communication in a Prisoner's Dilemma game

Chapter 2 will investigate how nonverbal communication (NVC) and personality affects cooperative decision making in a Prisoner's Dilemma game. The experiment will investigate (i) the existence of nonverbal signalling, (ii) the existence of individual differences related to cooperativeness (namely, Machiavellianism and emotional intelligence), (iii) the relationship between individual differences in Machiavellianism and emotional intelligence, and non-verbal communication, (iv) the relationship between nonverbal signals and ratings of trustworthiness and (v) the relationship between individual

differences in Machiavellianism and emotional intelligence, and ratings of trustworthiness

Chapter 3: Individual differences in social judgement- what accounts for accuracy in perceiving honesty?

In chapter 3, individual differences in social judgement will be investigated. In experiment 1, the role of emotional intelligence and Machiavellianism in judging the Big Five traits in friends and strangers will be investigated. In experiment 2, the role of social intelligence in assessing trustworthiness will be explored.

Chapter 4 Theory of Mind and Machiavellianism

In this chapter, the relationship between Theory of Mind and manipulateness in the form of Machiavellianism is studied. If Machiavellianism has evolved as a successful cheater strategy, it would be expected that high-Machs are good in understanding the intentions of others. However, it is equally possible that individuals who are less manipulative and more cooperative (i.e. the low-Machs) are superior in ToM tasks, as social intelligence might have been a result of Green Beard altruism, the need for altruists to recognise the same trait in others.

Chapter 5 Mach no mates? The role of Machiavellianism and sex in the evolution of friendships and social networks

Chapter 5 will assess how sex and Machiavellianism affects the maintenance and formation of social networks. It is expected that males, having evolved in social surroundings

consisting of closely related individuals, have less need than females for emotional sensitivity that might be crucial when interacting with unrelated conspecifics. However, males would have benefited from the capacity to form large coalitional networks, in order to successfully collaborate in territory defence. Thus, males are expected to obtain lower scores on a scale that measures warmth and closeness of relationships, but higher on a scale that measures the size of the social networks. The importance of female dispersal during evolution, in turn, might have led to enhanced sensitivity in social relationships, as females had to bond and form alliances within their new group after dispersal from their natal territory. Thus, it is expected that females would score higher on the warmth and closeness of friendship, whereas the size of the network probably is not of that great importance.

In order to be capable of maintaining close, reciprocal relationships, a person would be expected to behave in other-regarding manner, rather than placing themselves before others in order to gain maximum benefits from the interactions. It is expected that people with a Machiavellian social style are characterised by putting less importance on friendships. However, Machiavellian individuals might be capable of forming loose ties with a large number of people at the same time, as this would lead to maximum benefits in terms of the number of potential individuals they can exploit.

Chapter 6. Who are the heroes? Characteristics of people who rescue others

Some forms of altruism, such as risky rescuing of unrelated, unknown individuals, have evolved under selection pressures very different from those dealing with reciprocal interactions amongst friends. Risky rescuing behaviour presents an evolutionary puzzle, as it is hard to understand how the genes promoting life-threatening behaviours could be maintained in the population when kin-selection explanations are ruled out. One possibility is that heroic rescue has evolved as a condition-dependent costly signal, showing something

about the quality of the individual as a potential sexual or social partner. If this is the case, it would be expected that males with poorer status (i.e. lower socio-economic background) are more likely to risk their lives in order to save another person. Individuals in poorer conditions might have less to lose and more to gain when risking an injury or loss of life, as the benefits of being labelled as a hero might increase their status, and lead to more social and mating opportunities. The study in this chapter will look at different characteristics of heroic individuals, utilising newspaper archives in analysing the context of risky rescues.

2. Relationship between Machiavellianism, Emotional Intelligence and Nonverbal Communication in a Prisoner's Dilemma game

Abstract:

The present chapter considers how nonverbal communication (NVC) and personality affects cooperative decision making in a Prisoner's Dilemma game. Theoretically, if altruism has evolved because altruistic individuals show preference for interacting with each other, it is expected that cooperativeness relates to nonverbal behaviour, which could function as a form of Green Beard (Dawkins, 1976). Moreover, non-cooperative personalities (i.e. high-Machs) should lack cooperative signaling, which should affect decision making of their partner in a PD game. Participants (N=80) interacted in dyads of friends (N=20) and strangers (N=20) before deciding how to share money in a PD game. It was found that defectors and cooperators did not show any differences between their Emotional Intelligence (EI) and Machiavellianism scores, nor in the amount of nonverbal behaviour. Moreover, individuals who defected did not appear to do so because their partner was less expressive or had a higher Machiavellianism score. However, in strangers (but not friends), predictions of cooperation were related to the Mach scores of the partner: people who interacted with high-Machs thought that it was less likely that their partner would cooperate. However, Machiavellianism was not related to any of the measured nonverbal behaviours. The results are discussed with a reference to evolutionary theory.

Note: Part of the chapter has been published in Lyons, M., & Aitken, S (2008) Machiavellianism in strangers affects cooperation. *Journal of Evolutionary Psychology*, 6, 173-185.

2.1 Introduction

Altruist detection

One of the main theoretical perspectives behind the evolution of altruism is the idea of altruist recognition, or the so-called Green Beard Effect (Dawkins, 1976). It is possible that during evolution, there were assortative interactions between altruistic individuals, leading like-minded characters to mingle with each other (Wilson and Dugatkin, 1997, Frank, Gilovich and Regan, 1993). Theoretically, altruism is an Evolutionarily Stable Strategy (ESS) if altruists are interacting preferentially with each other, and rejecting non-altruists as interaction partners. Computer simulations have provided some theoretical support for the plausibility of Green Beard Effect in driving the evolution of altruism (Riolo, Cohen and Axelrod, 2001, Jansen and VanBaalen, 2006). If altruists are, indeed, benefiting from mutual co-operation with each other, this would require that a) people have phenotypic altruistic characteristics and/or send out signals that aid in identifying their altruistic tendencies and b) altruistic individuals are especially sensitive to the characteristics/signals sent by other altruists.

There is some evidence for genetically linked altruistic signaling in species such as lizards (Sinervo et al, 2006) and social amoebas (Queller et al, 2003). Sinervo et al (2006), for example, discovered that in side-blotched lizards, males who have blue throats cooperate together in guarding their mates. At least in this species, blue throats indicate some form of genetic similarity, and reinforces cooperation between unrelated individuals. The existence of altruistic signaling in humans is still largely unresolved, and the main aim of the present chapter is to shed some light on the topic.

Research has shown that people have some capacity to distinguish between cooperators and defectors (Brosig, 2002, Brown, Palameta and Moore, 2003, Cosmides and

Tooby, 1992, Frank, Gilovich and Regan, 1993, Verplaetse, Vanneste and Braeckman, 2007, Yamagishi et al, 2003). Furthermore, this recognition ability seems to translate into behavioural decisions- in experimental settings, individuals refuse to cooperate with others who they rate as untrustworthy, and prefer to interact with partners who they think can be trusted (Gächter, Herrmann and Thoni, 2004). At present, it is unclear what cues are used in this process. Frank (1988) suggested that recognition accuracy is related to nonverbal communication, which could function as a form of a Green Beard. Previous research has found that nonverbal behaviours such as smiling (Mehu, Grammer and Dunbar, 2008), head nods (Brown, Palameta and Moore, 2003) and eye gaze direction (Gueguen and Jacob, 2002) are used when people are signaling cooperative intentions. Moreover, the nonverbal signals are used when people are trying to assess the trustworthiness of another person (Brown, Palameta and Moore, 2003, Verplaetse, Vanneste and Braeckman, 2007).

Verplaetse, Vanneste and Braeckman (2007), for example, showed that people were accurate in distinguishing cooperators from non-cooperators in snapshot pictures taken during a prisoner's dilemma game. The authors speculated that this accuracy was related to emotional leakage by the defectors, which could be identified in their facial expressions. Another study by Brown, Palameta and Moore (2003) found that participants who scored highly on a self-reported altruism scale smiled and nodded more than low scorers, and were rated as being more concerned about others' welfare than low scorers. It seems that the nonverbal behaviours were accurately used in predicting altruism of the other. Other research has discovered that smiling is related to favourable first impressions (Riggio and Friedman, 1986) and ratings of trustworthiness (Eckel and Wilson, 2003). However, the role of facial expressions in cooperative decision making is still a very much under-researched area of study.

Although lie-detection literature has found that people are relatively poor in assessing

honesty, lie detection ability relies heavily on the type and context of the lie. Warren, Sheltrel and Bull (2009), for example, recently demonstrated that when people were assessing defection with emotional content, detection accuracy was significantly above chance. In their study, participants were guessing whether an individual was lying about a video-clip containing emotional or neutral images. The lies with an emotional context were easier to recognize, indicating the importance of emotional leakage in the face. The link between facial expressions and altruism is probably due to emotional processes in social interactions.

According to DeWaal (2008), altruistic decision making is likely to involve affect, which can be recognized in the facial expressions of the altruist. Frank (1988), amongst others, suggested that we can identify cheaters and cooperators through emotional leakage in the face. If empathy is a driving force behind altruism, and is manifested in the nonverbal channel, people should be able to reliably read the cooperative signals in others. Some studies have found that individuals can predict at above chance level if another person cooperates or defects in an experimental game setting (Frank et al, 1993, Pradel, Euler and Fetchenhauer, 2009). However, what cues are used in this process is still to be demonstrated.

Nonverbal communication- Eye gaze

Eye gaze, or looking in the direction of the other, is a powerful signal indicating an interest in the interaction. Gazing is of paramount importance in human and non-human primate communication- so much so, that primates have evolved special neural circuitry for processing the gaze direction of others (see Langton, Watt and Bruce, 2000). Not only does gaze tell us where the attention of the other is, but eyes convey a wealth of information about mental and emotional states as well (see Frischen, Bayliss and Tipper, 2007, for an excellent recent review, and Doherty, 2006 and Povinelli and Vonk, 2004 for an opposing view).

Many species have evolved the capacity to distinguish between direct and averted gaze, which, according to Emery (2000), could have provided an essential tool for survival- if a predator is looking at you directly, it is more likely to be aware of your existence, and the probability of an attack is high. In addition, in many species, eye gaze communicates dominance and submission.

In humans, eye contact plays many roles in facilitating social interactions from altruistic transactions to attracting a mate. Fink and Penton-Voak (2002), for example, speculated that eye-gaze plays an important role in facial attractiveness- direct gazing between the opposite sexes, indicating interest in the other, is important when rating beauty in others. This agrees with Mason, Tatkov and Mcrae (2005), who found that female faces that were initiating eye-contact were rated as more attractive than faces that were disengaging from eye-contact. Interestingly, this effect was only found when males were rating the faces. For females who were rating female faces no such pattern was found. Moreover, Jones et al (2006) found that the social context of eye gaze is important as well. In their study, direct eye-contact was rated as more attractive when accompanied by a smile rather than a neutral expression. However, neutral expression was rated as more attractive than smiling when the stimulus face was looking away from the judge. This would suggest that when the observer perceives that the other has got an interest in him/her (as judged by the direction of the gaze), it is better that the attention is accompanied by positive emotions.

Moreover, probably because of the social significance of the information contained in the eyes, people have attentional biases towards eyes that are looking at them directly (Baron-Cohen, 1995, Conty et al, 2006). We seem to be sensitive to the feeling of “being looked at”, and undeniably, experimental evidence implies that this feeling induces cooperation and altruism.

For example, Kleinke and Singer (1979) found that people were more likely to take a leaflet given by a confederate who was gazing at them directly, rather than glancing away. Similarly, Gueguen and Jacob (2002) had two confederates ask people to participate in a mock survey. They discovered that the length of gaze matters as brief eye-contacts elicited less participation from females than glances with longer duration. This cooperation might be, at least partially, induced by the notion of likability. Gazing can create an impression of honesty: people who gaze more are seen as being more credible and truthful (Argyle and Cook, 1976). Gazing could function in providing a signal indicating a high likelihood of cooperation by the person who engages in eye contact.

Gaze aversion, in turn, has been related to shyness and social anxiety, and also psychopathic and narcissistic tendencies (Farabee et al, 1993, Izuka, 1994, Larsen and Shackelford, 1996). If averted gaze is typical of psychopaths and narcissistic individuals, who are less cooperative and more self-regarding, this should warn the observers about a reduced likelihood of cooperation by the other. Not only are we using eye gaze as a signal about the quality of the person, but eyes seem to be a strong cue eliciting altruism, even in experiments where people are exposed to pictures of eyes (Bateson, Nettle and Roberts, 2006).

Interesting recent studies have found that economic behaviour is affected by the presence of artificial eye stimulus. Haley and Fessler (2005), for example, discovered that when people were playing an economic game, more money was donated if their computers had a backdrop consisting of eye stimulus rather than having a neutral backdrop. Another study found that subjects donated 29% more money in a public goods game when being watched by a picture of a robot (Burnham and Hare, 2007). In a similar vein, Bateson, Nettle, Roberts (2006) found that people were donating more money to an honesty box in a University staff café on weeks when a picture of pairs of eyes were put near to the donation box.

This evidence ties in with theories of indirect reciprocity and reputation in maintaining altruism (Nowak and Sigmund, 1998). If we are likely to receive indirect benefits when behaving altruistically, it would be helpful if somebody was observing these altruistic acts when they are being performed.

When eye contact is used in more naturalistic, dyadic interactions, it communicates the quality of the relationship. Gaze is used, amongst other things, to collect information, regulate interaction, communicate liking, intimacy and involvement between two people (Coker and Burgoon, 1987, Guerrero, 2005, Kleinke, 1986, Knapp & Hall, 2006). It would be expected that people who gaze more are more interested in the interaction which, in turn, should lead to increased willingness to cooperate with the other.

Nonverbal communication- Head nods

Head nods have an important function as both a linguistic tool (McClave, 2000) and as a signal encouraging and rewarding the other person during interaction (Knapp and Hall, 2006). Nodding can signify involvement, supportiveness and understanding in what the other person is talking about (Clark and Krych, 2004, Knapp and Hall, 2006), all of which are essential when cooperative actions are taking place in real-life settings. It is possible that the feeling of rapport is related to the amount of head nods displayed, especially in pairs of strangers (Bernieri et al, 1996). The amount of head nods displayed when talking and listening could be part of a stable personality trait characterized by being altruistic. In relation to nodding in a cooperative context, Brown, Palameta and Moore (2003) discovered that cooperativeness in the form of self-reported altruism was positively correlated with head nods. The authors suggested that head nods could be interpreted as a display of honesty, and could have a function in inducing cooperation. Not only is nodding likely to induce

cooperation from the interaction partner, but nodding might also function in increasing cooperative tendencies of the person who is performing the nodding movements. There is some experimental evidence for this.

Wells and Petty (1980), for example, asked their participants to either nod or shake their heads while listening to personal stereos, thinking that they were testing the quality of the gadgets. After that, participants were asked to rate how much they would agree with a persuasive message. Wells and Petty (1980) discovered that the nodding participants were significantly more likely to agree than the head shaking participants were (Wells and Petty, 1980). Another similar study found that individuals who were asked to nod in an experimental situation showed a preference for a neutral object, whereas individuals who were shaking their heads established a dislike for the same objects (Tom et al, 1991). Wells and Petty claimed that nodding does, in fact, induce feelings of approval and favourable thinking, whereas head shakes have the opposite effect. It seems that producing the movement alone affects our behaviour and attitudes, even when the purpose of the nodding is masked in experimental situation (i.e. instructing participants to nod in order to test the quality of personal stereos) (Wells and Petty, 1980). Based on the studies reviewed above, it would be expected that cooperative decision making is influenced by head nods- people who nod more should be cooperative, and trusted more by other people than people who nod less.

Nonverbal communication- Smiling

Smiling is a frequently observed facial expression that could have evolved as a social signal facilitating cooperative interactions. There is some empirical evidence that smiling is related to positive social outcomes. For example, Godoy et al (2005) found that in a farming and foraging society, smiling was related to social capital, indicating that people who smiled

more managed to hold more long-term cooperative relationships. Moreover, Tidd and Lockard (1978) reported that smiling by restaurant waiters was positively correlated with the monetary value of service tips they received from customers.

There is also some laboratory experimental evidence that smiling induces trust and cooperation (Brown, Palameta and Moore, 2003, LaFrance and Hecht, 1995, Scharlemann et al, 2001). LaFrance and Hecht (1995), for example, found that pictures of transgressors (i.e. people who were labeled as plagiarists) were judged more leniently if they displayed smiles than if they had a neutral facial expression. The smiling plagiarists were rated as more trustworthy, which affected the leniency of the judgment. Similarly, pictures of smiling faces induced higher levels of trust and cooperation in a one-shot trust game amongst strangers (Scharlemann et al, 2001). Brown, Palameta and Moore (2003) discovered that altruism was related to expressivity, and that the smiles of altruistic people were shorter and more symmetrical than the smiles of non-altruists. Self-reported altruism is, in turn, correlated with decisions to cooperate in Prisoner's Dilemma-like scenarios (Brown, Palameta & Moore, 2003). These findings together would suggest that smiling is used as an honest signal, indicating the willingness to cooperate. More support for smiling in humans as a Green Beard signal comes from studies indicating that genuine smiles are hard to fake (e.g. Ekman, Davidson and Friesen, 1990), and are therefore likely to be honest signals of the quality of the other as an interaction partner. Moreover, others seem to have the capacity to recognize enjoyment smiles, both consciously and at a more subconscious level. Miles and Johnston (2007), for example, found that people were accurate in labeling true smiles as expressions denoting happiness, and that people who were primed with true smiles chose more positive words than people primed with fake smiles or neutral expressions. Thus, not only do we express feelings of pleasure and enjoyment by honest smiles, but others seem to be capable of recognizing these emotional states in others as well.

Individual differences in cooperativeness- Machiavellianism

When it comes to the issue of trustworthiness, humans seem to exhibit strong individual differences in cooperativeness (Gunnthorsdottir et al, 2002, Kurzban and Houser, 2005, Ishii and Kurzban, 2008). It has been suggested that these differences are adaptations (Kurzban and Houser, 2005), the different types co-existing in an evolutionary equilibrium. Mealey (1995), for example, speculated that the existence of consistently cheating and manipulating individuals, psychopaths, is probably a result of frequency dependent selection. When the non-cooperative psychopaths are rare, they do well in the population. However, if the cheaters were to start increasing in numbers, they would soon run out of people to exploit, as their victims would become cautious about cooperation. Interestingly, it seems that cooperativeness and deceitfulness are part of the same personality trait that varies in a continuum (Ashton, Lee and Son, 2000). In fact, Ashton, Lee and Son (2000) suggested that “honesty” should be labelled as the sixth stable personality trait amongst the well-established Big Five.

One personality characteristic that relates to cooperativeness, honesty and trustworthiness is Machiavellianism, a trait manifested by manipulateness, cynicism and self-interested behaviours (Wilson, Near and Miller, 1996). Research has linked Machiavellianism with deception in laboratory experiments. In a study by Gunnthorsdottir, McCabe & Smith (2002), for example, individuals scoring high on a scale measuring Machiavellianism consistently failed to reciprocate cooperation. On the other hand, these high-Machs can also come across as charming and intelligent, due to their ability to manipulate the emotions of others, leading Wilson et al. (1996) to define Machiavellian behaviour as “a strategy of social conduct that involves manipulating others for personal gain, often against the other’s self-interest”. There is some evidence that Machiavellianism does, in fact, bring financial benefits to the high-Mach individual. For example, Machiavellianism has

been related to an increased sales performance in used car salesmen and estate agents, (Aziz, 2004, 2005). In order to successfully persuade somebody to buy a product that often might be over-priced and faulty, callousness and emotional detachment (characteristics of high-Machs) is probably of great benefit.

As well as pointing at the success of high-Machs as manipulators of others, there is some evidence that people have the capacity to recognize Machiavellian individuals. A study by Wilson, Near and Miller (1998) employed the use of fictional story characters written by high and low -Machs. When the characters were assessed by the participants in the study, they were judged as being exploitative, and consequently rejected as potential social partners. Despite this intriguing finding, there is little research as to whether people have the ability to detect high-Machs in face-to-face interactions, and if they can, how this affects their cooperative behaviour.

It remains unclear whether people would refuse to cooperate with high-Machs in face-to-face interactions, or whether high-Machs could disarm their opponents, and come across as being charming and cooperative. It would be expected that people have some ability to accurately judge the Machiavellianism of another person during a face-to-face interaction. Although there is some evidence that individual differences in personality are manifested in differences in nonverbal communication (Borkenau and Liebler, 1992, Campbell and Rushton, 1978, Gifford, 1994, although see LaFrance, Heisel and Beatty, 2004 for criticism), the relationship between Machiavellianism and non-verbal communication is unclear. There are relatively well established links between emotions and facial expressions (see Parr and Waller, 2007), and Machiavellianism and emotional coolness (Austin et al, 2007, Christie and Geis, 1970) indicating that Machiavellianism could potentially be related to the lack of appropriate facial expressions in cooperative social context. The absence of correct, honest signaling could lead to suspicions about the genuineness of the person, and withdrawal of

cooperation.

Individual differences in cooperativeness- Emotional Intelligence

The other dimension of the personality construct of Machiavellianism, according to Andrew, Cooke and Muncer (2008) is a type of social intelligence called Emotional Intelligence (EI). EI has been defined as a skill that allows people to monitor the emotions of themselves and those of other people, and use this ability to influence the behavior of the self and the others (Salovey and Mayer, 1990). Interestingly, recent research has found that Machiavellianism and EI are negatively correlated with each other (Austin et al, 2007), leading Andrew, Cooke and Muncer (2008) to suggest that they could be the two poles of the same personality construct. Although the construct validity of EI remains unresolved (Keele and Bell, 2008), it is a well-researched area of personality evidenced by a large number of research articles that include “emotional intelligence” published since 1993.

There has not been much research on the role of emotional intelligence in promoting cooperation in a laboratory environment. However, different strands of research have demonstrated that EI promotes social success in both laboratory settings and in real life. A recent brain imaging study, for example, provided some support for the superiority of emotionally intelligent people in processing of social information (Reis et al, 2007). When presented with a version of the Wason-selection task, more emotionally intelligent individuals were able to process information related to social exchange faster than less emotionally intelligent individuals. EI scores also predicted enhanced activity in the left frontal polar region and the left temporal cortex of the brain during the reasoning task. This evidence points at the possibility that EI has a neuronal base, and that people with higher EI understand cooperative interactions with more ease than people with lower EI.

EI also seems to be related to multiple positive outcomes in life, such as performance in a job interview (Fox and Spector, 2000), satisfaction with personal relationships (Lopes, Salovey and Strauss, 2003, Lopes et al, 2004), pro-social orientations (Lopes et al, 2005), social competence and sense of humor (Yip and Martin, 2006) and the size of social network (Austin, Saklofske and Egan, 2005). Charbonneau and Nicol (2004), for example, investigated the relationship between self-reported emotional intelligence and peer-reported pro-social behaviours in a group of adolescents in a training camp. They found a positive correlation between emotional intelligence and other-rated altruism. It seems that people with high EI have the capacity to form and maintain long-term relationships, and are well-liked amongst their peers. It follows then that EI is expected to be related to laboratory measures of cooperativeness. The positive pro-social orientations should also be visible in the nonverbal channel, with the expectation that high emotional intelligence transfers to positive displays of emotion (e.g. smiling) and involvement in the interaction (e.g. gazing and nodding).

Machiavellianism, EI, cooperation and Nonverbal Communication in friends and strangers

Although EI and Machiavellianism are both well-researched constructs, it is not clear, at the moment, how individual differences affect interactions between friends and strangers. Although high-Machs, for instance, are characterized as being deceitful and cynical, it would be expected that they can monitor and change their behaviour when interacting with friends (Wilson et al, 1998). Moreover, it is not known how the issues of trustworthiness, cooperation and facial expressions might be affected by how well the participants know each other. Context and strength of a relationship has a fundamental influence on how people behave in experimental settings (Wagner and Smith, 1991, Tice et al, 1995, Thomas and

Fletcher, 2003, Wong and Hong, 2005). Thomas and Fletcher (2003), for example, found that the strength of acquaintanceship was a strong predictor of the capacity to read the mind of the other. Therefore, it would be expected that friends reach a higher accuracy in predicting cooperation than strangers do. Furthermore, it is more likely that friends base their predictions on previous experience, rather than on nonverbal behaviour in the experimental situation.

This study, then, aims to provide some preliminary evidence for the role of nonverbal communication, Machiavellianism and Emotional Intelligence in cooperative decision making in pairs of friends and strangers. Although there is some evidence that people are accurate in distinguishing cooperators and cheaters (Frank, Gilovich and Regan, 1993), and that nonverbal communication is related to self-rated altruism (Brown, Palameta and Moore, 2003), no studies have looked at actual cooperation, facial expressions, personality and impressions of trustworthiness together. Moreover, previous studies have concentrated on interactions between strangers (Frank, Gilovich and Regan, 1993), or have looked at cooperation in an anonymous laboratory setting where people are interacting via computer monitors (Gunnthorsdottir et al, 2002, Kurzban and Houser, 2005). This study aims at looking at personality, nonverbal communication and cooperation in face-to-face interactions between friends and strangers. Predictions of the study are the following:

Hypothesis 1. Cooperators are expected to score higher on Emotional Intelligence, whereas defectors should be higher in Machiavellianism. Cooperators are also expected to send out signals of their cooperativeness, thus engaging in more nodding, smiling and eye gaze than non-cooperators. **Thus, cooperators are predicted to have more pro-social personalities, and engage in more pro-social behaviours than non-cooperators.**

Hypothesis 2. Defection might occur because an individual does not trust her/his

partner. If people are somehow able to recognize high-Machs (Wilson, Near and Miller, 1998), this should affect the decisions they make in a Prisoner's Dilemma. Thus, partners of high-Machs are expected to defect in the Prisoner's Dilemma game. Lack of trust might also be related to the nonverbal behaviours of the partner. It is expected that partners of defectors smile, nod, and gaze less than partners of cooperators. **It is expected that partners of defectors engage in fewer pro-social behaviours, and have fewer pro-social personality characteristics than partners of cooperators.**

Hypothesis 3. Individuals base their impressions of honesty on nonverbal characteristics and personality of the partner. Machiavellianism, head nods, smiling and gazing are predicted to be negatively correlated with expectations of cooperation. **Thus, personality and nonverbal behaviours affect the ratings of trustworthiness.**

Hypothesis 4. Even when dealing with strangers, people seem to be accurate in predicting who is a cooperator and who is a defector (Frank, Gilovich and Regan, 1993). **Thus, people are expected to reach higher than average accuracy in their predictions of cooperation.**

Hypothesis 5. If people do give out cues of cooperativeness, individuals should base their assessment of trustworthiness of the partner on these cues. People who are accurate in predicting cooperation have partners who are low on Machiavellianism, and smile, gaze and nod more than partners of people who are wrong in their predictions. **It follows then that accuracy of prediction should be based on the NVC and personality of the partner.**

Hypothesis 6. High-Machs, showing a cool and detached inter-personal style, should engage in less pro-social behaviours, such as smiling, nodding and gazing at the others. EI, in turn, should be related to increased number of pro-social behaviours. **Thus, Mach scores should be negatively correlated with the duration of gaze and smiling, and the number**

of nodding and smiling bouts. EI scores should be positively correlated with the duration of gaze and smiling, and the number of nodding and smiling bouts.

2.2 Method

2.2.1 Participants

Eighty subjects participated in the study. Their mean age was 26.8 (9.7 s.d). Males (N=40) were slightly, but not significantly older than females (N=40) (27.4 years, 8.4 s.d, and 27.0 years, 11.3 s.d, respectively).

The participants were told that they would be taking part in a study investigating cooperation and decision making, and that they would be paid between £5 and £10 depending on the outcome of the experiment. People turned up for the experiment with a same-sex friend, who was then paired up with either their friend, or with a same-sex stranger from another pair. Ten of the pairs were female friends, ten were female strangers, ten were male friends and ten male strangers.

2.2.2 Materials

(i) *Machiavellianism scale* (Christie and Geis, 1970)

Machiavellianism was measured using the Mach IV scale devised by Christie and Geis (1970) (appendix 1). This 7-point Likert scale consists of 20 questions asking about the views people have on human nature and the tactics they employ when interacting with others. The possible total scores on the questionnaire range between 20-140. The questionnaire has been widely used in social psychological research, and shows good internal reliability (e.g. Fehr, Samson and Paulhus, 1992, Paulhus and Williams, 2002).

(ii) *Emotional intelligence- The Schutte Self-Report Emotional Scale (SSREI)* (Schutte et al, 1998)

EI was measured using the SSREI scale devised by Schutte et al. (1998). The scale consists of 33 items, which are scored on a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Three of the items are negatively scored. The possible scores on the scale range from 33-165. The scale is easy to use due to relative brevity of the questionnaire (see appendix 2).

(iii) *Team building exercise*

In this pen and paper exercise, participants had to imagine they were setting up a new country, and agree on different aspects of the country (such as the location of the country, the national animal, main source of income and so on) (appendix 3). These types of exercises have been widely used in companies in team building settings. The purpose of the mock exercise was to get participants to communicate together while their facial expressions were covertly recorded.

(iv) *Analysis of the Nonverbal Communication*

Only relatively broad categories of nonverbal behaviours were selected for analysis. Five minutes of each dyadic interaction were analysed. Five minutes was chosen because that was the minimum time of interaction between the pairs. An observer blind to the hypothesis encoded the behaviours of six participants in three pairs in order to get a measure for inter-

rater reliability (Pearson's r). Inter-rater reliability was calculated for the number of nods and smiles, and the total duration of smiles and eye gaze (in seconds) during the five minute interaction. See table 2.1 for definitions of the behavioural categories.

Table 2.1. Behavioural categories, encoding and inter-rater reliabilities

Behaviour	Operational definition	Encoding	Inter-rater reliability
Smile	Corners of lips are drawn up, mouth may or may not be open*	Duration (seconds/5 minute period)	.91
Smile		Number of bouts in 5 minute period	.89
Nod	Continuous up-down movement of the head in the sagittal plane **	Number of bouts in 5 minute period	.93
Gaze	Encoder's eyes in the direction of partners face * *	Duration (seconds/5 minute period)	.93

* Knapp and Hall, 2006 ** Noller, 2005

(v) Analysis of expectations of cooperation

In order to find out whether there is a relationship between cooperative decision making and the expectations of cooperation by the other, subjects were divided into cooperators or defectors depending on their behaviours in the Prisoner's Dilemma game. The likelihood of cooperation by the partner was measured by a Likert-type questionnaire (1=very unlikely to cooperate, 5=very likely to cooperate, see appendix 4), and treated here as an ordinal variable. Although Johnson & Creech (1983) and Zumbo & Zimmerman (1993) maintain that

Likert scales can be treated as continuous variables if there are 5 or more categories, due to a relatively small sample size, non-parametric statistics are used to analyse the scale.

(vi) *Other analytical issues*

Although some researchers suggest the use of Bonferroni corrections when conducting multiple comparisons on the same data set (e.g. Curtin and Shulz, 1998), others have argued against them, suggesting that this might lead to a type 2 error (Moran, 2003, Nakagawa, 2004, Perneger, 1998). When multiple comparisons are conducted in the present study, Bonferroni corrections will not be applied, as there is a risk that significant trends will not become obvious, and null-hypotheses would be accepted when they actually are not correct.

2.2.3. Procedure

On arrival, participants were given the Mach IV and Emotional Intelligence questionnaires to fill in. In addition to that, the Self-reported Altruism scale (Rushton et al, 1989), and the 10-item Personality Inventory (Gosling et al, 2003) were administered (these will be analysed more closely in the following chapter). After that, they were taken into a room with a small table and two chairs that were facing each other. Participants were asked to cooperate in a team-building exercise in which they had to imagine they are setting up a new country, and agree with their partner on different aspects of running the country. They were instructed to spend 10 minutes on this task. The actual length of time participants engaged in the task varied between 5 and 15 minutes. While engaging in the task, participants were filmed on CCTV cameras, which were positioned unobtrusively near the ceiling. When the existence of the cameras was revealed to the subjects after the experiment, only a few people

said that they were aware of the cameras. All subjects gave their consent to use the videotapes for analytical purposes.

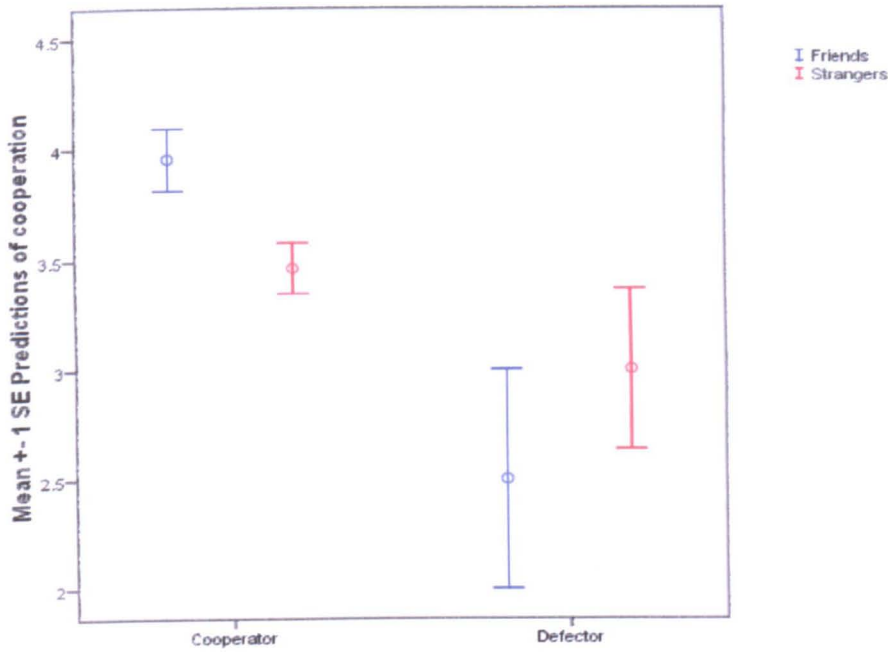
After the team building exercise, participants were separated, and they were presented with a Prisoners Dilemma. They were told to try to predict, based on the previous interaction, whether their partner would cooperate. If both cooperated, they were told they would receive five pounds. If one cooperated and the other defected, they were told that the cooperator would get nothing and the defector would get ten pounds. If both participants defected, they were told that they still would get two pounds each.

After deciding whether to cooperate, participants filled in a Likert-type measurement (1 =very unlikely 2=unlikely 3=can't say 4=likely 5 =very likely) of how likely they thought it is that their partner would cooperate. They were then de-briefed and thanked for the participation. All participants were paid £5, irrespective of the outcome of the PD game.

2. 3. Results

Of the 80 participants, 65 people cooperated and 15 defected. Seven defectors were in pairs of strangers, and eight in pairs of friends. People who cooperated rated the likelihood of cooperation higher than people who did not cooperate (Friends: Mann Whitney U 66.0, $Z=-2.27$, $p=.023$, Strangers: Mann Whitney U 63.5, $Z=-2.01$, $p=.044$, see figure 2.1).

Figure 2.1. Predictions of cooperation in cooperator/defector friends and strangers (1=very unlikely to cooperate, 5= very likely to cooperate)



Hypothesis 1. Cooperators are predicted to have more pro-social personalities, and engage in more pro-social behaviours than non-cooperators.

According to hypothesis 1, individuals cooperate or defect because they are intrinsically more or less pro-social. In addition to this, cooperators are expected to signal their cooperativeness by engaging in more gazing, smiling and nodding. Hypothesis 1 was tested by conducting a series of Mann Whitney U tests using cooperators and defectors as the independent variable, and Machiavellianism, EI , Gaze, Smile and Nods of self and the other as dependent variables. There were no significant differences between cooperators and defectors in their Machiavellianism or EI scores. Between pairs of friends, at least in this sample, high-Machs were no more likely to defect than low-Machs. Similarly, friends who

had higher EI were no more likely to cooperate than friends who had lower EI. Defecting and cooperating friends did not differ significantly in the duration of smiling or gazing, or in the number of head nods or smiles during the measured five minute period. The largest difference was found in the smile duration of cooperating and defecting friends- the defectors smiled longer during the interaction than the cooperators did. However, the difference was not statistically significant (Mann Whitney U 73.0, $Z=.137$, $p=.091$) (see table 2.2 for means and appendix 5 for Mann-Whitney test results).

In a similar way as in pairs of friends, defecting and cooperating strangers did not differ significantly in their Mach or EI scores, or in their smiling, gazing or nodding. The highest differences were found between the Mach scores of defecting and cooperating strangers- defectors scored marginally more (73.9 than cooperators did (65.9). However, the difference was not statistically significant (Mann Whitney U 68.5, $Z=-1.675$, $p=.095$).

Hypothesis 2: It is expected that partners of defectors engage in fewer pro-social behaviours, and have fewer pro-social personality characteristics than partners of cooperators

Hypothesis 2 postulates that people defect because they expect their partners to defect. Thus, it is expected that defectors have partners who engage less in smiling, gazing and nodding. In addition, defectors are expected to have high-Mach and low EI partners. Again, a series of Mann Whitney U tests were conducted in order to find out whether cooperators and defectors had partners who were significantly different in their nonverbal behaviours, Machiavellianism, and EI. Table 2.3 shows that cooperating and defecting friends did not differ in their nonverbal behaviours or the personality measurements

Table 2.2 Machiavellianism, Emotional Intelligence and Nonverbal behaviour in cooperator/defector friends and strangers

	Cooperator Friend mean (s.d) N=32 C	Defector Friend mean (s.d) N=8	Cooperator Stranger mean (s.d) N=33	Defector Stranger mean (s.d) N=7
Smile bouts	14.22 (4.45)	16.5 (3.2)	12.27 (4.53)	9.86 (5.64)
Smile Duration	1.07 (.615)	1.37 (.52)	.85 (.79)	.75 (.75)
Gaze duration	1.62 (.68)	1.59 (.55)	1.49 (.76)	1.63 (.70)
Nod bouts	3.28 (3.50)	3.50 (2.90)	6.48 (1.75)	4.43 (3.04)
Mach IV	69.53 (9.59)	70.75 (13.59)	65.91 (9.089)	73.86 (11.21)
EI	158 (20.6)	152.2 (25.3)	156 (13.9)	161.8 (22.6)

Table 2.3. Machiavellianism, Emotional Intelligence and Nonverbal Communication in the partners of cooperators and defectors

	Cooperator Friend mean (s.d) N=32 C	Defector Friend mean (s.d) N=8	Cooperator Stranger mean (s.d) N=33	Defector Stranger mean (s.d) N=7
Smile bouts	11.09 (4.5)	13.0 (4.54)	11.48 (4.72)	13.57 (4.86)
Smile Duration	.894 (.67)	.889 (.55)	.805 (.80)	1.00 (.69)
Gaze duration	1.64 (.71)	1.51 (.31)	1.51 (.77)	1.51 (.67)
Nod bouts	3.38 (3.4)	3.12 (2.4)	6.09 (4.41)	6.29 (5.49)
Mach IV	70.19 (10.2)	67.8 (8.7)	65.94 (9.89)	72.43 (12.74)
EI	158.6 (21.6)	153.2 (15.2)	158.42 (15.9)	150.57 (11.13)

Hypothesis 3. Personality and nonverbal behaviour affect the ratings of trustworthiness.

According to hypothesis 3, smiling, nodding and gazing are perceived positively, and increase ratings of trustworthiness. Machiavellian individuals are, in turn, likely to be rated as less likely cooperators. Individuals with high EI are likely to be rated as more likely cooperators.

Hypothesis three was tested by using Spearman rank correlations. Prediction of cooperation was measured with the questionnaire asking about the likelihood of cooperation by the partner (appendix 4) (1=very unlikely, 2=unlikely, 3=can't say, 4=likely, 5=very likely). Spearman correlations were made between predictions of cooperation, Machiavellianism, EI, smiling, nodding and eye gaze of the partner.

In pairs of friends, none of the recorded behaviours were related to the prediction of cooperation or defection (table 2.4)

Table 2.4. Spearman rank correlations for predictions of cooperation, Mach, EI and NVC of the partner in friends and strangers

Prediction	Smile Bouts of other	Smile duration of other	Gaze of other	Nods of other	Mach score of other	EI of other
Other cooperator (friends)	-.055 p=.735	.099 p=.545	.003 p=.984	.005 p=.997	-.055 p=.735	.061 p=.715
Other cooperator (strangers)	-.235 p=.144	-.267 p=.096	.305 p=.065	.074 p=.648	-.326 p=.04*	.229 p=.156

*p<.05

However, strangers seem to use several cues in predicting the trustworthiness of others (see table 2.4). Smile duration was negatively (although not significantly) correlated with prediction of cooperation, indicating that the longer the partner smiled, the less cooperative s/he was deemed to be. The duration of eye gaze was positively correlated, and the Machiavellianism of the partner had a negative correlation with the prediction of cooperation, implying in strangers, high-Machs were thought to be less likely to cooperate. The duration of eye gaze during the interaction, in turn, led to positive evaluations of the likelihood of cooperation, although the correlation between gaze and predictions of cooperation was not statistically significant (see table 2.4). In summary, there was some support for hypothesis three (personality and nonverbal behaviour affect the ratings of trustworthiness), but only in pairs of strangers.

Hypothesis 4. People are expected to reach higher than average accuracy in their predictions of cooperation

In order to test hypothesis 4, participants were organized into three groups according to the predictions of the behavior of the partner (cooperates, doesn't cooperate, can't say). People who were in the "cooperate" group ticked "very likely or likely" on the questionnaire measuring the likelihood of cooperation. People who predicted that their partner would not cooperate chose the answer "unlikely or very unlikely". If the answer "can't say" was chosen, the participant was placed in the "no prediction" category (see table 2.5).

Table 2.5. Accuracy in predicting cooperation and defection in a Prisoner's Dilemma game

Prediction accuracy	Friends	Strangers	Overall sample
Predicts correctly that partner cooperates	N=25 (62.5%)	N=18 (45%)	43(53.8%)
Predicts correctly that partner defects	N=0	N=1 (2.5%)	1 (1.25%)
Predicts incorrectly that partner cooperates (when partner actually defects)	N=8 (20%)	N=6 (15%)	14 (17.5%)
Predicts incorrectly that partner defects (when partner actually cooperates)	N=4 (10%)	N=1 (2.5%)	5 (6.25%)
No prediction	N=3 (7.5%)	N=14 (35%)	17 (15%)

Accuracy was deemed as correct when the person thought that the other is likely or very likely to cooperate, and the other actually cooperated. On only one occasion, an individual predicted defection correctly. When looking at the accuracy of predictions, only accuracy in predicting cooperation (and not defection) will be analysed (see table 2.5).

Table 2.5 shows that the majority of friends (62.5%) correctly predicted cooperation, whereas a fifth of the friends predicted cooperation when their friend actually defected. Strangers were accurate in their predictions of cooperation 45% of the time, whereas over a third of strangers did not make a prediction at all.

In order to calculate the expected accuracy rates, a procedure from Frank, Gilovich and Regan (1993) was followed. If a person expects cooperation 100% time, they will be accurate each time they expect cooperation. In this procedure, the predicted cooperation rates are multiplied by the actual cooperation rates, and added to the predicted defection rates multiplied by the actual defection rates (see table 2.6). The procedure is trying to account for this by calculating what the expected accuracy rates would be for a person who makes random predictions.

In the present study, 37 friends made a prediction. 33 of these predicted that their partner would cooperate. Thus, the predicted cooperation rate for friends was .892 (89.1%). Out of the 33 friends who were expected to cooperate, 25 did so. Thus, the actual accuracy in predicting cooperation was 75.7 % (25/33). Expected defection in friends was calculated by taking the percentage of friends who were predicted to defect ($4/37= 10.8\%$). In reality, 8 friends defected ($8/37=21.7\%$). Predicted cooperation rate (89.2) multiplied by the actual cooperation rate (.783) was added to predicted defection rate (10.8) multiplied by the actual defection rate (.217). Thus, $(89.2 \times .783) + (10.8 \times .217) = 72.18$ is expected accuracy rate. The actual accuracy rate in predicting cooperation was 75.7%, which exceeds the expected accuracy.

In strangers, 26 individuals made predictions. 24 of them predicted that their partner would cooperate. The predicted cooperation rate was .923 (92.3%). Out of 26 strangers, 19 did cooperate. Thus, the actual cooperation rate was 73%. The predicted defection rate was $2/26= .076$, and the actual defection rate was $7/26= 26.9$. The expected accuracy rate was $(.923 \times 73) + (.076 \times 26.9)= 69.63$. Actual accuracy in predicting cooperation was $18/24=75$ (24 strangers were expected to cooperate, 18 actually did so). Thus, prediction accuracy (75%) in strangers exceeded what would have been expected if people were randomly making their predictions (69.6%). As in friends, actual accuracy exceeded the expected accuracy, although the statistical significance remains unknown. Thus, the results provided support for hypothesis four- participants, in both friends and strangers, reached higher than average accuracy in predicting cooperation.

Table 2.6. Rates of predicted and actual behavior in a Prisoner's Dilemma game

Predicted behavior	Actual cooperation (friends)	Actual defection (friends)	Total predicted (friends)	Actual cooperation (Strangers)	Actual defection (Strangers)	Total predicted (Strangers)
Cooperate	25	8	24 (92.3)	18	6	24 (92.3)
Defect	4	0	2 (7.7)	1	1	2 (7.7)
Total actual	29 (78.3%)	8 (21.7)	26	19 (73.1%)	7 (26.9)	26

Table 2.8 Are Emotional Intelligence and Machiavellianism related to nonverbal behaviours? Correlations between Mach IV and EI scores in pairs of friends (N=40) and strangers (N=40).

	Smile duration (friends)	Smile bouts (friends)	Gaze duration (friends)	Number of head nods (friends)	Smile duration (strangers)	Smile bouts (strangers)	Gaze duration (strangers)	Number of head nods (strangers)
Mach score	-.058 p=.724	.162 p=.317	-.175 p=.279	-.346 p=.029	-.142 p=.382	-.132 p=.416	-.311 p=.055	-.122 p=.454
EI score	-.224 p=.164	-.192 p=.235	.212 p=.189	.164 p=.311	-.294 p=.066	-.324 p=.041	.496 p=.001**	.230 p=.153

Hypothesis 5 Accuracy of predictions is based on the nonverbal communication and personality of the partner

Hypothesis 5 postulates that individuals reach accuracy in their predictions based on the nonverbal behaviours, Machiavellianism, and EI of their partner. This was tested by running a series of Mann Whitney U tests, where the accuracy of predicting cooperation (correct, incorrect) was the independent variable, and Machiavellianism, EI, smile duration, smile bouts, gaze duration and bouts of head nods were the dependent variables. Although binomial logistic regressions would have been more appropriate, it was decided that the sample size did not allow this. Normally, it is recommended that there are at least 15 participants for each predictor variable, which means that a sample size of at least 90 would have been required. Here, the sample size was only 40 in each of the categories (friends and strangers), and non-parametric statistics were deemed as more appropriate. In pairs of friends, accuracy of prediction was not related to Machiavellianism, EI, or the nonverbal behaviours of the partner (see table 2.7 and appendix 5). In pairs of strangers, in turn, people who inaccurately predicted that their partner would cooperate, had partners who had higher scores on the Mach IV scale, although the difference was not statistically significant ($p=.08$, see appendix 5).

Hypothesis 6. Mach scores should be negatively correlated with the duration of gaze and smiling, and the number of nodding and smiling bouts. EI scores should be positively correlated with the duration of gaze and smiling, and the number of nodding and smiling bouts.

Spearman rank correlations were used, correlating Mach and EI scores with nonverbal behaviours. In friends, none of the correlations were significant (see table 2.8). In strangers, the only significant correlation was found between EI and duration of gaze. EI scores were

positively correlated with looking at the direction of the other (Spearman $r=.496$, $p=.001$).

Machiavellianism scores were negatively, but not significantly, correlated with the eye gaze (Spearman $r=-.311$, $p=.055$).

Table 2.7 Differences in mean rate of nonverbal behavior, Machiavellianism and EI in partners of individuals who accurately and inaccurately predict cooperation

Behaviour of the partner	Accurate prediction mean (s.d) (friends) N=25	Inaccurate prediction mean (s.d)(friends) N=8	Accurate prediction mean (s.d) (strangers) N=18	Inaccurate prediction mean (s.d) N=6
Smile bouts	12.11 (3.7)	10.11 (2.5)	12.11 (3.7)	8.00 (5.2)
Smile Duration	.64 (.47)	.50 (.20)	.64 (.48)	.38 (.20)
Gaze	1.64 (.75)	1.60 (.55)	1.6 (.86)	1.77 (.79)
Nod	2.97 (3.6)	3.50 (2.4)	6.11 (4.5)	6.5 (4.7)
Mach IV	62.5 (8.0)	72.5 (12.7)	63.5 (8.0)	70.5 (12.8)
EI	156.3 (22.0)	157.8 (22.2)	157.4 (11.1)	167 (20.0)

Interestingly, EI scores in strangers had a negative relationship with smiling, although the correlations were not significant. It seems that emotionally intelligent strangers have the need to smile less and for shorter duration than their less emotionally intelligent counterparts.

2.4 Discussion

Perhaps unsurprisingly, the results indicate that people do seem to base their behaviour in the Prisoner's Dilemma on what they predict their partner is likely to do (Gächter et al 2004), as people who cooperated rated their partners potential cooperation more highly than defectors did. This monitors the recent findings of Altmann, Dohmen and Wibral (2008), who discovered that subjects who were classified as reciprocators exhibited higher levels of trust. The authors speculated that this could be due to fair and selfish types

having fundamentally different beliefs about human behaviour. It is possible that in this study as well, people who cooperated have generally higher levels of trust than people who defected. However, the causal relationship between cooperative decision making and expectations of the partners behaviour are indiscernible in the present experiment. Because the participants made their decision in the PD game before assessing the trustworthiness of the other, it is possible that they were basing their expectations on their own behaviour rather than the expected behaviour of the partner. The experimental design of the present study could be improved by randomly alternating the order in which the participants assess the cooperativeness of the other and make their own cooperative decisions. The willingness to trust others is a complex process, involving a myriad of dispositional, anticipatory and situational factors (Snijders and Keren, 2001), and future research should attempt to identify the interplay between these issues and their contribution to ratings of trustworthiness.

Hypothesis 1. Cooperators are predicted to have more pro-social personalities, and engage in more pro-social behaviours than non-cooperators.

In this study at least, people who scored high on the Machiavellian scale were not more likely to defect than people who obtained low scores. This was true in both friends and strangers, although in strangers, people who defected had marginally higher Mach scores. Perhaps this trend would become more apparent in a larger sample size with more defecting participants. The present study had a relatively small sample size, and low rates of defection, which makes it hard to draw any definitive conclusions. Knowing that the exploitative nature of high-Machs should become apparent in one-shot interactions with strangers, it would have been expected that defectors score significantly higher on the Mach scale. Perhaps lifting the veil of anonymity increases other-regarding behaviours, even in the manipulative high-

Machs. Brosig (2002) found that if subjects were allowed to communicate before a PD game, even more self-regarding individuals were less willing to exploit their partner if they assumed the partner would cooperate. It would be interesting to see whether the high-Mach participants who cooperated after a face-to-face interaction would defect in an anonymous PD game, where subjects are interacting via computers.

In the present study, cooperators were not different to defectors in their nonverbal communication. Nevertheless, the behaviours analysed here (gaze, nod, smile) might not be the signals that people use in indicating cooperativeness, or they might not be honest signals of altruistic quality. Presumably, something like a head nod would be easy enough to fake, allowing deceiving individuals to appear to be more altruistic without incurring a cost.

However, some have argued that facial expressions are honest signals of quality, in that the cost of sending a signal differs according to the characteristics of the sender (Scharlemann et al, 2001). Perhaps one can attempt to fake interest in the interaction, but holding a sustained conversation with another requires substantial amount of concentration, with careful synchronization between gazing and speech (Rutter and Stephenson, 1977). According to Andrews (2002) "People could produce such... (deceptive).. clues by failing to produce a facial expression where one is expected, by producing an expression where none is expected, by producing a mixed expression where a pure expression is expected, by producing an expression of unexpected intensity, or a combination of these factors" (pp 112).

The cost of behaviours such as nodding, gazing and smiling would then not be related to time and energy constrains, but to timing of an appropriate cooperative signal with other such signals, and synchronizing these with the behavior of the interaction partner. The present study did no analyse more fine-grained details of behaviour, such as synchrony of movements, or how genuine the smiling was. Perhaps, if the occurrence of genuine vs non-

genuine smiles, or the synchronization of behaviour was measured, cooperator/defector differences would become more apparent.

Hypothesis 2. People defect because they expect their partner to defect. Thus, it is expected that people who defect have high-Mach partners, and/or partners who are less facially expressive.

Unexpectedly, characteristics of the partner did not have an effect on cooperative decision making in the PD game. Defectors, neither in friends nor strangers, did not have high-Mach partners or less expressive partners. Again, as discussed before, these differences could become more apparent with more detailed analyses of the interactions. Recently, Krumhuber et al (2007) found that subtly altering the facial expressions of a hypothetical partner affected cooperative decisions in a trust game. People rated faces with genuine smiles as more trustworthy and cooperative, and were also more likely to cooperate with these faces. It would certainly be worthwhile to replicate the present study, and conduct a more detailed analysis of the facial expressions, especially in terms of the Duchenne versus non-Duchenne smiles.

Hypothesis 3. Personality and nonverbal behaviours affect the ratings of trustworthiness.

As expected, none of the nonverbal behaviours or Machiavellianism of the partner were related to how cooperative the partner was rated as in pairs of friends. Friends, who have had previous experience of their partner in social interactions, should base their expectations of cooperation on the knowledge they possess about the other, rather than on the

facial expressions during a short laboratory experiment. Moreover, the Machiavellianism score of the friend did not affect the prediction of cooperation either, which could be due to several factors. Wilson et al. (1998) conceded that although the deceptive nature of high-Machs should become apparent in short face-to-face interactions with strangers, they should be able to switch strategies and behave cooperatively when advantageous. Moreover, the fact that pairs of friends took part in the study could indicate that high-Machs are more likely to behave cooperatively when interacting with friends, which was predicted by Wilson et al. (1996). There is not much research into how high-Machs behave in the real world, how they form and maintain friendships with others, which would be a potentially interesting avenue for future studies.

Strangers, in turn, seem to use eye gaze as a proxy for cooperative intentions. The present study found a positive, although non-significant correlation between duration of gaze and ratings of trustworthiness. This monitors previous studies (for example, Argyle and Cook, 1976), where gaze was found an important factor in inducing trust and cooperative behaviours.

In strangers, prediction of cooperation was negatively (although not significantly) correlated with the duration of smile during the interaction, i.e. smiling strangers were perceived as being less trustworthy. It is possible that the smiling strangers were not engaging in genuine, so-called Duchenne –smiles, which, at least in experimental situations, evoke positive feelings (Surakka and Hietanen, 1998) and personality evaluations (Frank, Ekman and Friesen, 1993), and is related to sharing resources (Krumhuber et al, 2007, Mehu, Grammer and Dunbar, 2007). In the present study, partly because of the quality of the videotapes, no distinctions were made between felt and faked smiles. The smiling strangers who were rated as likely to defect could have been faking the messages of enjoyment during the interaction, leading to more negative evaluations by their partner. The issue of faked

smiles and ratings of trustworthiness is certainly something that should be addressed in future research.

Interestingly, in strangers, it seems that people do have some ability to predict the potential trustworthiness of another person, even when they have interacted with them for only a short period of time. In strangers, but not in friends, a negative correlation was found between expectations of cooperation and the Machiavellianism score of the other. This finding was similar to that of Cherulnik et al (1981), who discovered that their participants were accurate in recognizing high –Mach strangers in silent video footage or still photographs. In their study, the judgment of Machiavellianism could not be pinned down to any particular behaviour or appearance of the judged person. In a similar way, high- Mach participants in the present study did not show any significant differences in facial expressions. However, Machiavellianism in strangers was negatively (although not significantly) correlated with duration of eye gaze. EI score, in turn, was positively correlated with eye gaze. It is possible that gazing is something that distinguishes high-Mach people, and that people use gazing as a proxy to assess cooperativeness in another person. Perhaps this would become more apparent with an improved experimental design, for example, selecting high and low-Machs to participate in the study, rather than using a correlational design.

Gazing aside, on the bases of current findings, the characteristics, behaviours and facial expressions that people use to assess trustworthiness are difficult to elucidate. The present study did not evaluate the contents of the speech, for example- perhaps the high-Machs revealed their cynicism and exploitative nature during the discourse with their pair. Berry et al (1997) found that a significant amount of social perception is based on the linguistic content of speech, we form impressions of others on the bases of how they use language. It would be interesting to see whether high-Machs express their cynical world view

in their speech, and how this might relate to ratings of trustworthiness.

Hypothesis 4 and 5. People are expected to reach higher than average accuracy in their predictions of cooperation. Accuracy of prediction should be based on the nonverbal communication and personality of the partner.

As in the study of Frank, Gilovich and Regan (1993), the accuracy rates in predicting cooperation were higher than expected, in both pairs of friends and strangers. An explanation for the high accuracy could be that generally speaking, people cooperate more than expected (Kiyonari, Tanida and Yamagishi, 2000), which could lead to high prediction accuracy by default. Participants could have been expecting cooperation, , None of the factors measured here were significant predictors of accuracy. It is possible that accuracy is based on factors that were not measured here, such as content of speech and communicative style (Berry et al, 1997) or facial micro-expressions (Ekman, 2003).

Hypothesis 6 Mach scores should be negatively correlated with the duration of gaze and smiling, and the number of nodding and smiling bouts. EI scores should be positively correlated with the duration of gaze and smiling, and the number of nodding and smiling bouts.

The only significant correlation between personality and nonverbal behavior was found in strangers, where more emotionally intelligent individuals engaged in more gazing during the interaction. Machiavellianism, in turn, was related to reduced eye contact with the partner, although the correlation between Machiavellianism and gazing was non-significant. The interplay between nonverbal communication and emotional intelligence is an interesting, albeit under-researched area of study. If one of the facets of EI is to be able to manage the

behavior and emotions of others (Salovey and Mayer, 1990), emotionally intelligent people seem to understand that maintaining eye contact is an important way to induce trust in the partner, and perhaps make them feel more at ease. There certainly is more room for research related to cooperative personalities and nonverbal behavior, especially in real-life face-to-face interactions.

The present study should be treated as a pilot study, giving ideas and directions for future research. It is apparent that we have the capacity to accurately assess the trustworthiness of others, and that we can somehow recognize high-Mach individuals, and rate them as less trustworthy. Our ability to detect potential cheats does seem to operate effectively within the artificial constraints of the prisoner's dilemma scenario, although the exact mechanisms still need to be identified through further research. Another interesting area of research is looking at individual differences in social sensitivity- some people seem to do better than others when assessing cooperativeness in others. The focus of the following chapter will be to look at how social intelligence affects the ability to assess cooperativeness and personality in others.

3. Individual differences in social judgement- what accounts for the accuracy?

Abstract

The present chapter looks at the relationship between Theory of Mind (ToM), Emotional Intelligence (EI) and Machiavellianism in social judgement. Study 1 (N=80) asked participants to fill in a short Big Five measurement for themselves and for a person they had previously interacted with during a team building exercise. In addition, participants filled in measurements on self-rated altruism, EI and Machiavellianism. EI emerged as a significant predictor in personality judgement ability. Moreover, especially in pairs of female friends, EI and self-rated altruism led to better accuracy in judging the Big Five traits of the other. Study 2 (N=38) involved identifying cooperators and defectors and the strength of relationship in videotapes of dyads who participated in a Prisoner's Dilemma experiment. In addition, participants completed EI, Mach and ToM measurements. Higher ToM was related to better accuracy in judging the relationship strength between individuals, but did not lead to improved performance in identifying cooperators and defectors.

3.1. Introduction

According to Gangestad et al (1992), the ability to pick up personality-related cues from others confers obvious adaptive benefits- if you know how another person is likely to behave, you can undertake actions that are advantageous to you. Thus, individuals who are more socially perceptive should be better in assessing the likelihood of cooperation by other people, gaining fitness benefits from the detection ability. Although previous studies have found that people are accurate in detecting potential cooperators (Frank, Gilovich and Regan, 1993, Lyons and Aitken, 2008, Pradel, Euler and Fetchenhauer, 2009), individual's are not equally competent. As the Green Beard Mutualism is one possible road to evolution of altruism, relying on the social perceptiveness of altruistic individuals in identifying other altruists, it would be expected that individual differences in cooperativeness and manipulateness relate to social intelligence. More specifically, it is expected that individuals with more altruistic dispositions are equipped with perceptual sensitivity that allows them to reliably assess the altruistic dispositions of others.

There is some evidence that altruism is related to social intelligence. For example, Paal and Bereczkei (2007) discovered that individuals who were better at understanding social relationships in mentalising stories also scored higher on a questionnaire measure of cooperation. This indicates that cooperation is related to theory of mind ability. Not only have altruists demonstrated a higher social intelligence, but they seem to perform better in domains of more traditional concepts of intelligence. Millet and Dewitte (2006), for example, found that in a Public Goods game, unconditional altruists had significantly higher IQ's than other participants, providing support for the theory of altruism as a costly signal (see also Chapter 6

of the present thesis). Interestingly, earlier studies found that intelligence was a significant predictor of the ability to judge the personality of other people (Harris, Vernon and Jang, 1999, Lippa and Dietz, 2000), suggesting a possible connection between altruism, general intelligence, and social perceptiveness. However, it is currently unclear whether social intelligence and/or altruism also relate to a better judgement of other people's behaviour or personality characteristics. One of the aims of the present chapter is to bring some light to this issue.

Research that looks at personality judgement, lie detection and cheat detection have all used different psychological paradigms in generating hypotheses. However, all of the approaches have many common aspects as they all rely on the capacity to read the behaviour of others accurately. Only the personality judgement literature has considered the importance of the individual characteristics of the judge in reaching accuracy. Evolutionary based cheat detection research has been devoid of these kinds of studies. Nevertheless, even within the personality judgement literature, the research area suffered some twenty-year long gap.

Before the 1960's, research on the accuracy of personality judgement concentrated on the characteristics of a good judge (see Taft, 1955, for a review). Earlier research suggested that intelligence, detachment from others, and emotional stability were some of the predictors of a good personality judge (Taft, 1955). Perhaps due to inconsistent findings and methodological issues, the area of research was abandoned for some twenty years, gaining a new lease of life after the theoretical invention of the Big Five paradigm. The finding of stable, consistent personality traits reawakened the research into finding what characteristics might be important when judging these traits in others. Studies have found that intelligence (Harris, Vernon and Jang, 1999, Lippa and Dietz, 2000) and emotional stability (Ambady, Hallahan and Rosenthal, 1995), amongst other factors, are good predictors of judgement abilities. Akert and Panter (1988) suggested that extraverts should be better decoders of

personality because they have exposed themselves to more social situations, and as a result, have gained more practice in assessing other people. In the same vein, Funder (1999) proposed that people often have implicit knowledge about the personalities of others, and this knowledge is largely gained through experience. In this view, extraversion would be an adaptive trait because more sociable individuals are better in predicting what people are likely to do, which helps them to deal with others to one's own benefit. However, it is still unclear whether extraversion is a desirable trait when assessing the character of another person. Most studies have concentrated on extraversion and the ability to understand emotions of others, and the findings have been somewhat inconsistent. The majority of research has found that extraverts do not possess any superior abilities in decoding affective states of others (Cunningham, 1977, Riggio and Friedman, 1982, Rosenthal, 1979, although see Funder and Harris, 1986, for conflicting results). Sociability might actually hinder accuracy of judgments, at least when assessing traits in strangers, as demonstrated by Ambady, Hallahan and Rosenthal (1995).

Another, yet still to be investigated individual difference that should be important when judging others, is Emotional Intelligence (EI). Part of the construct involves the ability to judge emotions in other people (e.g. Salovey and Mayer, 1990), and it would be expected that people with high EI would be proficient in assessing honesty and personality traits of others. More evidence for the importance of EI in personality judgement comes from studies relating self-monitoring to judgement ability (Ambady et al, 1995), and EI to self-monitoring (Schutte et al, 2001). Self-monitoring, or the heightened awareness of self in social situations, share common properties with EI. Schutte et al (2001), for example, discovered that high self-monitors also scored high on an emotional intelligence scale. Perhaps the ability to understand others stems from the ability understand oneself in relation to other people. Moreover, research in neuropsychology suggests that emotional processing and self-

monitoring are related of the functioning of the same cortical region, Orbitofrontal Cortex (OFC). A recent study by Beers et al (2006) found that when self-monitoring was experimentally increased in OFC patients, it led to improved emotional responses. Based on the research reviewed above, it would be expected that people who score high on EI are better in judging the character and behaviour of others.

The other side of EI, namely, Machiavellianism, could also be a potential predictor of social judgement ability. Perhaps the evolutionary “cheater strategies” (e.g. Mealey, 1995) are successful due to heightened capacity in understanding others, leading to better chances of manipulating others to ones own benefits. In fact, Vogt and Colvin (2003) called for research into the role of psychopathy in judging personality traits. Psychopaths are superior manipulators of people, and being able to assess how another person is going to act should be an advantageous tool for manipulation. People who are high in the construct Machiavellianism are highly manipulative, and possess characteristics similar to psychopaths. According to McHoskey, Worzel and Szyarto (1998), high-Machs might actually be sub-clinical psychopaths. Therefore, it would be expected that people who score high on the scale measuring Machiavellianism are better in predicting personality and the behaviour of others than low -Machs are.

Another, potentially fruitful area of research is Theory of Mind (ToM) in relation to the ability to judge the honesty of others. ToM, or mentalising ability, deals with the capacity to attribute mental states, intentions and emotions to others. Although most studies have concentrated on dichotomous existence or absence of ToM in children and clinical populations, few studies have found that ToM does have prominent individual differences in normally functioning adult populations (Kinderman, Dunbar and Bentall, 1998, Stiller and Dunbar, 2007). Although ToM might be an ability that has evolved only in humans (e.g. Hayes, 1998), it is still unclear what we use the mentalising capacity for. Knowing that the

free-rider problem has put major pressure on the evolution of human perceptual mechanisms, it would not be unreasonable to suggest that ToM in humans evolved partly to counteract the problem of cheating. Individuals with superior ability in understanding how the minds of other people work would have conferred fitness benefits by avoiding being cheated on in social dilemmas.

The aims of the present chapter are two-fold. Firstly, to see what variables might be important when judging the personality of another person and, secondly, to see what factors are important when assessing honesty and cooperativeness. The first part of the chapter looks at the relative importance of self-rated altruism, EI and Machiavellianism in reaching accuracy when predicting the Big Five traits of another person after a brief interaction. It is expected that irrespective of the strength of the relationship (i.e. whether interacting with strangers or acquaintances), these individual differences relate to a higher consensus between self-and other-rated Big Five traits. The second part of the study looks at the importance of ToM, EI and Machiavellianism in judging relationship status (whether people are strangers or acquainted) and assessing the likelihood of cooperation from looking at videotapes of individuals interacting with each other before a PD game. It would be expected that high ToM, EI and Mach scores, individually, predict a better ability to identify cheats and cooperators. The studies will make the following predictions:

Hypothesis 1: Emotional Intelligence is something that we use when interacting with others, and which should be beneficial in terms of improved inter-personal perception. Thus, individuals who score high on an Emotional Intelligence measure should be better at judging the personality and altruism in other people.

Hypothesis 2: If Machiavellianism is a behavioural strategy characterised by manipulation and deceitfulness, being able to predict how others are likely to behave would

be an advantage to a high-Mach person. Therefore, it is expected that high scores on the Machiavellianism scale are positively correlated to the ability to judge personality and altruism in other people.

Hypothesis 3: If altruism has evolved through Green Beard Altruism, it would be expected that altruists have the capacity to recognise the altruistic status of others. Consequently, self-rated altruism should have a positive relationship with personality judgment ability.

Hypothesis 4: It is possible that Theory of Mind has evolved in the context of promoting cooperation in humans. It would be expected that having good Theory of Mind skills aids in judging cooperativeness in other people.

3.2 Study 1

3.2.1 Method

3.2.1.1 Participants

Participants in study 1 were the same as in Chapter 2. Eighty subjects participated in the study. Males (N=40) were slightly, but not significantly older than females (N=40) (27.4 years, S.D= 8.4, and 27.0 years, S.D. 11.3, respectively).

3.2.1.2. Materials

(i) *Machiavellianism scale* (Christie and Geis, 1970)

Machiavellianism was measured using the Mach IV scale devised by Christie and

Geis (1970) (appendix 1). This 7-point Likert scale consists of 20 questions asking about the views people have on human nature and the tactics they employ when interacting with others. The possible total scores on the questionnaire range between 20-140. The questionnaire has been widely used in social psychological research, and shows good internal reliability (e.g. Fehr, Samson and Paulhus, 1992, Paulhus and Williams, 2002).

(ii) *Emotional intelligence- The Schutte Self-Report Emotional Scale (SSREI)* (Schutte et al, 1998)

EI was measured using the SSREI scale devised by Schutte et al. (1998). The scale consists of 33 items, which are scored on a 5-point Likert scale (1=strongly disagree, 5=strongly agree). Three of the items are negatively scored. The possible scores on the scale range from 33-165. The scale is easy to use due to relative brevity of the questionnaire (see appendix 2).

(iii) *Team building exercise*

In this pen and paper exercise, participants had to imagine they were setting up a new country, and agree on different aspects of the country (such as the location of the country, the national animal, main source of income and so on) (appendix 3). These types of exercises have been widely used in companies in team building settings. The purpose of the mock exercise was to get participants to communicate together while their facial expressions were covertly recorded.

- (iv) *The Big Five- The Ten-Item Personality Inventory (TIPI)* (Gosling, Rentfrow and Swann, 2003)

TIPI was developed for researchers to use in situations where there are time constraints hindering the testing process (Gosling, Rentfrow and Swann, 2003). Although the instrument does not have as good psychometric properties as the longer Big Five measurements, it serves as a reasonable proxy for the personality dimensions (Gosling et al, 2003). Other studies have found that the validity, test-retest reliability and convergence between self and observer ratings of the short questionnaires is reasonable, and that they provide a reliable measure of personality (Gosling, Rentfrow and Swann , 2003, Muck, Hell and Gosling, 2007, Rammstedt and John, 2007). TIPI consists of 10 items, 5 of which are reverse-scored. The items are scored on a 7-point Likert scale (1=disagree strongly, 7= agree strongly). The possible scores for each of the personality traits range from 2-14 (See appendix 6).

- (v) *The Self-Report Altruism Scale (SRAS)* (Rushton, Chrisjohn and Fekken, 1981)

The self-reported altruism scale consists of 20 items asking about the frequency of past helping behaviours (Rushton, Chrisjohn and Fekken, 1981). The options in the 5-point Likert scale consists of “Never, Once, More than once, Often, Very often”. The first item of the scale (“Have you ever helped to push a stranger’s car out of the snow”) was changed, in order to be more appropriate to British participants. The new item on the scale was denoted as “Have you bought the Big Issue”.

The possible scores range from 20-100. Although longer versions of self-rated altruism scales do exist (e.g. Johnson et al, 1988), it was decided that the short measurement

would be more appropriate for the present study, reducing the time participants had to spend filling in the questionnaires. See appendix 6 for an example questionnaire.

3.2.1.3 Judgement accuracy calculations

Here, only the person –centered (as opposed to the variable- centered) accuracy will be reported (e.g. Biesanz, West, and Millevoi, 2007, Letzring, 2008). The person-centred accuracy provides a single score over multiple traits, and allows the analysis of the judgement ability by correlations between the distance of self-, and other-rated personality. In the present study, the judgement accuracy will be calculated across all the Big Five traits in order to reach a single score. The accuracy score itself is obtained by calculating the distance between self- and other-rated personality score on each of the five traits, and dividing the score by five. For example, if a person gives him/herself 13 points on extraversion, and the judge gives him/her 13 points as well, the distance is counted as 0. If a person gives him/herself a score of 8 on agreeableness, and the judge gives him/her a score of 3, the distance is calculated as 5. Each personality variable can score maximum 14 points- thus, the distance between the judge and the observer varies between 0 and 14. The lower the value, the less distance there is between the self and the other-rating. Thus, in this case, a low value denotes a more accurate judgement.

3.2.1.4 Procedure

Participants were told that they would be taking part in a study investigating cooperation and decision making, and that they would be paid between £5 and £10 depending on the outcome of the experiment. People turned up for the experiment with a same-sex

friend, who was then paired up with either their friend, or with a same-sex stranger from another pair. Ten of the pairs were female friends, ten were female strangers, ten were male friends and ten male strangers.

On arrival, participants were administered the Machiavellianism scale, the Self-Reported Altruism scale and the Schutte Self-Report Emotional Intelligence scale. After filling in the questionnaires, they were taken into the experiment room where they were seated down facing the person they were interacting with. The dyads were requested to complete a paper and pen team-work exercise, which required them to imagine that they are setting up a new country (see Appendix 3). The dyadic interactions lasted between 5-15 minutes. After the team-work exercise, subjects were requested to fill in the short Big Five inventory, Ten-Item Personality Inventory (TIPI), for both themselves and their interaction partner.

3.2.2 Results

Descriptive statistics

Table 3.1 shows the means and standard deviations for all of the questionnaires. All the measures were normally distributed, and parametric statistics will be used when analysing the data.

Table 3.1 Means/Standard Deviations for the personality prediction accuracy, Machiavellianism (Mach IV scale), Self-Rated Altruism (SRAS) and Self-Rated Emotional Intelligence (SSREI)

	Mean (s.d) (N=80)
Overall prediction accuracy (distance between self and other rating)	2.31 (s.d.09)
Mach IV	68.4 (s.d.10.5)
SSREI	156. 8 (s.d.17.8)
SRAS	55.3 (s.d.13.4)

Overall prediction accuracy between the self and the other was 2.31 (S.D .09), with scores ranging between 0.6 (most accurate) and 5 (least accurate). The mean scores for the self-reported altruism scale was 55.3 (S.D 13.4), Schutte Self-reported Emotional Intelligence questionnaire 156.8 (S.D 17.8) and Machiavellianism scale 68.4 (S.D 10.5). The scores were normally distributed and parametric statistics will be used when analysing the results.

Bivariate Cross-Correlations between the variables

In order to see how personality prediction accuracy correlates to altruism, EI and Machiavellianism, bivariate correlations were conducted between all of the measures. Bivariate cross-correlations between the variables showed that the distance between self and other-rated accuracy and emotional intelligence had a negative correlation (-.281, $p=.013$, $N=80$), indicating that more emotionally intelligent individuals were better in judging the personality of another person.

Table 3.2 Cross-correlations between prediction accuracy, altruism, Machiavellianism and EI (N=80).

	SRAS	SSREI	Mach IV
Prediction accuracy	-.104 p=.367	-.281 p=.013**	-.084 p=.470
SRAS		.369 p=.001**	-.317 p=.004**
SSREI			-.220 p=.05*

Self-reported altruists were also more emotionally intelligent ($r=.369$, $p=.001$), and less Machiavellian ($r=-.317$, $p=.004$). Emotional intelligence, in turn, was negatively correlated with Machiavellianism ($r=-.220$, $p=.05$). Due to the problem of collinearity between predictor variables (i.e. significant bivariate correlations between SRAS and SSREI, SRAS and Mach IV, and SSREI and Mach IV), it was decided that multiple regression would not be an appropriate analytical method for the data.

Hypothesis 1: People who score high on Emotional Intelligence should be better in judging the personality of others

Figure 3.1 Relationship between personality prediction accuracy and emotional intelligence in female friends

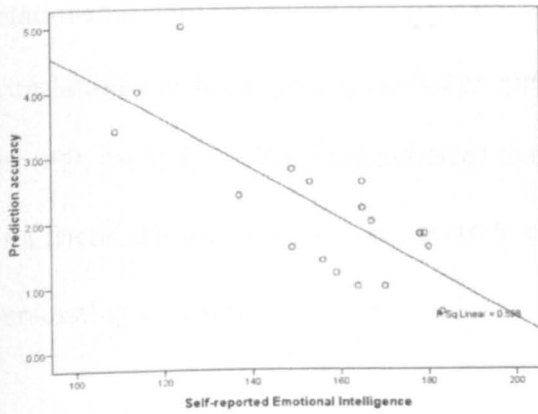


Figure 3.2 Relationship between personality prediction accuracy and emotional intelligence in female strangers

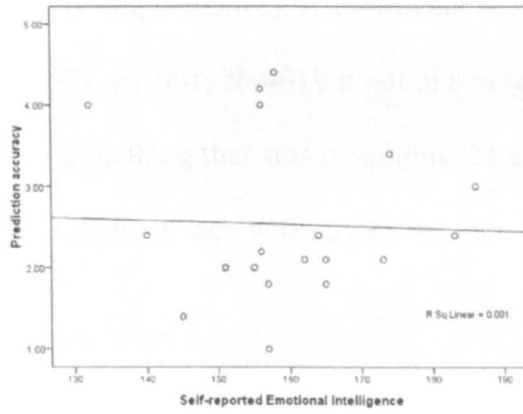


Figure 3.3 Relationship between personality prediction accuracy and emotional intelligence in male friends

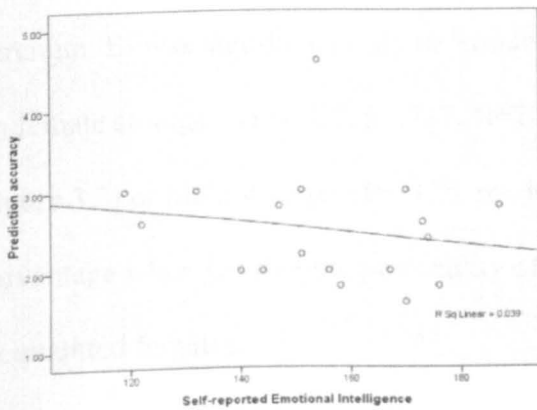
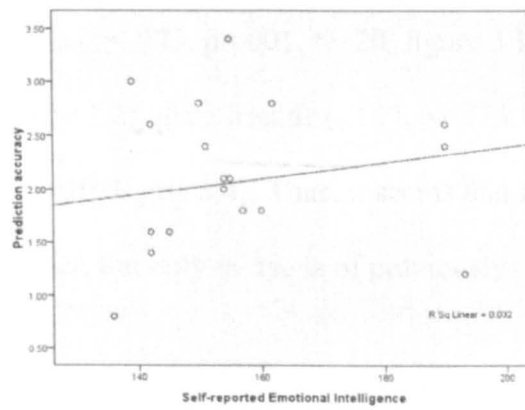


Figure 3.4 Relationship between personality prediction accuracy and emotional intelligence in male strangers



In the overall sample, EI was, indeed, related to improved judgement accuracy, as the correlation between self-and other-rated judgement and EI was negative and significant ($r=-.281, p=.013, N=80$). When analysing females and males separately, the correlation remained significant in only females ($r=-.480, p=.002, N=40$) but not in males ($r=-.010, p=.951, N=40$) implying that in females, higher self-reported EI correlates with better ability in judging the personality of others.

In order to look at the role of EI in personality judgement when interacting with friends and strangers, the data were split into two groups according to the strength of the relationship with the interaction partner (stranger or acquaintance). A significant negative correlation was found in acquainted people ($r=-.571$, $p=.001$, $N=40$) but not in strangers ($r=.099$, $p=.555$, $N=40$). This indicates that EI is something that aids in judging the character of a friend. However, it does not seem to provide an advantage when assessing the personality of a stranger.

In order to see how sex (female/male) and relationship strength (stranger/acquaintance) affects personality judgement, the data were split into four groups, which were analysed separately (female friends, female strangers, male friends and male strangers). When correlating judgement ability according to the sex and the relationship strength, EI was significant only in female friends ($r=-.773$, $p=.001$, $N=20$, figure 3.1) but not in female strangers ($r=-.037$, $p=.787$, $N=20$, figure 3.2), male friends ($r=-.197$, $p=.433$, $N=20$, figure 3.3) or male strangers ($r=.179$, $p=.462$, $N=20$, figure 3.4). Thus, it seems that EI is of advantage when judging the personality of another, but only in dyads of previously acquainted females.

Hypothesis 2: People who score high on Machiavellianism should be better in judging the personality of others

In the overall sample, Machiavellianism did not have a statistically significant relationship with personality judgement accuracy scores ($r=-.084$, $p=.470$, $N=80$). At least in the present sample, manipulateness did not provide an advantage when judging the personality of another person.

The correlations between Machiavellianism and accuracy were non-significant even when males ($r=-.068$, $p=.689$, $N=40$) and females ($r=-.083$, $p=.610$, $N=40$) were analysed separately. However, when the data were split into groups according to relationship strength (acquaintance or stranger), some significant trends emerged. Interestingly, in strangers, Machiavellianism had a significant negative correlation with personality judgement ($r=-.338$, $p=.037$, $N=40$), indicating that Machiavellianism is an asset when dealing with previously unknown people. In friends, Machiavellianism was not correlated with prediction accuracy ($r=.157$, $p=.349$, $N=40$).

Correlations were non-significant when female friends ($r=.227$, $p=.336$, $N=20$), female strangers ($r=-.394$, $p=.085$, $N=20$), male friends ($r=-.119$, $p=.639$) and male strangers ($r=-.110$, $p=.654$, $N=20$) were analysed separately.

Hypothesis 3. Self-rated altruism should be related to personality judgement ability

Individual scores on self-rated altruism were not significantly correlated to the ability to assess personality ($r=-.104$, $p=.367$, $N=80$) in the overall sample. Neither was relationship strength important, as correlations were non-significant in acquainted individuals ($r=-.245$, $p=.147$, $N=40$) or in strangers ($r=.003$, $p=.994$, $N=40$). Sex did not seem to play a role either. When males and females were analysed separately, neither had strong correlations between the variables (Males= $r=-.028$, $p=.869$, $N=40$, Females= $r=-.180$, $p=.266$, $N=40$). However, when sexes were split into groups according to the strength of the relationship, significant trends emerged. Within female friends, self-rated altruism lead to better personality judgement ability ($r=-.575$, $p=.008$, $N=20$). In female strangers, the association was not significant ($r=.180$, $p=.448$), and neither was it in male friends ($r=.268$, $p=.282$, $N=20$) or male strangers ($r=-.344$, $p=.144$, $N=20$).

Discussion study 1

Some interesting trends emerged when looking at personality judgement ability and personality traits. In the overall sample, EI had a significant relationship with the ability to judge the Big Five traits in another person. Machiavellianism did not lead to better judgement accuracy, nor did the self-reported altruism when relationship strength and sex were combined. However, when the data were split into two groups according to relationship strength (Stranger/Acquaintance), Machiavellianism had a significant correlation with judgement ability in strangers. EI, in turn, had a significant relationship with personality judgement ability in acquaintances, especially in acquainted females.

Female friends were more accurate in personality judgement if they obtained high scores on the EI and self-rated altruism questionnaires. The finding that EI relates to judgement ability in friends, especially female friends, but not in strangers, is intriguing, and warrants further discussion. It seems that when emotionally intelligent individuals meet a stranger, they are not using their emotional understanding in making personality judgment. However, emotionally intelligent people, especially females, seem to fare better when making judgments about their friends. Perhaps emotional intelligence is something that people use successfully in stable relationships. Previous research has found that EI is related to multiple positive outcomes in personal relationships (Lopes, Salovey and Strauss, 2003, Lopes et al, 2004, Lopes et al, 2005, Yip and Martin, 2006). It is possible that one of the factors that lead to social success is the ability to know your friend well, and be able to predict how they are going to behave in different situations. Why EI should be important in female but not male relationships could be partly due to different biological processes between the sexes.

For example, Lieberman (2000) drew links between women's social intuition, implicit learning and estrogen levels. According to Lieberman, intuition is a result of implicit

learning, in which the learner is not aware of the learning process. The hormone estrogen affects the amounts of dopamine released into the striatum, which affects the speed by which people form implicit associations (see Lieberman, 2000). Estrogen could affect the processing of social information by speeding up the formation of subconscious learning of nonverbal signals. So far, the relationship between emotional intelligence and estrogen is unknown. Future research should address this issue- after all, emotional intelligence research has discovered that females score consistently higher than males in EI measurements, and females also seem to have superior abilities in tasks requiring implicit information processing, such as decoding nonverbal behaviours. The ultimate causes of judgement accuracy in female friends could be related to fitness benefits behind the ability to form close and supportive relationships with other females.

Interestingly, Machiavellianism had a significant relationship with personality judgement ability, but only in strangers. This finding is difficult to explain, as it is unclear why it would be beneficial to have the ability to assess the qualities of a stranger, but not an acquaintance. Perhaps, when high-Machs have established a friendship, they lose the interest in trying to understand the other, whereas in new, emerging relationships, the ability to assess personality is more important. Nevertheless, the finding that Machiavellianism is an advantage when judging the personality characteristics of a previously unknown person is peculiar, as previous studies have found that friends are normally better judges than strangers are (e.g. Borkenau and Liebler, 1992). Jonason et al (2008) suggested, Machiavellianism is a “hit and run” social strategy, where individuals move quickly from one relationship to another, employing a social style based on exploitation of others. The findings of the present study provide support, albeit indirectly, in that Machiavellianism was related to an ability to judge the characteristics of a stranger. At present, there is not much evidence for how Machiavellian individuals function in their social relationships. Following chapters will aim

to explore Machiavellian social functioning in more detail.

There has also been some criticism for the validity of short Big Five measurements, which is potentially one of the methodological shortcomings of the present study. Although some studies have found that the validity, test-retest reliability and convergence between self and observer ratings of the short questionnaires is reasonable (Gosling, Rentfrow and Swann, 2003, Muck, Hell and Gosling, 2007, Rammstedt and John, 2007), Herzberg and Brahler (2006) questioned the validity of this measure as a reliable proxy for the longer questionnaires. However, due to the lengthy nature of the study, it was necessary to use a short measure. Furthermore, as participants were completing the same personality measurement for themselves, and for their interaction partner, the use of a longer questionnaire would have taken too long to complete. In the future, it would be interesting to use more extensive and performance-based EI and Big Five measures with a larger sample size, to see if the same effects found in this study still prevail. Moreover, it would be fascinating to incorporate biological measures of hormones (especially estrogens) to see how these might affect interpersonal perception and personality judgement accuracy. The present study should be treated as a pilot study, giving some possible directions for future research.

3.3 Study 2

3.3.1 Method

3.3.1.1 Participants

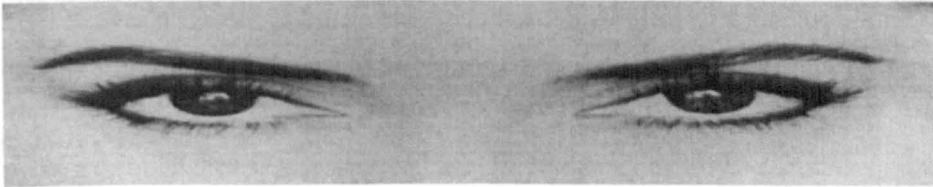
Study 2 consisted of 38 participants. 27 of these were females, and 11 were males. Mean age of participants was 38.3 (s.d 9.1). Participants were recruited from the staff working in Liverpool Hope University.

3.3.1.2 Materials

(i) *The Eyes Test* (Baron-Cohen et al, 2001)

The eyes test consists of 36 pictures of pairs of eyes (see figure 3.5 for an example item). Each picture is surrounded by four words depicting emotions. Participants are required to match the eyes with the correct emotion. Each correct response scores a point, making the range of possible scores between 0-36.

Figure 3.5. Example Item from the “eyes” test



The example item in figure 3.5 is circled by the following word options: Joking, flustered, convinced, desire. The correct answer for this item is desire.

The test has been used as a measurement of Theory of Mind capacity, and benefits from providing a continuous score rather than a categorical answer given by the false belief tasks. Past studies have found that schizophrenic (Bora et al, 2008, Kelemen et al, 2006), autistic (Baron-Cohen et al, 2001) and depressed patients score abnormally low on this test (<22), whereas the scores for normally functioning adults range between 23 and 36.

(ii) Video clips on Prisoner's Dilemma Game

The video tape consisted of short, 60-s clips of the interactions between 10 pairs consisting of male and female strangers and acquaintances who took part in the study reported on Chapter 2. The videotapes consisted of pairs in which one of the participants cooperated, and the other one defected. Participants were presented with a forced-choice question in which they had to nominate which one of the two within the dyad did, and which one did not share the money. Each correct guess scored one point, and incorrect guesses were not penalised. Thus, each person could score anything between 0-10 on guessing the cooperators and defectors within the 10 dyads. The participants were also requested to indicate whether the dyads consisted of people who know each other, or whether the people in the dyad were strangers. As there were 10 dyads, the correct scores on this could also vary between 0 and 10.

3.3.1.3 Procedure

Participants were tested in a seminar room in Liverpool Hope University, using a VHS to play videoclips recorded during the Prisoner's Dilemma experiment reported in Chapter 2. Participants were first given the Mach IV and EI questionnaires, after which the Eyes test was administered. Following this, the participants were shown video clips of 10 pairs who had participated in the Prisoner's Dilemma game reported in the previous chapter. The subjects were explained how the payoff matrix of the game works, and they were asked to indicate which one of the pair would cooperate, and which one would defect. They were also requested to indicate whether the dyad knew each other, or whether they were strangers.

3.3.2 Results

Descriptive statistics

The mean scores for the measurements were the following: The Eyes test = 26.4 (3.88 s.d), Mach IV= 66.93 (11.99 s.d), Emotional Intelligence= 178.14 (18.59 s.d), correct guesses on PD outcome= 5.55 (1.67 s.d), correct guesses on relationship strength= 6.79 (1.44 s.d). One-Sample Kolmogorov-Smirnov Test had non-significant p-values for all of the variables. Thus, parametric statistics are used when analysing the data.

Hypothesis 1 Emotional Intelligence has a positive correlation with judging cooperation and relationship strength

According to hypothesis 1, EI is something that we use in successful inter-personal interactions, and should, in theory, relate to the ability to judge cooperativeness in others. Again, the experimental hypothesis was rejected- emotional intelligence bore no relation to judging PD game outcomes (Pearson $r=-.121$, $p=.469$) or the strength of relationship between participants (Pearson $r=-.050$, $p=.766$).

Hypothesis 1 Machiavellianism has a positive correlation with judging cooperation and relationship strength

Pearson correlations were conducted between the Mach IV scores and the number of correct answers when identifying co-operators and defectors, and judging the strength of relationship. Both were found to be non-significant, in both judging the PD game outcomes (Pearson $r=.165$, $p=.324$) and judging the strength of relationship (Pearson $r=-.168$, $p=.314$).

Hypothesis 3 Theory of Mind has a positive correlation with judging cooperation and relationship strength

Theory of Mind did not appear to predict the ability to identify trustworthiness in the PD game, as the correlation between performance on the Eyes test and the number of correct judgements of cheats and co-operators was non-significant (Pearson $r = .086$, $p = .606$). However, ToM did go some way in explaining the ability to judge whether two people are strangers or acquaintances, as higher scores on the Eyes test had positive correlation with the number of correct guesses (Pearson $r = .336$, $p = .039$).

3.3.4 Discussion study 2

In the present study, Machiavellianism and Emotional Intelligence were not related to the ability to judge cooperators and defectors in a PD game, or to the ability to assess relationship strength between two people. This would indicate that people with more Machiavellian inclinations have not evolved perceptual sensitivity to identify signals related to behavioural inclinations of others. Although not much is known about the co-evolution of trustworthiness and social perception (see Vigil, 2009), the results of the present study suggest that being manipulative does not require superior social perception. The following chapter will look at the relationship between Machiavellianism and Theory of Mind more closely, to see how the two constructs might be related to each other.

Interestingly, although study 1 found that EI predicted better ability to judge personality, the same did not seem to prevail when looking at the capacity to judge

trustworthiness. The strongest correlations in study 1 were found between acquainted females after face-to-face interaction. Study 2, instead, was investigating 3rd party perception of behaviour, using judges who were not familiar with the people they were observing. Perhaps, again, stronger correlations would be found if the judges knew the individuals they were judging. During human evolution, cooperation was more likely to occur between individuals who know each other, rather than as a one-shot interaction between complete strangers (Kiyonari, Tanida and Yamagishi, 2000). Thus, it makes more sense to be able to assess the cooperativeness of an individual who a person interacts with regularly. It is likely that when assessing people who are known to the individual, judgements are based on the knowledge gained during previous interactions, coupled with the behaviour of the other during current contact. It would be interesting to see whether ToM plays a part in assessing cooperativeness of an acquaintance on one-to-one interaction, as this might be a more ecologically valid method of investigation, being a more truthful manifestation of the social environment where humans were evolving. Interestingly, ToM emerged as a predictor of the ability to judge relationship strength in pairs of strangers. Perhaps ToM did not evolve to facilitate recognition of truthful individuals and aiding cooperation, but it emerged from the need to keep track of coalitions and alliances between others within ones social group. Primates, for example, seem to have some idea of third-party relationships, and the ability to use this knowledge when forming coalitions (Silk, 1999). The knowledge of who is friendly with whom is important when assessing the likelihood of receiving support from individuals during conflict. There is evidence that both new and old world primates possess a sophisticated ability to assess the quality of the relationships between other individuals in their group, and use this knowledge in making informed, adaptive social decisions (see Silk, 2007). This would imply that the knowledge of third party relationships evolved early in the primate taxa- in humans, the evolution of higher levels of intentionality could have facilitated

even more complex knowledge of other people's relationships. Ultimately, the evolution of theory ToM could have been driven by expanding group size, resulting in an increased cognitive demand for a system that allows individuals to keep track of other's relationships. Although it is not clear why humans evolved higher levels of intentionality, the present study suggests that rather than benefiting in recognising free-riders, ToM could have evolved in complex pair-bonded fission-fusion societies, where knowing your friends from your foes would have brought adaptive benefits when constructing one's social networks. Whatever the selection pressures leading to ToM in human ancestors, large brains and human-specific intelligence evolved under increasingly complex social systems, placing increasing computational demands on the individuals.

4. Theory of Mind, Machiavellianism and social attributions

Abstract

This chapter investigated the relationship between manipulateness, social intelligence, and attributional styles. It was expected that Machiavellian individuals would perform well in a task that measures cold cognition, but obtain lower scores on a task that measures hot cognition part of ToM. Furthermore, high-Machs were expected to possess an externalising attributional style, blaming other people rather than themselves for negative events. It was found that high-Machs did not possess an externalising attributional style, but did have worse performance on both hot and cold cognition tasks, indicating that their manipulative tactics are not based on enhanced understanding of others. It is possible, indeed, that lack of understanding harnesses Machiavellians with the capacity to exploit, as they might have a deficit in comprehending the emotions of others. The results are discussed in terms of evolution of individual differences social strategies.

4.1 Introduction

Humans are equipped with a powerful social tool, theory of mind (ToM), which gives us the capacity to understand others as intentional agents who can, potentially, be manipulated and deceived. One of the findings in chapter 2 was that manipulateness in the form of Machiavellianism did not lead to deceptive behaviour in the Prisoner's Dilemma game. The reason for this could be that high-Mach individuals have the capacity to adjust their behaviour according to the situation they find themselves in. The lack of anonymity in the experiment could have led even the high-Machs to cooperate, because of the beneficial effects of reputation as a cooperator. The ability to flexibly adjust to social situations is typical of our species (e.g. Paulhus and Martin, 1988), although the individual determinants of this capacity are less studied area of research. It is possible that this flexibility is partly due to social intelligence, or more specifically, ToM. The aim of this chapter is, then, to find out whether high-Machs have superior understanding of others. It would be expected that if Machiavellianism is an evolutionary cheater strategy, the high-Mach individuals possess good theory of mind skills, in order to be successful in manipulating others for their own benefit.

Since Premack and Woodruff (1978) first introduced the term "theory of mind", extensive research and theorising has been conducted into other species (Barrett, Henzi and Rendall, 2007, Hare and Tomasello, 2005, Hart, Hart and Pinter-Wollman, 2008, Penn and Povinelli, 2007) children (Charman et al, 2000) and clinical populations (Bora et al, 2008, Craig, et al 2004, Lee et al, 2005). Some of the findings of the copious studies have been the universality of ToM in humans, and the possible absence of it in other species (see Heyes,

1998). Typically, children develop ToM around the age of four, but individuals on the autistic spectrum never quite learn to understand the intentions or emotions of others (see Baron-Cohen, 1997). ToM deficits are also apparent, for example, in schizophrenic, depressed and bipolar patients, who have demonstrated a decreased ability to encode emotions of other people (Craig, et al 2004, Kerr, Dunbar and Bentall, 2003, Lee et al, 2005). In addition to this, schizophrenic patients have impairments in reasoning about intentions of others based on contextual information (Craig et al, 2004, Mazza et al, 2001). The social significance of ToM is demonstrated in numerous studies that have revealed a link between autism and lack of recognising information contained in gaze direction (Baron-Cohen, 1995, Baron-Cohen & Cross, 1992), understanding causes of emotional states (Baron-Cohen, Spitz and Cross, 1993), understanding deception (Baron-Cohen, 1992, Sodian and Frith, 1992) and false beliefs. These studies together indicate that ToM and understanding intentionality are critical for functioning without difficulty in social environments.

Despite abundant research into social cognition, hardly any of the studies have looked at individual differences in normally functioning adults (see Paal and Bereczkei, 2007, Stiller and Dunbar, 2007 for exceptions). It is clear that adults show remarkable individual variation in their mentalising ability. Moreover, research has found that these differences correlate positively with the size of the social network of an individual (Stiller and Dunbar, 2007). Another study suggested that self-reported cooperative tendencies were related to ToM capacity (Paal and Bereczkei, 2007). Theoretically speaking, being able to understand the emotions, beliefs and desires of others should provide people with the capacity to be successful in their social lives.

This chapter will look at the relationship between Machiavellianism and ToM, with the expectation that the Machiavellian social success is possible due to superior mindreading skills. In evolutionary terms, a link between Machiavellianism and ToM is a strong

possibility. In order to use a manipulative strategy successfully, an individual should have a good understanding of the emotions and intentions of others (McIlwain, 2003). At present, there is some, but mostly indirect evidence for a link between Machiavellianism and social cognition.

Several studies have discovered that Machiavellianism and ToM, separately, are related to schizophrenia. For example, two studies have found that people with schizophrenia score lower than control group on a scale that measures Machiavellianism (Mazza et al, 2003, Sullivan & Allen, 1999). Mazza et al (2003) suggested that the low scores of schizophrenic patients in the Machiavellianism scale is related to poor mentalising ability, associated with underlying ToM deficits. Perhaps it is possible, then, that higher scores on the Machiavellian scale correlate positively with performance on theory of mind tasks. Paal and Berezkei (2007) set out to investigate the relationship between the cold cognition part of ToM (which will be explained later in the chapter) and Machiavellianism. The subjects in the study filled in the Mach IV scale, and completed a ToM task which requires reading stories about social relationships, and answering questions with increasingly complex levels of intentionality. Perhaps surprisingly, Paal and Berezkei (2007) did not find a relationship between mindreading ability and Machiavellianism in adults. One of the explanations given by the authors was that high-Mach individuals might have lacked the motivation to perform in the laboratory task, hence leading to average scores on the ToM test. Contradicting the finding of Paal and Berezkei (2007), observational studies on children have found some evidence for the link between Machiavellianism and ToM. For example, bullying behaviour in children has provided some support for the idea that high-Machs have superior mentalising abilities. Sutton et al (1999) found that some children who are bullies have good ToM skills, too. Other research has discovered that bullies also score high on the kiddie-Mach scale (Andreou, 2004, Sutton and Keogh, 2000). These studies indicate that there is a relationship between

Machiavellianism and ToM- perhaps the bullies, in order to be able to identify the victims, and incorporate other children into the harassment, need to be able to understand what is going on in other peoples' minds. It is also possible that the high-Mach children who are bullies are not capable of feeling empathy, which allows them to carry on tormenting their victims.

According to McIlwain (2003), Machiavellianism is a disorder of empathy, where high -Mach individuals have the capacity to understand affective and intentional states of others, but somehow lack the capacity to feel empathetic concern. It is likely that this bypassing of empathy is related to attributing blame to the victim, somehow viewing the victim as somebody who deserves the aggression. Interestingly, bullying in children has been related to hostile attributional styles (see Dodge, 2006) implying that the bullies somehow justify their actions by directing blame to their victims. Although there currently is not much research into Machiavellianism and causal attributions, it would be expected that high-Machs are capable of callous manipulation partly because they see other people as causes of negative actions. This view is partly supported by the findings of a questionnaire survey in a corporate setting: this study reported that Machiavellian orientation was related to the belief that people deserve whatever misfortunes they might encounter in life (Mudrack, 2007). Findings like this would suggest that high-Machs tend to think that negative events are caused by others, rather than by the self, circumstances or pure chance. One of the aims of the present chapter is to explore the link between Machiavellianism and blame attribution further.

Individual differences in attribution of blame seem to be consistent and stable over time (Robins et al, 2004), and related to deficits in social cognition (Kinderman, Dunbar and Bentall, 1998, Langdon et al, 2006). Kinderman, Dunbar and Bentall (1998) found some evidence for a relationship between attributional styles and ToM. In their study, subjects were asked to read stories about complex social relationships, and answer questions about the

intentions and social knowledge of the characters in the stories. The authors discovered that ToM deficits in a student population were related to an increased tendency to blame other people for negative social events. The authors hypothesised that ToM is essential in order to see the world from another person's perspective, noting that "When involved in a negative social interaction (for example, say a friend is unusually curt) it is possible to explain the behaviour of the other person either in terms of a trait (the friend is hostile) or in terms of the situation (the friend has had a bad day, is feeling unwell etc). The former involves making an external personal attribution whereas the latter involves making an external situational attribution. However, to make the external situational attribution in this example, it is necessary to be able to appreciate the other person's point of view..." (Kinderman, Dunbar and Bentall, 1998, p194).

There are some suggestions that instead of having superior understanding of others, Machiavellian individuals might, instead, have deficits in their social cognition. ToM deficits have been linked with schizophrenia (Corcoran, Mercer and Frith, 1995, Frith and Corcoran, 1996), and schizophrenia has been linked with negative, externalising attributional style (Kayne and Bentall, 1989). This research, together with the proposed negative attributional styles of high-Machs, would suggest that rather than possessing superior social cognition, high-Machs might, in fact, have deficits in how they perceive other people.

As well as appreciating another person's point of view, and being able to attribute the reasons for their behaviour to causes other than stable personality traits, social cognition consists of the ability to make inferences about others' affective and knowledge states. The two components of social understanding, which Stone (2000) named "hot" and "cold" cognition, form distinct but related aspects of ToM.

According to Stone (2000), cold cognition refers to the capacity to make inferences

about others epistemic states which can be classified as knowledge about other people's beliefs, knowledge, or their focus of attention. Hot cognition, in turn, refers to the capacity to make inferences about affective states, such as knowing what the other person might be feeling on the basis of cues such as facial expressions. Others have made analogous distinctions, but using different terminology. Tager-Flusberg and Sullivan (2000) named the mechanisms of social intelligence as the "social perceptive" and the "social cognitive" components of theory of mind. Similarly, Gallese, Keysers and Rizzolatti (2004) called them the "simulation" and "theory theory" of theory of mind. According to Gallese, Keysers and Rizzolatti (2004), the simulation (or the hot cognition, or social perceptive theory of mind) is based on the use of mirror neuron system, and involves the capacity to represent the mental states of others as if they were the mental states of the self.

The proposed relationship between hot and cold cognition has yet to be unequivocally established (Paal and Bereczkei, 2007). There is some evidence that the two mechanisms are not associated. Tager-Flusberg and Sullivan (2000) found that in children with William's syndrome, the social-perceptual component was spared, whereas the social-cognitive component was impaired. Based on the current knowledge on characteristics of high-Mach individuals, it is possible that Machiavellian people perform well in the tests where they have to reason about the epistemic states of others, but may fail on tests where they have to draw on their intuition in order to assess the affective states of others.

It is clear that attributing mental states to others is restricted by cognitive limitations, and that some people perform significantly better than others. It seems that answering questions up to four levels on intentionality (e.g. I *know* that he *knows* that she *thinks* that I *believe*) is relatively easy, but if the levels of intentionality are increased, the error rates increase dramatically (Kinderman, Dunbar and Bentall, 1998). However, some participants in the study by Kinderman et al were good in answering questions tapping into five and six

levels of intentionality. As well as looking at the relationship between Machiavellianism and overall performance on a cold cognition test, the present study will look at the levels of intentionality in more detail.

If Machiavellianism is an evolutionary cheater-strategy, it would be expected that the high-Machs do well on ToM tasks. However, it is equally possible that high-Machs, having a disorder of empathy (McIlwain, 2003), only do well on cold cognition, but not on hot cognition tasks. If this is the case, the present chapter would provide more evidence for the idea that hot and cold cognition are part of different processes, probably relying on different neural mechanisms.

If Machs do have a deficit in understanding other people, as suggested by McIlwain (2003), it is also expected that high- Machs have an externalising attributional style, blaming other people for negative events. Perhaps this cognitive style harnesses high-Machs with a manipulative capacity, and allows them to carry on exploiting deserving others without feeling empathy towards the victims. Based on the evidence reviewed here, the predictions of this study are the following:

Hypothesis 1. Manipulativeness is of advantage when reasoning about the epistemic and knowledge states of others. *Thus, Machiavellianism score correlates positively with performance on tasks that measure "cold" cognition.*

Hypothesis 2. Previous studies have found that some individuals reach higher (e.g. 5th and 6th) levels of intentionality with fewer errors than others. It is expected that these individuals are high-Machs, who make less errors when making complicated inferences about other people's relationships. *Thus, participants who make fewer errors at 5th (or above) levels of intentionality are expected to be high-Machs.*

Hypothesis 3. Machiavellianism has been labelled as a disorder of empathy

(McIllwain, 2003). High-Machs are manipulative because they can not feel what their victim might be feeling. *Thus, Machiavellianism score correlates negatively with performance on tasks that measure "hot" cognition.*

Hypothesis 4. If Machiavellian individuals score high on cold cognition and/or low on hot cognition tasks, the two types of cognitive styles should be unrelated or negatively correlated to each other. *Thus, it is expected that there will either be a negative correlation, or no correlation at all, between hot and cold cognition tasks*

Hypothesis 5. In order to be able to exploit other people, it is expected that rather than blaming circumstances or themselves, high-Machs blame other people for negative events. *Thus, Machiavellian individuals should have an externalising bias in a test that measures attributional style*

4.2 Method

4.2.1 Participants

The participants (N=60, 37 females, 23 males) were a mixture of students and the general public in the North West of England. The mean age of the participants was 33.97 years (SD 11.96). The mean age for females was 35.9 years (SD 12.5) and 30.4 years for males (SD10.3). Participants were recruited via snowball sampling and advertising in psychology tutorial classes. Subjects were tested in their homes and in the canteen and seminar rooms in Liverpool Hope University.

4.2.2 Materials

(i) *The Internal, Personal and Situational Attributions Questionnaire (IPSAQ)*

(Kinderman and Bentall, 1996)

This 32-item questionnaire assesses the causal locus of attributional styles. IPSAQ describes 16 negative events (for example, “a friend has betrayed the trust you had on her” and 16 positive events (e.g. “a friend tells you that she respects you”). Respondents are required to write down the most likely cause for the event. They are then asked to indicate whether the event is due to the participant (internal attribution), to the other person (personal attribution) or to circumstances or chance (situational attribution). Each response is given one point. The responses can be added up to obtain a score for three negative and three positive attributions (Positive internal, personal and situational, and negative internal, personal and situational scores). The six sub-categories can also be collapsed into scores representing cognitive biases- the externalising bias (EB) and the personalising bias (PB).

Externalising Bias

EB is the tendency to attribute more positive than negative events to oneself. EB is calculated by subtracting the number of internal attributions for negative events from the number of internal attributions for positive events. Self-serving bias (i.e. attributing more positive than negative events to oneself) are indicated by a positive EB score.

Personalising Bias

Personalising bias (PB) measures the tendency of a person to attribute negative events to others instead of situations and circumstances. This score is obtained by summing up the number of personal and situational negative events, and dividing it by the total number of

personal attributions. If the PB score is greater than 0.5, the person has a tendency to attribute negative events to other people rather than to situations.

The IPSAQ scale has been used widely in clinical research, and shows good internal reliability (Diez-Alegria et al, 2006, Kinderman and Bentall, 1996, 1997, Langdon et al, 2006, McKay, Langdon and Coltheart, 2005, McKay and Cicolotti, 2007). See appendix 8 for an example.

(ii) *The Eyes test* (Baron-Cohen et al, 2001).

The eyes test consists of 36 pictures of pairs of eyes (see figure 3.4 for an example item, and Chapter 3 for a description). Each picture is accompanied by four words depicting different emotions. Participants are required to match each picture with a correct emotion, scoring one point for each correct response. Thus, the possible scores on the test range between 0-36.

(iii) *The Imposing Memory Task (IMT)* (Stylianou, 2007, Kindermann et al, 1998, Stiller & Dunbar, 2002)

This test consists of stories about complex social relationships between people. An example story deals with a man wanting to ask a woman out for a date, but is afraid of rejection, so he asks the friend of the woman instead, hoping that she would bring her friend with her (see appendix 9). The participants are given a booklet containing the stories and the questions, and are asked to answer the questions after reading each story. The questions involve deciphering increasingly complex levels of intentionality. Each mentalising question contains two statements, one true and one false. In order to answer the questions correctly, participants have to have a complex understanding of the relationships between the characters

in the stories. Each story has eight questions attached to it, one question for each level of intentionality (e.g. first level: John thought that Penny knew, second level: John thought that Penny knew what Sheila wanted... and so on).

In the present study, participants read three mentalising stories. These were initially devised by Kindermann et al (1998) and later modified by Stiller and Dunbar (2007) and Stylianou (2007). The scoring system that different studies have used varies slightly. However, the different scoring systems have high inter-correlations (Stylianou, 2007). Here, the negative marking system is used. The negative marking system gives each correct answer a score of one point, and 0.5 points are deducted when a question is answered incorrectly. Thus, for each level of intentionality, an individual could score maximum three points after answering the questions attached to the three stories. There are altogether 24 questions, and the possible range of scores varies between 12 and 24.

The scoring system follows the method of Kinderman et al (1998), where the subjects own state of mind is not included when calculating the levels of intentionality. Hence, the first level of intentionality indicates the existence of ToM (i.e. *I think that you are*). Appendix 8 shows the stories and the questions used in the study.

(iv) The Mach IV scale (Christie and Geiss, 1970)

The Machiavellianism scale consists of 20 statements, asking about the participants general view on human nature. The questions (e.g. Most people have a vicious streak that is just waiting to come out) are measured on a 7-point Likert Scale (strongly disagree –strongly agree). The possible scores on the scale range from 20 to 140.(see appendix 1 for an example of the questionnaire).

4.2.3 Procedure

Participants were approached in psychology seminar classes, or recruited from the researchers social network via snowball sampling. Some participants were tested in small groups (between 2-8 people) and others were tested by themselves. Most subjects were e-mailed or handed out the IPSAQ and Mach IV a few days before taking part in the ToM tasks. This was done in order to minimise the testing time at any one session. Participants were informed that they would be taking part in a personality study. Participation was voluntary, and the subjects were not paid for their time.

4.3. Results

Descriptive statistics:

Table 4.1. Means and standard deviations for the Eyes test, IMT, externalising bias, personalising bias (negative and positive), and Machiavellianism

Measure	Female (N=37) Mean (SD)	Male (N=23) Mean (SD)	Total Mean (SD)
The eyes test	25.7 (4.8)	25.8 (4.8)	25.72 (4.76)
IMT	14.9 (4.0)	14.3 (5.0)	14.7 (4.4)
Externalising bias	4.9 (3.5)	2.0 (2.8)	2.6 (3.7)
Personalising Bias (negative)	2.9 (4.1)	1.1 (.97)	.99 (.64)
Machiavellianism *	63.8 (10.4)	74.9 (12.6)	67.9 (12.4)

* Significant difference between males and females

Table 4.1 shows the means of the tests for females, males and the whole sample. The only significant difference between males and females was in the Machiavellian scores, where males scored significantly higher than females (Mann Whitney U= 124.00, Z=-3.318, p=.001).

Kolmogorov-Smirnov tests showed that the data were not normally distributed for the Eyes test. Therefore, non-parametric tests were deemed as appropriate for the analysis of the data.

Table 4.2. Number of correct answers at each level of intentionality

Levels of intentionality	No correct answers	One correct answer	Two correct answers	All answers correct (% of participants)
First level	0	1	2	57 (95%)
Second level	1	0	14	45 (75%)
Third level	2	5	14	39 (65%)
Fourth level	0	6	20	34 (56.7%)
Fifth level	4	11	26	19 (31.7%)
Sixth level	3	12	24	21 (35%)
Seventh level	2	18	22	18 (30%)
Eighth level	9	12	28	11 (18.3%)

Table 4.2 shows that more than half of participants answered ALL their questions correctly up until four levels of intentionality. 95 % were able to answer all of their 3 questions correctly at the first level, 75 % answered all of their 3 questions correctly at the second level, and so on. However, the performance drops dramatically after the fourth level of intentionality- just over third of people did not make any mistakes when confronted with questions tapping into five levels.

Hypothesis 1 Machiavellianism score correlates positively with performance on tasks that measure “cold” cognition.

Using the median split, participants were divided into low/high -Machs. Median Mach score in the sample was 68. Thus, an individual scoring 69 or above was placed in the high Mach group, and individuals scoring 68 or less were placed in the low- Mach group. The sample consisted of 27 high-Machs (mean score 77.9, 8.4 SD) and 33 low-Machs (means score 59.5, 8.2 SD).

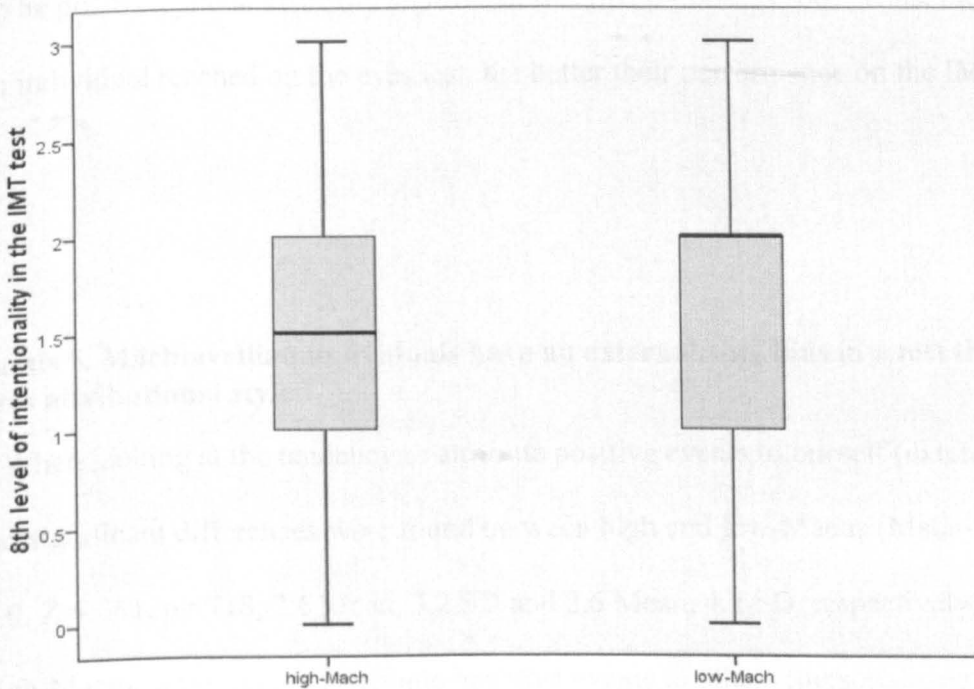
In order test hypothesis 1 (Machiavellians perform well on cold cognition task) a Mann Whitney U test was conducted, using the Machiavellian group (high, low) as an independent variable, and the test score on the IMT test as the dependent variable. The difference was significant (Mann Whitney $U=234.0$, $Z=-2.43$, $p=.015$), but in an unexpected direction- instead of obtaining superior scores, the high-Machs performed significantly worse than the low- Machs on the IMT test (13.4 mean, 4.9 SD and 15.7, 3.8 SD, respectively).

The same pattern prevailed when a correlation was run between the Mach IV scale and the IMT test. The higher the Machiavellianism score, the lower the performance on the IMT ($r= -.278$ $p=.038$).

Hypothesis 2 Participants who make less errors at 5th (or above) levels of intentionality are expected to be high-Machs.

A Mann-Whitney U test was conducted at each level of intentionality using the Machiavellianism group (high, low) as the independent variable, and the number of correctly answered questions at that level (0-3) as the dependent variable. There were significant differences between high and low-Machs at the 8th level on intentionality- when asking about the most complicated scenarios, high-Machs perform significantly worse than low-Machs (Mann-Whitney U=217.0, Z=-2.29, p=.022). Figure 4.1 shows that the median for low-Machs was 2 correct answers, whereas the median for high-machs was 1.5 correct answers at 8th level of intentionality. Otherwise, the top, middle and bottom quartiles of the scores for both high and low-Machs were similar (figure 4.1). At other levels of intentionality, high and low-Machs did not differ in the amount of correct answers.

Figure 4.1. The performance of high and low-Machs at the 8th level of intentionality



Hypothesis 3. Machiavellianism score correlates negatively with performance on tasks that measure “hot” cognition.

The Mann Whitney U test between high and low -Machs and the performance of the Eyes test was significant (Mann Whitney $U=.222.50$, $Z= -3.12$, $p=.002$) in the expected direction- high-Mach individuals scored significantly lower than low-Mach individuals on the eyes test (24.1 Mean, 11.6 SD and 27.0 Mean, 4.3 SD, respectively). However, this relationship was not significant when a correlation was conducted between the two tests ($r=-.162$ $p=.221$)

Hypothesis 4. Hot and cold cognition are not related to each other

In order to test the hypothesis that hot and cold cognition are unrelated, a Spearman Rho correlation was conducted between the eyes test and the IMT test. The correlation was found to be positive, and statistically significant ($r=.501$, $p=.001$, $N=60$). Thus, the better score an individual reached on the eyes test, the better their performance on the IMT test as well.

Hypothesis 5. Machiavellian individuals have an externalising bias in a test that measures attributional style

When looking at the tendency to attribute positive events to oneself (externalising bias), no significant differences were found between high and low-Machs (Mann-Whitney $U=325.0$, $Z=-.361$, $p=.718$, 2.6 Mean, 3.2 SD and 2.6 Mean, 4.2 SD, respectively). Neither were high-Machs more likely to attribute negative events to others (personalising bias) than low-Machs were (Mann-Whitney $U=278.0$, $Z=-.95$, $p=.340$, .98 Mean, .85 SD and 1.0 Mean, .40 SD, respectively)

4.4 Discussion

Machiavellianism and social cognition (Hypotheses 1, 2 and 3)

The results show that Machiavellianism is related to theory of mind, but perhaps in an unexpected way. Instead of being the manipulators who understand complex relationships between people, high-Machs were found to be the opposite, performing poorly on both cognitive and affective empathy tasks. This indicates a poor, rather than a superior mind reading capacity. Why high-Machs should obtain lower scores on the cold cognition task, which requires reasoning about the knowledge states of individuals, is an intriguing finding. Looking at neuronal correlates of social cognition might provide some explanations for the peculiar under-performance of high-Machs in the cognitive and emotional ToM tasks.

Research has found that several brain regions are responsible for the development of human-typical social understanding. Frith and Frith (2003) proposed that the most important structures for ToM capacity are the medial pre-frontal cortex, temporal pole and posterior temporal lobes. Although other brain regions have been implicated in social cognition (see, for example, Adolphs, 2009), there is no doubt that the frontal lobes have paramount importance in allowing us to understand the emotions and intentions of others (Hirao et al, 2008, Kipps and Hodges, 2006, Shamay-Tsoory, Aharon-Peretz and Perry, 2008). Interestingly, research has found that frontal lobe dysfunction might be one of the characteristic features of Machiavellianism and psychopathy as well (McNamara, Durso and Harris, 2007, Sommer et al, 2006). For example, McNamara, Durso and Harris (2007) tested a group of Parkinson's disease patients, who completed a task that requires the use of frontal lobes. They also measured the manipulateness in the patients, using the Mach IV scale. The authors discovered that high-Mach patients performed poorly, indicating a relationship between Machiavellianism and frontal lobe dysfunction. Interestingly, the study implies that

the often found drastic personality change in Parkinson's disease patients might be due to malfunctioning frontal lobes- the high-Mach patients were also found to be less cooperative and more suspicious of others than the low-Mach patients. McNamara, Durso and Harris (2007) suggested that Machiavellianism is a facultative social strategy, which is kept under control by the frontal neural networks. When the frontal lobe inhibition is lifted, individuals resort more readily to manipulative behaviours, having high levels of Machiavellianism as the default social strategy. Interestingly, another recent study found that advanced Parkinson's patients had impaired theory of mind functions, but only when tested on the cognitive component of ToM (Peron et al, 2009). These studies, together, go some way illuminating the findings of the present chapter- perhaps Machiavellianism and cognitive ToM are part of the same neural networks, controlled by the frontal lobes. This would explain why the present study found a negative correlation between Machiavellianism and performance on the cognitive theory of mind test.

Perhaps superior social cognition is not necessary for successful manipulation of others. For example, frontal lobe dysfunction is evident in psychopaths, individuals who are callously driven by utilitarian motives (Sommer et al, 2006, Pridmore, Chambers and McArthur, 2005). Despite of this, psychopaths seem successful in their manipulation of others (Morgan et al, unpublished manuscript). McHoskey, Worzel and Szyarto (1998) suggested that rather than being maladaptive personality, Machiavellianism could be a manifestation of sub-clinical psychopathy. It is possible that in a similar manner to psychopaths (e.g. Sommer et al, 2006), high-Machs have deficits in frontal lobes, possibly even in the structures related to the Mirror Neuron System (Shamay-Tsoory, Aharon-Peretz and Perry, 2008) which is reflected in malfunctioning of social cognition. Future research could provide fascinating insights into the neurological functioning of the Machiavellian individuals, and how this relates to their social behaviour.

Perhaps high-Machs (and psychopaths) are so proficient in manipulating others for their own benefits because they have a decreased understanding of others. Pro-social emotions, such as empathy, guilt and remorse, might be tools that prevent us from overt exploitation of others. Perspective taking and empathy share, at least partly, the same neural networks (Brunet-Goyet and Decery ,2006). No published studies have yet explored the relationship between social cognition and pro-social emotions. It would be interesting to find out whether enhanced perspective taking capacity relates to heightened pro-social emotions, leading to better cooperative abilities. Future studies should investigate the relationship between emotions and social cognition further, possibly looking at the interaction between these variables and Machiavellianism and cooperation.

The findings of the present chapter are also interesting in the light of the Machiavellian selfish behaviour. Recent research has found that ToM plays an important role in cooperative tendencies (Paal and Berezkei, 2007, Sally and Hill, 2006) and it is possible that the high-Machs fail to be cooperative because of they have poor insight into other's behaviour. A developmental exploration by Sally and Hill (2006), for example, found that in children, development of ToM was related to fair offers on an ultimatum game. Paal and Berezkei (2007), in turn, found that in a non-clinical adult population, better scores on the IMT test (a measure of cognitive ToM) related to higher scores on a cooperativeness scale. Moreover, there is some evidence for the role of pre-frontal cortex in cooperative interactions. McCabe et al (2001) conducted an fMRI study on subjects who were engaged in a trust game either against the computer, or with another individual. The authors witnessed significantly increased activity in the pre-frontal region when the participants were playing with another human, as opposed to playing with a computer. Interestingly, individuals who failed to cooperate did not show the same pattern as their PFC activation did not differ between the human and non-human conditions. Although McCabe et al (2001) did not look at

Machiavellianism and cooperation, previous studies have found that in similar settings, high-Machs are more likely to employ a deceptive strategy (see Mokros et al, 2008, for evidence for psychopaths). Perhaps high-Machs are individuals who have malfunctioning pre-frontal areas, and fail to assess the likelihood of deception and cooperation, resulting in treating both intentional and unintentional agents in a similar way. Machiavellian individuals tend to treat others with suspicion (Harrell, 1980, McHoskey, Worzel, and Szyarto, 1998), which could stem from dysfunctioning frontal lobes, and the inability to assess cooperative intentions of others.

An interesting avenue for future research would be to look at the relationship between ToM and cooperativeness further. Perhaps rather than aiding us to deceive and out-perform others, ToM in humans evolved because it assisted us in altruistic interactions with our conspecifics. Whether this ability makes us better in recognising and distinguishing between potential cooperators and deceivers as well is another interesting question, and could be easily tested in further studies. If good theory of mind capacity is, indeed, a predictor of cooperativeness and the ability to recognise cooperators, more support would be found for the Green Beard theory as one of the driving forces behind the evolution of altruism (Dawkins, 1976).

Although it is possible that high-Machs performed poorly on the ToM tasks due to impaired frontal lobe functioning, other, more parsimonious explanations are as feasible. It is possible that the high-Mach participants were simply resorting to guessing the answers to the questions on the IMT task, especially when the questions were getting increasingly complex. During the experiment, some of the participants were complaining about the difficulty of the task, and mentioned that they were tempted to guess the answers. Although the experimenter did not note down the identity of these individuals, it is possible that high scores in Machiavellianism result in poorer performance due to lack of effort. In the present

experiment, performance was not rewarded, which could have affected the final scores. It would be interesting to repeat the experiment, and give participants rewards according to their performance on the tasks. Perhaps the high-Mach individuals would try harder if they knew they could gain something by doing this, resulting in better scores on the IMT task. It would also be interesting to see whether the Eyes test results would improve if the performance was tied to a reward.

Relationship between hot and cold cognition (Hypothesis 4)

A moderate, positive correlation was found between the affective and cognitive mentalising tasks. This does not point at a complete separation of the two ToM systems, but implies at least some overlap. This mirrors previous research on neurological correlates of hot and cold cognition, which has found that both types employ partly similar and partly separate neural networks. Vollm et al (2006), for example, presented 15 male volunteers with cartoon stimuli depicting cognitive and empathy inducing social situations. fMRI scans revealed that common neural networks, such as the medial prefrontal and temporal lobes were activated in both tasks. However, Shamay-Tsoory, Aharon-Peretz and Perry (2008) found support for the idea that the affective and cognitive ToM is largely dissociated. The authors found that individuals with lesions in the Inferior Frontal Gyrus (IFG) performed poorly on a task assessing affective empathy, whereas individuals with damaged Ventromedial Prefrontal Cortex (VmPFC) failed the task assessing cognitive empathy (Shamay-Tsoory, Aharon-Peretz and Perry, 2008). Interestingly, an area of the IFG (Brodmann Area 44) has been identified as a central part for mirror neurons (Rizzolatti, 2005). It is likely that the affective part of theory of mind, at least, relies partly on the existence of mirror neurons. It is possible that in order to identify emotions of other individuals, one has to be able to know what these

emotions feel like. This ability might not rely on the ability to make cognitive inferences about the intentions of others. Nevertheless, Shamay-Tsoory, Aharon-Peretz and Perry (2008) did not rule out the possibility that the two ToM systems do partly overlap. They proposed that cognitive and emotional empathy could be partly related, and both IFG and VmPFC could be used in both types of cognitive reasoning. However, it is likely that the core cognitive architecture of empathy-driven ToM is in the mirror neuron system, and the core structure of cognitive ToM is located in the VmPFC. Thus, the idea of partial overlap between hot and cold cognition would explain why the present study found a moderate, positive correlation between the eyes test (hot cognition) and the IMT test (cold cognition).

Machiavellianism and causal attributions (Hypothesis 5)

The findings did not support the proposition that Machiavellianism is related to the tendency to attribute positive rather than negative events to oneself (personalising bias) or attributing negative events to other people rather than to external situations (externalising bias). Although there is evidence that schizophrenic and depressed patients have abnormal attributional styles (Kayne and Bentall, 1989, Kinderman and Bentall, 1997), coupled with ToM deficits (Craig, et al 2004, Lee et al, 2005), in the present study, Machiavellianism and ToM deficits did not lead to differences in attributional styles. It is possible that the association between attributional styles and Machiavellianism is non-existent, or that the present instruments failed to tease out any significant relationships. Self-rated measurements can be biased by socially desirable responding (Holden and Ronald 2007), which could alter the results, and lead in Type 2 errors in research. Furthermore, the high-Mach individuals could have resorted to random answers in the IPSAQ measurement, as the questionnaire is relatively lengthy to fill in, each question requiring imagining oneself in a social situation

with other people.

In summary, Machiavellianism seems to be inversely related to social cognition, but is not related to attributional styles. It is possible that manipulation of others is achievable without superior social intelligence, and might even be facilitated by lack of empathy and poor understanding of other peoples' minds. Interestingly, Machiavellianism (as measured by the Mach IV scale) seems to be a male-typical strategy, leading Andrew, Cooke and Muncer (2008) to suggest that manipulativeness and empathy are two ends of the same continuous personality trait, both having strong biological and evolutionary base. Machiavellianism could be an evolved male-typical strategy, beneficial in the mating context (Linton and Wiener, 2001) or in inter-group conflict (Wilson, Near and Miller, 1998), whereas empathy and social intelligence could be adaptations for forming bonds with unrelated individuals, useful for females in mating systems characterised by male philopatry (Geary and Flinn, 2002). The next chapter of the thesis aims to investigate this idea further, looking into the relationships between Machiavellianism and social bonds in males and females.

5. Mach no mates? The Role of Machiavellianism and Sex in Friendships and Social Networks

Abstract

Previous studies have found robust sex differences in forming and maintaining friendships. It is possible that rather than sex alone, personality plays a role in friendship quality. This study looked at the relationship between the trait Machiavellianism and friendship quality, using the Mach IV (Christie and Geis, 1970) and the Friendship Questionnaire (Baron-Cohen and Wheelwright, 2003) instruments. 263 (188 females, 55 males) individuals participated in an on-line survey. It was found that irrespective of age and sex, Machiavellianism was negatively related to self-reported importance of friendship. The findings are discussed in relation to ontogeny and evolution of pro-social behaviour.

5.1. Introduction

Humans have the capacity to form long-lasting, reciprocal friendships with unrelated individuals. Trivers (1971) explained the ultimate causes of this using the theory of reciprocal altruism, which explains the emergence of cooperation through mutually beneficial, fitness-increasing social contracts. Although reciprocity in human relationships is a well-known phenomenon, personality and sex differences in friendships and social networks are a less studied area of research, at least from an evolutionary perspective. There are, for example, remarkable sex (Vigil, 2007) and personality differences (Berry, Willingham and Thayer, 2000) in the quality of bonds that individuals form with others. The present chapter aims to look at the role of gender and the personality trait Machiavellianism in friendships and social networks, using evolutionary theory in generating hypotheses.

Evolution has produced obvious sex differences in female and male cognitive styles. Males are more competitive and less empathetic than females are, whereas females show superior cognitive capacities in the social domain, being better in empathising, mind-reading and encoding and decoding facial expressions (e.g. Baron-Cohen and Wheelwright, 2004, Hall et al, 2000, LaFrance, Hecht and Paluk, 2003, Rotter and Rotter, 1988). Andrew, Cooke and Muncer (2008) suggested that male/female differences can be crystallised into two basic, opposing dimensions- empathising and manipulateness in terms of Machiavellianism. The authors proposed that instead of the so-called systemising brain (Baron-Cohen 2003), the human male brain is better characterised as being manipulative and calculating, and the opposing style would be the female-type emotionally responsive, socially intelligent brain.

There is plenty of developmental and experimental evidence for male and female differences in the domain of social intelligence. Research has shown that the sex differences start at an early age. Females, even as infants, are more tuned into social stimuli than males

are (Connellan et al, 2001, Haviland and Malatesta, 1981). For example, Connellan et al (2001) demonstrated that day-old female infants looked longer at faces than boys did, whereas boys looked longer at mobiles than girls did. Females, both children and adults, are more expressive than males are (LaFrance, Hecht and Paluck, 2003), and perform better in decoding emotional facial expressions (Rotter and Rotter, 1988, Hall, Carter and Horgan, 2000, Thayer and Johnsen, 2000). Females obtain higher scores on self-reported (Baron-Cohen and Wheelwright, 2004) as well as on more objective measures of empathy (Petrides and Furnham 2000). At a neural level, a recent study found that when processing social information, females recruit areas containing mirror-neurons more than males do (Schulte-Ruther et al, 2008), which could provide a possible proximate mechanism facilitating the sex difference in social cognition. Another proximate cause for the sex difference could be in hormonal actions, especially in pre-natal hormones that affect the sexual differentiation of the brain in uterus. Knickmeyer et al (2006), for example, found that pre-natal testosterone levels predicted mentalising ability in children at the age of five. Males, in general, receive higher levels of testosterone pre-natally, which could be one of the factors affecting sex differences in social intelligence as adults.

The proximate (e.g. neural mechanisms, hormones) and developmental factors affecting sex differences in human cognition have been well demonstrated. The proximate causes have also led to some speculations about the possible ultimate causes of these sex differences (Geary, 2006). Vigil (2007) suggested that male philopatry and female migration could play an important role in the evolution of sex differences in social cognition and friendship formation. According to this idea, in the evolutionary past, males stayed in natal territories, whereas females migrated to another group when reaching maturity. This led to different selection pressures for the sexes, where male social life was based on competing and forming coalitions with male kin, whereas females were required to form social support

networks with unrelated individuals (Geary and Flinn 2002). The fitness benefits of female coalition formation have been demonstrated in pygmy chimpanzees, where friendly relationships between unrelated females lead to better access to resources, resulting in earlier age of reproduction (Parish, 1996). However, there is less evidence for the role of friendship in human female reproductive success, partly because the fitness benefits of behaviour in humans is more difficult to study. Essock-Vitale and McGuire (1985) studied a sample of 300 women in Los Angeles, and discovered that one of the most important source of help was provided by unrelated female friends. Although the study did not look at the reproductive benefits of helping, it is possible that forming close bonds with others is an evolved strategy in females, resulting, ultimately, in increased reproductive success. The need to bond with unrelated individuals, in turn, could have selected for enhanced vigilance and sensitivity to social cues, as non-kin based relationships seem to be more fickle in nature than relationships between related individuals.

Not only do males and females differ in social cognition, but sex differences are prevalent in forming and maintaining friendships and social networks as well. Developmental studies have shown that boys prefer large, hierarchically structured groups, whereas girls form dyadic groups, where relationships are based on intimacy and emotional attachment (see Vigil, 2007). Men seem to trade intimacy to larger number of friends- Vigil (2007) found that males report spending less time with their friends, but having larger, less intimate networks than females do. The author rationalised this by suggesting that female ancestors needed a safe socioecological environment, which could be secured by forming fewer, close relationships with greater amount of investment in maintenance of the bond. Males, in turn, have adapted to different environments, where, according to Vigil (2007) “Stronger kinship ties may have enabled males to form larger and hence more competitive coalitions by relaxing the selective pressure to engage in interpersonal maintenance behaviours with each

group member within their social ecologies “ (p. 146). Thus, the need to form kin-based coalitions that compete against other such coalitions could explain why males have the tendency to form large, functional groups, such as groups based on athletic prowess. This ties in with the Male warrior hypothesis (VanVugt, in press), which asserts that males have evolved specific psychological make-up due to the demands of inter-group competition and intra-group cooperation. Experimental evidence shows that male (but not female) cooperation in a public goods game is affected by inter-group competition, suggesting that men have evolved stronger responses to cues implying out-group threat (Van Vugt, De Cremer and Janssen, 2007).

Interestingly, the size of an individual’s social network is an area of research that has remained quite distinct from the study of the quality of bonds with one’s friends, at least in research that takes the evolutionary perspective (see Vigil, 2007, for an exception). One of the aims of the present chapter is to highlight the relationship between the possible quality/quantity trade-off in social relationships.

The relationship between sex, personality, and the size of an individual’s network is a potentially fruitful area of study, especially from evolutionary point of view. Recent research has shown that on average, the number of individuals that a person is in regular contact with is around 150 (Hill and Dunbar, 2003, Zhou et al, 2005). However, not all of these contacts are equally important. It seems that human social networks are characterised as being layered in structure, with the people closest to an individual being in the innermost, smallest layer. Dunbar and Spoor (1995) named the individuals in the innermost circle as members of the “support clique”. the best friends who people would turn to when they need emotional or financial support. This innermost circle of friends consists normally of 3-5 individuals, and has been measured as the number of individuals a person has initiated contact with in the previous 7 days (Roberts et al, 2008, Dunbar and Spoor, 1995). The second most important

layer in the network is the “sympathy group”, which normally has the size of 9-15 individuals. The size of the sympathy group can be measured by asking how many people a person has initiated contact with in the past 30 days, excluding the individuals in the past 7 days (Roberts et al, 2008, Dunbar and Spoors, 1995). These are the people who are within the circle of friends, the people whose sudden death would cause an individual a great deal of upset (Buys and Larsen, 1979). However, these averages are surrounded by significant individual variation as the size of the support clique, for example, can vary between 0-14 individuals (Dunbar and Spoors, 1995). Although at present, the research on individual differences in the propensity to connect with others is in its infancy, some studies have found important factors that play a role in the network size.

Toddertell, Hollman and Hukin (2008) found support for the idea that personality affects the size of social networks. Some individuals seem to have a higher propensity to make friends, acquaintances and bring people together, and the higher this propensity is, the larger the number of people they are connected to. The propensity to make friends could, in turn, could be related to cognitive capacities, such as Theory of Mind. Stiller and Dunbar (2007) discovered that Theory of Mind skills are positively related to social network size, implying that social intelligence is an important factor constraining the size of networks. Nettle (2007) found a similar pattern in his study, confirming that Empathy Quotient (EQ, a construct related to Theory of Mind) is positively correlated with the size of one’s support groups and sympathy groups. Interestingly, females have on average better Theory of Mind skills, coupled with a higher EQ, implying that females should have larger networks as well. This somewhat contradicts the findings of previous research, which either has not found sex differences in social network size (Nettle, 2007, Dunbar and Spoors, 1995) or has found that males have larger network than females (Vigil, 2007). It is possible that rather than biological sex, individual variation in personality is a better determinant of the size of a social network.

There is some evidence for the relevance of the Big Five framework in the size of social networks. Roberts et al (2008) looked at two of the Big Five traits, neuroticism and extraversion, and found that extraverted individuals have larger support cliques, but that extraversion is not related to the size of the sympathy group. However, when the authors controlled for age, the relationship between extraversion and support cliques was non-significant. Hence, it seems that age might be a confounding factor in social network research.

One possible personality trait affecting individual differences in network size and friendship quality could be Machiavellianism, a trait characterised by callous affect and manipulative inter-personal style. Chapter 4 showed that the high-Mach participants scored lower on the social cognition tasks, exhibiting a cognitive style similar to individuals on the autistic spectrum. Knowing that both autistic and Machiavellian people have difficulties with inter-personal relationships, probably due to deficits in perspective taking and empathising abilities, it would be expected that high-Machs have lower quality friendships than their less manipulative counterparts. There is some, albeit indirect, evidence of how high-Machs function in friendships. Christie and Geis (1970) proposed that the defining feature of Machiavellianism is how people relate to others in inter-personal relationships. They found that the high-Machs relate to others in a more distant way, without emotional commitments. Wastell and Booth (2003), in turn, found that Machiavellianism was positively related to alexithymia, a condition that is characterised by the lack of the ability to feel empathy for other people. Perhaps Machiavellian individuals are, in a similar way to autistic individuals, incapable of understanding emotions, which is an essential tool for forming lasting friendships. In many ways, high-Machs are exhibiting an inter-personal style typical of males, who are more occupied with establishing dominance hierarchies than forming close, emotionally supportive bonds. One of the aims of the present chapter is, then, to provide

evidence for the putative relationship between Machiavellianism and friendship quality. It is predicted that Machiavellianism is negatively related to friendship quality, irrespective of the sex or age of the participant. On the other hand, Machiavellianism is expected to correlate with large network size. If Machiavellianism is, indeed, an evolved strategy based on manipulation and deceit, high-Mach individuals would be expected to strive to have large numbers of distantly bonded individuals in their sphere of manipulation.

Based on the previous literature on sex and personality differences in friendship quality and network size, the following predictions are made:

Hypothesis 1. There are sex differences in Machiavellianism, friendship quality, and network size. Males are expected to score higher on Machiavellianism and have larger networks, whereas females are expected to have better quality friendships.

Hypothesis 2. Machiavellian individuals are likely to have poorer quality friendships than their less manipulative counterparts. Thus, it is expected that irrespective of the sex of the participant, there is a negative correlation between Machiavellianism and friendship quality, when age of the participant is controlled for.

Hypothesis 3. Machiavellianism is expected to be positively correlated with the size of an individual social networks, when age is controlled for.

Hypothesis 4. It is likely that there is a trade-off between the quality and quantity of the social network. Friendship quality should be negatively related to the number of individuals in both support cliques and sympathy groups, when age is partialled out.

5.2 Method

5.2.1 Participants

Altogether, 312 participants filled in an on-line survey. The study consisted of two populations. One of the populations consisted of 145 first year psychology students, of which 39 were males, and 106 were females. This sample was recruited through Liverpool Hope University, and the students took part in exchange for a course credit (Sample 1). The student participants filled in the Mach IV and the Friendship Quotient (FQ) scales on-line on the university's research participation website. The remaining 167 (37 males, 130 females) participants were recruited through the researchers social networks, and advertising the study on internet websites (Sample 2). In addition to the Mach IV and FQ scales, this sample also filled in a questionnaire asking about the size of the participants' social network. 20 of these participants filled in the Mach and the FQ scales, but not the social network questionnaire. These individuals were not included in the data analysis. Thus, the section that looks at social networks, FQ and Machiavellianism consists of 147 individuals (36 males, 111 females). The section that analyses the relationship between Mach and FQ consists of 292 individuals (217 females, 75 males), 145 from sample 1 and 147 from sample 2.

In total, 182 individuals labelled themselves as students. The rest of the sample were either in employment (N=95) or unemployed (N=15). 187 were residents in the United Kingdom, 45 were in the USA and Canada, 25 in Mexico, and the remaining 35 participants were living in Holland, Kenya, Venezuela, Cyprus, New Zealand, Australia, Sweden and Finland.

The mean age of the male participants was 29.9 years (10.4 s.d) and the mean age of the female participants was 26.1 (9.3 St Dev). Mean age of the student sample was 22.9 years (6.5 s.d) and the non-student sample had the mean age of 36.5 years (9.9 s.d).

5.2.2 Materials

(i) *The Mach IV Scale* (Christie and Geis, 1970)

See chapter 2 and appendix 1 for description

(ii) *The Friendship Questionnaire* (Baron-Cohen and Wheelwright, 2003)

This self-report questionnaire was developed as a relatively short measure looking at the strength of the quality of friendships. Baron-Cohen and Wheelwright (2003) chose the questions in the scale after consulting research literature on sex differences in friendship styles. The FQ questionnaire comprises of 27 questions, half of which are reverse scored. Maximum score on each question is 5, and the minimum score is 0. Thus, an individual score can range between 0 and 135. In addition, the questionnaire has got 8 filler items that are not included in the final scoring.

Baron-Cohen and Wheelwright (2003) found that the mean score for males (70.3) was significantly lower than the means score for females (90.0). Similarly, the same study discovered that people with diagnosis of Asperger's syndrome or autism scored significantly lower (53.2), than the control population (70.3). See appendix 9 for an example of the questionnaire.

(iii) *The Social Network Questionnaire* (Dunbar and Spoors, 1995)

The questionnaire that was used to measure the size of an individuals support clique and sympathy group was adapted from Dunbar and Spoors (1995). The questionnaire asks individuals to name the people they have been in social contact with during the past 7 days

(indicating individuals in the support clique) 30 days (indicating individuals in the sympathy group). In the original questionnaire, people were also requested to note whether the individuals were males or females, relatives, friends or acquaintances. However, as most studies using this questionnaire have combined the kin, friends and acquaintances when measuring the size of the social network (Spoors and Dunbar, 1995, Dunbar and Hill, 2003, Stiller and Dunbar, 2007, Roberts et al, 2008), the present study only asked individuals to name the initials of their contacts, but not who they were. It was thought that in this way, the time required for completing the on-line study would be significantly reduced, and people would have the resiliency to complete all the measurements included in the study. See appendix 10 for an example.

5.3 Results

Descriptive statistics

The mean Machiavellianism score for the combined sample was 71.3 (12.9 s.d). The mean Friendship Quotient score was 84.6 (16.7 s.d). The Kolmogorov -Smirnov test of normality indicated that the data for Machiavellianism and Friendship Quotient were normally distributed. Thus, when analysing these questionnaires, parametric tests are used. The mean score for the number of individuals a person has initiated contact with in the past 7 days (support clique) was 10.5 (8.3 s.d). The means score for the number of individuals in the social network during the remaining month (sympathy group) was 20.3 (15.6 s.d). Distribution for both the support cliques and the sympathy groups deviated significantly from normal (Kolmogorov-Smirnov, $p=001$ for both), thus, non-parametric statistics are used when analysing the size of social networks.

Hypothesis 1- Sex differences in Mach, network size and Friendship Quotient Scores

Table 5.1. Means and standard deviations for females, males and the whole sample in the Mach IV scale, Friendship Questionnaire and social networks.

Measure	Female mean (s.d)	Male mean (s.d)	Total
Friendship ** Questionnaire	88.8 (15.8)	73.2 (15.6)	84.6 (12.7)
Mach IV**	69.9 (12.09)	75.2 (14.0)	71.3 (12.9)
Contacts in past 7 days	10.1 (11.4)	7.9 (11.5)	10.5 (8.3)
Contacts in past 30 days	22.7 (15.6)	17.6 (17.0)	20.3 (15.6)

** Difference between the sexes is statistically significant at $p=.001$

The mean female score for Machiavellianism was 69.9 (12.09 s.d) and the mean male score was 75.2 (14.09 s.d). A t-test showed that the difference was statistically significant. Males scored significantly higher than females ($t(242)=-3.092, p=.002$). Thus, the present results confirmed the findings of previous studies as males did, indeed, obtain higher scores on the Mach IV scale than did females.

The mean Friendship Questionnaire score was 88.8 for females (15.8 s.d) and 73.2 for males (15.6 s.d). Again, the difference was statistically significant- females scored higher on the questionnaire measuring the quality of friendships ($t(242)=7.471, p=.001$). This sex difference was similar as found by Baron Cohen and Wheelwright (2004), and indicates that females are better in forming warm, supportive relationships than males are.

The mean score for male support clique was 7.9 (11.5 s.d), whereas the mean support

clique size for females was 10.1 (11.4 s.d). The difference was not statistically significant (Mann Whitney $U=2560$, $Z=-.633$, $p=.527$). Similarly, no statistical differences were found for the mean sympathy group size for females and males (22.7 mean, 15.6 s.d, and 17.6 mean, 17.0 s.d, respectively. Mann Whitney $U=2153.5$, $Z=-.840$, $p=.401$). This indicates that at least in this sample, males and females have got similar sized social networks, both when measured by the number of social contacts in the past week, and in the past 30 days.

Hypothesis 2 Relationship between Machiavellianism and Friendship Quotients

In order to see how Machiavellianism relates to Friendship Quotient, zero-order correlations were conducted between the Mach IV and the FQ scales. The higher the Machiavellianism score, the lower the FQ score ($r=-.297$, $p=.001$, $N=292$). However, Machiavellianism was also negatively related to age ($r=-.179$, $p=.002$, $N=292$). Age did not, in turn, have a correlation with the FQ ($r=.005$, $p=.939$). When age was partialled out, Machiavellianism still was significantly, negatively correlated with Friendship Quality ($r=-.296$, $p=.001$).

When analysing males and females separately, the same pattern prevailed. In females, Machiavellianism was significantly, negatively correlated with FQ ($r=-.232$, $p=.001$, $N=217$) and age was negatively, although not significantly correlated with Machiavellianism ($r=-.109$, $p=.111$, $N=217$). Even when age was controlled for, the relationship between Machiavellianism and FQ remained significant ($r=-.229$, $p=.001$, $N=214$). Again, no relationship was found between age and FQ ($r=.035$, $p=.613$, $N=217$).

For males, Machiavellianism was also negatively correlated with FQ ($r=-.292$, $p=.011$, $N=75$) and age ($r=-.400$, $p=.001$, $N=75$). Even when age was partialled out, the

relationship between Machiavellianism and FQ was found to be significant, although to a lesser degree ($r=-.233$, $p=.045$, $N=55$). Thus, it seems that in males, but not in females, age is a mediating factor between Machiavellianism and the quality of friendships. In males, age did have a positive, although non-significant correlation with the quality of friendships ($r=.206$, $p=.077$, $N=75$).

Using the median split, individuals were divided into high and low Machs. The median for the sample was 71- thus, individual's scoring 70 and under were in the low Mach group, and individuals scoring 71 and above were placed in the high-Mach group. In order to see what kind of an interaction Machiavellianism and sex had with friendship quality, a 2 x 2 ANOVA was conducted, where the Mach groups and sex were the independent variables, and the score on the FQ was the dependent variable. Female low-Machs had the highest score on the FQ questionnaire (mean 92.6), followed by female high-Machs (mean 84.8). Male low-Machs had a mean score of 82.04, and male high-Machs scored lowest, mean score 70.5. Sex alone was a significant predictor in the FQ scores ($F(1)=27.39$, $p=.001$, partial eta squared .103), and so was Machiavellianism ($F(1)=16.28$, $p=.001$, partial eta squared .064). However, the interaction between Machiavellianism and sex were found to be non-significant ($F(1)=.625$, $p=.430$, partial eta squared .003). Thus, sex and Machiavellianism both, independently, affect the way individuals form relationships with others.

Hypothesis 3 Machiavellianism, support cliques and sympathy groups

In order to test whether Machiavellianism is related to the size of an individual's social networks, Spearman Rank correlations were conducted between the Mach IV scale and the number of individuals in the support and sympathy cliques. Both the support clique and Machiavellianism ($r=-.040$, $p=.602$, $N=147$) and the sympathy group and Machiavellianism

($r = -.052$, $p = .510$, $N = 147$) were not significantly correlated for the sample as a whole. Thus, contrary to what was predicted, Machiavellian individuals did not have a larger number of people in their social spheres.

In order to test whether the same pattern prevails when analysing males and females separately, the data were split according to sex of the individual, and Spearman correlations were conducted between the network size and the Mach IV scale. In the female sample, correlations between support clique and Machiavellianism were non-significant ($r = -.110$, $p = .200$, $N = 111$). The same pattern was found for Machiavellianism and sympathy group ($r = -.072$, $p = .419$, $N = 111$). In males, there was a slightly positive, although non-significant correlation between Machiavellianism and support group ($r = .228$, $p = .156$, $N = 36$), and a non-significant positive correlation was also found between Machiavellianism and the number of people in the sympathy group ($r = .107$, $p = .528$, $N = 36$). Thus, the null hypothesis is accepted- Machiavellianism is not, at least in this sample, related to the size of an individuals' social network.

Hypothesis 4 Is there a trade-off between friendship quality and quantity?

In order to find out whether individuals trade close, warm relationships with having a large number of people in their social networks, partial and zero-order correlations were conducted between the FQ scores, and the size of the support and sympathy groups. Interestingly, no such trade-off was found between FQ and the size of the support group ($r = .100$, $p = .230$, $N = 147$). However, a significant positive relationship was discovered between the FQ scores and the size of the sympathy group. The larger amount of people an individual had been in touch with in the previous month, the better overall quality their friendships were as well ($r = .200$, $p = .02$, $N = 147$). This was the case even when age was

controlled for ($r=.189$, $p=.034$, $N=147$). Thus, it seems that individuals do not trade friendship quality with quantity. More likely, the individuals who have large social networks have the capacity to maintain close relationships despite of the large numbers.

5.4. Discussion

The hypotheses were partly supported: males scored significantly higher on the Machiavellianism scale, and females scored higher on the FQ questionnaire. However, no sex differences were found in the social network size. The sex difference in Machiavellianism is a robust, consistent finding, and it would not be unreasonable to suggest that Machiavellianism is an evolved male-typical trait, bringing some kind of benefits to males who behave in a manipulative manner. More specifically, Jonason, Li, Webster and Schmitt (2009) suggested that Machiavellianism is of advantage in short-term social encounters. The charming nature of the high-Mach, coupled with exploitative inter-personal style, is something that is suited for a “hit and run” social strategy (Jonason et al, 2009), which is beneficial for males especially in the mating context (Linton and Wiener, 2001). Knowing that men can increase their reproductive success by mating with multiple females, and that men are, in general, more interested in short-term sexual relationships than women are, it seems possible that Machiavellianism has evolved to facilitate the pursue of women. There is some empirical evidence for the relationship between Machiavellianism and mating strategy. Jonason et al (2009), for example, found evidence that the so-called Dark Triad (Machiavellianism, Narcissism and Psychopathy) relate to a mating strategy characterised by the pursuit of multiple short-term matings. In addition to this, McHoskey (2001) discovered that Machiavellianism was related to promiscuous, often coercive mating strategy, but only in males. Linton and Wiener (2001) also found that Machiavellianism is related to potential

conceptions measured in terms of mating success, and suggested that sexual selection theory could offer a plausible explanation for the existence of personality differences in manipulateness. Future research could address the role of sexual selection, and look at Machiavellianism in relation reproductive strategies, especially in terms of whether females actually find high-Mach males attractive in short-term liaisons. Findings of the present study provided further support for the idea that Machiavellianism is a personality trait more typical of males (Andrew, Cooke and Muncer, 2008), and that it could have evolved because of the fitness benefits in short-term mating context.

The results also brought some indirect support for the suggestion that manipulateness and empathy are part of the same personality trait, both at the extreme ends of the continuum (Andrew, Cooke and Muncer, 2008). Females scored significantly higher in the friendship quality measurement, which indicates that females find it easier to form and maintain emotionally close, supportive relationships. The finding mirrors those of Baron-Cohen and Wheelwright (2003), who found that males scored lower on the FQ measurement than females did. This supports the experimental evidence of female superiority in sending and reading social signals (Hall et al, 2000, LaFrance, Hecht and Paluck, 2003, Rotter and Rotter, 1988, Thayer and Johnsen, 2000) and out-performing males in Theory of Mind tasks (e.g. Baron-Cohen et al, 2001). It is obvious that sex differences in the social domain have an evolved base, but are also under control of proximate mechanisms, such as hormones and neurotransmitters (Heinrichs and Domes, 2008). The findings also provide an excellent platform for speculating ultimate reasons for the sex difference.

Hormones, such as testosterone, explain some of the male/female differences in social behaviour. For example, both pre-natal (Knickmeyer et al , 2006) and circulating (Hermans, Putman and van Honk, 2006) testosterone has been linked with more male-typical social cognitive styles. Hermans, Putman and Van Honk (2006) point out that “relationship between

T and human behavior likely lies in its propensity to amplify power motives and dominance, whilst attenuating empathy” (p. 859).

Hormones such as oxytocin (OT) and Vasopressin (a male equivalent of OT) have been demonstrated to relate to affiliative social behaviours, and might play a vital role in how individuals value close relationships with others. Oxytocin is a neuropeptide that mediates a host of behaviours relating to mother-infant bonding, sexual behaviour and social interactions (Bartz and Hollander, 2006, Campbell, 2008). For example, a study by Domes et al (2007) showed that individuals who had received a nasal spray of OT performed significantly better than the control group in Baron Cohen’s Eyes test. Another study found that OT administration affected the levels of altruism in a trust game. The oxytocin group increased their monetary transfers in comparison to the control group (Koshfeld et al, 2005). If OT is one of the hormones determining cooperative behaviour, it is possible that Machiavellian individuals have less circulating OT or Vasopressin, which makes them less likely to behave in an altruistic manner. The links between OT and Machiavellianism are a potentially fruitful area of research, and will be discussed later in this chapter.

Oxytocin may also provide a proximate explanation for the sex differences in forming close friendships with unrelated individuals. Not only does OT increase peoples sensitivity to social signals (Domes et al, 2007), but it also seems to function in focussing attention to positive aspects of social interactions. Guastella, Mitchell and Mathews (2008) showed that when participants were given intranasal OT, they remembered previously seen happy faces better than the non-oxytocin control group. Interestingly, the same did not apply to angry or sad faces, implying that OT is especially important in remembering social signals carrying positive valence. Moreover, Unkelbach, Guastela and Forgas (2008) found that OT facilitated the recognition of positive words related to sex and social relationships in male participants. It seems that people who have higher levels of circulating OT pay more attention

to pleasurable features of interactions with others, which, in turn, might facilitate the importance of having intimate social relationships. Thus, sex differences in forming social relationships might partially be explained by OT. Females, having higher circulating levels of OT, might be more prone to affiliate with others, remember positive aspects of interactions, and have more sensitivity to signals sent by others. Future research could look more closely into the role of OT and social relationships, and see whether OT plays a role in mediating the sex differences in friendship formation. Anyhow, it seems that there is a strong biological base for the sex differences in social behaviour, which ties in with the proposed ultimate causes of these differences as well.

One of the important factors shaping female social cognition in the past could be linked with female dispersal. The finding that females score higher on the Friendship Quotient than males do ultimately ties in with this. If the ancestral women were migrating to new groups when reaching maturity, it would have been beneficial for females to evolve sensitivity to social signals, which fosters the development of close, supportive relationships. In fact, there is evidence to suggest that complex relationships in primates contribute to reproductive success, and that sophisticated social cognition might have evolutionary roots in the multifaceted social lives (Cheney, Seyfarth, and Smuts, 1986). Human females, having to move to a new group of strangers, would have needed the capacity to understand others more than males that carried on living in their natal group with familiar individuals.

Having the social sensitivity to bond with unrelated individuals probably conferred major reproductive advantage to the ancient females. Child-rearing in humans does not involve the mother and the father alone, but is part of an intricate helping network consisting of kin and non-kin alike (Hrdy, 1999). As female reproductive success can be enhanced by good quality child-care, the ancestral females who had the capacity to form relationships with potential helpers probably had an increased number of surviving offspring. In modern hunter

gatherers, allomothering of related and unrelated children is a fairly common phenomenon (Crittenden and Marlowe, 2008, Ivey, 2000, Tronick, Morelli and Finn, 1989), and brings obvious benefits to the mother by increasing the children's chances of survival. Whether the same holds for women in industrial societies as well remains to be demonstrated.

The idea that males are more likely to form large, less intimate social networks was not supported. Males did not report more social contacts than females did. In fact, on average, females had slightly larger networks, although the difference was not statistically significant. Both the support groups and the sympathy groups were found to be very similar in males and females, which mirrors the findings of Nettle (2007). Nettle discovered that both the size of the sympathy and the support cliques were not significantly different between males and females, but that empathetic orientation in the form of the Empathy Quotient (EQ) was a moderating factor. Nettle (2007) found that irrespective of the sex of the participant, higher scores on the EQ questionnaire (Baron-Cohen and Wheelwright, 2004) were related to larger support and sympathy group sizes. However, as Nettle pointed out, numerical values are less likely produce sexually dimorphic responses. Nettle (2007) suggested that looking at the quality of friendship within the social networks probably produces more differences between the sexes. This is what the present study found too. Females did report closer, more empathetic friendships, whereas no sex differences were found in the size of social networks. It is possible that other variables, such as individual differences in empathising ability (Nettle, 2007) or theory of mind (Stiller and Dunbar, 2007) are more important determinants of social network size than gender alone.

Relationship between Machiavellianism and Friendship Quotient

As predicted, the reported friendship quality was inversely related to an individuals

score in the Mach IV scale. This implies that high-Machs have, indeed, problems in the social arena, a finding that deserves multiple proximate, developmental and evolutionary explanations. All of the different paradigms together can give a fuller understanding of why some individuals are more manipulative than others, and why and how this affects their personal relationships with their peers.

If individual differences in personality are a result of human behavioural plasticity and the propensity to take the most adaptive actions suited to an individual's environment (McDonald, 1998), the Machiavellian social behaviour could be best looked at as an interplay between ontogenetic and evolutionary causes. Belsky, Steinberg and Draper (1991) developed an idea of an intricate link between childhood experiences, inter-personal orientation and reproductive strategies, which are based on human flexibility in improving reproductive success based on their living social and physical environments. According to this theory, children's early social and emotional development is affected by family, especially the warmth of the bonds with parents, and this subsequently impacts how individuals interact with others socially. If a child grows up with existential insecurity, where the future is uncertain in some way or another (e.g. through parental behaviour, poverty, war and so on), it might be more adaptive to be mistrustful and non-cooperative.

There is plenty of evidence for the relationship between both dispositional and experimentally induced attachment security and altruism (Britton and Fuendeling, 2005, Mikulincer et al, 2001, 2005). In fact, Mikulincer et al (2005) maintained that attachment theory can explain why some people fail to behave altruistically, a claim that enforces the putative links between Machiavellianism and insecure attachment even further. According to Mikulincer et al (2001, 2005), securely attached individuals have a reduced need for self-protection and self-enhancement, and can afford to put energy into other behaviours, such as caring about others. Insecure attachment, in turn, fosters a personality that is characterised by

having less empathy for other individuals (Britton and Fuendeling, 2005), a finding that could explain the link between Machiavellianism, empathising deficits and eventually, the lack of close social bonds with others. Although it is not clear how Machiavellianism is related to different attachment styles, alexithymia (a disorder of empathy) might have some of its origins in insecure childhood attachment (Picardi, Toni and Caroppo, 2005). In a similar way to people with alexithymia, Machiavellian individuals might struggle to understand the emotions of others, leading to behaviour that is characterised by being cool and emotionally detached (Christie and Geis, 1970). Of course, the attachment system does not function in isolation from innate, genetic influences, but, as Mikulincer et al (2005) stated, "It's innate parameters are gradually shaped and altered by social experiences with attachment figures, resulting eventually in fairly stable individual differences in attachment style- a systematic pattern of relational expectations, emotions, and behaviours that results from a particular attachment history" (p.817). Future research could look at the relationship between childhood attachment to parents, development of friendship, and Machiavellian social style. It would be expected that there is a relationship between the three variables, although the causality might be difficult to establish.

The high-Mach scores on the Friendship Questionnaire is an expected finding, in the light of previous studies on Machiavellian individuals in social settings. It seems that high-Machs simply have less interest in interacting with others, which could be related to their apparent ToM deficits (see previous chapter). McHoskey (1999), for example, discovered that high-Machs were more interested in financial gain than creating a feeling of community, and that Machiavellianism was negatively related to pro-social behaviour. Machiavellian personality is related to lack of altruism, poor social relationships and selfish behaviour, but how these affect each other is still not known. Developmental evidence suggests that affective quality of friendships in children and adolescents influence their pro-social

behaviour and social adjustment in a positive way (Berndt, 2002, Barry and Wentzel, 2006). The ontogeny of friendship, altruism and pro-sociality is a potentially fruitful avenue of research, especially in terms of Machiavellianism and the development of cheater strategies. Younis (1986) suggested that altruism develops through turn-taking and retaliation, and that parental practises affect how children learn to interact with their peers. Future research could try to tease out the relevant importance of friendship and manipulateness in the development of altruistic behaviour. Nevertheless, the finding that high-Machs have poor social relationships could provide an explanation for why Machiavellian individuals resort to cheating and manipulation when dealing with others.

Machiavellianism and size of social networks

The hypothesis that high-Machs have larger social networks was not supported in the present study. Scores on the Mach IV scale were not positively correlated with the number of social contacts in the past seven days (support clique) or the number of social contacts in the past month (sympathy clique). If high-Machs do, indeed, have larger quantities of shallow relationships in their social networks, the current methodology failed to discover this. It might be that high-Machs are more likely resort to defection when dealing with strangers in one-shot interactions, but that they are still capable of maintaining reciprocal acquaintanceships with people who are members of their sympathy and support groups. It is likely that high-Mach deceitful strategy would not work in a long-term relationship, as people would eventually withdraw the friendship with the untrustworthy friend. Another, yet unexplored possibility is that Machiavellian individuals have friendships that are shorter in duration- rather than reaping benefits from a large quantity of people at the same time, high-Machs might have a series of short-lived social relationships, where they move on to exploit

somebody else after they have been rejected by previous social partners. In order to be an adaptive behavioural strategy, this would have required a high mobility in the EEA, in order to avoid the adverse reputational effects of cheating. Mealey (1995) suggested a similar kind of strategy for primary psychopaths, people who are genetically pre-disposed to take advantage of others. At present, there are no published studies on Machiavellianism and social mobility. It would be interesting to find out whether high-Machs have shorter relationships, and move quickly from one social network to another. This would support the idea that high-Machs are sub-clinical psychopaths (McHoskey, Worzel & Szyarto 1998), who employ similar kind of cheater strategies in order to gain fitness benefits.

Although the prediction was that Machiavellianism is positively related to social network size, the hypothesis could have been in opposing direction as well. Machiavellian poorer ToM ability, as demonstrated by the previous chapter, could have resulted in decreased ability to keep track of social relationships (Stiller and Dunbar, 2007). Interestingly, high-Machs did not have less reported social contacts than low-Machs did, which indicates that the relationship between Machiavellianism, ToM and social networks is not straightforward.

Trade-off between quality and quantity of relationships

The results suggest that people do not trade relationship quality to a large number of people in their networks. The FQ questionnaire correlated positively with the number of individuals in the sympathy group (people contacted during the previous month) but not in the support group (people contacted in the past seven days). It is interesting that the more people the subjects were connected with, the stronger the emotional bonds they had, too. It seems that some individuals simply value social relationships more than others, and are

prepared to invest more time and energy maintaining large numbers of close bonds.

Individual variation in social network size and quality probably includes variables such as emotional intelligence and empathy (Lopes, Salovey and Straus, 2003, Nettle 2007). Nettle (2007), for example, found that Empathy Quotient (EQ) is related to the size of social circles, indicating that individuals with warmer inter-personal orientation also have the capacity to maintain larger networks. Evolutionarily speaking, this package of social connectedness and the capacity to form and maintain friendships is probably related to evolution of altruism, maintained proximately by a host of developmental and biological influences. Reciprocal altruism is a robust explanation for the existence of friendships (Trivers, 1971). However, other forms of altruism, such as risky rescuing acts directed towards strangers, warrant different types of evolutionary accounts. The following chapter will look more closely at the evolution of risky rescuing behaviour, using the costly signalling theory as a framework for formulating hypotheses.

6. Who are the heroes? Characteristics of people who rescue others

Abstract

Heroic rescuing behaviour is a male-typical trait in humans, and it is possible that life risking acts represent a costly signal, showing that a rescuing male has good underlying genetic quality. Previous research has shown that males with low status occupations are more frequent rescuers than males who have higher socio-economic statuses. This study looked at news archives of local papers in the UK in order to discover what kind of characteristics rescuers possess. It was found that males were highly more likely to rescue than females were, and that a typical rescuer was a low status male rescuing another male. Males with low socio-economic status were more likely to rescue in all the contexts (fire, drowning, violence and traffic accidents). Socio-economic status and heroism are discussed in relation to evolutionary theory. It is suggested that heroism could be a condition dependent life history strategy, related to steep future discounting.

Note: Part of the chapter has been published in Lyons, M. (2005). Who are the heroes? Characteristics of people who rescue others. *Journal of Cultural and Evolutionary Psychology*, 3, 239-248.

6.1. Introduction

Previous chapters dealt with personality traits, nonverbal communication and social intelligence, which can be deemed as more proximate, psychological mechanisms mediating pro-social behaviour. When looking at ultimate, adaptive explanations of altruism, one of the most exciting recent theoretical developments has been costly signalling theory (Bliege Bird and Smith, 2005, Gintis, Smith and Bowles, 2001, Millett and Dewitte, 2007, Wilson et al, 2008, Zahavi and Zahavi, 1997). According to this idea, by behaving altruistically, individuals signal some underlying qualities which would make them desirable as a mate, collaboration partner or an ally. Because altruism, by its evolutionary definition, is costly, only good-quality individuals can afford to engage in this behaviour. Costly signalling theory of altruism has been used to explain human collective actions (Gintis, Alden Smith and Bowles, 2001, Smith and Bliege Bird, 2000) and male mating strategies (Griskevicius et al, 2007).

There is some evidence for altruism as a costly signal in humans and non-human animals alike. In ornamented fowls, for example, altruistic alarm calling has been related to mating success in males (Wilson et al, 2008). In their study, Wilson et al (2008) discovered that males who emitted a higher number of anti-predator calls had a higher number of partners and more success in siring offspring. The authors suggested that alarm calls could function as an honest signal of quality. Only the best quality males could afford to draw the attention of the predator, and survive the potential attack. Studies on humans, in turn, have found a connection between risky foraging strategies and public generosity (Smith and Bliege Bird, 2001) and unconditional altruism and intelligence in a game theory experiment (Millett and Dewitte, 2007). Moreover, a recent study found that men, but not women, were willing to

give higher donations to a charity when observed by a member of the opposite sex (Iredale, Van Vugt and Dunbar, 2008). Griskevicius et al (2007) discovered that men were more heroic in hypothetical scenarios when primed with romantic motives. Kelly and Dunbar (2001) suggested that heroism could have evolved as a sexually selected trait, owing to a female choice for risk-taking males.

Heroism is an interesting phenomenon in humans, and is not easily explained by more traditional kin selection or reciprocal altruism theories. Humans sometimes engage in extreme rescuing behaviour, where an individual puts his/her life at risk in order to save the life of another individual, who often is not related to the rescuer. Previous research has shown that when rescuing requires physical prowess and instant action, males are more likely to rescue than females are (Becker and Eagly 2004, Johnson 1996). Females, in turn, engage in more subtle forms of rescuing, such as hiding Jewish people from Nazis during the holocaust (Becker and Eagly, 2004). Risky, physically demanding rescuing behaviour seems to be a male-typical trait in humans, related to general risk-taking and sensation seeking behaviour (Becker and Eagly 2004, Nell 2002, Rosenblitt et al 2001). These, in turn, could be the proximate product of both male hormones both in uterus (Fink et al, 2006) and post-natally (Daizman and Zuckerman, 1980, although see Rosenblitt et al, 2001).

According to Zahavis handicap principle, in order to produce viable offspring, females should favour male traits that signal good genetic quality (Zahavi 1975, 1977). Presumably, if a male takes a high risk and survives, the risk taking behaviour could be interpreted as an honest signal of good quality. Thus, the high prevalence of males in heroic acts could be explained by costly signalling theory. Perhaps the males who do take risks have better mating success than their less heroic counterparts. Further evidence for costly signalling theory comes from studies that have investigated female choice for heroic males. When faced with hypothetical vignettes depicting males with different characteristics, women

have shown preference for heroic risk-takers in both short and long-term mating contexts (Farthing 2005, Kelly and Dunbar 2001).

Interestingly, a previous study has found that heroic rescuing acts are more prevalent in lower socio-economic classes. Johnson (1996) analysed several characteristics of 676 people who had been granted the Carnegie Hero Award. According to his data, a typical rescuer was a male with a relatively low-status occupation rescuing an unrelated male person. Johnson offered the high-risk nature of low-status occupations as one possible reason for this phenomenon. Another as yet unexplored possibility is that heroic risk-taking is a condition dependent life history strategy. Perhaps males with low socio-economic status have more to gain and less to lose when risking their lives. Wealthier males have the financial ability to broadcast their status to prospective mates. Conspicuous consumption of goods, for example, could have evolved as a costly signal that advertises the value of a male as a mate (Miller, 2000). Men from poorer backgrounds might not have the means to compete by purchasing luxury commodities, and could instead increase their mating success by showing their quality by dangerous risk-taking.

The difficulty in studying heroism lies in the fact that naturalistic observations are not easily conducted due to the relatively rare occurrence of rescuing behaviour. Moreover, presenting people with hypothetical situations is questionable as we do not always know why we are behaving the way we do (Bargh and Chartrand, 1999). Previous heroism studies have used mainly the archives methodology. For example, Becker and Eagly (2004) and Johnson (1996), researched the Carnegie bravery award recipients. However, the Carnegie bravery award is biased towards granting awards to people in rural settings and small towns (Johnson 1996).

This study will look at local newspapers that reported rescuing behaviour in the UK, both in rural areas and cities. The rescuing events provide a unique window to naturalistic behaviour in emergency situations. Because local newspapers have the tendency to account for even minor incidences in the area, it is assumed that rescuing behaviour is reported irrespective of the sex, relationship and socio-economic status of people involved.

The present study aims to provide some preliminary data for heroic acts, especially for the relationship between sex, SES, relationship strength and context of the rescue. If rescuing behaviour has evolved as a conditional male mating strategy, evolving through female choice for heroic males

Hypothesis 1: Males should rescue more than females do

Hypothesis 2: Males with low socio-economic status should rescue more than males from socio-economic groups

Although other aspects of heroism will be analysed as well, no specific predictions will be made for these.

6. 2 Method

The data were collected using a news-database website (www.icnetwork.co.uk), which contains local news from all over the UK. The period that the data were collected from was between 01/2001 and 10/2004. The search words used were a combination of “hero, rescue, Good Samaritan”. The news normally included the context of the rescuing action and the sexes and the relation of the rescuer and the rescued. The age of the rescuer and the rescued was reported in majority of the cases, and the occupation of the rescuer was also presented relatively often. The occupation of the rescued person was reported less often, and

was not recorded as one of the variables in the study. The minimum criteria for including a case in the analysis was the information on the sexes of both the rescuer and the person rescued. People whose heroic actions were part of their jobs (e.g. firemen, lifeguards or policemen) were not included in the data. However, if a person was described as being off-duty, they were included.

Unlike Johnson's (1996) study, the heroic acts of children were included in the data if it was clear that the child was aware of the risk involved, and showed intentionality in his actions. For example, a boy who went in between his friend and a dog that was biting the friend was clearly showing awareness of the danger of the situation. However, people under the age of 16 were excluded from the data when analysing the effect of socio-economic status of the rescuer, due to the fact that socio-economic background is not reported in the census data for children under the age of 16.

The following data, when present, were recorded:

- The relationship between the rescuer and the rescued (related, unrelated but knew each other, stranger)
- The context of the rescuing act (fire, drowning, violence, traffic, other)
- The sex and age of the rescuer and the rescued
- The socioeconomic class of the rescuer, based on his/her occupation. People were divided into 3 different socioeconomic classes, modified after The Standard Occupational Classification (2000). The Standard Occupational Classification (SOC) attempts to classify the occupations of British people into 9 major groups, which are divided into smaller sub-groups. In this study, for analytical purposes, the 9 groups were amalgamated into 3 groups. In some cases, the rescuers did not fit to any of the

groups in the classification system (for example, pensioner, student etc). In these cases, when analysing the socio-economic group of the rescuer, these people were left out of the analysis. The 3 socio-economic classes in this study are the following:

1. Professional occupations (Groups 1-3 in SOC, 2000). Examples: Architect, engineer
2. Skilled occupations (Groups 4-6 in SOC, 2000). Examples: Lorry driver, fitness instructor
3. Unskilled occupations (Groups 7-9 in SOC, 2000). Examples: Warehouse operator, cleaner

The search resulted in 355 cases in which a person risked his/her life in order to save the life of somebody else. 69 cases lacked the information on the sex of either the rescuer and/or the rescued, and were discarded from the final analysis. The 286 remaining rescues were conducted by 303 males and 25 females. In 43 cases, there were more than one rescuer, and in 72 cases, more than one person was rescued. Due to complications in analysing the dynamics of multiple people-multiple rescuer cases, the 43 cases with more than one rescuer were excluded from further analysis. Thus, the final dataset consists of 243 rescuing acts. The number of people who were rescued was 308.

In 121 cases, based on the occupation of the rescuing person, the heroes could be divided into one of the 3 socioeconomic categories adopted from SOC (2000). Only in 9 cases could the socio-economic group of females be determined. Thus, females were excluded from the analysis. The 3 socio-economic groups were analysed for 112 male rescuers.

6.3 Results

Sex differences in the rescuing acts

The rescues were conducted by 227 males and 16 females. People who were rescued consisted of 190 males and 118 females. A Chi-square test showed that males were both rescuers ($X^2=190.23$, $df=1$, $p=.001$) and were rescued ($X^2=12.24$, $df=1$, $p=.001$) significantly more often than females were. Thus, there was strong support for hypothesis 1- males were more likely to be rescuers than females were.

A goodness-of-fit test showed that males were more likely to rescue males than females ($X^2=11.96$, $1df$, $p=.001$). However, females were as likely to rescue males as they were likely to rescue females ($X^2=1.923$, $1df$, $p=.166$).

Table 6.1. Relationship (relative, knew by not related, stranger) and sex of the rescuers and the rescued

Rescuer Sex	Rescued Sex			
	Relative	Knew but not related	Stranger	Total
Male	Male 17	Male 63	Male 104	292
	Female 13	Female 41	Female 54	
Female	Male 4	Male 1	Male 1	16
	Female 3	Female 5	Female 2	
Total	37	110	161	308

Males were reported to rescue strangers more than acquaintances and acquaintances more than relatives. Females rescued relatives more than acquaintances and acquaintances

more than strangers (see table 6.1). Males were rescued more than females in all the categories of relationships (table 6.1).

Age of the rescuers and the rescued

The mean age of the male rescuers was 34.12 (SD 15.32), and the female rescuers was 28.9 (SD 18.4). The mean age of the people who were rescued was 30.08 (SD 24.50). The mean age of the males who were rescued was 29.3 years (SD 14.6). The mean age of the rescued females was 31.2 (SD 19.2). None of the age differences were statistically significant, indicating that male rescuers were similar in age to female rescuers. In a similar way, females who were rescued were similar in age to males who were rescued.

Males in the professional category were older (49.7, SD 6.08) than males in the skilled (37.3, SD 12.3) or unskilled (34.8, SD 12.0) categories. One way ANOVA showed that the age difference between the socio-economic classes of the rescuers were statistically significant ($F(2)=4.512, p=.013$). A post hoc test (LSD) found that the professional males were significantly older than the skilled ($p=.024$) and the unskilled ($p=.004$). Although the males in the skilled group were marginally older than the unskilled males, the difference was not statistically significant ($p=.361$).

SES, rescuing context and relationship between the rescuers and the rescued

It was possible to compare the proportions of males in 3 socio-economic groups to actual proportions of males in each of these groups in Britain (see table 6.2).

The single sample Chi-square had a highly significant value 213.3(2), $p=.001$. Males in the lowest socio-economic group were more likely to rescue than males in the 2 higher socio-economic categories.

Table 6.2. Distribution of Socio-economic groups in the dataset and in a national survey

Socio-economic group of the rescuer	Hero data 2001-2004	Walker et al (2000) (% of population in the UK)
Professional	Observed = 6 Expected = 32	29 %
Skilled	Observed = 24 Expected = 58	52 %
Unskilled	Observed = 82 Expected = 21	19 %

The fact that males in the lowest group rescue most could be due to more hazardous living environments of poorer people, which might affect both the rate of accidents and rescuing. It is assumed that at least in the context of road accidents, all the socio-economic groups have an equal opportunity to be present at the scene, whereas in the case of a house-fire, people who live in the area are more likely to be present. The context of the rescuing act was analysed in relation to the socio-economic class of the rescuer by using a Chi-Square test. The expected values were provided by the proportions of males in each socio-economic group (Walker et al 2000). Males in the lowest group were most likely to rescue in all contexts of rescues (fire: $X^2 = 88.1$, $df=2$, $p=.001$, road accidents: $X^2 = 28.3$, $df=2$, $p=.001$, drowning: $X^2 = 80.2$, $df=2$, $p=.001$, violence: $X^2 = 28.0$, $df=2$, $p=.001$) (see figure 6.1).

Table 6.3 Context of the rescue

Context	N of cases	% of all cases
Fire	95	39.1
Traffic accident	21	8.6
Violence	32	13.2
Drowning	85	35
Other	10	4.1

Figure 6.1. Socio-economic group of the rescuer and the context of the rescue

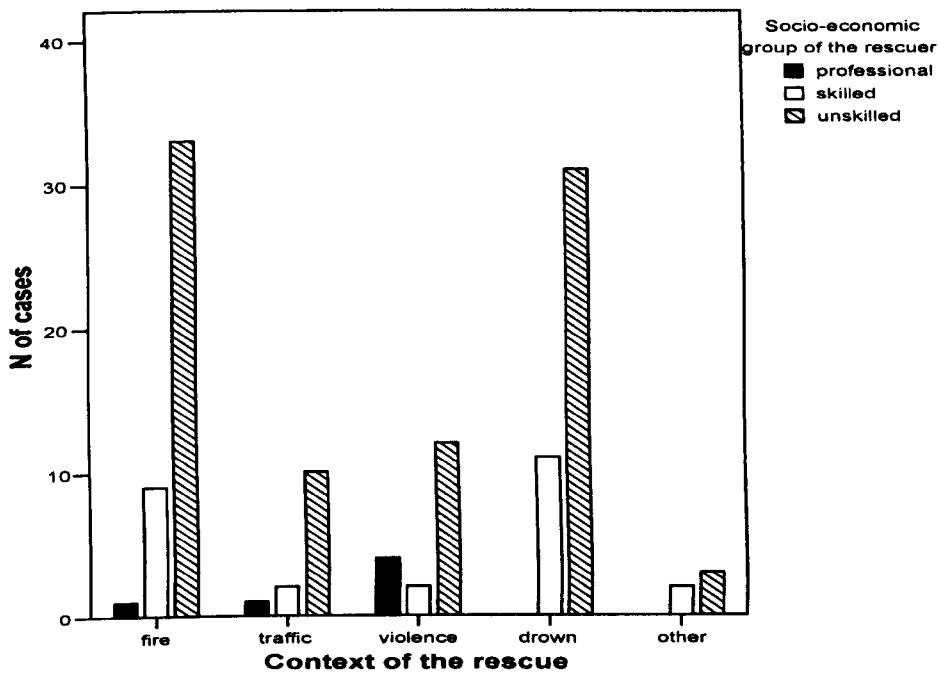
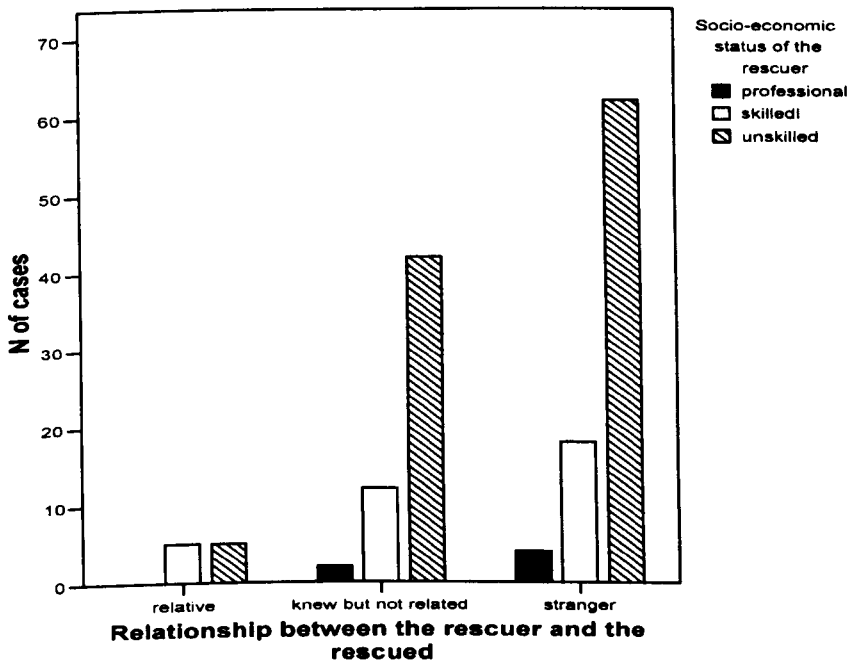


Figure 6.2 shows that people in the unskilled group rescued more strangers than men in the two higher socio-economic groups did. Rescuing relatives was reported relatively rarely for all the socio-economic groups, and no reports were found in where the professional

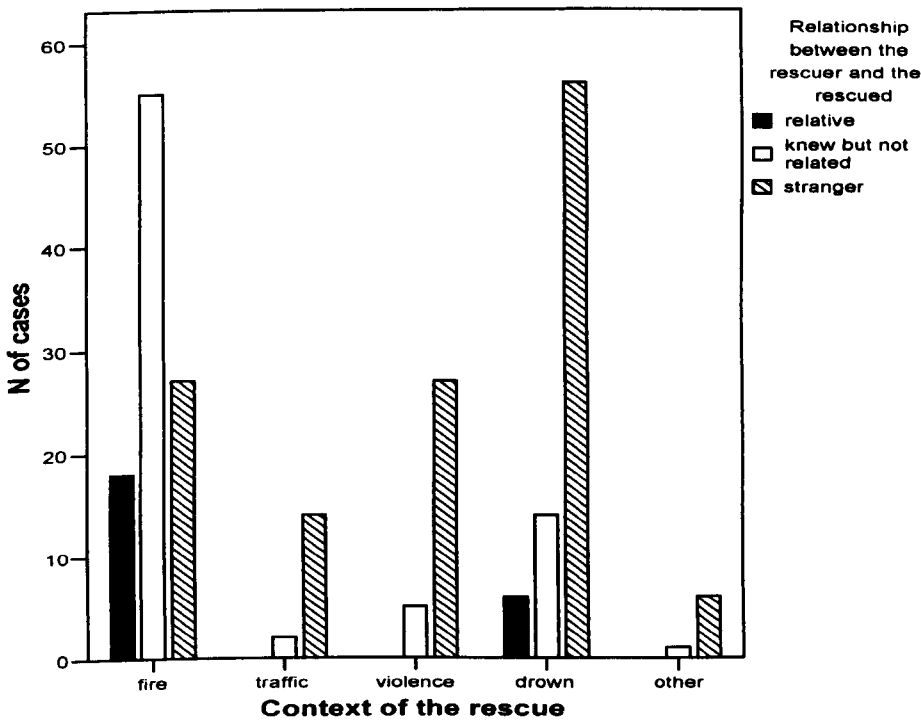
group were saving the lives of relatives. This probably reflects a bias in reporting. Perhaps, when an emergency situation happens within the family, people try to deal with it without the aid of outsiders, and certainly would not want any media attention.

Figure 6.2. Socio-economic group of the rescuer and the relationship between the rescuer and the rescued



Strangers were rescued most in all the contexts of the rescue (although not in fire, where the largest number of rescues was between unrelated acquaintances). Strangers were rescued most in the context of drowning, as shown in figure 6.3.

Figure 6.3. Relationship between the rescuer and the rescued and the context of the rescue



6.4 Discussion

The findings of Johnson (1996) were replicated in this study- males were more likely to engage in risky rescuing behaviour than were females, and most rescuers were found in the lowest socio-economic class. The sex difference found in this and previous studies indicate that heroic rescue could be a sexually selected trait, evolving through female choice for risk-taking males. The fact that males from the lowest socio-economic group were reported to rescue most in all the contexts of emergencies indicates that heroism could be a condition-dependent mating strategy. Perhaps men who are financially secure have other means of impressing women, whereas men from poorer backgrounds might receive more fitness benefits when risking their lives. According to Cashdan (1996), in long-term relationships, women prefer wealthy males, who are able to provide for the family. When looking for short-term partners to sire their offspring, females are looking for traits, such as heroism, that

indicate good genetic quality of the male. Both anthropological (e.g. Borgerhoff Mulder, 1990, Cronk, 1991) and questionnaire (e.g. Buss, 1989) data has indicated that at least in some cultures, wealth translates into mating success.

Mating success of heroes is an under-researched area of study. Dingle (2005) looked at the reproductive success of 2nd world war heroes, and found that the heroic veterans had more children and were more likely to be married than the non-heroic veterans. Of course, these data exclude information on extra-pair copulations. It would be expected that especially in short-term mating, heroic males achieve high success. An interesting study would be to look at the number of long-term and short-term partners of males in different occupational groups. For example, firemen, who are heroic by their occupational definition, should have a high number of short-term partners in relation to other, less heroic occupational groups.

Moreover, no studies, so far, have looked at the relative importance of wealth versus heroism in female choice. Kelly and Dunbar (2001) found that females prefer heroic risk takers rather than altruistic non- risk takers, or non-altruistic risk-takers. It would be interesting to extend the study by Kelly and Dunbar (2001), and include the wealth of a male as one of the variables.

Interestingly, in this study, males in the lowest socio-economic groups were significantly younger than males with the highest SES. This, again, points at the possibility that heroism is part of a male mating strategy. Younger males put more effort into finding mates, which is, proximately, mediated by higher levels of testosterone. For example, a recent study found that testosterone in human males was associated with mating success (Peters, Simmons and Rhodes, 2008), probably due to increased investment in courtship and mate seeking. Furthermore, testosterone has been associated with risk taking in firefighters (Fannin and Dabbs, 2003), soldiers (Gimbel and Booth, 1996) entrepreneurs (White, Thornhill and

Hampson, 2006) and financial traders (Coates and Herbert, 2008). Testosterone production and mating effort in males decreases with age, which could explain why individuals from the lower SES were younger than people from the wealthier background. Other variables, such as marital status, the birth of a child, or a divorce could also affect the levels of testosterone and risk-taking propensity (Burnham et al, 2003, Gray et al, 2002, Gray et al 2004, Gray, Yang and Pope, 2006, Mazur and Michalek, 1998, van Anders and Watson, 2006). It would certainly be interesting to look at the pair bonding status of the male heroes, in order to find out whether heroism is more prevalent in single males.

The finding that men are most likely to rescue stranger males does not point at straightforward mate selection. Although the heroes are worshipped by the media, and get public recognition by bravery awards (Becker and Eagly 2004), their reputation would have been less widely spread before the invention of mass media. On the other hand, recent theoretical advances in the study of the evolution of altruism suggest that reputation is a driving factor in maintaining altruistic behaviour in a population (Mohtashemi and Mui 2003, Nowak and Sigmund 1998, Wedekind and Milinski 2000). It is possible that in our evolutionary past, social information was passed on through ever-increasing networks of friends and relatives. Consequently, when engaging in a rescue, a male could ensure that his heroic reputation would be advertised to many prospective mates via indirect social networks.

The costly signaling theory does not automatically imply that wasteful signals are used in the mating context. Heroism could also have evolved as a result of indirect reciprocity, which does not necessarily transfer to direct benefits in mating. People who are altruistic can be attractive to others as preferred social partners, resulting in higher status and better access to resources (Price 2003), which may or may not result in greater success in finding partners. Indeed, experimental studies have found that altruism is linked to status gain, and that altruists are also preferred as interaction partners (Hardy and VanVugt, 2006).

Perhaps the heroic males gain higher statuses, and are supported more by their local communities. Although computer simulations and laboratory experiments have found that indirect reciprocity is an evolutionarily viable strategy (Mohtashemi and Mui 2003, Nowak and Sigmund 1998, Panchanathan and Boyd, 2004 , Wedekind and Milinski 2000), the fitness benefits of it are still to be demonstrated in future studies.

It is also possible that heroism is not an evolutionary adaptation, but a by-product of something else. Copious studies have found that living in unpredictable environments is related to behaving like the future does not exist, behaviour that is termed “future discounting” by economists. Future discounting has been related to smoking (Bickel, Odum and Madden, 1999) heroin (Madden et al, 1997) and cocaine use (Heil et al, 2006), gambling (Reynolds, 2006) and homicide (Wilson and Daly, 2001), to name a few. Perhaps in this study, people in lower socio-economic groups were more likely rescuers due to steep future discounting, which might prompt individuals to take more risks when there is less to lose and the potential gains are higher. There are plenty of cross-cultural data showing that people in lower socio-economic classes have lower life expectancy and high mortality (e.g Martikainen , Valkonen and Martelin 2001, O’Shea 2003, Chernichovsky and Anson 2005). It has been suggested that psychological mediators of risk-taking in humans might be related to life expectancy itself (Wilson and Daly 2001), which might explain the higher incidences of heroism in lower socio-economic groups. The data didn’t reveal enough about the background of the people who were rescued. If the people who are rescued belong to a lower socio-economic group as well, it could be argued that the rescuing cases are reflecting steep future discounting which leads to increase in risk-taking in general.

It is still undemonstrated what the interaction between the frequency of accidents, socio-economic class and heroism is. It is unclear whether there is a link between pair bonding status and heroism, and how big part societal gender norms play in the existence of sex differences in heroism. In the future, a further avenue of research would include conducting a follow-up study on the real-life rescuers, and find out more information about their lives before and after the rescue. If heroism is related to female choice, we would expect to see an increase of mating opportunities after a male has risked his life in order to save the life of somebody else. If heroism is, in turn, related to indirect reciprocity, the heroes would be expected to show an increase in their social status and access to resources.

7. Summary and Discussion

The final section of the thesis will summarise the findings of the data chapters, and discuss these in relation to issues surrounding evolution of altruism in humans.

7.1 Data Chapter summaries

Chapter 2. Relationship between Machiavellianism, Emotional Intelligence and Nonverbal Communication in a Prisoner's Dilemma game

Chapter 2 looked at how some aspects of nonverbal communication, personality and strength of the relationship affect how people behave in a Prisoner's Dilemma. The proximate determinants of cooperation in dyadic interaction involve an interaction between cooperative dispositions (whether an individual is pro-social or pro-self) and trusting behaviour (whether an individual expects the other will cooperate or defect). Obviously, the complexity and intricacy of cooperative interactions is hard, if not impossible, to capture in a single study. Nevertheless, the results give some indication of what proximate processes are involved. Some of these involve the possible existence of cooperative signalling, and the recognition of these signals by the cooperative partner. Moreover, evolution could have produced a polymorphic mix of individuals with varying degrees of pro-social inclinations. Thus, some people are more cooperative than others, which should also relate to stable individual differences in sending out cooperative signals.

At least in this study, cooperators did not signal their involvement in the interaction by nodding, gazing or smiling more. Although this does not disprove the existence of cooperative signalling, it does point to other cues, such as micro-expressions (Ekman, 2003) and content of the speech as possible sources of advertising trustworthiness. It is possible that during an interaction, we do give out cues about our emotional states, indicating involvement

and enjoyment in the communication process. Perhaps individuals who were less comfortable during the dyadic collaborative task indicated this by inconsistent microexpressions, which were not analysed in the present study. According to Schmidt and Cohn (2001), signalling involvement in the interaction can be costly in terms of the need to synchronise ones' facial expressions with the behaviour of the other person. This requires at least some degree of concentration on the other, and can be difficult to fake. Thus, it is possible that the defectors in the present study, rather than smiling, gazing or nodding less, lacked the synchronisation of the behaviour, which could be a more reliable measure of interest in collaboration than broader categories of nonverbal communication.

Interestingly, although individuals with Machiavellian inclinations did not defect more, the partners of the high-Machs in dyads of strangers rated the likelihood of cooperation lower. Somehow, after a relatively short interaction, people seemed proficient in recognising manipulative individuals, namely, partners who scored high on the Machiavellian instrument. It is unclear what cues led to the prediction, as Machiavellianism was not related to any of the measured nonverbal cues. Perhaps the high-Machs revealed their manipulative tendencies in the content of their speech, which was not analysed in the study. Another, as yet unexplored possibility is that the high-Mach participants did not synchronise their behaviour with the other, creating an impression of lack of interest. This could have led to scepticism by the partner about the likelihood of cooperation by the high-Mach individual.

Although previous research has found that personality traits have a significant impact on cooperative decision making (Declerck, Boone and Kiyonari, in prep., Gunnthorsdottir, McCabe and Smith, 2002, Wilson, Near and Miller, 2008) the present study found no differences between cooperators and defectors in respect to Machiavellianism and Emotional Intelligence. According to Declerck, Boone and Kiyonari (in prep), some people are intrinsically motivated to cooperate, which could be part of an evolved, adaptive individual

difference within humans. Such individuals (for example, individuals who possess high Emotional Intelligence) will always cooperate as long as they trust their partner to reciprocate (Camerer and Fehr, 2006). Individuals who are equipped with less altruistic dispositions, in turn (such as high-Machs) might still be prompted to overcome their greedy nature if extrinsic motives for cooperation exist. Extrinsic motivations might have been increased by the fact that due to the experimental design, decisions in the PD game were not anonymous, but participants might have been driven by socially desirable responding, which could have dampened the selfish inclinations of the high-Machs.

Another factor increasing the rate of cooperation is the element of face-to-face interaction, bringing more ecological validity to the experimental design. Engaging in social interaction with the PD partner might, in fact, function in increasing social motives, even in Machiavellian individuals. Campbell (2008) suggested that the neuropeptide oxytocin (OT) functions in increasing pro-social motivation through extrinsically rewarding social interactions. Perhaps the high-Machs, who are likely to deceive in anonymous conditions, benefit from pleasurable face-to-face interactions, resulting in increased rates of cooperation. If this is the case, OT might function in a positive way, enhancing both cooperativeness and trust in one-shot cooperative dilemmas between strangers. Nevertheless, this would go against the findings of Declerck, Boone and Kiyonari (in prep), who found that Machiavellian individuals deceived even more when they were administered OT nasally, and had a brief interaction with their PD game partners. The authors suggested that rather than giving more incentives to cooperate, the presence of trust drives manipulative individuals to even more deceit. At present, not much is known about how biological proximate mechanisms interact with individual differences in cooperative situations. The interactions between biological processes and personality in social dilemmas provide a promising avenue for future research, especially in terms of pro-social and pro-self individuals and their

decision making.

Interestingly, the present study provided some indirect evidence for OT and individual differences in trust-inducing non-verbal behaviour. OT has been found to increase eye-gaze (Guastella, Mitchell and Dadds, 2008) and the present study found a positive correlation between individuals' EI and the duration of eye gaze. Moreover, duration of the gaze was positively (although non-significantly) correlated with the ratings of trustworthiness. This indicates that, at least when interacting with strangers, emotionally intelligent individuals attempt to maintain more eye-contact, which might have a function in increasing trust. Trust, in turn, is an essential tool for maintaining cooperation, as one of the proximate reasons behind defective strategies (besides the lack of pro-social orientation) could be a lack of trust in the partner.

In the present study, defection was not related to lack of trust in the partner. The lack of trust might be created by the lack of signalling of honest intent by the other person. If a person suspects the other person will not cooperate, in order to avoid being cheated by the other, a defective strategy would be expected. In the present study, defectors did not have less expressive partners, or partners who lack pro-social orientation (i.e. high-Machs), indicating that defection was not based on the measured characteristics of the other. However, defection rates remained very low, and it is possible that the experimental design could have lifted the veil of anonymity, and reinforced cooperation even from the Machiavellian partners. Although in this study cooperative decisions were not made on the basis of the characteristics of the partner, people did somehow know (especially in strangers) when their partner was potentially deceitful, as a significant negative correlation was found between the ratings of likelihood of cooperation and the Machiavellian scores of the partner.

Overall, individuals reached higher than expected rates of accuracy when predicting

cooperation. This is in line with previous studies (e.g. Frank, Gilovich and Regan, 1993, Verplaetse, Vanneste and Braeckman, 2007) that had similar findings- individuals are better than chance in recognising cooperative and deceitful persons, a capacity that could be adaptive in reducing the risk of being exploited. The recognition ability could be due to implicit, subtle cues, sent out by the co-operators. Although in the present study, accuracy of prediction was not based any of the measured nonverbal behaviours, it is still possible that the more subtle cooperative cues do exist, and that people can accurately use these in predicting the likelihood of cooperation. Equally, it is possible that the nature of the situation triggered a cognitive module labelled the “social exchange heuristic” (Kiyonari, Tanida and Yamagishi, 2000), which prompts both cooperative and trusting behaviour in a mixed- motive game setting. In the present study, as defection rates remained low, people might have reached accuracy by chance.

Other studies using the PD experimental design have also found unexpectedly high rates of cooperation which, according to Wischniewski et al (2009), could be due to implicit obedience towards social norms, which requires a tit-for tat cooperative behaviour, conditionally cooperating unless the partner defects. Thus, in one-shot interactions, people are likely to cooperate, as this is the socially expected response even amongst unacquainted individuals.

Chapter 3: Individual differences in social judgement- what accounts for the accuracy?

Chapter 3 investigated the relationship between Machiavellianism, Emotional Intelligence, self-rated altruism and accuracy in social judgement. On one hand, superior judgement ability could be beneficial for individuals with manipulative tendencies, as knowing how the other is likely to behave would allow Machiavellians to reap more benefits from their social partners. If this was the case, perceptiveness and manipulateness could

have evolved together, giving the non-altruists an adaptive advantage over more altruistic individuals. On the other hand, more altruistic and socially intelligent individuals should perform well when assessing character and trustworthiness, as this capacity would be integral for maintaining altruism through Green Beard effect (Dawkins, 1976).

Some evidence was found for the latter hypothesis. Emotional Intelligence and self-reported altruism were related to an increased ability in judging personality, and Theory of Mind was related to increased performance in assessing whether people are strangers or acquainted with each other. It is possible that altruistic individuals possess the capacity to judge the intentions of others, which, in turn, impacts the ultimate existence of altruism as an evolutionarily viable strategy. Interestingly, high-Machs were no better or worse in judging personalities, which indicates that perhaps superior social understanding is not a requirement for successful exploitation of others.

The empathy (or the Hot-Cognition) component of Theory of Mind also played a role in social judgement. Although in study 2, ToM did not relate to accuracy in judging cooperativeness in videotapes of dyads unknown to the judge, it did help in judging whether these dyads consisted of friends or strangers. Study 2 found a positive correlation between the Eyes test (Baron-Cohen et al, 2001) and the number of correct hits when guessing the relationship status of the dyads in the videotapes. It does seem that people can use ToM in assessing 3rd party relationships, and the closeness of the bond between people unknown to the judge. These findings raise the issue of the context of the evolution of human-specific social intelligence. Perhaps ToM did not specifically evolve to aid the identification of honesty, but to keep a track of other individual's relationships, as in order to make informed decisions about who to form alliances with, it would have been beneficial to understand who are friends and enemies. Nevertheless, social intelligence seems to be related to enhanced social judgement ability, and is a worthwhile area for future investigations.

This chapter looked at the relationship between Machiavellianism, attributional styles, and ToM. It was expected that Machiavellian manipulation is related to a good understanding of the epistemic, knowledge states of others, but relates to worse performance on a task measuring the emotional states of others. Furthermore, in order to have the ability to exploit others, Machiavellian individuals were expected to have an attributional style that directs blame to other people. In addition, it was expected that the so-called “hot” and “cold” cognition are, at least partially, separate from each other, having evolved under slightly different evolutionary pressures.

The findings were somewhat surprising- instead of having superior epistemic and affective understanding of others, high-Machs performed poorly on both of the domains. There are many factors that could explain this. It is possible that manipulation does not require understanding of the belief and intentional states of others, and that ToM and altruism have evolved under slightly different selection pressures. Moreover, as the “cold-cognition” part of the task required considerable amount of concentration, it is possible that the high-Machs, having no financial incentives, were simply guessing the right answers rather than putting effort into trying to perform well. Machiavellian performance on this task might have been improved by relating the performance to a reward in terms of financial or status gain.

The high-Mach poor performance on recognising emotions in eyes was not an unexpected finding. Emotion recognition might be based on simulation of the emotions of others in oneself (see Goldman and Sripada, 2005), which Machiavellian individuals have difficulties with (Wastell and Booth, 2003). In fact, having a good understanding of how others feel might even impede manipulation, as this might lead to simulation of the feelings in oneself, and evoke pro-social emotions, such as guilt, which deters an individual from

being deceitful (Baumeister, Stillwell and Heatherton, 1994). In this sense, Machiavellians, in a similar way to psychopaths, might have an advantage in exploiting others, as they might have a dampened sense of guilt and remorse, coupled with poor empathetic skills.

Chapter 5 Mach no mates? The Role of Machiavellianism and Sex in the Evolution of Friendships and Social Networks

Chapter 5 investigated how Machiavellians function in personal relationships. Previous research has found that individuals in the autistic spectrum, having difficulties in understanding other people, have also poorer quality social relationships (Baron-Cohen and Wheelwright, 2003). As previous chapter found that high-Machs scored lower on ToM measurements, it was expected that Machiavellian individuals would also have difficulties in maintaining warm and supportive relationships. Furthermore, it was expected that in order to effectively manipulate people, high-Machs would have larger, but more superficial social networks, as having more people under their influence would, presumably, result in increased evolutionary fitness.

Machiavellianism was related to poorer quality relationships, in both male and female participants. Furthermore, females reported warmer and closer friendships than males did, reinforcing the ultimate theories of female dispersal affecting sex differences in the social domain (Geary, 2006). Machiavellianism was not correlated to network size, which suggests that high-Machs might have a sequence of short-lived social relationships rather than befriending a large number of people at once. Moreover, males and females did not differ in their network size. Interestingly, individuals who reported higher quality friendships were also reporting larger number of people in their sympathy groups. It is possible that this can be explained by a third variable, for example, social intelligence. Previous research has found

that epistemic ToM correlates positively with an individual's social network (Stiller and Dunbar, 2007), indicating that individuals with a better understanding of other's are more sociable, and might place more importance in establishing and maintaining relationships. The relationship between social intelligence and network size and quality is still to be demonstrated by further research. Moreover, these variables might have a link with altruism, as there are some suggestions that both friendship development (Younis 1986) and cooperativeness (Paal and Berezckei, 2007) might be linked to Theory of Mind capacity. It is possible that evolution has produced individuals who are both unconditionally cooperative (Kurzban and Hauser, 2005), place more importance on supportive relationships, and have higher levels of social intelligence. It would be interesting to find out whether the putative polymorphic cooperative strategies relate to stable differences in social intelligence and the capacity to form relationships, and how environmental factors might affect the co-development of these different strategies as well.

Chapter 6 Who are the heroes? Characteristics of people who rescue others

This chapter brought some preliminary evidence for the costly signalling theory as an ultimate cause for altruism, at least in the context of risky rescuing behaviour. According to the costly signalling theory, when individuals are performing an altruistic act, they are sending a signal to their audience indicating that the individual must have good underlying genetic qualities in order to afford a costly behaviour (Bliege Bird and Smith, 2005, Gintis, Smith and Bowles, 2001, Millett and Dewitte, 2007, Wilson et al, 2008, Zahavi, 1995). As males have a potential for a higher life-time reproductive success than females have (depending on the access to sexual partners), it would be expected that costly behavioural signals are exhibited more by males than females. Moreover, it was expected that

environmental (i.e. socio-economic status) and life-history (i.e. age) variables affect the importance of exhibiting costly altruistic signals.

Not only were males more likely rescuers than females were, but the socio-economic status of a male also played a part. The study, utilising newspaper archives reporting heroic acts, found that males of the lowest socio-economic status were the most likely rescuers in all contexts of rescue. This makes sense in the light of potential benefits of a heroic male in terms of increasing desirability as a social or a sexual partner as their reputation spreads within wider social networks. Previous research has found that indeed, females prefer heroic, altruistic risk-takers, specifically in short-term relationships (Farthing, 2005, Kelly and Dunbar, 2001). Presumably, if a male has a reputation as being a hero, the females can (subconsciously, of course) assume that the male has good underlying genetic quality, being able to survive such risks. Altruistic risk-taking (i.e. risking the life of oneself to save another person) would then make sense if a male has not got other, for example, financial means to impress females. It would be interesting to see what kind of short and long-term mating benefits being labelled as a hero brings to males, and whether female choice might have been a driving force behind the evolution of risk-taking.

Farthing (2005) found that in risk-taking alone was not desirable for females, but the act had to involve benefits to others as well in order to be preferred by women. Farthing rationalised this by asserting that if a male risks his life to save a stranger, he is likely to do the same for his partner and his offspring as well. Another possible benefit for the female might be increased social status of the male. Indirect reciprocity by others knowledgeable of the heroic act could bring new resources and alliances to the male, increasing his attractiveness as a sexual partner. This ties in with the idea of competitive altruism (e.g. Van Vugt, Roberts, and Hardy, 2007), which postulates that in order to raise their status, people compete to be seen as being altruistic. Ultimately, some types of altruistic actions could have evolved

because of competitive altruism. Proximately, risky rescuing might be mediated by future discounting, the tendency to act impulsively. As males in the lowest socio-economic category have more need to raise their status, and less to lose even if they die or get badly injured during the rescue, they might be more prone to engage in risky rescuing behaviour.

7.2 Overall Discussion

Cooperation and altruism form a complex phenomenon, involving a myriad of proximate and ultimate causes interacting with developmental forces to produce the behaviour. Moreover, different types of behaviours warrant different proximate and ultimate explanations, as no single theory can explain comprehensively the complexities of altruism in humans. Rescuing a stranger, reciprocating a favour to a friend, or helping a relative are behaviours that have evolved under diverse selection pressures, and are also mediated by different proximate factors. In addition, different altruistic acts have different meanings to males and females, as there seem to be significant evolved sex differences in social strategies. Not only are there differences in altruism between the sexes, but variation can be found within sexes as well, as polymorphism in cooperation has probably evolved under frequency-dependent selection (e.g. Mealey, 1995). The present thesis aimed at unravelling some of these complexities to provide more pieces to the puzzle of evolution of human sociability.

It is apparent that one of the unique features of human behaviour is the capacity to overcome self-regarding tendencies, and pursue fair outcome in reciprocal actions. This goes beyond the capacities of other primates, as though other species might show adversity towards income equality (see DeWaal, 2006), this usually extends only to situations where the individual herself is treated unfairly. Situations where the actor receives more than the other (labelled as “advantageous inequity aversion” or “overcompensation”, see Brosnan, 2006 for

more references), do not seem to apply to non-human primates. A chimpanzee might throw a tantrum if they observe a conspecific obtaining a desirable treat, but they will not complain if they are the recipients instead of the other individual (Brosnan and DeWaal, 2003). Human inequity aversion forms a strong base for large scale cooperation (Fehr and Schmidt, 1999), and is probably based on evolved pro-social emotions, or so-called “commitment devices” (Frank, 1988).

Interestingly, as demonstrated by the present thesis and previous research (see, for example, Boone, Declerck and Suetens, 2008), individuals are much more likely to cooperate than would be expected if they were driven solely by self-regarding motives. Why individuals should cooperate in experimental games (sometimes with anonymous strangers) is peculiar, and warrants further speculation. The “mismatch hypothesis” (Hagen and Hammerstein, 2006) provides a feasible explanation for the high rates of cooperation. In our evolutionary history, individuals were likely to form reciprocal relationships with people who live in close vicinity, and less likely to rely on strangers in one-shot situations (Trivers, 2004). In experimental settings, participants might be using an evolved exchange heuristic, which assumes that cheating behaviour will be detected and punished, and that a more beneficial solution will be to cooperate with others. However, this theory does not account for the substantial inter-individual variation in cooperative strategies- people do seem to possess stable traits, varying in degrees of cooperativeness (Camerer, 2003). One interesting question is whether others are accurate in recognising these traits- being able to identify a potential cheat, and withdraw cooperation would be an ability that would have conferred significant fitness advantages in ancient hominids.

Judging from the findings of the present thesis and previous research, it is apparent that people have evolved the ability to identify potential cooperators and cheats (e.g. Frank, Gilovich and Regan, 1993, Pradel, Euler and Fetchenhauer, 2008). Results of the study in

Chapter 2 demonstrated that people did perform better than at chance when assessing trustworthiness of others. Moreover, individuals had the capacity to recognise strangers who are potentially manipulative, as the PD experiment found that high-Mach strangers (but, interestingly, not friends) were rated as less likely cooperators. People seem to be making quick judgements about a stranger's cooperative status, but it is not clear what kind of cues are used in this process. In the present study, high-Machs did not show more (or less) of the measured non-verbal behaviours. It is possible that the cynical attitudes of high-Machs become more obvious in the content of their speech and/or more minute movements of the face, leading to suspicions about their likelihood of cooperation in a Prisoner's Dilemma game. Interestingly, high-Machs were not more likely to defect, which could be a result of lifting the veil of anonymity in the game. People are sensitive to cues that indicate a possibility of being detected and punished when cheating (e.g. Fehr and Henrich, 2003), which could have led to even Machiavellian people to overcome their self-regarding tendencies, and achieve cooperation in the experiment.

Boone, Declerck and Suetens (2008) suggested that there are two factors that affect the likelihood of achieving mutual cooperation. According to the authors, "One class relates to social information concerning aspects of one's interaction partners, such as past behaviour or reputation, facial familiarity and emotional expressions. The information is external to the dilemma, but plays a role in tacit reasoning as it may provide information about issues such as trustworthiness of the interacting person and/or the likelihood of attaining mutual cooperation" (Boone, Declerck and Suetens, 2008, p.179). In pairs of friends, for example, one would expect that past behaviour is a better determinant of likelihood of cooperation, and facial cues during the experimental interaction would not be as important. The present thesis found that in pairs of friends, Machiavellian individuals were not rated as less likely to cooperate. This would suggest that high-Machs are capable of at least appearing to be

cooperative, and attain the trust of their friend. Interestingly, this did not extend to Machiavellian strangers, who were not trusted to be cooperative. Due to lack of knowledge of the reputation of the stranger, this lack of trust must be based on emotional expressions (or the lack of them) in the high-Mach partner. The other determinants of mutual cooperation, according to Boone, Declerck and Suetens (2008), "...pertains to ecological information that concerns the strategic opportunities afforded by the situation" (p. 179). This includes more strategic calculations of different pay-off matrices in different behavioural strategies. For example, as in the present PD game, the decision making was not completely anonymous, indirect reciprocity might have affected the cooperation rates in even the more self-regarding players (see also Panchanathan and Boyd, 2004).

The existence of stable altruistic dispositions in humans is an interesting possibility, and would, ultimately, be possible via frequency-dependent selection for different behavioural morphs (Mealey, 1995). The behaviour of these morphs could be driven by proximate mechanisms such as polymorphism in neurotransmitters, leading to different emotional experiences and concerns for others. These unconditional altruists could have conferred reproductive advantage in our evolutionary history from having the reputation of being a trustworthy friend, partner of a social ally. The ultimate mechanism that facilitates the evolution of unconditional altruism could be based on Green Beard mutualism- the possibility that individuals with altruistic disposition are also harnessed with the ability to recognise the same disposition in others. It is possible that positive social attributes such as Emotional and Social Intelligence have evolved in cooperative context, aiding in recognising altruistic tendencies in others.

The present thesis researched the possibility that Theory of Mind is a trait related to increased judgement ability. Theory of Mind could have had its evolutionary origins in the need for large scale cooperation. Individuals seem to differ substantially in how good social

understanding they possess (Stiller and Dunbar, 2007), and there is a possibility that social cognition is, at least partly, a stable disposition, under substantial genetic and hormonal influences (Hughes and Cutting, 1999). Furthermore, it is an interesting possibility that the individuals with better social cognition are also more altruistic, and have the capacity to use their skills to judge altruism in others. Although a previous study found that self-reported cooperativeness was related to enhanced performance on a ToM task (Paal and Berzcekei, 2007), the present thesis did not provide evidence for the benefits of ToM in an altruist detection task. Interestingly, although ToM was not related to increased altruist detection, it was beneficial in understanding something about the strength of relationship in videotapes of dyads of interacting friends and strangers. Individuals who scored higher on the Eyes-test were also better in identifying which pairs on the videotapes were strangers, and which ones were friends. Future research should identify further how individual differences in social cognition may relate to social perceptiveness and altruistic dispositions, for example, looking at the role of ToM in cooperative interactions. Interestingly, manipulative individuals were found to have poorer social intelligence, as high-Machs scored lower on ToM measures. This indicates that Theory of Mind and cooperativeness could be part of the same evolved capacity, functioning in maintaining reciprocal altruism. It is possible that humans have evolved polymorphism in both altruistic dispositions, and perceptual systems aiding in recognising co-operators (Lyons, 2009), but more research is needed in order to discover how altruism and perceptiveness co-vary between individuals, and what adaptive benefits the combination of different dispositions might bring.

In order to fully understand the evolution of altruism in humans, the framework of Niko Tinbergen's would be beneficial, taking the proximate, ultimate, developmental and evolutionary trajectories into account in the context of different ultimate theories. Moreover, the importance of individual differences in cooperativeness, together with evolved sex

differences, need to be incorporated into the picture. It is important to remember that not only does evolution deal with human universals, but within-species adaptive differences as well.

7.3 Conclusion

In conclusion, main findings of the thesis provide evidence for the existence of “altruist detection” capacity in humans (Brown and Moore, 2000), relating to evolution of Theory of Mind as one of the possible mechanisms in aiding altruist recognition. Findings of the experiment in Chapter 2 showed that individuals with manipulative tendencies (high-Machs) were rated as less likely cooperators in a Prisoner’s Dilemma game. The lack of trust in a high-Mach partner could, at least partly, be due to reduced eye-contact from the more manipulative game partner. It is possible that high-Machs had less interest in the interaction, which could be manifested by less gazing in the direction of the other (Knapp and Hall, 2006). This could have prompted evaluations that the high-Machs are less likely to cooperate, lacking involvement in the collaborative experimental task.

Interestingly, Machiavellianism did not seem to be a useful trait when trying to understand the affective and knowledge states (namely, hot and cold ToM) of others. The experiment in chapter 4 demonstrated that in contrary, high-Machs performed poorly when trying to understand the emotional states, supporting the idea of McIlwain (2003) that Machiavellianism is characterised by deficits in understanding other people. This was further investigated in chapter 5, where a questionnaire measurement found that Machiavellianism was inversely related to ratings of warmth and closeness in personal relationships. Perhaps superior understanding of other individuals is not necessary when employing manipulative strategies. In fact, emotional deficits might lead to more successful manipulation, as understanding emotions might be a deterrent to exploiting others.

Linton and Wiener (2001) suggested that Machiavellianism has evolved as a male-

typical cheater strategy, bringing males fitness benefits in short-term mating context. Interestingly, according to the costly signalling theory, some forms of altruism (namely, heroic rescuing behaviour) might have evolved because of fitness benefits to the heroic male, showing underlying quality as a mating partner (Griskevicius et al, 2007). Chapter 6 brought some evidence for the relationship between heroism as a condition-dependent male mating strategy, as the most likely rescuers were males with lower social statuses. Although it is not clear, at the moment, what the relationship between Machiavellianism, socio-economic status, and heroic rescuing is, the hormone testosterone might provide some insights into the topic. High levels of testosterone have been associated with increased mating effort in males (Alvergne, Faurie and Raymond, in press). Although it is unclear whether high-Mach mating strategies are proximately mediated by testosterone, it is a hypothetical possibility. Moreover, in some individuals, testosterone is related to impulsivity and future discounting (Takahashi et al, 2006), which would suggest a connection between heroism, Machiavellianism and testosterone. This would be an interesting topic for future research.

The thesis provided some interesting, preliminary evidence for the possible selection force behind evolution of social cognition. As social intelligence does not appear to be something that individuals use when manipulating others, it is possible that this capacity evolved to aid in assessing honesty and trustworthiness in potential collaboration partners. Findings in chapter 3 indicated that a questionnaire measure of Emotional Intelligence lead to better personality judgement accuracy, especially in acquainted females. Moreover, Theory of Mind was related to better judgement ability when assessing relationship strength between strangers, indicating that ToM might have been important in early hominids when keeping track of 3rd party relationship in a fission-fusion social setting. Recently, Aureli et al (2008) suggested that fission-fusion dynamics put pressure on communicative and cognitive capacities of individuals. Perhaps ToM is something that evolved in humans to aid in coping

with constant splitting and fusing of the social groupings. The relationship between ToM, altruism and the ability to understand other's relationships forms a potentially fruitful avenue for future research, especially in terms of investigating whether ToM relates to altruistic behaviours (Paal and Bereczkei, 2007), altruist recognition, and whether altruists are good in recognising others with same dispositions.

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Appendices

Appendix 1: The Mach IV Scale

Listed below are a number of statements that describe attitudes that different people have. There are no right or wrong answers, only opinions. Read each item and decide whether you agree or disagree and to what extent.

- (1) Disagree Strongly
- (2) Disagree
- (3) Disagree slightly
- (4) Neither disagree or agree
- (5) Agree slightly
- (6) Agree
- (7) Agree strongly

Disagree	Agree	
1 2 3 4 5 6 7		The best way to handle people is to tell them what they want to hear
1 2 3 4 5 6 7		Never tell anyone the real reason you did something unless it is useful to do so R
1 2 3 4 5 6 7		One should take action only when sure it's morally right R
1 2 3 4 5 6 7		Most people are basically good and kind R
1 2 3 4 5 6 7		It's safest to assume that all people have a vicious streak and it will come out when they are given a chance
1 2 3 4 5 6 7		Honesty is the best policy in all cases R
1 2 3 4 5 6 7		There is no excuse for lying to somebody else R
1 2 3 4 5 6 7		It is hard to get ahead without cutting corners here and there
1 2 3 4 5 6 7		All in all, It is better to be humble and honest than important and dishonest R
1 2 3 4 5 6 7		When you ask someone to do something for you, it's best to give the real reasons for wanting it rather than giving reasons which carry more weight R
1 2 3 4 5 6 7		Most people who get ahead in the world lead clean, moral lives R
1 2 3 4 5 6 7		Anyone who completely trusts anyone else is asking for trouble
1 2 3 4 5 6 7		The biggest difference between most criminals and other people is that criminals are stupid enough to get caught
1 2 3 4 5 6 7		Most men are brave R
1 2 3 4 5 6 7		It's wise to flatter important people

- 1 2 3 4 5 6 7 It's possible to be good in all respects **R**
- 1 2 3 4 5 6 7 Barnum was very wrong when he said that there's a sucker born every minute **R**
- 1 2 3 4 5 6 7 Generally speaking, men won't work hard unless they're forced to do so
- 1 2 3 4 5 6 7 People suffering from incurable diseases should have the choice of being put painlessly to death
- 1 2 3 4 5 6 7 Most people forget more easily the death of their father than the loss of their property

The q's with R are reversed (ie. if somebody scores seven, give them a score of 1 for that q).

Appendix 2: Self-Reported Emotional Intelligence Scale

Here are a number of statements that may or may not apply to you. Please write the number next to each statement to indicate the extent to which *you agree or disagree with that statement*.

Disagree Strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

1. ___ I know when to speak about my personal problems to others
2. ___ When I'm faced with obstacles, I remember times I faced similar obstacles and overcame them
3. ___ I expect that I will do well on most things I try
4. ___ Other people find it easy to confide in me
5. ___ I find it hard to understand the non-verbal messages of other people
6. ___ Some of the major events in my life have led me to re-evaluate what's important and what is not important
7. ___ When my mood changes, I see new possibilities
8. ___ Emotions are one thing that makes my life worth living
9. ___ I am aware of my emotions as they happen
10. ___ I expect good things to happen
11. ___ I like to share my emotions with others
12. ___ When I experience a positive emotion, I know how to make it last
13. ___ I arrange events others enjoy
14. ___ I seek out activities that make me happy
15. ___ I am aware of the non-verbal messages I send to others
16. ___ When I'm in a positive mood, solving problems is easy for me
17. ___ By looking at their facial expressions, I recognise the emotions other people are experiencing
18. ___ I know why my emotions change
19. ___ When I'm in a positive mood, I'm able to come up with new ideas
20. ___ I have control over my emotions
21. ___ I easily recognise my emotions as I experience them
22. ___ I motivate myself by imagining a good outcome to tasks I take on
23. ___ I compliment others when they have done something well

Disagree Strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

- 24 ___ I am aware of the non-verbal messages people send
- 25 ___ When another person tells me about an important event in his or her life, I
almost feel as though I have experienced this event myself
- 26 ___ I know what other people are feeling by just looking at them
- 27 ___ I help other people feel better when they are down
- 28 ___ I can tell how people are feeling by listening to the tone of their voice
- 29 ___ I use good moods to help myself keep trying in the face of obstacles
- 30 ___ It is difficult for me to understand why people feel the way they do
- 31 ___ When I'm faced with a challenge, I give in because I think that I will fail
- 32 ___ I present myself in a way that makes a good impression on others
- 33 ___ When I feel a change in emotions, I tend to come up with new ideas

Appendix 4: Assessing the likelihood of cooperation

How likely is it that the other person will vote “yes”?

Very likely

Quite likely

Can't say

Not very likely

Definitely not likely

Why do you think so? Please explain briefly. _____

Appendix 5

- Mann Whitney U values for data in Chapter 2

Statistical significance of behavioral and personality differences between cooperating and defecting friends

Behaviour	Mann-Whitney U (Friends)	Z scores	p values	Mann-Whitney U (Strangers)	Z score	p values
Smile bouts	91.000	-1.255	.222	95.500	-.715	.485
Smile Duration	73.000	.137	.091	115	-.018	.986
Gaze	108.000	-.677	.517	93.500	-.783	.433
Nod	109.000	-.651	.539	92.500	-.823	.415
Mach IV	105.000	-.779	.454	68.500	-1.675	.095
EI	104.000	-.812	.434	103.500	-.428	.676

Statistical significance of behavioral and personality differences between the partners of cooperators and defectors

Behaviour of the partner	Mann-Whitney U (Friends)	Z scores	p values	Mann-Whitney U (strangers)	Z score	p values
Smile bouts	91.000	-1.255	.222	89.00	-.947	.363
Smile Duration	127.500	-.017	.987	94.00	-.766	.463
Gaze	125.000	-.085	.934	104.500	-.392	.702
Nod	121.500	-.223	.829	114.500	-.036	.972
Mach IV	105.000	-.779	.454	76.00	-1.408	.169
EI	100.000	-.947	.359	94.500	-.749	.463

Differences in Machiavellianism, EI and nonverbal behaviours of the partners of accurate and inaccurate judges

Behaviour and characteristics of the partner	Mann-Whitney U (friends)	Z scores	p values	Mann-Whitney U (Strangers)	Z scores	p values
Smile bouts	57.500	-1.456	.140	29.500	-1.64	.100
Smile Duration	62.00	-1.255	.190	50.00	-.267	.820
Gaze	88.500	-.484	.629	44.00	-.667	.537
Nod	51.00	-.202	.871	51.00	-.202	.840
Mach IV	87.00	-.526	.599	26.800	-2.04	.08
EI	96.500	-.147	.883	41.00	-.870	.385

Appendix 6: Ten Item Personality Inventory

Here are a number of personality traits that may or may not apply to you and the person you just interacted with. Please write the number next to each statement to indicate the extent to which *you agree or disagree with that statement*. You should rate the extent to which the pair of traits applies to you and the other, even if one of the characteristics applies more strongly than the other. You should try and guess what the other person is like, even if you don't know her/him too well.

Disagree Strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
1	2	3	4	5	6	7

I see myself as:

1. ___ Extraverted, enthusiastic
2. ___ Critical, quarrelsome
3. ___ Dependable, self-disciplined
4. ___ Anxious, easily upset
5. ___ Open to new experiences, complex
6. ___ Reserved, quiet
7. ___ Sympathetic, warm
8. ___ Disorganised, careless
9. ___ Calm, emotionally stable
10. ___ Conventional, uncreative

I see the other person as:

1. ___ Extraverted, enthusiastic
2. ___ Critical, quarrelsome
3. ___ Dependable, self-disciplined
4. ___ Anxious, easily upset
5. ___ Open to new experiences, complex
6. ___ Reserved, quiet
7. ___ Sympathetic, warm
8. ___ Disorganised, careless
9. ___ Calm, emotionally stable
10. ___ Conventional, uncreative

Appendix 7: Self-Reported Altruism Scale

Referring to your own personal experiences, please tick a box most relevant to you:

	Never	Once	More than once	More than 4 times	Often
1. I have bought the Big Issue					
2. I have given directions to a stranger					
3. I have made change for a stranger					
5. I have given money to a charity					
5. I have given money to a stranger who needed it (or asked me for it)					
6. I have donated goods/clothes to a charity					
7. I have done voluntary work for a charity					
8. I have donated blood					
9. I have helped carry a stranger's belongings (books, parcels etc)					
10. I have delayed an elevator and held the door open for a stranger					
11. I have allowed somebody to go ahead of me in a queue (e.g. in the supermarket)					
12. I have given a stranger a lift in my car					
13. I have pointed out a clerk's error (in a bank, at the supermarket) in undercharging me for an item					
14. I have let a neighbour who I didn't know too well borrow an item of some value to me (e.g. a dish, tools, etc)					

	Never	Once	More than once	More than 4 times	Often
15. I have bought Charity Christmas cards deliberately because I knew it was a good cause					
16. I have helped a classmate who I did not know that well with a homework assignment when my knowledge was greater than his/hers					
17. I have before being asked, voluntarily looked after a neighbour's pets or children without being paid for it					
18. I have offered to help a disabled or an elderly person across the street					
19. I have offered my seat on a bus or train to a stranger who was standing					
20. I have helped an acquaintance to move households					

Appendix 8: Internal, Personal and Situational Attributions Questionnaire

I.P.S.A.Q.

Name: _____

Sex:

Age: _____

Occupation:

Date Completed:

INSTRUCTIONS

Please read the statements on the following pages. For each statement please try to vividly imagine that event happening to you. Then try to decide what was the main cause of the event described in each statement. Please write the cause you have thought of in the space provided. Then tick the appropriate letter (a,b or c) according to whether the cause is :

- a) Something about you
- b) Something about another person (or a group of people)
- c) Something about the situation (circumstances or chance)

It might be quite difficult to decide which of these options is exactly right. In this case, please pick **one option**, the option which **best** represents your opinion. Please pick **only one** letter in each case.

Thank you for your time and co-operation.

Note For Users

This scale was designed by Peter Kinderman and Prof. Richard P. Bentall, of the Department of Clinical Psychology, Whelan Building, P.O. Box 147, Liverpool, L69 3BX, based on previous work by McArthur (1972) and Bentall, Kaney and Dewey (1991). The scale is a research tool and should not be used for routine clinical assessment. Permission is granted for its use in research protocols on condition that the authors are first notified.

1. **A friend gave you a lift home.**

What caused your friend to give you a lift home?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

2. A friend talked about you behind your back.

What caused your friend to talk about you behind your back?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

3. A friend said that he/she has no respect for you.

What caused your friend to say that he/she has no respect for you ?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

4. A friend helped you with the gardening.

What caused your friend to help you with the gardening?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

5. A friend thinks you are trustworthy.

What caused your friend to think you are trustworthy?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

6. A friend refused to talk to you.

What caused your friend to refuse to talk to you?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

7. A friend thinks you are interesting.

What caused your friend to think you are interesting?
(Please write down the one major cause)

.....
.....
Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

8. A friend sent you a postcard.

What caused your friend to send you a postcard?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

9. A friend thinks you are unfriendly.

What caused your friend to think that you are unfriendly?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

10. A friend made an insulting remark to you.

What caused your friend to insult you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

11. A friend bought you a present.

What caused your friend to buy you a present .
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

12. A friend picked a fight with you.

What caused your friend to fight with you?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

13. A friend thinks you are dishonest.

What caused your friend to think you are dishonest?
(Please write down the one major cause)

.....

.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?

c. Something about the situation (circumstances or chance) ?

14. A friend spent some time talking to you.

What caused your friend to spend time talking with you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

15. A friend thinks you are clever.

What caused your friend to think you are clever?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

16. A friend refused to help you with a job.

What caused your friend to refuse to help you with the job?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

17. A friend thinks you are sensible.

What caused your friend to think that you were sensible?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

18. A friend thinks you are unfair.

What caused your friend to think that you are unfair?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

19. A friend said that he/she dislikes you.

What caused your friend to say that he/she dislikes you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

20. A friend rang to enquire about you.

What caused your friend to ring to enquire about you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

21. A friend ignored you

What caused your friend to ignore you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

22. A friend said that she(he) admires you.

What caused your friend to say that she(he) admired you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

23. A friend said that he(she) finds you boring.

What caused your friend to say that he/she finds you boring?
(Please write down the one major cause)

.....
.....
Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

24. A friend said that she(he) resents you.

What caused your friend to say that she/he resents you?
(Please write down the one major cause)

.....
.....
Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

25. A friend visited you for a friendly chat.

What caused your friend to visit you for a chat?
(Please write down the one major cause)

.....
.....
Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

26. A friend believes that you are honest

What caused your friend to believe that you are honest?
(Please write down the one major cause)

.....
.....
Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

27. A friend betrayed the trust you had in her.

What caused your friend to betray your trust?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

28. A friend ordered you to leave.

What caused your friend to order you to leave?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

29. A friend said that she(he) respects you.

What caused your friend to say that she(he) respects you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

30. A friend thinks you are stupid.

What caused your friend to think that you are stupid?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

31. A friend said that he/she liked you.

What caused your friend to say that he/she liked you?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?
- b. Something about the other person or other people ?
- c. Something about the situation (circumstances or chance) ?

32. A neighbour invited you in for a drink.

What caused your friend to invite you in for a drink?
(Please write down the one major cause)

.....
.....

Is this :

- a. Something about you ?

b. Something about the other person or other people ?

c. Something about the situation (circumstances or chance) ?

INTERNAL, PERSONAL, AND SITUATIONAL ATTRIBUTION QUESTIONNAIRE

SCORING KEY

Each item describes the action of an actor towards a target person. Subjects have to choose one of three possible explanations for each action.

- a. An internal attribution
- b. An external, personal, attribution
- c. An external, situational, attribution

Positive : 1, 4, 5, 7, 8, 11, 14, 15, 17, 20, 22, 25, 26, 29,
31, 32

Negative: 2, 3, 6, 9, 10, 12, 13, 16, 18, 19, 21, 23, 24, 27,
28, 30

Appendix 9: Imposing Memory Task

1. JOHN'S PROBLEM

It was nearly the end of the day, John thought it might be nice to go to the pub for a drink after work. At first, he wasn't sure whom he should ask to go with him. He very much wanted to ask Sheila, whom he fancied, but he thought that she didn't like him enough to want to give up her aerobics class to go drinking with him. He could, of course ask Pete, his usual drinking companion. Pete was always happy to spend an hour or two in the pub before going home. Then he happened to see Penny. He knew that Penny was one of Sheila's friends. Penny might be able to help him out. She would know whether Sheila would be willing to go out for a drink rather than go to her aerobics class. "Listen Penny," he said, "I thought I might go for a drink after work. I was going to ask you and Sheila if you wanted to come. Would you ask Sheila whether she would like to come for a drink with us?" Penny looked surprised. John had never asked her to go out with him before, but she thought that he was very keen on Sheila. She began to suspect that John wanted to find out whether she knew what Sheila might want to do.

John's Problem - Please tick the correct answer to each question:

1. (a) John wanted to go home after work
(b) John wanted to go to the pub after work
2. (a) John thought Sheila would not like to go to the pub with him
(b) John thought Sheila would like to go to the pub with him
3. (a) Penny believes that John thinks that she does not know that John wants to go out with Sheila alone because Penny thinks that John thinks that Penny would know if Sheila would want to go out with him.
(b) Penny does not believe that John thinks that she does not know that John wants to go out with Sheila alone because Penny thinks that John thinks that Penny would know if Sheila would want to go out with him.
4. (a) Penny believed that John thought she would not know what Sheila would want to do
(b) Penny believed that John was hoping she would know what Sheila would want to do
5. (a) John thought that Penny thought that John wanted Penny to find out what Sheila wanted to do because John wanted to go out with Sheila alone
(b) John thought that Penny thought that John wanted Penny to find out what Sheila wanted to do because John wanted to go out with them both
6. (a) John thought that Penny knew what Sheila wanted to do
(b) John thought that Penny did not know what Sheila wanted to do
7. (a) John knew that Penny would suspect that John believed that she would know that he hoped that Penny would know if Sheila would go out with him.
(b) John did not know that Penny would suspect that John believed that she would know that he hoped that Penny would know if Sheila would go out with him.
8. (a) Penny did not suspect that John hoped that Penny would know that John knew that she and Sheila were mates and that Penny would believe that John suspected that Penny would know whether Sheila believed that John was worth giving up her aerobics for.
(b) Penny suspects that John hoped that Penny would know that John knew that she and Sheila were mates and that Penny would believe that John suspected that Penny would know whether Sheila believed that John was worth giving up her aerobics for

Appendix 9: The Friendship Questionnaire

This questionnaire has 35 questions. Please answer every question. For each of the following questions, tick the box next to the statement which most applies to you.

1. a I have one or two particular best friends.
 b I have several friends who I would call best friends.
 c I don't have anybody who I would call a best friend.

2. a The most important thing about a friendship is having somebody to confide in.
 b The most important thing about a friendship is having somebody to have fun with.

3. a If I had to pick, I would rather have a friend who enjoys doing the same things as me than a friend who feels the same way about life as I do.

 b If I had to pick, I would rather have a friend who feels the same way about life as I do, than a friend who enjoys doing the same things as me.

4. a I like to be close to people.
 b I like to keep my distance from people.

5. a When I talk with friends on the phone, it is usually to make arrangements rather than to chat.

 b When I talk with friends on the phone, it is usually to chat rather than to make arrangements.

6. a I tend to think of an activity I want to do and then find somebody to do it with.
 b I tend to arrange to meet somebody and then think of something to do.

7. a I prefer meeting a friend for a specific activity, e.g., going to the cinema, playing golf.
 b I prefer meeting a friend for a chat, e.g., at a pub, at a café.

8. a If I moved to a new area, I would put more effort into staying in touch with old friends than making new friends.
 b If I moved to a new area, I would put more effort into making new friends than staying in touch with old friends.

9. a My friends value me more as someone who is a support to them than as someone to have fun with.
 b My friends value me more as someone to have fun with than as someone who is a support to them.

10. a If a friend had a problem, I would be better at discussing their feelings about the problem than coming up with practical solutions.

- b If a friend had a problem, I would be better at coming up with practical solutions than discussing their feelings about the problem.
11. a If a friend was having personal problems, I would wait for them to contact me as I wouldn't want to interfere.
- b If a friend was having personal problems, I would contact them to discuss the problem.
12. a When I have a personal problem, I feel that it is better to work it out on my own.
- b When I have a personal problem, I feel that it is better to share it with a friend.
- c When I have a personal problem, I feel that it is better to try and forget about it.
13. a If I have to say something critical to a friend, I think it's best to broach the subject gently.
- b If I have to say something critical to a friend, I think it's best to just come right out and say it.
14. If I fell out with a good friend and I thought that I hadn't done anything wrong, I would
- a do whatever it takes to repair the relationship.
- b be willing to make the first move, as long as they reciprocated.
- c be willing to sort out the problem, if they made the first move.
- d not feel able to be their *close* friend anymore.
15. My ideal working space would be
- a in an office on my own, without any visitors during the day.
- b in an office on my own, with an occasional visitor during the day.
- c in an office with one or two others.
- d in an open plan office.

For the next set of questions, please tick the box to indicate your answer.

16. How easy do you find discussing your feelings with your friends?
- Very easy
- Quite easy
- Not very easy
- Quite difficult
- Very difficult
17. How easy would you find it to discuss your feelings with a stranger?
- Very easy

Quite easy
Not very easy
Quite difficult
Very difficult

18. In terms of *personality*, how similar to your friends do you tend to be?

Very similar
Quite similar
Not very similar
Very dissimilar

19. In terms of *interests*, how similar to your friends do you tend to be?

Very similar
Quite similar
Not very similar
Very dissimilar

20. How important is it to you what your friends think of you?

Of no importance
Of little importance
Fairly important
Very important
Of upmost importance

21. How important is it to you what strangers think of you?

Of no importance
Of little importance
Fairly important
Very important
Of upmost importance

22. How easy do you find it to admit to your friends when you're wrong?

Very easy
Quite easy
Not very easy
Quite difficult
Very difficult

23. How easy to do you find it to tell a friend about your weaknesses and failures?

Very easy
Quite easy
Not very easy
Quite difficult
Very difficult

24. How easy do you find it to tell a friend about your achievements and successes?

- Very easy
- Quite easy
- Not very easy
- Quite difficult
- Very difficult

25. How interested are you in the everyday details (e.g., their relationships, family, what's currently going on in their lives) of your *close* friends' lives?

- Completely disinterested
- Not very interested
- Quite interested
- Very interested

26. How interested are you in the everyday details (e.g., their relationships, family, what's currently going on in their lives) of your *casual* friends' lives?

- Completely disinterested
- Not very interested
- Quite interested
- Very interested

27. When you are in a group, e.g., at work, school, church, parent group etc., how important is it for you to know the "gossip," e.g., who dislikes who, who's had a relationship with who, secrets.

- Of no importance
- Of little importance
- Fairly important
- Very important
- Of great importance

28. Do you work harder at your career than at maintaining your relationships with friends?

- Yes
- No
- Equal

29. How often do you make plans to meet with friends?

- Once or twice a year
- Once every 2 or 3 months
- Once a month
- Once every couple of weeks
- Once or twice a week
- 3 or 4 times a week
- More than any of the above

30. How would you prefer to keep in touch with friends?

(Please put: 1 in the box next to your most preferred method, 2 in the box next to your second preference, 3 in the box next to your third preference)

Face to face contact

E-mail/letters

Telephone calls

31. How easy to do you find it to make new friends?

Very easy

Quite easy

Not very easy

Quite difficult

Very difficult

32. What would be the *minimum* social contact you would need to get through a *day*?

No contact—I don't get lonely

Just being near to people, even if I am not talking to them

A casual chat, e.g., with a shop assistant or hairdresser

A chat with a friend

Two or three chats with friends during the day

More than any of the above

33. What would be the *minimum* social contact you would need to get through a *week*?

None—I don't get lonely

Being around people, even if I wasn't talking to them

Casual chats, e.g., with a shop assistant or hairdresser

One chat with a friend

Two or three chats during the week with friends

One chat every day with a friend

Two or three chats every day with a friend

More than any of the above

34. When talking with friends, what proportion of your time do you spend talking about the following:

(Please put: 1 in the box next to the topic that you talk most about, 2 in the box next to the topic you talk next most about, etc., through to 7 in the box next to the topic you talk least about. Use each number only once, i.e., there should be no ties.)

Politics and current affairs

Hobbies and interests (e.g., sport, TV, music,

cinema, fashion, holidays, gardening, DIY, etc.)
Personal matters (e.g., life choice decisions, arguments, feelings)
Work
Family and friends
The weather
What you've been doing since last time you spoke

35. At social occasions, when you meet someone for the first time, how likely are you to talk about the following.

(Please put: 1 in the box next to the topic that you talk most about, 2 in the box next to the topic you talk next most about, etc., through to 7 in the box next to the topic you talk least about. Use each number only once, i.e., there should be no ties.)

Politics and current affairs
Hobbies and interests (e.g., sport, TV, music, cinema, fashion, holidays, gardening, DIY, etc.)
Personal matters (e.g., life choice decisions, arguments, feelings)
Work
Family and friends
The weather
What you've been doing recently

Thank you for completing this questionnaire.

Appendix 9- Short Social Network Questionnaire

A CHECKLIST OF YOUR RECENT SOCIAL CONTACTS

In the spaces below, please list the **INITIALS** of everyone with whom you had some kind of social contact (a) **during the last 7 days** and (b) **during the rest of the last month** (i.e. approx. 30 days).

Contact

means some form of interaction, including face-to-face, phone call, email or text-messaging, or a letter.

Please **DO NOT INCLUDE** people whom you contacted for professional reasons (e.g. your doctor, lawyer, hairdresser, priest, employer or supervisor, plumber or DIY consultant etc) **UNLESS** you considered that interaction to have been of a mainly **SOCIAL** nature at the time.

All Contacts within LAST 7 days within previous ~30 days	All OTHER contacts [DO NOT INCLUDE ANYONE ALREADY IN COLUMN 1]
	<p style="text-align: center;">INITIALS ONLY PLEASE!</p>