EXAMINING FRIENDSHIP DYNAMICS IN SOCIAL ANXIETY WITH ITERATED GAMES OF THE PRISONER'S DILEMMA

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ABSTRACT

Individuals with social anxiety have been shown to have higher levels of friendship impairment and greater difficulty establishing close relationships than persons without social anxiety. However, the mechanisms associated with such impairment have not been widely examined. Previous research suggests that deficiencies in prosocial behaviors (e.g., low warmth, limited self-disclosure, and constrained cooperation) during interpersonal exchanges may partially explain their difficulties developing close relationships.

The present study aimed to examine the effect that rejection may have on prosocial behaviors, as well as other factors associated with developing and maintaining friendships, including trust, perceived likeability, closeness/connectedness, using an iterated, computerized version of the Prisoner's Dilemma (PD) game. Participants with high (n = 56) and low (n = 35) social anxiety were asked to play the PD game with another participant (actually an experimental confederate) whom they met at the start of the study. Participants were led to believe that they were playing the PD game against the other participant but were actually playing against a computer that was programmed with a strategy meant to initially facilitate cooperation. Cooperation, or giving, in the PD game was measured primarily by the number of tokens that the participant shared with his/her partner. Additionally, participants were randomized to either rejection or non-rejection conditions. Partway through the study, those in the rejection condition were exposed to a programmed decrease in giving by their partner as well as an ambiguous in-person rejection (administered by the experimenter). Participants in

the non-rejection condition were not exposed to either the programmed or in-person manipulations. Outcomes of interest included total giving during the PD game, constriction of giving, and the use of particular strategies following rejection in the PD game, as well as various measures of relationship quality collected at the end of each round of play. It was hypothesized that individuals with high social anxiety in the rejection condition would exhibit less total giving and a constricted response to low partner giving and also be less likely to use prosocial strategies to encourage cooperation (i.e., a coaxing strategy) following rejection by the partner compared to those with low social anxiety in the rejection condition. Additionally, we anticipated that those with high social anxiety in the rejection condition would provide lower ratings of the following relationship quality domains following the rejection condition: trust, closeness/connectedness, and perceived likeability than those with low social anxiety in the rejection condition.

Overall, results provided little support for these hypotheses. However, there were several significant main effects that highlighted differences among those with high and low social anxiety. For example, individuals with high social anxiety had greater ratings of the expectancy of future rejection and of the importance of their next turn for maintaining the quality of their relationship with their partner. Additionally, there was a trend level (p = .08) social anxiety group by rejection condition interaction on the participant's trust of his/her partner, such that those with high social anxiety exhibited reductions in relationship trust following rejection whereas those with low social anxiety did not. Implications of these findings as well as limitations and future directions of study are also explored.

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CHAPTER 1

INTRODUCTION

Examining Friendship Dynamics in Social Anxiety with Iterated Games of the Prisoner's Dilemma

Social anxiety is characterized by fears of negative evaluation and rejection in social situations that cause distress and/or interference in social functioning. As social animals, human beings rely on close relationships to satisfy a wide range of our emotional and psychological needs. Friendships are one example of these close relationships that seem to be particularly important for positive psychological adjustment and improved quality of life (e.g., Headey, Holmstrom, & Wearing, 1985; Ryff & Singer, 1996). For individuals with social anxiety, however, the formation of friendships and maintenance of these relationships can be an especially challenging and stressful experience. In fact, people with social anxiety tend to have higher levels of friendship impairment and increased difficulty developing close bonds with others (Meleshko & Alden, 1993; Rodebaugh, 2009). Although a relationship appears to exist between friendship impairment and social anxiety, the nature of this impairment has not been widely examined (Rodebaugh, Klein, Yarkoni, & Langer, 2011). Most of the knowledge that we have about relationship impairment in social anxiety has been derived through research on the interpersonal behaviors of these individuals.

Social Anxiety and Interpersonal Behaviors: Potential Contributing Factors for Relationship Impairment

Research involving the interpersonal interactions of people with social anxiety has shown that these individuals tend to exhibit constricted behaviors and/or deficiencies related to affiliation, assertiveness, cooperation, and warmth (e.g., Creed & Funder, 1998; Rodebaugh, Gianoli, Turkheimer, & Oltmanns, 2010; Walters & Hope, 1998). For example, individuals with social anxiety demonstrate less dominant and cooperative behaviors during social interactions and exhibit difficulty in reciprocating prosocial behaviors, such as receiving/giving gifts and self-disclosure of personal information (Fernandez & Rodebaugh, 2011; Meleshko & Alden, 1993). This collection of constrained behaviors and limited emotional expressiveness during social interactions has been referred to as difficulties with "positive reciprocity" (Rodebaugh, Klein, et al., 2011, p. 427).

The ability to experience and convey positive emotions and display signals of connectedness allows others to feel comfortable, facilitates openness, encourages the expression of emotions in others, and shows potential relationship partners that we are interested in them. Not surprisingly, individuals with social anxiety often have trouble expressing these positive signs of engagement (Mallott, Maner, De Wall, & Schmidt, 2009; Meleshko & Alden, 1993; Rodebaugh, et al., 2010). For example, individuals with social anxiety tend to show restricted signs of intimacy during interpersonal exchanges, including both non-verbal (e.g., lack of eye contact) and verbal behavior (e.g., disclosing less personal content, less warm and expressive speech, etc.) (Cheek & Buss, 1981; Gilbert, 2001; Mallott et al., 2009; Papsdorf & Alden, 1998). Individuals with social anxiety may have particular difficulty

expressing these signs of closeness and positive emotion as their interaction partners escalate and intensify the level of intimacy (Meleshko & Alden, 1993).

Additionally, how likeable one perceives himself or herself to be to others likely plays a role in determining whether a person decides to approach a potential friend or remain engaged during an interaction. Individuals with social anxiety are frequently preoccupied with how others perceive them. In interpersonal exchanges, especially those that involve the possibility for increased intimacy, these individuals often find themselves overly concerned that others are not enjoying their company (Rapee & Heimberg, 1997; Rodebaugh, Klein, et al., 2011). This preoccupation with their own likeability may contribute to the constrained behaviors that people with social anxiety often display during interpersonal exchanges. Unfortunately, despite their best efforts to not draw attention to themselves and limit rejection through restricted behaviors and affect, research has shown that individuals with social anxiety tend to come across as *less* likeable during interpersonal interactions (Meleshko & Alden, 1993). In fact, one study by Papsdorf and Alden (1998) showed that one of the major factors that led to the decreased likeability of socially anxious individuals during interpersonal interactions was that their partners viewed them to be dissimilar to themselves. This perceived lack of similarity between those with social anxiety and their partners was related, in part, to individuals with social anxiety displaying more overt signs of anxiety and less willingness to engage in self-disclosure.

The ability to manage and respond adaptively to perceived or real rejection is another important factor for preserving existing friendships and pursuing new ones.

Although rejection frequently occurs in friendships to varying degrees (e.g., termination of a relationship, being ignored when you see the person in public, not receiving a quick response to a text message, etc.), it is likely that the fear of some form of rejection underlies the higher levels of friendship impairment among socially anxious individuals (Rodebaugh, 2009). Given that the experience of rejection tends to worsen as the closeness of the personal relationship is increased (Fitness, 2001), it is reasonable to assume that the potential for this unpleasant outcome decreases the interest of socially anxious individuals in forming close relationships and/or slows down the process of building trust and increasing intimacy.

Previous research has shown that individuals with social anxiety are particularly sensitive to perceived cues of rejection as well as rejection itself (Levinson, Langer, & Rodebaugh, 2013; Maner, DeWall, Baumeister, & Schaller, 2007). In fact, studies have shown that people with social anxiety and/or fears of negative evaluation tend to decrease their use of prosocial behavior (e.g., giving fewer "rewards," exhibiting poorer verbal communication, engaging in less eye contact, etc.) and are perceived to be less sociable (e.g., less nice and friendly) with new interaction partners directly after an experience of rejection, whereas non-socially-anxious individuals increase these behaviors when faced with a new partner after an experience of rejection (Maner et al., 2007). Its appears that individuals who are low in social anxiety view rejection as a sign that they need to increase their efforts to be sociable/accepted so that they do not miss out on the potential to establish additional social resources. However, those with high social

anxiety seem to view new interactions as likely places for further rejection rather than as opportunities for new social connections (Mallot et al., 2009).

Friendship Development: The Importance of Cooperation and Reciprocity

Cooperation is fundamental for the development and maintenance of close relationships, such as friendships (Hartup, 1989). Hartup (1998) defined friendships as "close relationships whose normative essentials consist of reciprocity and commitment, and which occur between individuals who see themselves more or less as equals" (p. 214). As a species, working collaboratively has continuous enhanced our ability to survive and solve problems of increasing complexity. Additionally, humans behave cooperatively in an effort to both build and maintain friendships (Bierman & Furman, 1984; Bigelow, 1977).

Reciprocation is one form of cooperation that has been found to build closeness and trust among engaging partners. In fact, one of the defining features of friendship is that it involves the exchange of costly favors and services (Silk, 2003). Moreover, equity theorists have contended that inequality in close relationships produces dissatisfaction and distress among exchanging partners (Walster & Walster, 1975). Although the social science literature indicates that reciprocity and equity are highly valued qualities among friends (Silk, 2003), a broad consensus of research has found that different expectations exist across varying types of relationships. For example, it would be reasonable to assume that one form of reciprocity, tit-for-tat (i.e., a strict one-for-one exchange of benefits between partners), might be a major contributor to the formation of close relationships. However, research has consistently shown that tit-for-tat reciprocity tends to

characterize exchanges between strangers and acquaintances, but not close friends (Hinde, 2002; Silk, 2003). In fact, strict reciprocity has actually been found to pose a detriment to friendship development and maintenance. For instance, results from Shackelford and Buss (1996) indicated that immediate reciprocity elicited strong feelings of betrayal among close friends, compared to partners in work-oriented relationships. Additionally, studies have shown that individuals in close relationships do not actively track exchanges with strict precision and appear to make concerted efforts to obscure the accounting of cost and benefits of their friends' contributions, while also hiding their own contributions during joint tasks (Silk, 2003). Paradoxically, it seems that even though individuals do not engage in careful monitoring of exchanges in close relationships, they simultaneously value equity of exchanges as an important feature of close relationships.

This apparent contradiction of interests may help to explain one of the ways that strangers and acquaintances can develop into close friends. Early cooperation and strict reciprocity, which are valued components of new or task-oriented relationships, may help to provide a foundation of trust that contributes to a lack of "score keeping" in close friendships. That is, close friends tend to cooperate regardless of recent exchange imbalances, whereas in less intimate relationships, individuals seem to be more concerned by "what have you done for me lately?" As stated by Seyfarth and Cheney (2012), "enduring friendships are thus built, at least in part, on the memory of past interactions and the emotions associated with them" (p. 171). It appears that the willingness to cooperate, and perhaps more importantly, to escalate cooperation early in a relationship (a behavior that is often

difficult among those who are socially anxious), may help to explain the frequency with which close friendships are established.

Given the importance of cooperation and reciprocity for the development and maintenance of close friendships, it is valuable to have an understanding of how these behaviors likely evolved. Particularly since evolutionary theory has greatly influenced the creation and design of many social dilemma games (including the Prisoner's Dilemma), which serve as important methods for studying these behaviors today.

The Evolution of Cooperation and Reciprocity

Reciprocal altruism is one of the major theories put forward to explain how non-kin human reciprocity may have evolved (Trivers, 1971). In its simplest terms, reciprocal altruism can be understood as the extension of a benefit to another with the unspoken expectation that a similar benefit will be provided by the recipient at a later time (Walsh, 2000). Despite the importance that evolutionary theory places on competition between members of our species for resources necessary for survival, we are also social animals who thrive on cooperation. A natural question therefore arises – how can members of a species that evolved and survived largely with its own interests at heart also be willing to assist potential competitors in obtaining resources, especially since any altruistic behavior will result in some level of cost to the individual who is supplying the benefit?

According to Trivers (1971), the model of reciprocal altruism was developed to explain the existence of altruism as a selected behavior for relationships in which individuals are not genetically related to the recipient (e.g., kin selection). The

model posits that non-kin altruism can be a function of natural selection when the energy costs involved in the altruistic behavior are trivial compared to the benefits to the recipient. In a single, one-off exchange, it would not be wise for an individual to incur any potential risks or costs on behalf of the recipient. However, in circumstances in which the recipient is likely to reciprocate the altruistic act in future encounters and the likelihood of finding oneself in a similar predicament as the recipient are fairly high, it would benefit the giver in the long run to incur a relatively small cost to assist the recipient. Of particular note, the theory of reciprocal altruism relies upon an uneven ratio of costs and benefits for a given altruistic act, more specifically, that the benefit of the altruistic act is greater for the recipient than the cost of the act to the giver.

Evolutionary theory suggests that cooperation between potential competitors can be beneficial to both parties in the long run and favored by natural selection under certain circumstances. For example, cooperation is more likely to occur when a given altruist repeatedly interacts with the same relatively small set of individuals and remembers the results of past encounters with these individuals (Trivers, 1971).

Of course, an environment overrun with cooperators leaves itself susceptible to individuals who present themselves as cooperators but who acquire resources without reciprocating (i.e., at no cost to themselves). In evolutionary psychology, these individuals are frequently called “cheaters” or defectors (Trivers, 1971; Trivers, 2006). Therefore, the ability to detect cheaters and their behaviors likely became an increasingly important aspect of the evolution of reciprocal altruism.

In humans, reciprocal altruism, including our propensity to detect cheaters, may be facilitated by complex systems of emotions and behaviors (Trivers, 2006). Emotions have the ability to take over systems that are typically voluntary (e.g., facial expressions), and when operating adaptively, likely cause us to commit actions that will improve our likelihood for survival and resource acquisition in the long run (Griffiths, 1990). This may be achieved, in part, by the ability of our emotions to manage our rational interest to maximize benefits in the short term (e.g., choosing to cooperate even though cheating provides the greater immediate gain). Emotions should therefore tend to facilitate reciprocal altruism. Some examples of emotions that likely serve this strategy include feelings of joy when we acquire resources, sadness and frustration when we do not, envy or jealousy when others have more of a resource than we do, and anger when others take our resources away (Walsh, 2000).

In regards to cooperation, we feel a sense of trust and friendship when others cooperate with us consistently and an accompanying sense of obligation to pay others back, which can serve to facilitate further cooperation in the future. On the other hand, we often feel anger and disgust when we are treated unfairly (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). Ideally, cheaters will feel remorse, anxiety, or guilt as a result of their exploitation and/or defection (i.e., lack of cooperation), and these emotions should lead to a greater likelihood that they will choose to cooperate in subsequent encounters (Nesse, 1990). Thus, the emotions that operate in conjunction with cooperation tend to be rewarding and/or pleasurable, whereas the emotions that often accompany being cheated or getting

caught cheating are usually punishing and/or painful. The more intense these emotions are, the more likely we are to forego the immediate gains of cheating and opt for the likely larger, long-term gains of sustained mutual cooperation (Mealey, 1995; Walsh, 2000).

Obviously, no one is compelled to cooperate all of the time. In fact, as we know from our everyday lives, it is fairly commonplace for individuals to choose the enticing nature of immediate gains and/or cheating in social interactions. Despite evolved mechanisms to encourage cooperation, the presence of chronic cheaters shows that there is still room for this strategy to survive and gain access to resources. Hence, it has been theorized that an evolutionary "arms race" likely occurred that guided the development of behaviors and strategies for both cooperators and cheaters. That is, cooperators likely developed stronger skills for detecting cheaters, and concurrently, cheaters acquired mechanisms for masking their intentions to cheat/defect (Cosmides & Tooby, 1992).

Given the potential adaptability of both cooperation and cheating, natural selection should favor a complex psychological system that allows individuals to regulate their tendencies for both cooperating and cheating (as well as their responses to such behaviors from others), depending upon the conditions of a particular environment. Thus, individuals will not simply fall dramatically into dichotomous categories of "cooperator" or "cheater" but will likely vary in the degree that these characteristics are displayed and the situations in which they employ a particular strategy (Trivers, 1971).

The Prisoner's Dilemma

Given that reproduction is the driving force behind evolution, it is usually most beneficial for individuals to have a greater desire to focus on their own interests. However, we also know that cooperation and reciprocity, while potentially costly endeavors, can improve our overall level of inclusive fitness (i.e., the ability to perpetuate our own genes). The conflict between our desire to put our own interest's first and the potential benefits of cooperation represent a dilemma that occurs frequently over the natural course of human interactions. The prisoner's dilemma (PD), a product of game theory and one type of social dilemma game, beautifully demonstrates the challenges associated with this conflict (Alexrod, 1984; Luce & Raiffa, 1957; Rapoport & Chammah, 1965).

The game is based upon a hypothetical scenario involving two male criminal accomplices (although the gender of these individuals is not important to the nature of the game) who have been arrested and are being held in jail for an alleged crime. Each of the criminals has promised that he would never "snitch" or betray the other. The prosecution has realized that the evidence they have against the two criminals is weak and therefore decides to meet with each of the prisoners individually and offer them a deal. The deal is that if Prisoner A testifies against Prisoner B, Prisoner B will be sentenced to 20 years in prison and Prisoner A will not receive a sentence and be released. A similar deal is offered to Prisoner B. However, if both decide to testify, then each of them will receive a plea bargain and a reduced sentence of five years. In the event that each of them chooses not to testify (i.e., if they cooperate with one another), they will receive minimal sentences of six months, given the inadequacy of the prosecution's evidence.

The dilemma arises because the two prisoners are held separately when the deals are being made, which inhibits their ability to communicate and coordinate a cohesive plan. Under these circumstances, it is most beneficial for Prisoner A to testify since he will either be released or receive a reduced sentence of five years. Either of these outcomes is far superior to the possibility of sticking to the original agreement (i.e., not to "snitch") and not have Prisoner B reciprocate this action – resulting in a 20-year sentence. Similarly, Prisoner B must choose between his own self-interest and honoring the initial agreement. The varying "payoffs" for each combination of decisions is what creates the biggest challenge to mutual cooperation. If each prisoner acts rationally, he will decide to pursue his own self-interest and testify against the other even though both of them would end up worse off than if they had each chosen to cooperate (Alexrod & Hamilton, 1981).

The prisoner's dilemma highlights the idea that mutual cooperation is the best possible outcome for the collective group, but it also emphasizes how difficult it is for this outcome to be achieved, especially in circumstances of limited or non-existent communication.

The Success of Tit-for-Tat

During the early 1980's, Axelrod conducted computer tournaments to see who could create the best strategy for playing iterated games of PD. Axelrod believed that social exchange researchers had not adequately explained *how* mutual cooperation develops (Alexrod, 1980a). He sought to invite individuals who were familiar with PD games and pit these individuals' strategies against one another in a controlled environment in which a multitude of simulations could be conducted in a

short period of time. The objective of each participant was to create a strategy that would finish the tournament with more total points than each of the other strategies. The payoff matrix for the tournament was the following: 3 points for mutual cooperation, 1 point for mutual defection, and when one player cooperated and the other defected, 5 points were awarded to the defector while the cooperating player received 0 points. Fourteen strategies were generated by faculty members across various departments, including mathematics and the social sciences. Additionally, one completely random strategy was added into the tournament, which brought the total up to 15. Every possible two-player strategy was pitted against all others (each strategy also played against itself) for 200 trials of PD. To achieve additional stability for the point totals, five rounds of the tournament were conducted (Alexrod, 1980a).

The winning strategy was *tit-for-tat* (TFT). TFT was a surprising winner, primarily because of the simplicity of its programming. In fact, TFT was the simplest strategy submitted and only had two rules: 1) cooperate on the first trial, and 2) mimic the previous move of the opponent on the following exchange (Alexrod, 1980a).

After Axelrod had a chance to review the results from the first tournament, he concluded that strategies could have been developed that would have outperformed TFT. Worried about the potential generalizability of the initial results, Axelrod put together a second tournament (Alexrod, 1980b). Similar to the first tournament, he invited knowledgeable parties across a range of academic disciplines; however, this time, he provided every participant with the results from

the first tournament and a discussion about strategies that could have beaten TFT had they been submitted. The second tournament included 63 different strategies (again including one that was completely random). The parameters of the second tournament were the same as the first (i.e., an identical payoff matrix, "round-robin" tournament style, and five rounds of competition), aside from the length of each contest, which was no longer fixed at 200 trials but varied according to a probability distribution (across the five rounds, the average length of each contest was 151 trails) (Alexrod, 1980b). Despite all of Axelrod's preparations, warnings, and precautions, TFT once again won the competition.

In the face of two convincing tournament victories, it appeared that reciprocation, specifically the use a TFT strategy, delivered a great deal of success in iterated games of PD while also providing empirical support for reciprocal altruism's viability as an evolutionary theory for cooperation.

The next major area of interest for Axelrod was determining the specific factors that made TFT consistently successful. Axelrod (1980b; 1984) theorized that there are four factors that are critical for TFT's success: lack of envy, niceness, provocability/forgiveness, and clarity.

"Lack of envy" refers to the TFT strategy's focus on its own performance, rather than its relative performance against a particular opponent. In other words, TFT is not as concerned with beating its opponent but is more concerned with maintaining its strategy regardless of the opponents' success. Given that TFT is not trying to gain a specific advantage through defection when the opponent cooperates (i.e., exploitation), TFT does not usually have to experience the consequences of

exploitation (i.e., lack of opponent trust and a pattern of consistent mutual defection).

"Niceness," in the context of PD games, means that the TFT strategy is never the first to defect, which often directs the opponent toward mutual cooperation. Axelrod consistently found that niceness was very important for success in PD games. For example, "nice" strategies garnered eight of the highest point totals in the first tournament and seven of the highest in the second (Axelrod 1980a; Axelrod, 1980b; Axelrod 1984). However, in any single encounter in which future interactions are not anticipated, "not nice" strategies (i.e., defect first) are the most successful.

Another factor important to TFT's success has to do with "provocability and forgiveness" (Axelrod 1984; Axelrod & Hamilton 1981). TFT engages in immediate reciprocation and mimicry of any change in behavior that is exhibited by the other player. Thus, when the other player switches from a strategy of cooperation to defection (and vice versa), TFT quickly responds with the same change in behavior. This strategy facilitates an effective combination of both swift retaliation and forgiveness, which allows TFT to not be taken advantage of (i.e., consistently exploited) while also having the ability to re-establish mutual cooperation after an act of defection (Axelrod, 1980b).

Lastly, "clarity" refers to the straightforward and easy to perceive nature of TFT's strategy. The importance of clarity is twofold: 1) its easiness to adopt encourages others to use TFT as a strategy, and 2) it allows the other player to track

the decisions made by TFT and understand without much difficulty what TFT's choices will be in subsequent interactions (Parks & Komorita, 1998).

The Prisoner's Dilemma and Social Anxiety Research

Research on the relationship between social anxiety and interpersonal relationships has demonstrated that these individuals tend to exhibit deficiencies related to affiliation, assertiveness, cooperation, warmth, and positive reciprocity (Creed & Funder, 1998; Rodebaugh et al., 2010; Rodebaugh, Klein, et al., 2011; Walters & Hope, 1998). Social dilemma games, such as the PD, appear to be an ideal arena to test the association between positive reciprocity, social anxiety, and close relationship impairment, since these games frequently involve the use of cooperative and reciprocal behaviors within the context of interpersonal exchange. The PD appropriately represents a commonplace conflict that occurs during interpersonal exchanges, that is, the trade-off between sizeable individual benefits in the short-term (e.g., reaping rewards with little or no cost, avoiding/minimizing potential rejection) and the potential for greater collective benefits in the long-term (e.g., sustained mutual cooperation, forming a lasting and meaningful relationship). Over the past few decades, these games have taught us much about patterns of reciprocity and factors that influence cooperation (see review by Komorita & Parks, 1995). In fact, over the past few years, a number of studies have begun to incorporate social dilemma games into their examination of social anxiety (and other psychological disorders) and impairment in close relationships.

In particular, a series of recent studies has shown that social dilemma games can be a practical, fast, and low-cost method for studying the nature of interpersonal

behaviors among those with social anxiety and how these behaviors may relate to their difficulties in close relationships (Rodebaugh, Klein, et al., 2011; Rodebaugh et al., 2013; Rodebaugh, Heimberg, Taylor, & Lenze, 2016). For example, using an iterated version of the PD (i.e., the flexible iterated PD; FIPD), Rodebaugh, Klein, and colleagues (2011) examined behaviors associated with positive reciprocity, assertiveness, and interpersonal constraint among those with social anxiety. Each round of the FIPD asked participants to divide 10 tokens between their computerized partner and themselves. The pay-off matrix (i.e., the assigned values for the tokens that are given versus kept) was designed to create a tension between exploiting one's partner for higher earnings in the short-term and cooperating with one's partner for a higher likelihood of maximizing earnings in the long-run (See *Flexible Iterated Prisoner's Dilemma* section in the Methods for additional details). Overall giving (i.e., the number of tokens out of ten that were given to the other player over the first 10 trials) and response to defection (i.e., the amount participants gave immediately following a trial in which 0 tokens were received) were used as measures of positive reciprocity and assertiveness, respectively. Men, but not women, with higher social anxiety displayed greater interpersonal constraint (i.e., they demonstrated less giving across the first 10 rounds of play). Additionally, men, but not women, with higher social anxiety were more likely to give after defections (i.e., after the partner gave nothing on the previous turn) than men with lower social anxiety.

Past research has suggested that individuals with social anxiety may react less positively to friendly deeds, particularly in close relationships, due to concerns

of being negatively evaluated and/or rejected during the reciprocation process (e.g., not paying back the favor adequately, misinterpreting the level of reciprocation that is appropriate, etc.) (Moscovitch, Orr, Rowa, Reimer, & Anthony, 2009). Rodebaugh, Klein, and colleagues' 2011 study also provided support for this theory. Participants who had lower scores on a measure of negative responses to favors (Favors Scale; Fernandez & Rodebaugh, 2011) (e.g., awkward or uncomfortable feelings toward friendly giving, guilt associated with not having returned a favor, hesitation about asking the friend for additional help before a previous favor had been reciprocated, etc.) showed increased giving when they imagined playing with a friend, but not when they imagined playing with a stranger or computer partner. However, participants who endorsed more negative responses to favors gave similar amounts regardless of whom they were playing, and they showed no preference for friends compared to the two less intimate relationships. Additionally, social anxiety was associated with less giving in the friend condition, and this effect was mediated by having a negative response to favors.

In 2013, Rodebaugh and colleagues extended their previous findings, examining positive reciprocity in a clinical sample. In line with previous findings, participants with social anxiety disorder (SAD) exhibited less giving across the first 10 turns as well as in general (i.e., over the entire first round) compared to a non-SAD group. Additionally, partial support for prior research on the decreased use of assertive/dominant behaviors among those with social anxiety (e.g., Walters & Hope, 1998) was also found. Individuals with SAD displayed a less assertive reaction to defection (i.e., they reduced giving by a relatively smaller amount) than those

without SAD. Although this finding only approached significance (p = .055), it suggested that individuals with SAD might exhibit constrained behavior in response to both positive *and* negative exchanges (Rodebaugh et al., 2013).

However, more recent work by Rodebaugh and colleagues (2016) suggests that a diagnosis of SAD may not be the most appropriate predictor of constrained giving during interactions with friends and that severity of social anxiety and/or correlates of social anxiety, such as interpersonal problems, may more effectively explain this relationship. In fact, diagnostic group (i.e., SAD, generalized anxiety disorder [GAD], or normal controls) did not have a significant relationship with total giving (as measured by a sum of overall giving at the end of the round). Furthermore, diagnostic group was not associated with differences in the slope or intercept of giving trajectories across groups (i.e., diagnostic group was not associated with the amount that participants initially gave or how much they gave over time).

Yet, within the group of individuals with SAD, severity of social anxiety significantly predicted initial giving as well as the pattern of giving across the first four turns. Individuals with SAD and higher social anxiety scores did not increase their giving as much over time as those with SAD and lower social anxiety scores, although both groups demonstrated positive slopes for giving across the first four turns. Interestingly, participants with SAD who had higher social anxiety scores tended to give more on the initial turn than those with lower social anxiety scores, which seems somewhat incompatible with prior research on social anxiety and interpersonal constraint (Rodebaugh, Klein, et al., 2011; Rodebaugh et al., 2013).

These findings suggest that individuals with SAD who experience higher levels of social anxiety may not be less likely to demonstrate positive reciprocity (e.g., warmth, self-disclosure, etc.) in an initial interaction (in fact, they may be a bit more prosocial than expected early on), but over time, their behaviors seem to become more constrained as the level of intimacy with the partner intensifies.

Additionally, Rodebaugh and colleagues' 2016 study examined various interpersonal problems, both separately and in combination with SAD and severity of social anxiety, to explore the potential impact that they have on interpersonal constraint. However, only one subscale of a measure of interpersonal problems, vindictiveness, predicted initial giving in the FIPD game. That is, individuals with higher vindictiveness scores (i.e., greater problems due to being self-centered and spiteful) tended to give less on their initial turn, irrespective of diagnostic group, compared to those without such problems. In addition, individuals with SAD who had higher social anxiety and vindictiveness scores were less giving than those without SAD and lower vindictiveness scores (Rodebaugh et al., 2016). Taken together, results from this most recent study suggest that it is the *severity* of social anxiety within the SAD group and/or particular interpersonal problems (i.e., vindictiveness) that provide the best explanation for giving behavior in iterated games of the PD.

The Current Study

The above review highlights several points regarding social anxiety and interpersonal behaviors and the use of social dilemma games to study such behaviors, which provided the foundation for the current study: 1) prosocial

behaviors, such as cooperation and warmth, are important elements to building and maintaining close relationships, 2) individuals with social anxiety tend to exhibit fewer prosocial behaviors during interpersonal exchanges, 3) following rejection, people with social anxiety engage in fewer prosocial behaviors with new interaction partners, whereas those without social anxiety increase their use of such behaviors, and 4) the use of iterated games of the PD has indicated that individuals with higher levels of social anxiety display interpersonal constraint during exchanges (e.g., less giving and reduced negative responses to defection), although diagnostic classification may not be the best predictor of such giving in clinical samples.

Although social dilemma games have recently been used for research on social anxiety and its influence on prosocial behaviors (e.g., Rodebaugh et al., 2011; Rodebaugh et al., 2013; Rodebaugh et al., 2016), the use of these games has been largely limited to examination of patterns of giving (overall and in response to defection) and factors that may influence these behaviors (e.g., lack of warmth and vindictiveness). The aim of the current study was to integrate and extend these findings by examining the effect that rejection may have on additional factors associated with developing and maintaining friendships, including trust, perceived likeability, closeness/connectedness, and responses to and expectations for future rejection, among others. Specifically, the current study examined the impact that rejection may have on prosocial behaviors and perceptions of the self in relation to others after cooperation and trust have been established with a single interaction partner.

Additionally, the use of specific strategies in response to rejection was examined. For example, the well-known PD strategy of TFT, which cooperates on the first trial and then mimics the previous move of the partner on the following exchange (e.g., Axelrod, 1980a; Axelrod, 1980b; Axelrod & Hamilton, 1981), employs strict reciprocity and may be a defensive tactic that socially anxious individuals use in response to the threat of rejection (i.e., limiting future interpersonal rejection by displaying behaviors that are congruent with their partner) (Rodebaugh, Klein, et al., 2011). Another strategy, called "coaxing," has been investigated using social dilemma games and has been shown to be an effective approach for building and re-establishing cooperation, and facilitating higher levels of mutual engagement (King-Casas et al., 2008). Coaxing involves initiating greater cooperation than anticipated in response to a partner's recent defection/lack of cooperation (i.e., being overly generous to a less giving partner in an effort to rapidly build trust). Given that this strategy involves taking greater risks and displaying assertiveness in the face of a seemingly damaged relationship, it seems reasonable to hypothesize that individuals with socially anxiety may have difficulties employing this interpersonal strategy. Multiple theories on friendship have characterized it as a relationship in which cooperation exists beyond the need for strict reciprocity (Silk, 2003; Tooby & Cosmides, 1996). That is, even in the face of misunderstandings, "bad days," and/or imbalances in costs vs. rewards, the previously established foundation of the friendship should allow the relationship to remain relatively intact. Thus, the current study asked whether individuals with social anxiety exhibited deficits across

multiple domains related to forming and maintaining friendships and whether such deficits persist despite a lengthy history of positive and cooperative interactions.

The current study examined these areas in three primary phases. Phase 1 attempted to establish a cooperative relationship between the participant and his/her partner over a prolonged series of exchanges. Phase 2 implemented a rejection manipulation. Finally, Phase 3 attempted to re-establish cooperation with the same interaction partner from the previous two phases. (For a more complete description of each phase see the *Procedure* section of the Methods).

Hypotheses

Constriction of giving following defection.

1. Among those in the rejection condition, those with high social anxiety will display a constricted response to defection (i.e., less of a decrease in giving in response to planned decreases in partner giving) compared to those low in social anxiety. Said another way, individuals with high social anxiety are expected to display greater interpersonal constraint and less assertive behavior in response to reductions in cooperation (i.e., negative exchanges).

Rejection condition as a moderator of the relationship between social anxiety and giving/response strategy (e.g., total giving, tit-for-tat, and coaxing).

2.

    a. There will be a social anxiety group by rejection condition interaction on total giving. Specifically, individuals with high social anxiety in the rejection condition will exhibit less total giving than

those with high social anxiety in the non-rejection condition. However, those with low social anxiety and in the rejection condition will display the opposite effect (i.e., there will be more total giving in the rejection condition compared to the non-rejection condition).

b. There will be a social anxiety group by rejection condition interaction on the use of a coaxing strategy (i.e., giving more than expected in response to a partner's defection). Specifically, individuals with high social anxiety will be less likely to use a coaxing strategy after rejection compared to those in the non-rejection condition. However, those with low social anxiety will be more likely to use a coaxing strategy in the rejection condition compared to the non-rejection condition.

c. There will be a social anxiety group by rejection condition interaction on the use of a TFT strategy (i.e., strict reciprocation of the partner's previous donation). Specifically, individuals with high social anxiety will be more likely to use a TFT strategy following rejection compared to those in the non-rejection condition. Additionally, among those in the rejection condition, those with high social anxiety will be more likely to use a TFT strategy compared to those with low social anxiety.

Expectation of partner's future rejection/defection.

3. Individuals with high social anxiety will have higher total expectancy ratings for their partner's future rejection/defection compared to those who are low in social anxiety. That is, those with high social anxiety will anticipate future rejection from their partner at higher levels than those with low social anxiety. These ratings will decrease over the course of the four rounds of the PD game (see *Procedures* section below for more details) for those with low social anxiety but not for those with high social anxiety. It is anticipated that individuals with low social anxiety will reduce their expectations for future rejection as cooperation is maintained over longer periods of time, whereas those with high social anxiety will endorse a fairly consistent expectation for future rejection over time. Additionally, the rejection condition will moderate the relationship between social anxiety and expectations for future partner rejection/defection, such that individuals with high social anxiety in the rejection condition will be more likely to have higher expectations for future rejection/defection compared to those in the non-rejection condition. However, no differences are expected on this measure as a function of rejection condition for those who are low in social anxiety.

Importance of the subject's next turn to maintain the quality of the relationship.

4. Individual with high social anxiety will have higher overall scores on ratings of the importance of their next turn for maintaining the quality of their relationship with their partner than those low in social anxiety. The

scores for this item will decrease over the course of the four rounds of the PD game for those low in social anxiety but not for those with high social anxiety. Additionally, the rejection condition will moderate the relationship between social anxiety and the importance of their next turn for maintaining the quality of their relationship, such that individuals with high social anxiety in the rejection condition will be more likely to have higher scores on the importance of their next turn for maintaining the quality of their relationship compared to those in the non-rejection condition. However, no differences are expected on this measure as a function of rejection condition for those who are low in social anxiety.

Quality of the relationship with their partner.

5. Compared to those who are high in social anxiety, individuals with low social anxiety will have higher total self-reported ratings for each of the following domains related to the quality of their relationship with their partner: perceived likeability, closeness/connectedness, and trust. Each of these ratings will increase over the course of Phase 1 (i.e., the first three rounds of the PD game) for those low in social anxiety, but not for those who are high in social anxiety. Additionally, the rejection condition will moderate the relationship between social anxiety and perceived likeability, closeness, and trust, respectively, such that individuals with high social anxiety in the rejection condition will have lower scores across each of these domains compared to those in the non-rejection

condition. However, no differences are expected on this measure as a function of rejection condition for those who are low in social anxiety.

Exploratory Aims

Interpersonal problems and predicating cooperation.

1. To explore whether various interpersonal problems (e.g., vindictiveness, coldness, etc.) predict giving (both pre- and post- rejection) above and beyond social anxiety group.

Desire to have future interactions with their partner.

2. To explore whether individuals with high social anxiety have less desire for future interactions with their partner at the end of Phase 3 (across experimental conditions) compared to those low in social anxiety.

Interest in having a similar experience with a new partner.

3. To explore whether individuals with high social anxiety are less interested in having a similar experience with a new partner immediately following Phase 3 (across experimental conditions) compared to those low in social anxiety.

CHAPTER 2

METHODS

Participants

Participants were undergraduate students enrolled in psychology and business classes at Temple University who completed the proposed study to fulfill course requirements. Participants completed the study along with a single interaction partner/player. However, all data were collected from the participant, as the interaction partner was an undergraduate confederate who was trained on the study's procedures. Confederates were used, rather than real-life friends, to prevent low recruitment and protect against unintended variability across friendship pairs (e.g., differences in closeness of the relationships). To minimize the chance that confederate characteristics exerted an unmeasured effect, efforts were made to standardize the confederate interactions across participants and conditions (e.g., in-person trainings and recommended conversation topics were provided).

In addition, there was a concern that the inclusion of opposite-sex interaction partners may provide unintended confounds and/or consequences (e.g., friendliness that is perceived as flirting). Since the intent of the study was to observe behaviors that are analogous to those in friendships, and not romantic relationships, each of the interaction pairs was constructed of either all heterosexual males or all heterosexual females.

Participants were excluded from the study if they were under the age of 18, homosexual, reported severe symptoms of depression (see the Beck Depression Inventory II in the *Measures* section for this description), or failed to fall within

either the highest or lowest quartile of scores on the Social Interaction Anxiety Scale. A total of 96 participants were recruited and examined in the current study. However, five participants were excluded from all analyses due to widespread missingness (i.e., missing an entire round of play in the PD game) and/or procedural issues within the study (e.g., errors in the PD game/set up, gross deviations in play from the experimenter's instructions, etc.). Thus, the final sample size was 91 participants. (See the *Power Analysis* section for additional details). Of the final group of 91 participants, 56 were recruited for high social anxiety group, and 35 were recruited for the low social anxiety group. Forty-six participants (51%) were assigned to the rejection condition whereas the remaining 45 participants were assigned to the non-rejection condition. The frequencies across each of the four major classification categories were the following: high social anxiety and rejection condition (27 participants), high social anxiety and non-rejection condition (29 participants), low social anxiety and rejection condition (19 participants), and low social anxiety and non-rejection condition (16 participants). Although the current study attempted to recruit an equal number of high and low social anxiety subjects, it proved more difficult than expected to recruit low socially anxious individuals. It is unclear why this disparity in recruitment success was apparent between the two groups.

Measures

Self-Report Questionnaires. All self-report measures appear in Appendix A.

Social Interaction Anxiety Scale – Straightforward items (SIAS-S). The SIAS (Mattick & Clarke, 1998) is a scale designed to measure anxiety in social interaction

situations involving dyads and groups. The SIAS contains 20 Likert-type items rated from 0 (*not at all characteristic of me*) to 4 (*extremely characteristic of me*). An example item is "I become tense if I have to talk about myself or my feelings." Studies have demonstrated that the reverse-worded items (i.e., items 5, 9, and 11) may detract from the validity of the scale, particularly for older individuals and those with lower levels of education (for review, see Rodebaugh, Heimberg, et al., 2011). Thus, only the 17 straightforwardly worded items were summed to create a total score (SIAS-S; Rodebaugh, Woods, & Heimberg, 2007). The SIAS has been widely used in the assessment of social anxiety and has shown good reliability (e.g., αs > .87, re-test coefficients > .90; Mattick & Clarke, 1998) and validity in a number of studies (e.g., Brown et al., 1997; Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Rodebaugh, Woods, Heimberg, Liebowitz, & Schneier, 2006). Cronbach's alpha was .91 in the current sample.

The SIAS was administered as part of an online screener prior to study participation. Responses obtained through previous administrations of the SIAS in a large sample of Temple undergraduates were used to derive the appropriate quartile cut-offs. Those scoring below the 25th percentile (SIAS-S < 8) and above the 75th percentiles (SIAS-S > 23) were assigned to the low and high social anxiety groups, respectively. Individuals in the low social group had a mean SIAS-S score of 4.34 (2.23) and those in the high social anxiety group had a mean score of 33.29 (7.28). Past research (Rodebaugh, Heimberg, et al., 2011) has shown a mean SIAS-S score of 43.93 (11.84) for a clinical sample.

Beck Depression Inventory (BDI-II). The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item scale designed to assess the existence and severity of symptoms of depression. The scale demonstrates high internal consistency among college students and outpatients (e.g., αs > .92), as well good convergent and discriminant validity (Beck, Steer, Ball, & Ranieri, 1996). A total score on the BDI-II was created by summing the 21 items. Cronbach's alpha was .90 in the current sample.

The BDI-II was administered online prior to study participation, and inclusion in the study was contingent upon receiving a BDI-II score $\leq$ 27. This cut-off score has been recommended by Sloan et al. (2002) to decrease false positive diagnoses of clinical depression among those with anxiety disorders. This inclusion criterion allowed those who were high in social anxiety to have moderate level of depression while increasing the probability that the findings were a function of social anxiety.

The Inventory of Interpersonal Problems (IIP-64). The IIP-64 (Horowitz, Alden, Wiggins, & Pincus, 2000) is a 64-item self-report measure of maladaptive interpersonal behavior, which includes eight sub-scales derived from behavioral tendencies on two axes: affiliation (hostile/cold to friendly behavior) and dominance (submissive to controlling behavior). Subscales of the IIP-64 have previously shown good psychometric properties, including good internal consistency (e.g., αs ranged from .72 to .88 for each of the subscales), test-retest reliability, convergent reliability, and factor structure (Horowitz et al., 2000; Vittengl, Clark, & Jarrett, 2003). In the current sample, Cronbach's alpha ranged from .74 to .90 for each of the eight subscales. Additionally, individuals with

generalized SAD have displayed elevated scores on each of the eight interpersonal problem subtypes compared to controls (Kachin, Newman, & Pincus, 2001), which supported the use of the IIP-64 in the current study for use in the first exploratory analysis.

Dyadic Trust Scale (DTS). The DTS (Larzelere & Huston, 1980) is an 8-item self-report measure of interpersonal trust. The DTS has demonstrated good internal consistency (e.g., $\alpha = .93$), construct validity, and discriminant validity (Larzelere & Huston, 1980). Cronbach's alpha was .84 in the current sample. Given that the DTS was initially developed for use across a range of romantic relationships, the items were modified to reference "playing partners," rather than romantic partners. Additionally, one item was modified slightly to more appropriately reflect the closeness of the relationship that was likely to occur during the study.

Unidimensional Relationship Closeness Scale (URCS). The URCS (Dibble, Levine, & Park, 2012) is a unidimensional 12-item self-report measure that assesses the closeness of social and personal relationships. The URCS has demonstrated good internal consistency across romantic partners, friends, strangers, and family members (e.g., $\alpha s > .93$). Cronbach's alpha was .84 in the current sample. Additionally, the URCS demonstrated convergent and divergent validity and significant intraclass correlations between romantic partners ($r = .41$) (Dibble et al., 2012). For the purpose of this study, the instructions and items were modified to reference "playing partners," rather than romantic partners, and to more appropriately fit the conditions of the study. In addition, three items were removed

due to a lack of relevance for the study's design (e.g., "My partner and I do a lot of things together").

Desire for Future Interaction Scale (DFI). The DFI scale (Coyne, 1976) is an 8-item measure of the desire for future interactions with the partner. This inventory has been prominently used in studies of interpersonal approaches to depression, but the ratings are typically interpreted as indicators of acceptance or rejection (e.g., Segrin, 1993). The DFI scale has demonstrated good internal consistency across clinical, non-clinical, and undergraduate samples (e.g., αs > .86) (Segrin, 1993; Taylor & Alden, 2006; Vorauer & Sasaki, 2009). Cronbach's alpha was .90 in the current sample. Two of the items from the DFI scale were removed and the remaining items were modified to reflect areas of acceptance/rejection that were likely to be endorsed within the conditions of the study.

Perceived likeability. Perceived likeability was assessed using the following selected items from the *Beliefs About Reactions to the Self* (BARS) scale (Segrin, 1993): 1) "My partner seems to enjoy interacting/playing with me"; 2) "My partner seems like he/she wants to get to know me better"; and 3) "My partner seems to like me." Each of the items was answered using a 5-point Likert-type scale with the following anchors: *Strongly Disagree* and *Strongly Agree*. The 12-item version of BARS has demonstrated good internal consistency (α > .94) (Segrin, 1993). For the purposes of the current study, the selected BARS items were modified to reflect the present tense and the conditions of the study (e.g., references to playing rather than talking). Cronbach's alpha was .88 in the current sample.

Likelihood of future defection/rejection. The likelihood of future defection/rejection was assessed using the following item: "My partner is likely to reject me during future exchanges." This item was answered using a 5-point Likert-type scale with the following anchors: *Strongly Disagree* and *Strongly Agree*.

Importance of the next move for maintaining relationship quality. The importance of the next move for maintaining the quality of the relationship with the partner was assessed using the following item: "My next move is very important for maintaining my current relationship with my partner." This item was answered using a 5-point Likert-type scale with the following anchors: *Strongly Disagree* and *Strongly Agree*.

Interest in a similar interaction with a new partner. Interest in having a similar interaction with a new partner was assessed using the following item: "I would be interested in having a similar interaction with a new partner if one were available." This item was answered using a 5-point Likert-type scale with the following anchors: *Strongly Disagree* and *Strongly Agree*.

Computerized Task.

Flexible Iterated Prisoner's Dilemma (FIPD). The FIPD program was similar to one used in previous studies on interpersonal constraint in social anxiety (Rodebaugh, Klein, et al., 2011; Rodebaugh et al., 2013; Rodebaugh et al., 2016). The general description of the original version of the FIPD is as follows. On each turn of the game, participants are asked to divide 10 tokens between their partner and themselves. Participants have 15s before they are asked to make a decision. Feedback screens are then provided for a maximum of 30s, which display

information about tokens given, tokens kept, points resulting from tokens given and kept, and total points. Feedback is also provided during decisions, which consists of a screen that displays the results of the trial immediately previous to the current trial (i.e., how many tokens the participant and the partner each had given and kept). Tokens that are given to the partner are worth 2 points to *each player* and tokens that are kept are worth 3 points to the *participant only*. Therefore, for any single trial, if both players fully cooperated (i.e., shared all 10 tokens) each player would earn 40 points. If each player kept all 10 tokens, each would receive 30 points. However, if one player fully cooperated and the other fully defected (i.e., kept all 10 tokens), the player who cooperated would only earn 20 points, whereas the defecting player would receive 50 points. Thus, a conflict is established between exploiting one's partner and maximizing earnings in the short term and mutually cooperating and maximizing earnings over the long term.

Each participant played 4 rounds with his/her partner; the first three rounds each consisted of 10 trials, whereas the final round consisted of 15 trials (see the *Procedures* section below for additional details). To make the interactions more realistic (i.e., to replicate potential errors in communication) participants' and partners' choices were affected by "noise" (i.e., random variation in the number of tokens given) that resulted in 10% of trials having anywhere between a 3-token increase to a 3-token decrease. However, noise did not result in values that were less than 0 or greater than 10 tokens. Errors were randomly generated, and information about errors that affected the participant's (but not the partner's) decision were also presented on the feedback screen.

Throughout the vast majority of the game (with one exception to be explained later), the FIPD program (i.e., the partner) used a modified raise the stakes (MRTS; Rodebaugh, Klein, et al., 2011, based on Roberts & Sherratt, 1998) strategy that is designed to be "friendly" and increase the likelihood for cooperation. The MRTS strategy increased cooperation by two tokens more than the participant's previous turn if the participant met or exceeded the strategy's previous turn. However, if the participant decided to undercut the number of tokens that the strategy gave on the previous turn, then it defaulted to strict reciprocation of the participant's previous contribution. The MRTS strategy was not designed to fully defect unexpectedly, with one important exception. For those in the rejection condition (for additional detail see the *Procedure* section), the last five turns of the third round included a steady decline in cooperation by the strategy until 0 tokens were given on each of the last two rounds. This reduction in cooperation was meant to increase the believability of the rejection manipulation.

Variables derived from the FIPD. The total number of tokens shared in the final round (i.e., Phase 3; see *Procedures* section for additional details) was used as a measure of total giving. Response to defection was measured by comparing total giving prior to the first programmed decrease in giving (i.e., turns 2-5 in the third round of Phase 1) and total giving following the first programed decrease in giving (i.e., turns 7-10 in the third round of Phase 1). Patterns of giving (i.e., giving trajectories) following the first programmed decrease in giving (i.e., turns 7-10 in the third round of Phase 1) were also examined as a measure of response to defection. (See *Data Analytic Strategy* section for additional details). Use of a coaxing

strategy was measured by number of times that the participant gave 2 or more tokens above the amount that his/her partner gave on the previous turn and was derived from turns 2-5 at the start of the final round. Use of a TFT strategy was measured by the number of times that the participant gave the exact amount of tokens, or 1 token above/below the amount that his/her partner gave on the previous turn, and was also derived from turns 2-5 of the final round.

Procedure

Screening. Undergraduate students enrolled in psychology and business courses were invited to complete an online screener consisting of a demographics questionnaire, the SIAS-S, and the BDI-II. Participants who meet the eligibility criteria (i.e., ≥ 18 years old, heterosexual, BDI-II ≤ 27, and SIAS-S scores in either the lowest or highest quartile) were invited to participate in the study. Participants who complete the screener received 0.5 hours of course credit, and those who participated in the in-lab portion of the study received an additional 1.5 hours of course credit.

Phase 1: Study explanation and increasing the likelihood for cooperation. Upon arriving at the laboratory, the participant was directed into a room and introduced to the "other participant" that he/she would be playing against. A confederate who was trained on the study protocol played the role of the other participant (the "partner"). Confederates were matched to the participant based upon his/her gender (i.e., the gender of the confederate was the same as that of the participant). The experimenter introduced himself/herself to the participant and the confederate and briefly described the consent form and the general

procedures of the study (e.g., playing a computerized version of a token exchange game with each other, completing a series of self-report questionnaires, etc.). During the time that the consents were being signed (with the experimenter out of the room for approximately 5 minutes), the confederate engaged the participant in a brief, semi-standardized "get to know you" conversation to establish friendliness and the likelihood for cooperation throughout the game. (Note: all confederates received a training protocol and an in-person training session to review the details of the study's procedure. Included in this training protocol was a script that highlighted the confederate's preferred openers, questions, prosocial behaviors, etc., for the "get to know you" conversation.)

After the experimenter returned to the room and consent was obtained from both the participant and the confederate, additional details of the game (e.g., the pay-off matrix, benefits of sharing vs. keeping, the potential for communication errors, etc.) were provided. An example of a single trial was also presented to the participant and the confederate to further illustrate how the game is played. Both players were informed that the study was interested in examining styles of play across different types of partners and that there might be a circumstance during one of the stoppages of play in which one of them would be given the opportunity of playing a different game with a new partner. Additionally, the experimenter explained that "if this player selects this option, he/she will be instructed on how to play the new game and will be given a new partner, and his/her former partner will be excused from the remainder of the study. If this player declines the option, then the two current players will resume playing the token game with each other." (Note:

this “option” was always given to the confederate who “accepted” or “declined” depending upon the participant’s assigned experimental condition [“accepted” in the rejection condition and “declined” in the non-rejection condition]).

Additionally, both players were informed that, depending on their results, they might be asked to come back and play together again as part of a short follow-up study for additional compensation (in reality, no follow-up study existed, but participants were led to believe that they might have to interact with their partner again in the future). After any questions had been answered, the participant and the confederate were each given a set of questionnaires to complete, which included measures about personality characteristics, and the nature and quality of the relationship (e.g., perceived likeability, trust, closeness/connected, etc.), among others.

Once the questionnaires were completed, the experimenter led the participant and the confederate out of the room and set the confederate up in a near-by research room with a single computer while the participant observed from the hallway. The experimenter then led the participant into a separate room with another computer and set him/her up in a similar manner. The experimenter informed the participant that he/she needed to give the other participant (i.e., the confederate) a few final instructions and that he/she would be right back. Upon returning to the participant, the experimenter instructed him/her that he/she could begin when ready. The participant was also led to believe that each player would be making his/her selections in the game at approximately the same time. In actuality, each participant played against a computer that used an identical strategy (aside

from a single exception explained in the following paragraph) for each participant during the initial phase.

Participants played three rounds during Phase 1. Each round consisted of 10 turns using an MRTS strategy. The use of three rounds of play in combination with an MRTS strategy was designed to further encourage cooperation that had the potential to persist over several rounds. At the end of each of the three rounds, participants took brief breaks to answer questions related to the perceived quality of their relationship with their partner (e.g., closeness, chance of future defection, importance of the next turn for the relationship, etc.) and their partner's perception of them (e.g., perceived likeability). For those in the rejection condition (see Phase 2 procedure below), the last five turns of the third round involved a steady decline in cooperation by the computer (the "partner") until zero tokens were provided on each of the last two turns. This reduction in cooperation was meant to increase the believability of the pending rejection for those in that condition.

Phase 2: Rejection manipulation/intermission. After the third round of play, the experimenter told the participant that he/she would be right back with the questionnaires after checking in with the other player. After 3 minutes, the experimenter returned and informed the participant that the option to play a new game with a different partner (which had been mentioned previously as a possible circumstance within the study) was provided to the other player. Depending upon the experimental condition to which the participant was assigned, the experimenter's behavior varied. *For the rejection condition*, the experimenter informed the participant that the other player had decided to change

games/partners and that a few minutes would be needed to make arrangements for the switch. After leaving for 5 minutes, the experimenter informed the participant that the other game involved a computer program that was not cooperating at the moment, and that play would simply resume with his/her previous partner. After apologizing to the participant for the confusion/delay, the experimenter provided the participant with another set of questionnaires that the participant was instructed to fill out with his/her current partner in mind. *For those in the non-rejection condition*, the experimenter informed the participant that another participant had entered the lab for a separate study and he/she needed a short 5-minute break to set things up for them. After the experimenter returned, the participant completed another set of questionnaires and resumed play with his/her current partner.

Phase 3: Resuming play with the same partner. Participants played one final round of FIPD that consisted of 15 turns. This round was slightly longer than the previous three to increase the likelihood that cooperation had the opportunity to be re-established. The MRTS strategy was again used, and the computer strategy began the round with a modest starting point of 5 tokens (regardless of condition) to heighten the ambiguity of its intentions to the participant (i.e., a starting point that was neither overly positive nor negative). One final packet of questionnaires was provided to the participant at the end of the last round.

Debriefing. Following the completion of questionnaires, the experimenter debriefed the participant about certain aspects of the study. To minimize the potential for future participants to learn sensitive information about the nature of

the study and its aims (e.g., use of confederates, rejection as a manipulation, computer rather than human playing partners, and the examination of social anxiety), participants were informed that the purpose of the study was to examine a variety of psychological factors that may influence cooperation and prosocial behavior. Once recruitment for the proposed study was completed, an email was sent to each participant containing a full disclosure about the methods and purpose of the study.

Data Analytic Strategy

Preliminary analyses. Frequencies were calculated for all variables of interest to determine missingness and independent samples *t*-tests were used to explore whether significant differences existed between those with missing and non-missing values for each of the variables of interest. No significant patterns of missingness were evident; therefore, missingness was determined to have likely occurred at random. Pairwise deletion, as opposed to listwise, was used for all subsequent analyses in an effort to maximize our ability to detect effects. All variables of interest were examined to determine whether they satisfied assumptions of normality. For variables that violated assumptions of normality, non-parametric tests (e.g., Spearman's rho) were used to examine relevant associations between variables. Variables of interest were also examined as a function of demographic variables (e.g., age, gender, ethnicity) to determine whether significant associations were evident. Depending on the variable properties, these tests were conducted using Pearson's correlations, Spearman's rho, or ANOVAs. Demographic variables significantly associated with variables of

interest were included as covariates in subsequent analyses. Five independent samples *t*-tests were used as manipulation checks to examine whether the rejection condition engendered the intended response. The manipulation check variables used in these analyses included total giving post-rejection manipulation and giving on the final four turns of the third round of Phase 1 (i.e., following the first programmed decrease in giving), as well as total scores for perceived likeability, likelihood for future rejection, and desire for a future interaction with one's partner (each assessed post-rejection manipulation).

Tests of primary hypotheses. *Hypothesis 1.* A mixed design analysis of variance (ANOVA) was conducted for those in the rejection condition only, with social anxiety group as the between-subjects factor, time (before and after the programmed decline in cooperation) as the within-subjects factor, and giving pre- and post-rejection as the dependent variable. Additionally, latent trajectory models were used to examine intercept and slope differences in giving across the four turns following the first programmed decrease in cooperation between the social anxiety groups and experimental conditions, as well differences between the social anxiety groups among those in the rejection condition alone. This analysis allowed for the comparison in patterns of giving over time, rather than simple comparisons of total giving across groups.

Hypotheses 2a-2c. For hypotheses 2a and 2c, ANOVA was used to test the main effects of social anxiety group and rejection condition, and the interaction of social anxiety group and rejection condition on each outcome variable (e.g., total giving and use of a TFT strategy). If significant interaction effects were found,

follow-up independent samples *t*-tests were used to determine significant differences between each of the relevant data points. Total giving pre-rejection manipulation was included as a covariate for hypothesis 2a. For hypothesis 2c, use of a TFT strategy was derived as the percentage of times that such a strategy was used during turns 2-5 of Phase 3.

For hypotheses 2b, chi-square tests were used to test the association between the rejection condition and the use of a coaxing strategy across social anxiety group. The use of a coaxing strategy was determined by whether such a strategy was used during turns 2-5 of Phase 3 (i.e., a dichotomous variable). (See *Statistical Assumptions* section in the Results for additional details).

Hypotheses 3-5. ANOVA was used to test the main effects of social anxiety group and rejection condition, and the interaction of social anxiety group and rejection condition on each outcome variable (e.g., expectations for future rejection/defection, perceived likeability, etc.). If significant interaction effects were found, follow-up independent samples *t* tests were used to determine significant differences between each of the relevant data points. Additionally, latent trajectory analyses were used to examine intercept and slope differences for each of the outcome variables. This analysis was used to determine differences in initial scores and whether slopes differed significantly over time (i.e., rounds of play) between groups and from a value of zero.

Tests of exploratory hypotheses. For the first exploratory hypothesis, Pearson's correlations and Spearman's rho were used to test the relationship between the subscales of the IIP-64, social anxiety group, and total giving pre- and

post-rejection. For exploratory hypothesis 2 and 3, ANOVA was used to test the test the interaction of social anxiety group and rejection condition on each outcome variable (e.g., desire for future interactions, interest in having a similar experience with a new partner). Fixed factors (e.g., social anxiety group, rejection condition) were analyzed as main effects, and the hypothesized two-way interactions (e.g., social anxiety group by rejection condition) were analyzed as interaction effects.

Power analysis. If predictors are measured without error, then the sample sizes required to detect interactions at $\alpha = .05$ for power .80 are 31 for a large effect size, 68 for a moderate effect size, and 485 for a small effect size (Buchner, Erdfelder, Faul, & Lang , 2013). Although no studies to date have examined the interactive effects of social anxiety group and rejection on total giving, use of a giving strategy, perceived likeability, and trust (among other variables of interest), comparable research from the existing literature suggests generally moderate effect sizes (Rodebaugh, Klein, et al., 2011; Rodebaugh et al., 2013). Therefore, in an attempt to balance the chances of Type II error with available time and resources, a target sample size of 100 was selected. As mentioned previously, 96 subjects were recruited in the current study and 5 subjects were later removed due to widespread missingness and/or procedural issues. Thus, a final sample size of 91 subjects was included in the data analyses.

CHAPTER 3

RESULTS

Preliminary Analyses

Data management. Data, both self-report and in the PD game, were examined for out of range values and missingness. A total of 96 subjects were recruited and examined in the current study, of which 58 were placed in the high social anxiety group and 38 in the low social anxiety group. On self-report measures, at least 1 data point (across all measures) was found to be missing for 18 participants. In regards to the PD game, data were missing for 2 participants. A total of 5 participants were excluded from all analyses due to widespread missingness (i.e., missing an entire round of play in the PD game) and/or procedural issues within the study (e.g., errors in the PD game/set up, gross deviations in play from the experimenter's instructions, etc.). Listwise deletion was used for these participants, which left a total of 91 participants remaining for the analyses. Missingness was further analyzed by examining whether significant differences existed between those with and without missing values for each of the variables of interest. This analysis revealed no significant patterns of influence. Pairwise deletion was used as necessary for all subsequent analyses. No more than 6 participants (out of the final sample of 91) were deleted from any single analysis.

Statistical assumptions. Data were analyzed to determine whether statistical assumptions for normality were satisfied. Two of the subscales of the IIP-64, cold and domineering, did not satisfy assumptions of normality due to significant deviations in skew (positive) and kurtosis. Thus, Spearman's rho, a non-parametric

approach, was used to analyze the relevant associations involving these two exploratory variables. Additionally, the use of a coaxing strategy variable, which measured the percentage of turns that a participant gave 2 or more tokens on each of the 4 turns following the rejection manipulation, exhibited significant positive skewness (standardized value = 2.52) with a large of number of 0% responses (i.e., 41% of the total sample). Thus, this variable was dichotomized to represent individuals who used a coaxing strategy at least once and those who never used this strategy. Chi-square tests were used to test the association between the rejection condition and the use of a coaxing strategy across social anxiety group. All remaining variables satisfied assumptions of normality and no influential outliers were present.

Sample characteristics. Demographic characteristics of the sample are provided in Table 1. The sample consisted of 91 participants. Participants were 67% female and ranged in age from 18 to 61. Age was significantly correlated with likelihood of future rejection scores after the rejection manipulation (r = -.32, p < .01) and was included as a covariate for relevant analyses. No additional significant relationships were found between demographic variables (i.e., age, gender, sexual orientation, and ethnicity) and variables of interest (all $ps > .08$).

Table 1. *Demographic characteristics* (*N* = 91)

Gender	
Female	67.0%
Male	33.0%
Age mean (*SD*)	20.51 (5.03)
Ethnicity	
African/African American	11.0%
Hispanic/Latino	2.2%
Asian American	9.9%
Caucasian/European American	67.0%
Mixed Ethnic Background	5.5%
Other	3.3%
Missing	1.1%
Sexual Orientation	
Exclusively Heterosexual	89.0%
Heterosexual with some homosexual experience	11.0%

Note. SD = standard deviation.

Manipulation check. Independent samples *t*-tests were used to examine whether the rejection condition engendered the intended response. Five separate independent variables were analyzed: total giving post-rejection manipulation (i.e., following the rejection manipulation) and giving on the final four turns of the last round of Phase 1 (i.e., following the first possible decrease in cooperation), as well as perceived likeability, likelihood of future rejection, and desire for a future interaction with one's partner (each assessed following the rejection manipulation).

As expected, participants in the rejection condition gave less tokens on the four turns following the first programmed decrease in cooperation (M = 18.09, SD = 8.84) than those in the non-rejection condition (M = 28.33, SD = 7.18), $t(89) = -6.06$, $p < .001$, $r = .54$. Additionally, participants in the rejection condition reported less perceived likeability (M = 11.78, SD = 3.98) and less desire for a future interaction with their partners (M = 16.89, SD = 4.43) than those in the non-rejection condition (M = 16.27, SE = 3.41; M = 21.67, SD = 6.39, respectively). Differences in perceived likeability, $t(89) = -5.77$, $p < .001$, $r = .52$, and desire for a future interaction with one's partner, $t(78.22) = -4.13$, $p < .001$, $r = .42$, were each significant. However, differences between the rejection and non-rejection conditions for likelihood of future rejection and total giving post-rejection manipulation were each non-significant, $t(85) = 1.55$, $p = .13$., $r = .17$ and $t(87) = 0.16$, $p = .81$, $r = .02$, respectively.

Associations of main variables of interest to social anxiety group and rejection condition. Associations of the study's main variables of interest to social anxiety group and rejection condition are presented in Table 2.

Table 2. *Point-biserial correlations of main variables of interest to social anxiety group and rejection condition*

	SA Group (*r*)	Rejection Condition (*r*)
Giving - Pre 1st Rejection	.01	.01
Giving - Post 1st Rejection	.01	.54**
Total Giving (Phase 3)	-.04	.15
Coax %	-.08	-.05
Tit-for-tat %	.03	.07
Likelihood of future rejection	-.30**	-.17
Importance of partner's next move	-.31**	.13
Dyadic Trust Scale	-.11	.45**
Unidimensional Relationship Closeness Scale	-.09	.20
Perceived likeability	.04	.52**

Note. SA (social anxiety) group: 0 = high social anxiety and 1 = low social anxiety; Rejection condition: 0 = rejection and 1 = non-rejection. Giving - Pre 1st Rejection = sum of giving 4 turns before 1st possible partner decrease; Giving - Post 1st Rejection = sum of giving 4 turns following 1st possible decrease; Coax % = use of coaxing strategy percentage; Tit-for-tat % = use of tit-for-tat strategy percentage. *$p < .05$; ** $p < .01$.

Tests of Hypotheses

Constriction of giving following defection (Hypothesis 1). It was hypothesized that among those in the rejection condition, those with high social anxiety would display a constricted response to defection (i.e., less of a decrease in giving in response to planned decreases in partner giving) compared to those low in social anxiety. There was a significant main effect of time (pre- vs. post- rejection), $F(1, 44) = 32.49$, $p < .001$, $r = .65$, indicating that giving was higher pre-rejection than post-rejection across social anxiety groups. There was no significant effect of social anxiety group, indicating that giving pre- and post- rejection was generally the same for those with high versus low social anxiety, $F(1, 44) < 1$, $r = .04$. Additionally, there was no group by time interaction effect between giving pre- and post-rejection and social anxiety group, $F(1, 44) < 1$, $r = .01$. This indicates that amount of giving pre- and post-rejection did not differ by social anxiety group. See Figure 1.

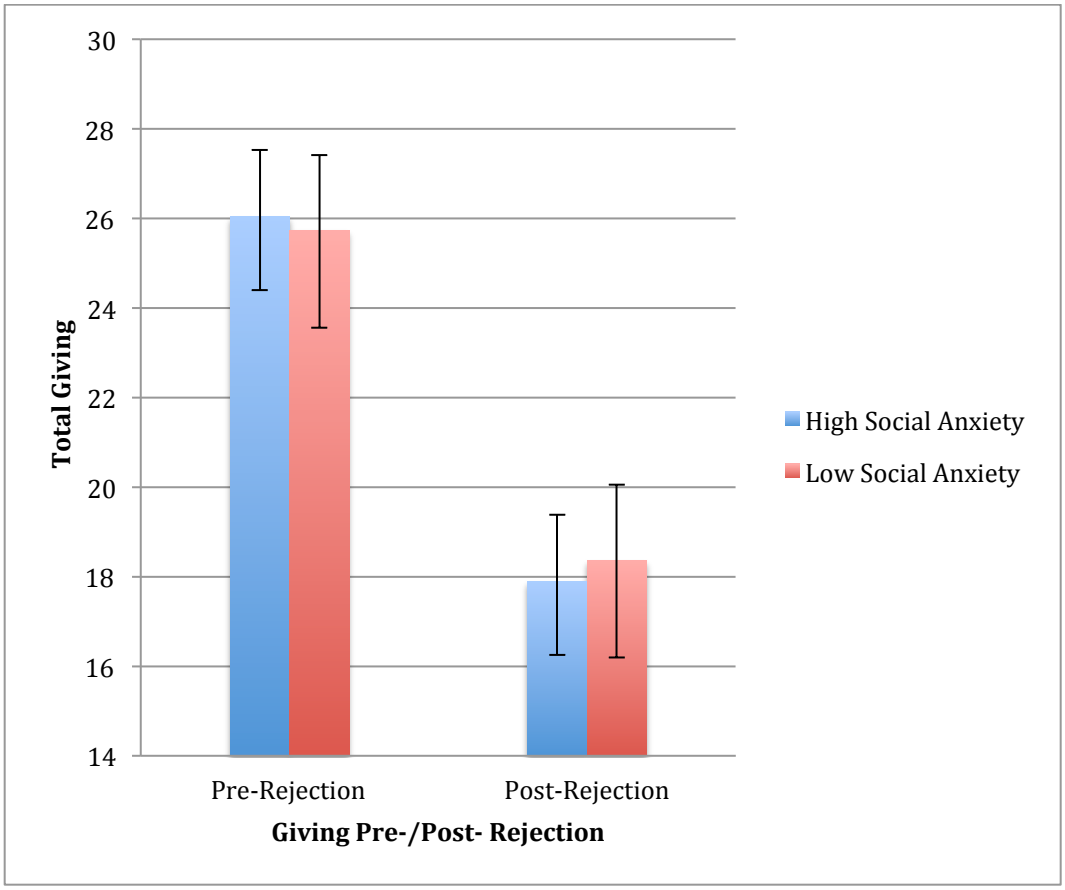

Figure 1. *The interaction between giving pre- and post- rejection manipulation and society anxiety group among those in the rejection condition. Note*. There was a significant main effect of giving pre- and post- rejection, $p < .001$. All other main and interaction effects were non-significant. Error bars represent the standard error of the estimated marginal mean.

Latent trajectory models were used to analyze giving across the four trials immediately following the first programmed decrease in cooperation in the PD game (i.e., turns 7-10 of Round 3). The mean intercept for those with high social anxiety was 6.06 ($p < .001$), whereas for those with low social anxiety it was 6.64 ($p < .001$), indicating that each group shared approximately 6 tokens following the first manipulated decrease in cooperation. There was no significant difference between the intercepts of the social anxiety groups ($b^* = .65$, $p = .13$). The mean of the slope among those with low social anxiety was negative and significant ($M = -.52$, $p =$

.001), indicating a slope value that significantly differed from 0 and decreased linearly over time. For those with high social anxiety, the mean of the slope was negative but non-significant (M = -.20, p = .18), which indicates a slope value that did not significantly differ from 0. Slope values did not differ significantly between the two groups (b^* = -.30, p = .16).

The mean intercept for those in the rejection condition was 5.54 (p < .001), whereas for those in the non-rejection condition, it was 6.95 (p < .001), indicating that those in rejection condition shared approximately 5-6 tokens following the first programmed decrease in cooperation, whereas those in the non-rejection condition shared approximately 7 tokens. There was a significant difference between these two intercepts (b^* = 1.38, p = .001). The mean of the slope among those in the rejection condition was negative and significant (M = -.70, p < .001), indicating a slope value that significantly differed from 0 and decreased linearly over time. For those in the non-rejection condition, the mean of the slope was positive and non-significant (M = .09, p = .56), which indicates a slope value that did not significantly differ from 0. Slope values differed significantly between the two conditions (b^* = .79, p < .001), such that those in the rejection condition has a steeper rate of decline in giving following the first programmed decrease in cooperation than those in the non-rejection condition.

An analysis was conducted to examine patterns of giving between the high and low social anxiety groups among those in the rejection condition only. The mean intercept for those with high social anxiety was 5.39 (p < .001), whereas for those with low social anxiety it was 5.72 (p < .001), indicating that each group shared

approximately 5-6 tokens following the first manipulated decrease in cooperation. There was a no difference between these two intercepts (b^* = .40, p = .50). The slope means were negative and significant for those with high (M = -.64, p < .001) and low (M = -.78, p = .001) social anxiety, indicating slope values that significantly differed from 0 and decreased linearly over time. However, the difference between slopes was non-significant (b^* = -.20, p = .47).

Rejection condition as a moderator of the relationship between social anxiety and giving (Hypothesis 2a). We hypothesized that the rejection condition would moderate the relationship between social anxiety and total giving post-rejection manipulation. Specifically, individuals with high social anxiety in the rejection condition would exhibit less total giving than those with high social anxiety in the non-rejection condition, and those with low social anxiety and in the rejection condition would display the opposite effect (i.e., there will be more total giving in the rejection condition compared to the non-rejection condition). After including total giving pre-rejection manipulation as a covariate, the main effects of rejection condition, $F(1, 87) < 1$, p = .88, r = .02, and social anxiety group, $F(1, 87) < 1$, p = .81, r = .03, on total giving post-rejection manipulation were not significant. Additionally, there was no significant interaction effect between rejection condition and social anxiety group on total giving post-rejection manipulation, $F(1, 87) < 1$, p = .65, r = .05. This indicates that the rejection condition, social anxiety group, or a combination of these two factors did not affect total giving post-rejection manipulation. See Figure 2.

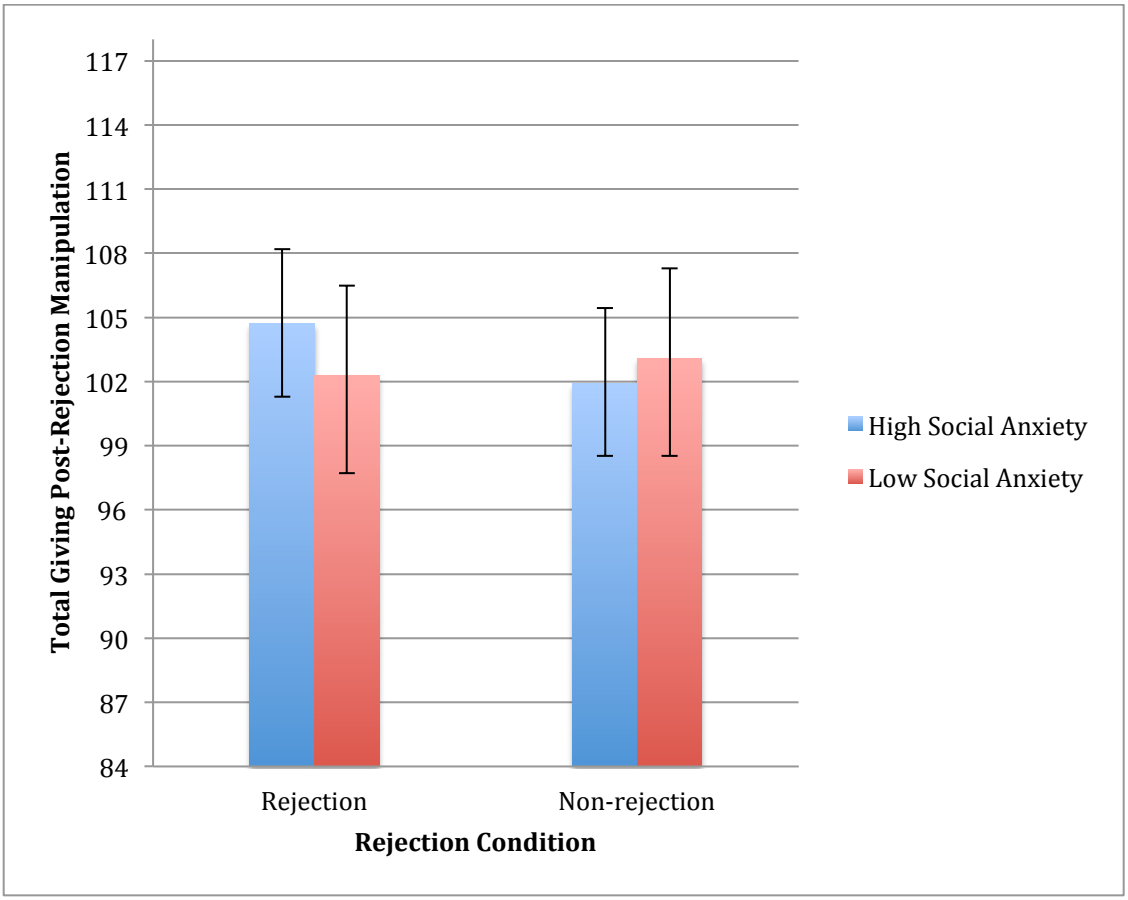

Figure 2. *The interaction of the rejection condition and social anxiety group on total giving (post-rejection manipulation). Note*. There were no significant main or interaction effects. Error bars represent the standard error of the estimated marginal mean.

The association between the rejection condition and the use of a coaxing strategy across social anxiety group. (Hypothesis 2b). Hypothesis 2b was initially planned to examine the rejection condition as a moderator of the relationship between social anxiety and the use of a coaxing strategy. However, as discussed previously, due to significant positive skewness of the use a coaxing strategy variable it was transformed into a dichotomous outcome (See *Statistical Assumptions* section for additional detail). Thus, the current version of hypothesis

2b examined the association between the rejection condition and the use of a coaxing strategy across social anxiety group using tests of chi-square.

It was hypothesized that individuals with high social anxiety would be less likely to use a coaxing strategy following rejection compared to those in the non-rejection condition. However, those with low social anxiety would be more likely to use a coaxing strategy following rejection than those in the non-rejection condition. There was not a significant association between the rejection condition, χ^2 (1, N = 91) = 0.02, p = .89, or social anxiety group, χ^2 (1, N = 91) = 0.01, p = .92, and whether or not a coaxing strategy was used. Additionally, there were non-significant associations between rejection condition among those in the high social anxiety group, χ^2 (1, N = 56) = 0.35, p = .55, or those in the low social anxiety group, χ^2 (1, N = 35) = 0.94, p = .33, and whether or not a coaxing strategy was used. See Figures 3 and 4.

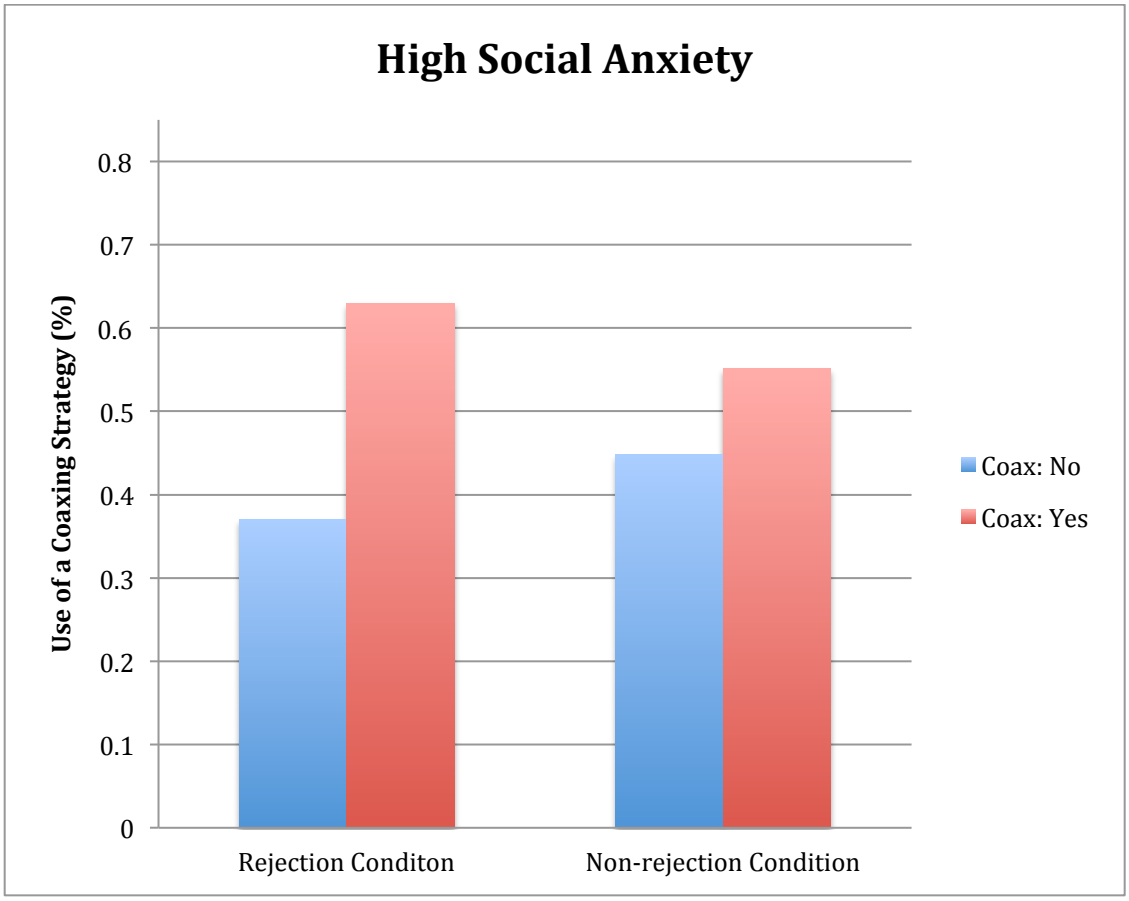

Figure 3. *The association between the rejection condition and the use of a coaxing strategy among those in the high social anxiety group. Note*. The association between *the rejection condition* and use of a coaxing strategy (Y/N) among those in the *high social anxiety group* was non-significant.

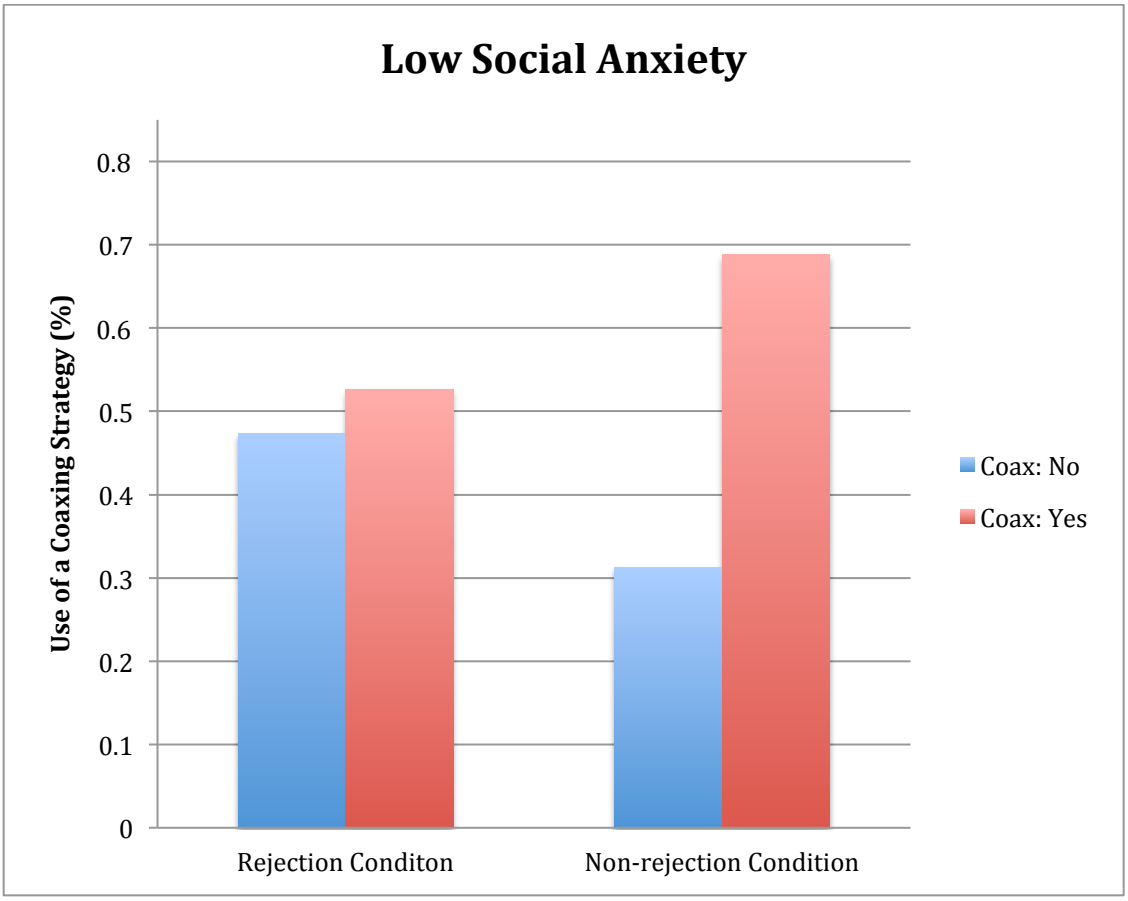

Figure 4. *The association between the rejection condition and the use of a coaxing strategy among those in the low social anxiety group. Note*. The association between *the rejection condition* and use of a coaxing strategy (Y/N) among those in the *low social anxiety group* was non-significant.

Rejection condition as a moderator of the relationship between social anxiety and use of a TFT strategy (Hypothesis 2c). We hypothesized that the rejection condition would moderate the relationship between social anxiety and the use of a TFT strategy. More specifically, individuals with high social anxiety would be more likely to use a TFT strategy following rejection compared to those in the non-rejection condition. Additionally, among those in the rejection condition, those with high social anxiety would be more likely to use a TFT strategy compared to those with low social anxiety. There was no significant main effect of the rejection

condition, $F(1, 87) < 1$, $p = .57$, $r = .06$, and social anxiety group, $F(1, 87) < 1$, $p = .78$, $r = .03$, respectively, on the percentage of times a tit-for-tat strategy was used. Additionally, there was no significant interaction effect between rejection condition and social anxiety group on the percentage of times a tit-for-tat strategy was used, $F(1, 87) < 1$, $p = .62$, $r = .05$. This indicates that the rejection condition, social anxiety group, or a combination of these two factors did not affect the use of a tit-for-tat strategy. See Figure 5.

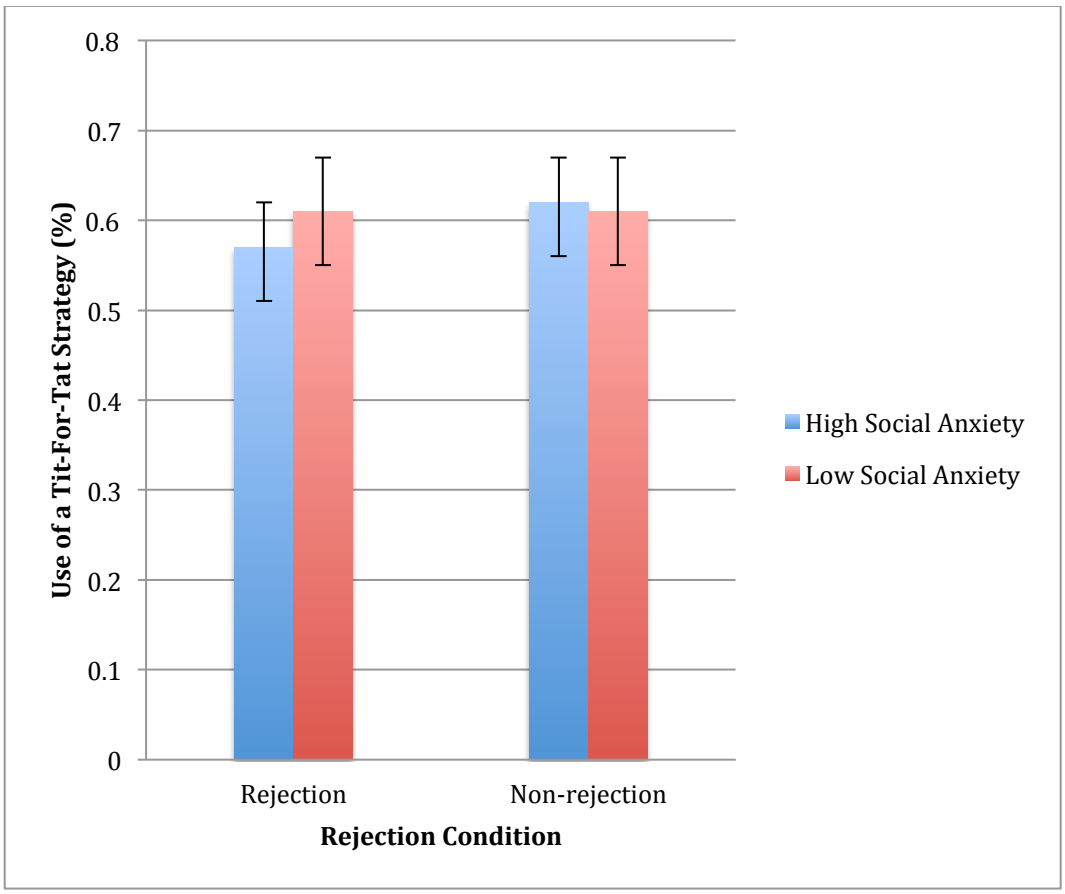

Figure 5. *The interaction of the rejection condition and social anxiety group on the use of a tit-for-tat strategy. Note*. There were no significant main or interaction effects. Error bars represent the standard error of the estimated marginal mean.

Expectation of the partner's future rejection (Hypothesis 3). We expected that the rejection condition would moderate the relationship between

social anxiety and expectations for future partner rejection, such that individuals with high social anxiety in the rejection condition would be more likely to have higher expectations for future rejection compared to those in the non-rejection condition, and no differences would be evident across rejection condition for those with low social anxiety. There was a significant main effect of age on the perceived likelihood of future rejection by the partner, $F(1, 85) = 7.64$, $p < .01$, $r = .29$. Thus, age was included as a covariate for all subsequent analyses. Additionally, there was a significant main effect of social anxiety group on the perceived likelihood of future rejection by the partner, $F(1, 85) = 7.56$, $p < .01$, $r = .29$, indicating that those in the high social anxiety group had higher expectancy ratings of future rejection by their partner. There was not a significant main effect of rejection condition on the likelihood of future rejection by the partner, $F(1, 85) = 2.40$, $p = .13$, $r = .17$. The interaction effect between social anxiety group and the rejection condition on the likelihood of future rejection by the partner was also non-significant, $F(1, 85) = 2.48$, $p = .12$, $r = .17$. See Figure 6.

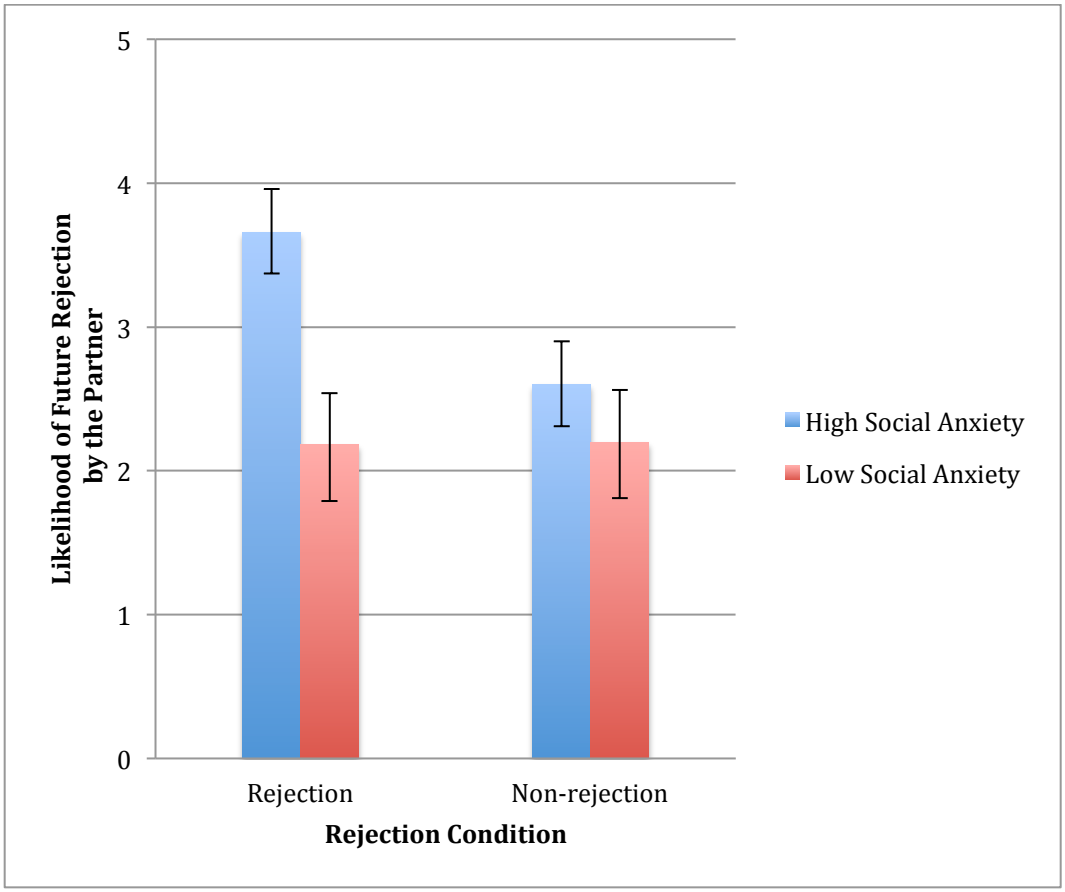

Figure 6. *The interaction of the rejection condition and social anxiety group on the likelihood of future rejection by the partner. Note*. There was a significant main effect of social anxiety group on the likelihood of future rejection by the partner, $p < .01$. All other main and interaction effects were non-significant. Error bars represent the standard error of the estimated marginal mean.

It was hypothesized that expectancy ratings for the partner's future rejection would decrease over time for those with low social anxiety but not for those with high social anxiety. Latent trajectory models were used to analyze scores for likelihood of future rejection over the course of the PD game (i.e., at the end of each of the four rounds of play). The mean intercept for those with high social anxiety was 1.52 ($p < .001$), whereas for those with low social anxiety it was 0.92 ($p < .001$). This finding indicates that, on average, at the end of round 1, subjects with high social anxiety endorsed responses of either "disagree" or "neutral", whereas those

with low social anxiety endorsed a response of "disagree" on whether their partner was likely to reject them during future exchanges. There was a significant difference between these two intercepts (b^* = -.53, p = .001). The mean of the slope among those with high social anxiety was slightly positive and non-significant (M = .03, p = .39), indicating a slope value that did not significantly differ from 0. For those with low social anxiety, the mean of the slope was slightly negative and non-significant (M = -.02, p = .69), which indicates a slope value that did not significantly differ from 0.The slopes of the two social anxiety groups did not differ (b^* = -.02, p = .70).

Importance of the subject's next turn to maintain the quality of the relationship with his/her partner (Hypothesis 4). We hypothesized that the rejection condition would moderate the relationship between social anxiety and the importance of their next turn for maintaining the quality of their relationship, such that individuals with high social anxiety in the rejection condition would be more likely to have higher scores compared to those in the non-rejection condition. However, no differences were expected on this measure as a function of rejection condition for those with low social anxiety. There was a significant main effect of social anxiety group on the importance of the subject's next turn for maintaining relationship quality with his/her partner, $F(1, 87) = 8.65$, $p < .01$, $r = .30$, indicating that those in the high social anxiety group placed greater importance on their next turn for maintaining the quality of the relationship with their partner. There was not a significant main effect of rejection condition on the importance of the subject's next turn for maintaining relationship quality with his/her partner, $F(1, 87) = 1.17$, $p = .28$, $r = .12$. The interaction effect between social anxiety group and the rejection

condition on the importance of the subject's next turn for maintaining the quality of the relationship with his/her partner was also non-significant, $F(1, 87) < 1$, $p = .95$, $r = .01$. See Figure 7.

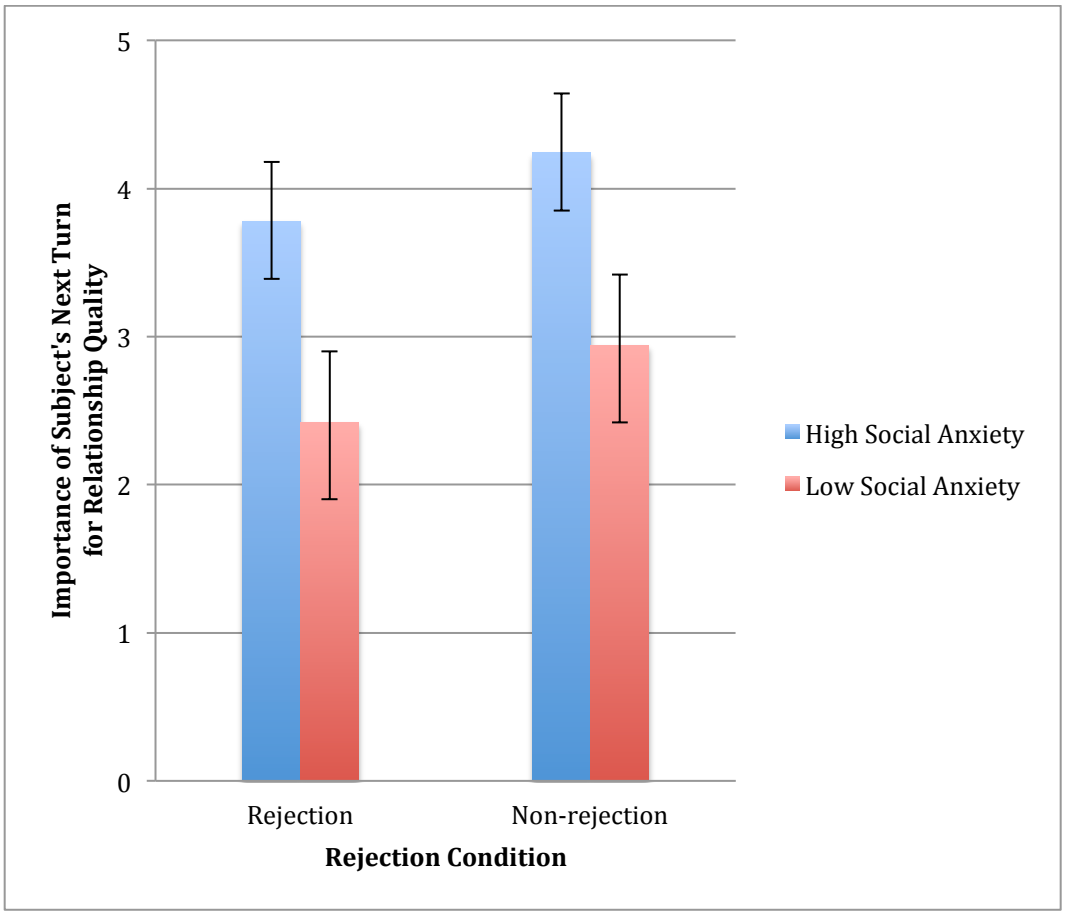

Figure 7. *The interaction of the rejection condition and social anxiety group on the importance of the subject's next turn for maintaining the quality of the relationship with his/her partner. Note*. There was a significant main effect of social anxiety group on the likelihood of future rejection by the partner, $p < .01$. All other main and interaction effects were non-significant. Error bars represent the standard error of the estimated marginal mean.

It was hypothesized that ratings of the importance of their next turn for maintaining the quality of their relationship with his/her partner would decrease over time for those low in social anxiety but not for those with high social anxiety. Latent trajectory models were used to analyze scores for the importance of the

subject's next turn for maintaining relationship quality with his/her partner over the course of the PD game (i.e., at the end of each of the four rounds of play). The mean intercept for those with high social anxiety was 2.12 ($p < .001$), whereas for those with low social anxiety it was 1.46 ($p < .001$). This result indicates that, on average, at the end of round 1, subjects with high social anxiety endorsed a response of "neutral," whereas those with low social anxiety endorsed responses of either "disagree" or "neutral" on whether the next turn was important for maintaining their current relationship with their partner. There was a significant difference between these two intercepts ($b^* = -.68$, $p < .01$). The slope means were slightly positive and non-significant among those with high social anxiety ($M = .04$, $p = .32$) and those with low social anxiety ($M = .05$, $p = .47$), indicating slope values that did not significantly differ from 0. In addition, social anxiety group did not predict differences in slope ($b^* = .01$, $p = .90$).

Quality of the relationship with the partner (Hypothesis 5). For the following set of analyses related to relationship quality, we anticipated that the rejection condition would moderate the relationship between social anxiety and perceived likeability, closeness, and trust, respectively, such that individuals with high social anxiety in the rejection condition would have lower scores across each of these domains compared to those in the non-rejection condition. Additionally, no differences were expected on each of these measures as a function of rejection condition for those with low social anxiety. It was further hypothesized that ratings for each of the relationship quality domains would increase over the course of Phase 1 for those with low social anxiety, but not for those with high social anxiety.

Perceived likeability. There was a significant main effect of the rejection condition on the subject's perceived likeability by his/her partner, $F(1, 87) = 28.86$, $p < .001$, $r = .50$, indicating that those in the rejection condition reported lower perceived likeability by their partner. There was not a significant main effect of social anxiety group on the subject's perceived likeability by his/her partner, $F(1, 87) < 1$, $p = .45$, $r = .08$. The interaction effect between social anxiety group and the rejection condition on the subject's perceived likeability by his/her partner was also non-significant, $F(1, 87) = 1.34$, $p = .25$, $r = .12$. See Figure 8.

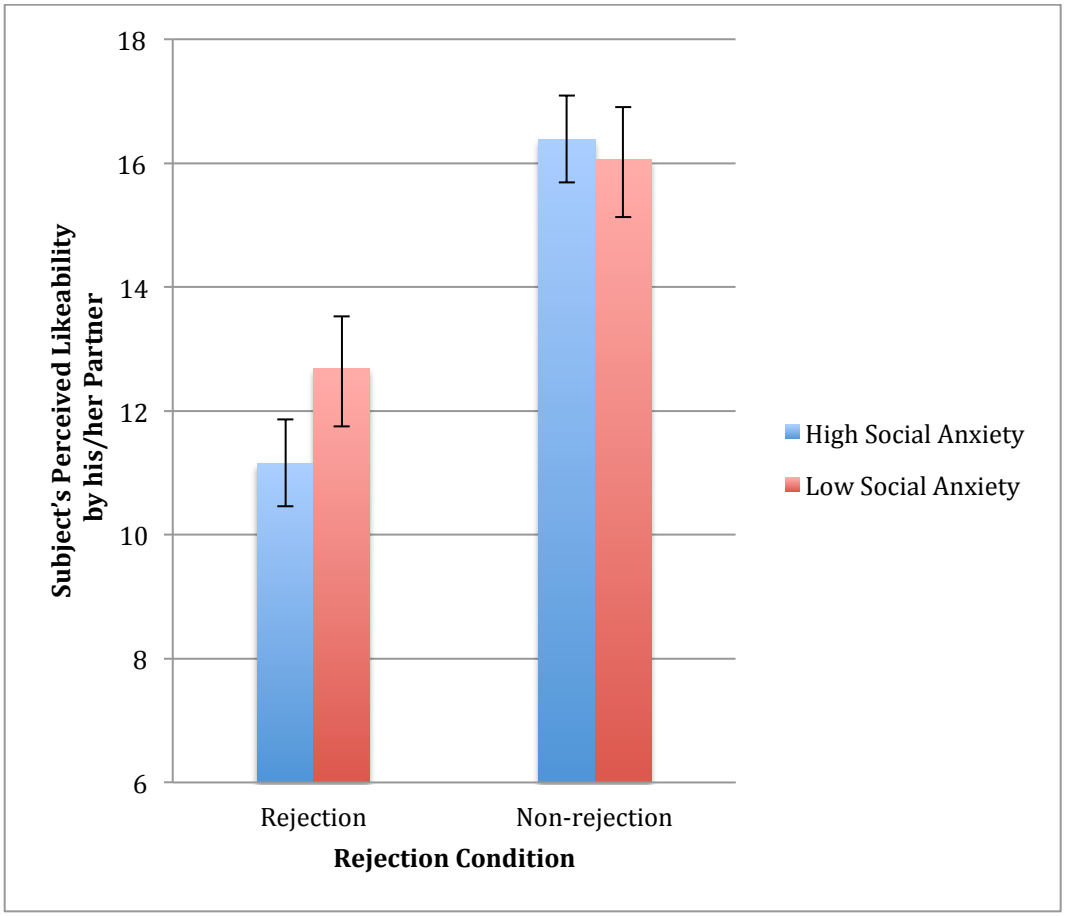

Figure 8. *The interaction of the rejection condition and social anxiety group on the subject's perceived likeability by his/her partner. Note*. There was a significant main effect of the rejection condition on the subject's perceived likeability by his/her partner, $p < .001$. All other main and interaction effects were non-significant. Error bars represent the standard error of the estimated marginal mean.

Latent trajectory models were used to analyze scores for perceived likeability over the course of the Phase 1 of the PD game (i.e., prior to the start of the game and at the end of each of the first two rounds). The mean intercept for those with high social anxiety was 7.68 ($p < .001$), whereas for those with low social anxiety it was 7.76 ($p < .001$). This suggests that, on average, prior to the start of the PD game, subjects with high and low social anxiety each endorsed responses of either "neutral" or "agree" on being liked by their partner. There was no significant

difference between these two intercepts (b^* = .11, p = .69). The mean of the slope among those with high social anxiety was negative and non-significant (M = -.13, p = .15), indicating a slope value that did not significantly differ from 0. For those with low social anxiety, the mean of the slope was positive and non-significant (M = .14, p = .28), which indicates a slope value that did not significantly differ from 0. Social anxiety group did not predict differences in slope (b^* = .12, p = .46).

Relationship Closeness. There was no significant main effect of the rejection condition, $F(1, 86) = 2.23$, p = .14, r = .16, and social anxiety group, $F(1, 87) < 1$, p = .45, r = .08, respectively, on the closeness of the relationship with the partner. Additionally, there was no significant interaction effect between rejection condition and social anxiety group on the closeness of the relationship with the partner, $F(1, 86) = 1.22$, p = .27, r = .12. This indicates that the rejection condition, social anxiety group, or a combination of these two factors did not affect the closeness of the relationship with the partner. See Figure 9.

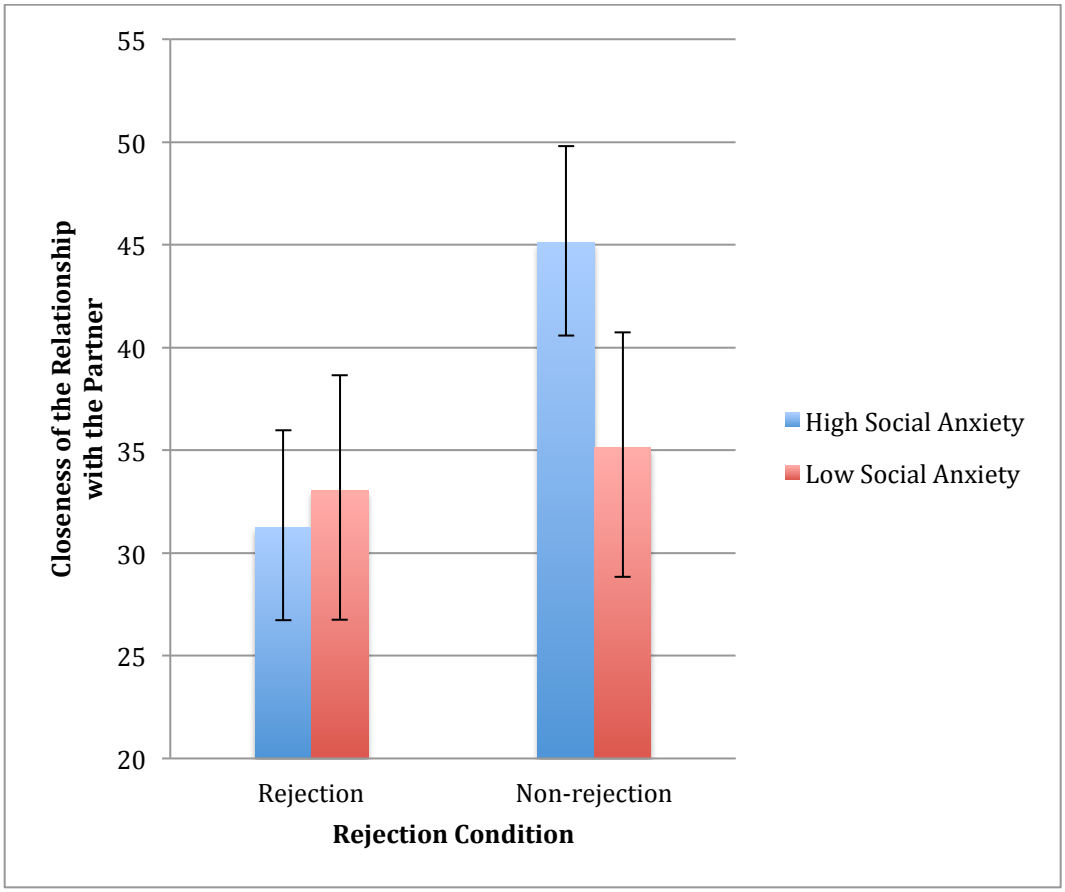

Figure 9. *The interaction of the rejection condition and social anxiety group on the closeness of the relationship with the partner. Note*. There were no significant main or interaction effects. Error bars represent the standard error of the estimated marginal mean.

Latent trajectory models were used to analyze scores for relationship closeness over the course of the Phase 1 of the PD game (i.e., prior to the start of the game and at the end of each of the first two rounds). The mean intercept for those with high social anxiety was 15.03 ($p < .001$), whereas for those with low social anxiety it was 14.10 ($p < .001$). This suggests that, on average, prior to the start of the PD game, subjects with high and low social anxiety each endorsed responses of either "somewhat disagree" or "slightly disagree" on having a close relationship with their partner. There was no significant difference between these two intercepts

(b^* = -.89, p = .65). The slope means were positive and significant for those with high (M = 2.36, p < .001) and low (M = 2.07, p < .001) social anxiety, indicating slope values that differed from 0 and increased linearly over the course of Phase 1. However, the difference between the slopes of the two social anxiety groups was non-significant (b^* = -.27, p = .73).

Trust. There was a significant main effect of the rejection condition on the subject's trust of his/her partner, $F(1, 85) = 16.87$, $p < .001$, $r = .41$, indicating that those in the rejection condition reported less trust of their partner. There was not a significant main effect of social anxiety group on the subject's trust of his/her partner, $F(1, 85) = 1.03$, $p = .31$, $r = .11$. The interaction effect between social anxiety group and the rejection condition on the subject's trust of his/her partner was also non-significant, $F(1, 85) = 3.22$, $p = .08$, $r = .19$. However, this effect trended toward significance and indicates that, among those with low social anxiety, trust of the partner was similar in the rejection (M = 52.89, SD = 18.38) and non-rejection conditions (M = 60.69, SD = 17.85), whereas those with high social anxiety had less trust of their partner in the rejection (M = 50.26, SD = 10.09) than in the non-rejection condition (M = 70.14, SD = 16.18). See Figure 10.

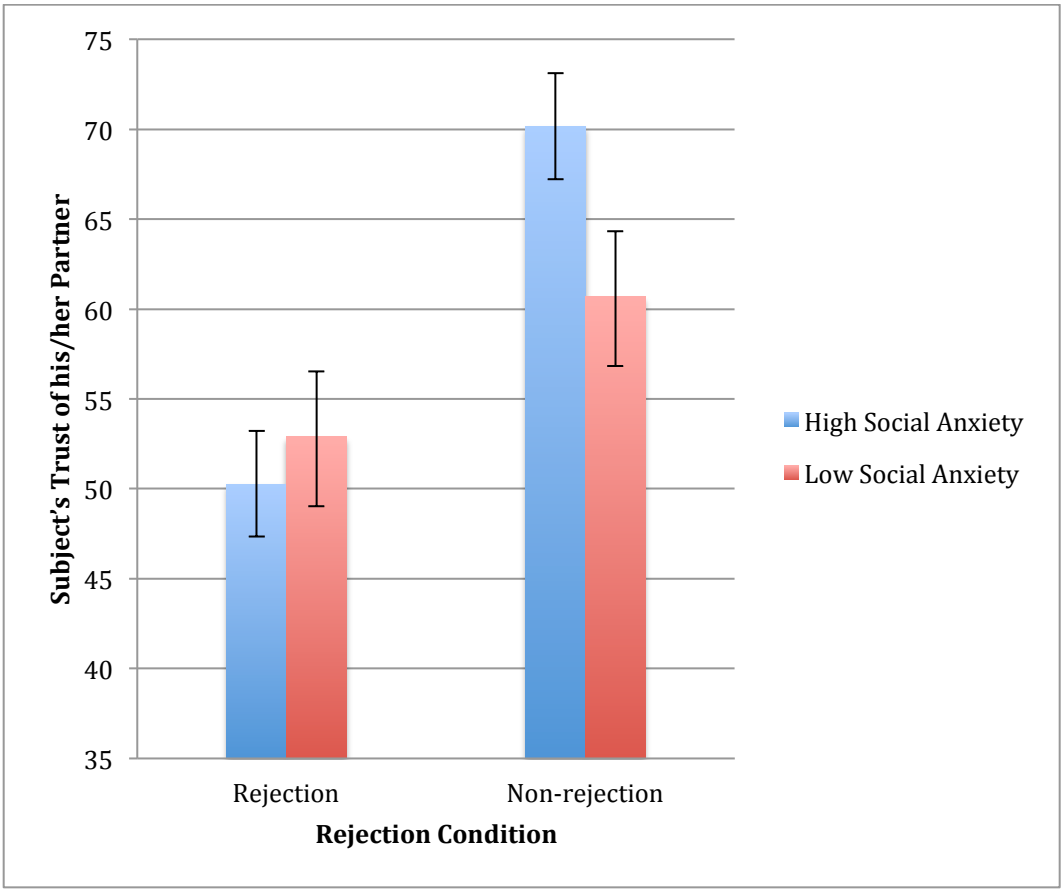

Figure 10. *The interaction of the rejection condition and social anxiety group on the subject's trust of his/her partner. Note*. There was a significant main effect of the rejection condition on the subject's trust of his/her partner, $p < .001$. However, the main effect of social anxiety was non-significant. The interaction of social anxiety group and the rejection condition on the subject's trust of his/her partner was non-significant, but trended toward significance, $p = .08$. Error bars represent the standard error of the estimated marginal mean.

Latent trajectory models were used to analyze scores for trust over the course of the Phase 1 of the PD game (i.e., prior to the start of the game and at the end of each of the first two rounds). The mean intercept for those with high social anxiety was 28.75 ($p < .001$), whereas for those with low social anxiety it was 29.85 ($p < .001$). This result indicates that, on average, prior to the start of the PD game, subjects with high and low social anxiety each endorsed responses of either "neutral" or "slightly agree" on having trust with their partner. There was no

significant difference between these two intercepts (b^* = .33, p = .81). The mean of the slope among those with high social anxiety was positive and significant (M = 2.06, p < .001), indicating a slope value significantly differed from 0 and increased linearly over the course of Phase 1. For those with low social anxiety, the mean of the slope was positive and non-significant (M = .95, p = .18), which indicates a slope value that did not significantly differ from 0. Social anxiety group did not predict a difference in the slope values (b^* = -.63, p = .45).

Exploratory Analyses

Interpersonal problems and predicating cooperation (Exploratory analysis 1). None of the IIP-64 subscales were significantly associated with either giving pre-/post- rejection manipulation, or total giving overall, all *ps* > .24.

Desire to have future interactions with their partner (Exploratory analysis 2). There was a significant main effect of the rejection condition on the subject's desire to have a future interaction with his/her partner, $F(1, 87) = 15.27$, $p < .001$, indicating that those in the rejection condition reported less desire to have a future interaction with their partner. There was not a significant main effect of social anxiety group on the subject's desire to have a future interaction with his/her partner, $F(1, 87) < 1$, $p = .97$. The interaction effect between social anxiety group and the rejection condition on the subject's desire to have a future interaction with his/her partner was also non-significant, $F(1, 87) < 1$, $p = .74$. See Figure 11.

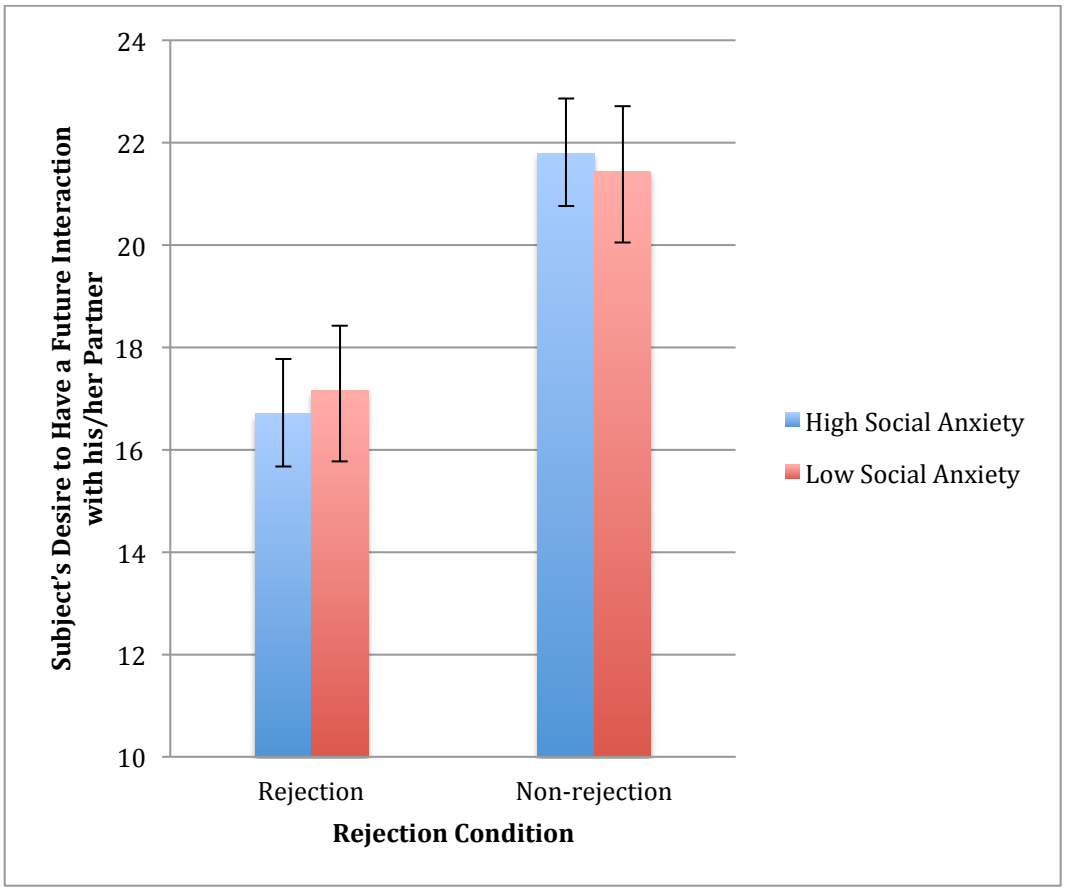

Figure 11. *The interaction of the rejection condition and social anxiety group on the subject's perceived likeability by his/her partner. Note*. There was a significant main effect of the rejection condition on the subject's desire to have a future interaction with his/her partner, $p < .001$. All other main and interaction effects were non-significant. Error bars represent the standard error of the estimated marginal mean.

Interest in having a similar interaction with a new partner (Exploratory analysis 3). There was no significant main effect of the rejection condition, $F(1, 87) < 1$, $p = .55$, and social anxiety group, $F(1, 87) < 1$, $p = .34$, respectively, on the subject's interest in having a similar interaction in the future with a new partner. Additionally, there was no significant interaction effect between rejection condition and social anxiety group on the subject's interest in having a similar interaction in

the future with a new partner, $F(1, 87) < 1$, $p = .47$. This indicates that the rejection condition, social anxiety group, or a combination of these two factors did not affect the subject's interest in having a similar interaction in the future with a new partner. See Figure 12.

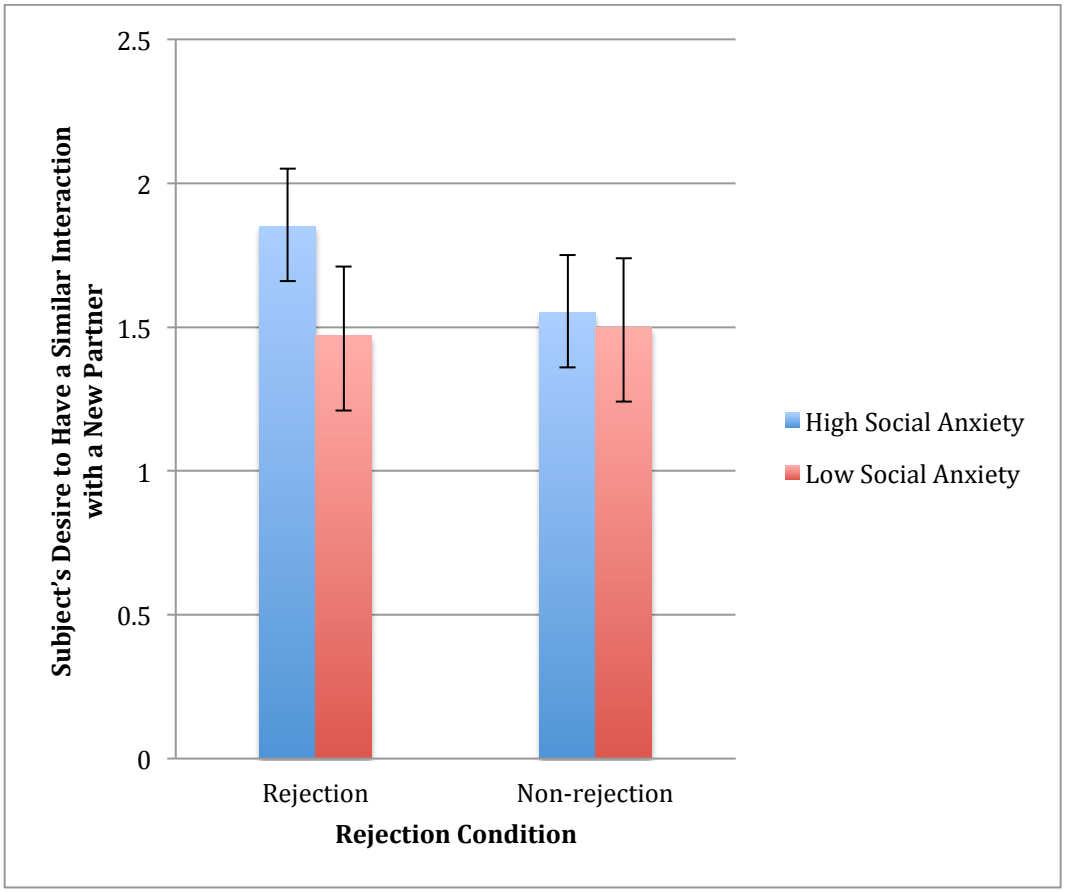

Figure 12. *The interaction of the rejection condition and social anxiety group on the subject's interest in having a similar interaction in the future with a new partner. Note*. There were no significant main or interaction effects. Error bars represent the standard error of the estimated marginal mean.

CHAPTER 4

DISCUSSION

Overview

Impairment in developing and maintaining close relationships, particularly friendships, is an area of great difficulty for those with social anxiety (Meleshko & Alden, 1993; Rodebaugh, 2009). Although previous studies have found associations between relationship impairment and interpersonal behaviors among those with social anxiety (e.g., Fernandez & Rodebaugh, 2011; Mallott et al., 2009; Meleshko & Alden, 1993), little is known about the processes that may underlie such impairment in the context of friendship development. The current study aimed to examine behaviors and, to a lesser extent, specific beliefs associated with friendship development through the use of a social dilemma game (i.e., the PD).

Past research on social anxiety, interpersonal behaviors, and rejection has yielded the following findings: 1) individuals with social anxiety often display fewer prosocial behaviors during interpersonal exchanges, 2) following rejection, individuals with social anxiety tend to engage in fewer prosocial behaviors in subsequent exchanges with new partners, and 3) in the PD game, those with social anxiety tend to show constraint during interpersonal exchanges, including less total giving and reduced responses to defection. Our study sought to integrate and extend these findings by examining the effect that rejection may have on several areas associated with friendship development and maintenance (e.g., cooperation, trust, perceived likeability, expectation for future rejection, etc.). Additionally, the use of specific interpersonal exchange strategies in response to rejection (e.g., coaxing and

TFT) was examined. Participants, either high or low in social anxiety, were asked to play a computerized PD game with another participant (i.e., the confederate/partner) and complete several self-report measures about the nature and quality of the relationship with their partner. Participants were then randomized into either rejection or non-rejection conditions. Following the rejection manipulation, participants were told to resume playing the PD game with their partner and asked to complete additional questionnaires. Results indicated that individuals with high social anxiety had higher ratings for expected future rejection and the importance of their next turn to maintain the quality of their relationship with their partner than those with low social anxiety. Additionally, there was a trend level (p = .08) social anxiety group by rejection condition interaction on the participant's trust of his/her partner, such that those with high social anxiety displayed a reduction in relationship trust following rejection whereas those with low social anxiety showed relatively no reduction. The discussion that follows reviews each of proposed hypotheses and their findings, as well as the implications, limitations, and areas of future research for the current study.

Constriction of giving following defection

It was hypothesized that individuals in the high social anxiety group and the rejection condition would exhibit a constricted response to defection, as indicated by less of a decrease in giving following a programmed decrease in giving by the partner at the end of Phase 1, than those with low social anxiety in the rejection condition. A significant main effect was found for giving pre- and post-defection,

which indicated that giving was significantly higher prior to the first programmed decrease in partner giving compared to after this event. This finding provides additional support for the PD game's ability to elicit changes in participant giving based on their partner's behavior, as both those with high and low social anxiety exhibited reductions in giving in response to defection. However, the main effect of social anxiety group and the interaction of giving pre- and post-defection and social anxiety group were each non-significant.

The non-significant results for the main effect of social anxiety group and the interaction effect were counter to the findings of Rodebaugh and colleagues (2013) in which participants with SAD exhibited a decreased response to defection (i.e., less of a reduction in giving) than those without SAD. The lack of a clinical sample in the current study may account for some of our inability to replicate these findings since the Rodebaugh and colleagues' 2011 study, which also used a non-clinical sample, only found evidence for a constricted response to defection among socially anxious men, but not women. It is also possible that this discrepancy exists due to our use of a gradual decrease in giving over the four defection turns rather than a sharp decline in defection (i.e., four straight turns in which the partner gives 0 tokens) as in the study by Rodebaugh and colleagues (2013).

Rejection condition as a moderator of the relationship between social anxiety and giving

We hypothesized that the rejection condition would moderate the relationship between social anxiety and total giving following the rejection manipulation. More specifically, we expected that individuals with high social

anxiety in the rejection condition would exhibit less total giving than those with high social anxiety in the non-rejection condition. Additionally, those with low social anxiety were anticipated to display the opposite effect (i.e., more total giving in the rejection condition compared to the non-rejection condition). This hypothesis was not supported, however, as the interaction effect of social anxiety group and the rejection condition on total giving was non-significant. Additionally, significant differences in giving were not found between social anxiety groups or rejection conditions. The lack of significant findings in the current study contrasts with the findings from relevant prior studies. For example, Rodebaugh and colleagues showed in two prior studies (2011, 2013) that individuals with social anxiety gave less compared to those without social anxiety. However, in the current study, total giving was nearly equivalent between those with high and low social anxiety across each of the rejection conditions.

Although Maner and colleagues (2007) found that non-socially anxious individuals tend to increase their use of prosocial behaviors with a *new* partner following rejection from a previous partner, we were unable to replicate this finding with individuals who were asked to re-engage with the same partner that recently rejected them. Perhaps it is possible that those with low social anxiety would have exhibited the hypothesized response (i.e., increased giving in response to rejection) if they were paired up with a new partner following the rejection manipulation.

The association between social anxiety and the use of a coaxing strategy

We hypothesized that individuals with high social anxiety would be less likely to use a coaxing strategy following the rejection condition compared to those

in the non-rejection condition. Conversely, we anticipated that those with low social anxiety would display the opposite pattern, that is, a greater likelihood to use a coaxing strategy following the rejection condition than those in the non-rejection condition. However, our results did not support either of these hypotheses. Previous research has suggested that individuals with low social anxiety may be more likely to engage in greater efforts to establish likeability following rejection through increased use prosocial behaviors (Maner et al., 2007), whereas those with higher levels of social anxiety have a greater propensity to "play it safe" and minimize risk during interpersonal exchanges, particularly following perceived rejection (Mallott et al., 2009; Meleshko & Alden 1993). Similar to the results for total giving, a lack of significant findings in this regard may be due in part to procedural design differences between Maner and colleagues' (2007) research and the current study (i.e., engaging with a new interaction partner following rejection as opposed to the same partner).

Rejection condition as a moderator of the relationship between social anxiety and the use of a TFT strategy

It was expected that the rejection condition would moderate the relationship between social anxiety and the use of a TFT strategy (i.e., strict reciprocation of the partner's previous giving). In particular, individuals in the high social anxiety group were hypothesized to be more likely to use a TFT strategy in the rejection condition compared to those in the non-rejection condition. Given that past studies have found that socially anxious individuals tend to exhibit constricted and/or fewer prosocial behaviors during interpersonal exchanges (Fernandez & Rodebaugh, 2011;

Meleshko & Alden 1993), it was expected that individuals in the high social anxiety group would employ a less risky strategy throughout the game compared to those with low social anxiety, particularly following perceived rejection. A lack of significant findings for this hypothesis may speak to the popularity and effectiveness of TFT as a cooperation/interpersonal exchange strategy more generally, rather than its use as "safe" strategy for socially anxious individuals. Support for TFT as an effective and widely used strategy for successful cooperation and reciprocal exchange has been demonstrated across several studies (e.g., Alexrod, 1980a; Alexrod, 1980b; Parks & Komorita, 1998).

Expectation of the partner's future rejection

As expected, those with high social anxiety had higher expectancy ratings for their partner's future rejection compared to those with low social anxiety. Corresponding with previous research on social anxiety and rejection (e.g., Levinson et al., 2013; Mallot et al., 2009), individuals with social anxiety appeared more likely to anticipate future rejection and other negative outcomes during interpersonal exchanges. However, contrary to our hypothesis, the rejection condition was not found to significantly moderate the relationship between social anxiety and perceived likelihood for future rejection. However, this effect trended in the expected direction (p = .12); that is, those with high social anxiety had slightly higher expectations for future rejection following the rejection manipulation than those in the non-rejection condition and ratings among those in the low social anxiety group were relatively unaffected by the rejection condition.

Although non-significant, this interaction effect's trend toward significance suggests that individuals in the high social anxiety group were more certain about future rejection following an experience of rejection than those with low social anxiety. Whereas the increased expectation of rejection following a recent episode of rejection seems perfectly logical, it is interesting that individuals with low social anxiety failed to demonstrate a similar response. One intention of this study was to facilitate an environment for cooperation and friendliness, in part, through a series of rounds of play that occurred prior to the rejection manipulation. This environment was designed to be analogous to a series of positive exchanges that may take place with an acquaintance prior to forming a new friendship. It was hypothesized that individuals with low social anxiety would be less affected by rejection if it followed a series of positive exchanges for the following reasons: 1) less expectation of rejection in general, and 2) a greater ability to draw upon a history of previous positive exchanges to inform the current status of the relationship. As suggested by Shackelford and Buss (1996), in friendships (as opposed to coalitions or other more casual exchange relationships), there is an expectation for greater tolerance of short-term imbalances and longer periods of relationship accounting. This finding suggests that individuals with high social anxiety may be more likely to weigh short-term imbalances or "bad days" more strongly and use this information as confirmatory evidence of their anxious or negative thoughts. However, given the non-significance of the interaction effect, interpretations of this finding should be regarded with caution.

Latent trajectory analyses revealed that individuals with high and low social anxiety differed significantly in regards to their initial scores (i.e., at the end of Round 1) on the likelihood of future rejection by their partner, such that those with high social anxiety were more likely to rate the possibility of rejection as "neutral," whereas those with low social anxiety tended to "disagree" with its likelihood. In line with previous research (e.g., Clark & Wells, 1995; Rapee & Heimberg, 1997), individuals with high social anxiety seem to anticipate rejection at higher levels than those with low social anxiety in the early stages of relationship development. However, contrary to our hypothesis, which anticipated a decrease in the likelihood of future rejection over time among those with low social anxiety and no change in slope among those with high social anxiety, there was no difference between the two groups' pattern of scores over time. Although those with low social anxiety exhibited a slightly negative slope over time, each group's slopes were statistically indistinguishable from a value of 0. This result suggests each group seems to form an expectation for the likelihood of future rejection in the early stages of the relationship (with this expectation being stronger among those with high social anxiety), which remains relatively stable over the course of subsequent exchanges and circumstances.

Importance of the subject's next turn to maintain the quality of the relationship with his/her partner

As anticipated, individuals with high social anxiety had stronger belief that their next turn was important for maintaining their current relationship with their partner than those with low social anxiety. This finding suggests that individuals

with high social anxiety may place greater importance on their current or most recent exchange than those with low social anxiety, possibly due to a belief that it will have a strong influence on the status of the relationship. It is possible that individuals with low social anxiety have a stronger ability to weigh past evidence when assessing relationship quality and believe that it is less likely for a single, recent interaction to disrupt a strong relationship's foundation. From this framework, it makes sense that individuals with high social anxiety would experience heightened anxiety in a given interaction since they seem to perceive the stakes associated with their current performance to be considerably more important.

Contrary to our hypothesis, the rejection condition did not moderate the relationship between social anxiety group and the importance of the subject's next turn for maintaining the quality of the relationship with his/her partner. Although it was expected that the rejection condition would not have an effect on this measure for those with low social anxiety, it was hypothesized that those with high social anxiety in the rejection condition would place greater importance on their next move than those in the non-rejection condition. Given that individuals with high social anxiety often perceive future rejection as fairly likely, they may have perceived the rejection as an expected outcome. Therefore, rather than increasing their perception of how important their next move is, the rejection condition may have served to legitimize their previous concerns and encourage similar feelings about the importance of individual interactions going forward.

Latent trajectory analyses showed that there was a significant difference between those with high and low social anxiety in regards to their initial scores (i.e., ratings at the end of Round 1) on the importance of the subject's next turn for maintaining the quality of the relationship. Individuals with high social anxiety were more likely to endorse a rating of "neutral" regarding the importance of their move, whereas those with low social anxiety endorsed mixed responses of either "disagree" or "neutral." This finding suggests that those with high social anxiety are more likely to feel that their next move has a stronger influence on relationship quality than those with low social anxiety at early stages of an interaction. This difference also suggests that individuals with high social anxiety may place higher importance on recent/current data about the relationship when forming a conceptualization about its quality, particularly when those data are perceived as negative.

It was expected that scores on the importance of the subject's next turn would decrease linearly over time for those with low social anxiety and remain relatively constant for those with high social anxiety. However, this hypothesis was not supported. Each of the groups' slopes on this measure were slightly positive and did not significantly differ from 0, which indicates that each group only slightly increased its belief that their next move is important as the relationship developed over time.

Quality of the relationship with their partner

Perceived likeability. Contrary to our hypothesis, individuals with low social anxiety did not have higher scores for perceived likeability (by their partners)

compared to those in the high social anxiety group. There was a significant main effect of the rejection condition, such that those in the rejection condition had lower scores for perceived likeability than those in the non-rejection condition. However, the interaction between social anxiety group and the rejection condition was non-significant.

The main effect of the rejection condition further supports the effectiveness of the rejection manipulation and its ability to alter the perception of subjects' feelings about the quality of their relationship with their partner. It was hypothesized that individuals with high social anxiety in the rejection condition would have lower scores compared to those with high social anxiety in the non-rejection condition. Even though this was the case, no interaction effects were present due to the fact that perceived likeability among those with low social anxiety was similarly affected (i.e., reduced) by the rejection manipulation.

It was further hypothesized that individuals with low social anxiety would exhibit a positive linear increase in perceived likeability scores over the course of Phase 1 (i.e., prior to the start of the game and at the end of each of the first two rounds), whereas those with high social anxiety would endorse scores that remained relatively stable over time (i.e., a slope that did not differ from 0). However, latent trajectory analyses revealed no significant differences in either the intercepts or slopes between those with high and low social anxiety, and neither group's slope differed significantly from a value of 0. This finding suggests that perceived likeability remains relatively stable and flat over the course of repeated partner exchanges for both those with high and low social anxiety.

Relationship closeness. It was hypothesized that those with low social anxiety would have higher scores for relationship closeness with their partner than those with high social anxiety; however, this was not the case. In fact, those with high social anxiety had slightly *higher* scores for relationship closeness than those with low social anxiety. Although the interaction of social anxiety group and the rejection condition was also non-significant, the results were in the hypothesized direction. That is, individuals with high social anxiety in the rejection condition displayed lower scores than those with high social anxiety in the non-rejection condition, whereas those with low social anxiety were relatively unaffected by the rejection manipulation. This finding suggests that rejection has a stronger effect on perceived closeness among those with high social anxiety, whereas those with low social anxiety appear better equipped to reconcile rejection as a small hiccup within the context of an established relationship. Interestingly, among those in the non-rejection condition, those with high social anxiety had *higher* scores for relationship closeness (although non-significant) than those with low social anxiety, which may suggest that individuals with high social anxiety are more likely to develop strong feelings of closeness, but may be more susceptible to discarding those feelings once perceived signals of rejection become apparent.

Latent trajectory analyses showed that initial ratings for relationship closeness were not significantly different between those with high and low social anxiety, with each group endorsing responses of either “somewhat disagree” or “slightly disagree” on having a close relationship with their partner prior to the start of the PD game. Although the slope of the scores for relationship closeness increased

linearly and positively over the course of Phase 1 for those with low social anxiety (in the hypothesized direction), slopes among those with high social anxiety were also linear and increased positively over time (contrary to our hypothesis). Interestingly, those with high social anxiety actually displayed a *steeper* rate of growth in relationship closeness over the course of Phase 1 than those with low social anxiety (although this difference was non-significant). This finding provides modest support for the notion that individuals with high social anxiety may be more likely to rapidly increase feelings of closeness in the early and developmental stages of a relationship, which possibly serve to intensify feelings of rejection when they are perceived.

Trust. Contrary to our hypothesis, those with low social anxiety did not have higher scores on trust of their partner than those with high social anxiety. However, there was a significant main effect of the rejection condition, such that those in the rejection condition had lower trust scores than those in the non-rejection condition. Additionally, there was a trend toward significance for the interaction of social anxiety group and the rejection condition on partner trust. This trend was in the hypothesized direction; i.e., those with high social anxiety in the rejection condition had lower scores on partner trust than those with high social anxiety in the non-rejection condition, whereas those with low social anxiety exhibited relatively little change in partner trust across rejection conditions.

Although this finding was non-significant, the trend toward significance is in line with the finding for relationship closeness and suggests that for individuals with high social anxiety, relationship trust is similarly affected (i.e., reduced) by

perceived rejection. Also in correspondence with the findings for relationship closeness, among those in the non-rejection condition, a trend was found that relationship trust was *higher* among those with high social anxiety than those with low social anxiety (t = 1.79, p = .08). It appears that in addition to relationship closeness, partner trust is another indicator of relationship quality that may be unreasonably inflated among those with high social anxiety in the early stages of relationship development.

Results from latent trajectory analyses indicated that there were no differences in initial trust scores (i.e., prior to the start of the PD game) between those with high and low social anxiety. In regards to changes in scores over time, it was expected that those with low social anxiety would exhibit positive and linear growth in trust with their partner, whereas those with high social anxiety would exhibit no changes in these values. Findings were inconsistent with our hypothesis, such that those with high social anxiety exhibited a positive and linear increase in trust of their partner over time, whereas the slope among those with low social anxiety was positive but did not differ significantly from a value of 0. Similar to scores for relationship closeness, it seems that individuals with high social anxiety were more likely to steadily increase feelings of trust at a higher rate than those with low social anxiety (although this difference was non-significant). This relatively rapid increase in trust over a short time period may leave individuals with high social anxiety susceptible to heighten feelings of disappointment, sadness, and rejection when such trust has been perceived to be violated.

Interpersonal problems and predicting cooperation

Exploratory analyses were conducted to determine whether interpersonal problems (as assessed by the IIP-64) predicted cooperation above and beyond social anxiety group. Results indicated that neither social anxiety group nor any of the IIP-64 subscales predicted giving during the PD game (i.e., pre-/post- rejection manipulation, or total giving). Contrary to findings by Rodebaugh and colleagues (2016), severity of social anxiety (in a non-clinical sample) was not associated with decreased giving in the PD game. Additionally, Rodebaugh and colleagues (2016) found that the IIP-64 subscale for vindictiveness predicted less initial giving, which was not the case in the current study. Although all 8 interpersonal problems subscales were significantly associated with social anxiety group, the current study failed to find a connection between interpersonal problems and giving in the PD game.

Desire to have future interactions with their partner

An exploratory analysis revealed that there was no difference in the subject's desire to have future interactions with his/her partner across social anxiety groups. However, those in the rejection condition reported less desire to have a future interaction with their partner than those in the non-rejection condition. Although it seems somewhat obvious that those in the rejection condition would have less desire to interact with their partner in the future, it was also reasonable to assume that those with low social anxiety would be less reactive to the rejection manipulation (compared to those with high social anxiety) and would maintain a similar interest in having future interactions (regardless of rejection) due to having a stronger ability to draw upon a history of previous cooperative exchanges.

However, non-significant findings for the interaction between social anxiety group and the rejection condition did not support this conclusion.

Interest in having a similar interaction with a new partner

Exploratory analyses revealed that there were no differences in the subject's interest in having a similar interaction in the future with a new partner as a function of social anxiety group or rejection condition. Although it is a bit surprising that those with high social anxiety were not less interested in having a similar interaction in the future, it seems more interesting that the rejection condition did not affect this outcome, as it did with previous analysis. Even though the rejection condition influenced the subject's interest in having a similar interaction in the future with their *current* partner, neither social anxiety group was deterred from having a similar interaction with someone new. Given Maner and colleagues' (2007) findings that those with low social anxiety seem to exhibit increased prosocial behaviors with a new interaction partner following rejection (and those with high social anxiety display the opposite pattern), it seemed plausible that the rejection condition would influence greater interest in engaging with a new partner among those with low social anxiety and have the reverse effect on those with high social anxiety. However, the non-significant interaction between social anxiety group and the rejection condition did not support this conclusion.

Summary

The present study contributes to, and in certain instances, contradicts previous research on social anxiety, interpersonal and prosocial behavior, and the use of behavioral economics games. For instance, in contrast to previous findings

that socially anxious individuals exhibit constricted responses to rejection/defection in the PD game (Rodebaugh et al., 2011; Rodebaugh et al., 2013) and fewer displays of prosocial behavior (e.g., warmth and personal disclosure) (e.g., Mallott et al., 2009; Meleshko & Alden, 1993; Papsdorf & Alden 1998) during interpersonal exchanges, the present study found no significant constrictions in giving post-rejection manipulation or in response to planned defections in the PD game. In fact, we found that those with high and low social anxiety were affected nearly identically by programmed decreases in tokens in the PD game. This finding suggests that each group has a tendency to mirror their partner's reductions in giving, at least immediately following a particular reduction.

No differences were evident between the social anxiety groups or rejection conditions in terms of the use of either a coaxing or TFT strategy. Individuals with high social anxiety were as likely to us a coaxing strategy regardless of the rejection condition they were placed in. It appears that socially anxious individuals do not reduce their use of "more active" strategies intended to boost cooperation and prosocial exchange in response to rejection, and correspondingly, are also just as likely to use "more assertive" strategies to re-establish cooperation as those with low social anxiety. It was also anticipated that socially anxious individuals would be more likely to revert to less risky or "mirroring" strategies (i.e., TFT exchange) in response to rejection. Our findings, however, did not support this hypothesis. Individuals regardless of social anxiety group or rejection condition were strikingly similar in their use of a TFT strategy in the PD game (approximately 60% of exchanges across these groups). The predominate use of TFT as a strategy may not

be that surprising in light of evolutionary theories, such as "reciprocal altruism" (Trivers, 1971), and the results of Alexrod's PD competitions (Alexrod, 1980a; Alexrod, 1980b), since both support TFT as the most universally successful means of solidifying cooperation while balancing possible risk.

As expected, individuals with high social anxiety endorsed higher expectancy ratings for future rejection than those with low social anxiety. Even though the interaction between social anxiety group and rejection condition was non-significant, it trended in the anticipated direction, which suggests that individuals with high social anxiety increase their expectations for future rejection following an initial rejection, whereas those with low social anxiety remain relatively unaffected by an initial rejection. Heightened expectations for future rejection among those with high social anxiety, particularly in response to initial perceived rejection, may deter these individuals from pursuing new potential friendships following an initial interaction and/or developing greater closeness with existing friends and acquaintances.

Individuals with high social anxiety were also more likely to place greater importance on their next move in the PD game to maintain the quality of their relationship with their partner compared to those with low social anxiety. Although social anxiety group did not interact significantly with the rejection condition, the heightened importance of singular moves among those with high social anxiety provides potential insight into contributing factors for relationship impairment. The perception that each interpersonal interaction/exchange is important (or possibly vital) for maintaining a good relationship likely overvalues the impact that single

interactions (or missteps) have on the relationship and may undervalue the importance of the relationship's pre-existing foundation. This belief may also make it difficult for socially anxious individuals to relax and "be present" during exchanges for fear that there current/next move may carry as much (or more) importance for relationship quality than the cumulative weight of their previous interactions. Furthermore, over-inflating the importance of the current/next move in an interpersonal exchange likely hinders one's ability to engage fluidly and effectively with potential relationship partners in the moment. However, given the non-significance of the interaction effect, these implications should be interpreted with caution. Additionally, both high and low socially anxious individuals have relatively consistent feelings about the importance of their next move over time, which suggests that each group may begin interpersonal exchanges with a particular belief about the importance of subsequent interactions and this feeling persists regardless of the relationship's length or the presence of perceived rejection.

In regards to relationship quality, results were mixed across various measures. Although non-significant, the slopes for perceived likeability (over the course of Phase 1) proceeded in opposite directions according to social anxiety group. That is, ratings of perceived likeability increased over time among those with low social anxiety and decreased for those with high social anxiety. Each group began with nearly identical scores for perceived likeability at the start of Phase 1. This result may suggest that socially anxious individuals perceive that potential friendship partners like them less the longer they interact with and the better they

get to know them. The opposite pattern may exist among those with low social anxiety, as they seem to interpret a longer history of exchanges as a sign of heightened likeability by their partner.

A similar pattern of results emerged for measures of both relationship closeness and trust. For individual with high social anxiety, ratings for closeness and trust were higher in the non-rejection condition compared to those in the rejection condition, whereas ratings for those is the low social anxiety group were relatively unaffected by the two conditions. However, surprisingly, the ratings on each of these measures were similar for the low and high social anxiety groups among those in the rejection condition. This finding suggests that individuals with high social anxiety may have overinflated feelings of closeness and trust in situations when rejection is not present. Furthermore, this finding indicates that feelings of closeness and trust among those with high social anxiety may be particularly sensitive to emotional injuries from perceived rejection, since these individuals seem to develop such feelings at faster rates and with higher ceilings.

Additionally, these findings may provide support to previous research which has shown that socially anxious individuals are more inclined to give more initially in the PD game (i.e., express increased warmth in early stages of a relationship) (Rodebaugh et al., 2016), but are less likely to do so as intimacy is increased by their partner (Meleshko & Alden, 1993; Rodebaugh et al., 2016). This pattern of interpersonal exchange may be due in part to achieving strong feelings of closeness and trust at premature stages in the relationship, which may limit efforts to develop

these feelings further and/or intensify concerns that the relationship will only deteriorate from such a height over time.

Limitations

There are several limitations to consider for the present study. First, it used an undergraduate, non-clinical sample, which limits the generalizability of the findings to non-college-aged individuals and/or those with a diagnosis of social anxiety disorder. Another limitation was the lack of recruitment of participants' actual friends. Since the study was interested in examining friendship dynamics, particularly those in the earlier stages of friendship development, it would be been better to use pairs of real-life acquaintances or casual friends who have not yet formed a close relationship. However, recruiting and standardizing such pairs of existing friends would pose significant challenges. Additionally, due to the design of the study, participants had not met their partners previously and were unaware that friendship dynamics were being analyzed, which likely influenced their engagement in ways that may have been different if the context and intentions of the study were explicitly stated.

Perhaps the most noteworthy limitation is the generalizability of the PD game as analogous to exchanges in an interpersonal domain. Although the PD game has shown evidence of test-retest reliability and internal consistency (Rodebaugh et al., 2013; Rodebaugh et al., 2016), there is limited support for the construct validity of the task as a proxy for interpersonal exchanges that may occur in friendship development. Additional research is needed to further examine the psychometric properties of these games and legitimize their use as stand-ins for observable

interpersonal behavior. Additionally, the structure of the rejection manipulation (i.e., programmed decreases in giving in the PD game followed by the experimenter informing the participant that his/her partner wanted to play with a new partner) was created for the current study and has never been previously examined as a method to foster sufficient feelings of rejection. Although several of the findings suggest that the rejection manipulation adequately achieved its desired effect, the use of several experimenters and confederates raises additional concerns about the standardization of the rejection manipulation dialogue and "get to know you" conversation, particularly since the delivery of the rejection dialogue required minor memorization and acting. Additionally, no manipulation check was preformed to examine adherence to the procedural training protocol for either the experimenter's rejection dialogue or the confederate's "get to know you" conversation.

Conclusion and Future Directions

The present study extends the literature on the use of behavioral economic games to examine social anxiety and interpersonal dynamics. No studies to date have used behavioral economics tasks in conjunction with an interpersonal rejection manipulation to study the effects of social anxiety on relationship dynamics. Additionally, few studies have used multimethod assessment approaches (e.g., computerized tasks and self-report questionnaires) to study relationship quality and interpersonal exchange behavior, as well as employed various statistical techniques to examine data both cross-sectionally and as trends over time. The present study makes further contributions to the literature by using multiple rounds

of the PD game in succession to study relationship development over time, use of new assessment measures (e.g., likelihood of future rejection, importance of the subject's next move), and the examination of specific exchange strategies in the PD game (e.g., TFT and coaxing) in addition to more traditional measures of cooperation (i.e., total tokens shared).

There are several areas worthy of future exploration in connection to the present study. First, additional studies are needed to validate the use behavioral economic games as measures of interpersonal behavior that are analogous to observable, face-to-face interactions. Furthermore, additional research is required to determine that cooperative behavior in the behavioral economics games equates to cooperation in interpersonal exchanges and one's ability to develop friendships or other close relationships. Future research should use a clinical population to examine differences that may be present among those with clinically severe social anxiety and/or a diagnosis of SAD. Ideally, future studies would benefit from an examination of real-life friendships as well as an exploration of various interpersonal dyads (e.g., strangers, acquaintances, friends).

The continued exploration of the influence that rejection has on relationship development is another important area for future examination. It would be beneficial for future studies to employ rejection manipulations that appropriately mimic the kinds of rejection that are likely to occur during the early stages of friendship (e.g., lack of responsiveness or inclusion, or observable signs of disinterest). Although it is useful for studies like this one to apply covert analysis of relationship dynamics, it would also be valuable to examine face-to-face

interpersonal exchanges for observable behaviors that either facilitate or hinder relationship closeness and development.

The present study examined the influence that social anxiety and rejection have on friendship dynamics using an iterated version of the Prisoner's Dilemma game. The intention of our research was to integrate findings from multiple studies and disciplines to further elucidate the factors that contribute to friendship impairment for socially anxious individuals with the hope that it would inform clinical interventions and improve their ability to maintain and develop close relationships.

REFERENCES

Axelrod, R. (1980a). Effective choice in the prisoner's dilemma. *Journal of Conflict Resolution*, *24*, 3-25. doi:10.1177/002200278002400301

Axelrod, R. (1980b). More effective choice in the prisoner's dilemma. *Journal of Conflict Resolution*, *24*, 379-403. doi:10.1177/002200278002400301

Axelrod, R. (1984). *The evolution of cooperation.* New York, NY: Basic Books, Inc.

Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science*, *211*(4489), 1390-1396. doi:10.1126/science.7466396

Beck, A. T., Steer, R. A., Ball, R., & Ranieri, W. F. (1996). Comparison of Beck Depression Inventories-IA and-II in psychiatric outpatients. *Journal of Personality Assessment, 67*, 588-597. doi:10.1207/s15327752jpa6703_13

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: Psychological Corporation.

Bierman, K. L., & Furman, W. (1984). The effects of social skills training and peer involvement on the social adjustment of preadolescents. *Child Development*, 151-162. doi:10.2307/1129841

Bigelow, B. J. (1977). Children's friendship expectations: A cognitive-developmental study. *Child Development*, *48*, 246-253. doi:10.2307/1128905

Brown, E. J., Turovsky, J., Heimberg, R. G., Juster, H. R., Brown, T. A., & Barlow, D. H. (1997). Validation of the Social Interaction Anxiety Scale and the Social Phobia Scale across the anxiety disorders. *Psychological Assessment, 9*, 21-27. doi:10.1037/1040-3590.9.1.21

Buchner, A., Erdfelder, E., Faul, F., & Lang, A. (2013). G*Power (3.1.7) [Power analysis program]. University of Kiel: Franz Faul.

Cheek, J. M., & Buss, A. H. (1981). Shyness and sociability. *Journal of Personality and Social Psychology*, *41*, 330-339. doi:10.1037/0022-3514.41.2.330

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment and treatment* (pp. 69–93). New York: Guilford Press.

Cosmides, L., & Tooby, J. (1992). Cognitive adaptations for social exchange. In J. Barkow, L. Cosmides & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 163-228). New York: Oxford University Press.

Coyne, J. C. (1976). Depression and the response of others. *Journal of Abnormal Psychology*, *85*, 186-193. doi:10.1037/0021-843X.85.2.186

Creed, A. T., & Funder, D. C. (1998). Social anxiety: From the inside and outside. *Personality and Individual Differences*, *25*, 19-33. doi:10.1016/S0191-8869(98)00037-3

Dibble, J. L., Levine, T. R., & Park, H. S. (2012). The Unidimensional Relationship Closeness Scale (URCS): Reliability and validity evidence for a new measure of relationship closeness. *Psychological Assessment*, *24*, 565-572. doi: 10.1037/a0026265

Fernandez, K. C., & Rodebaugh, T. L. (2011). Social anxiety and discomfort with friendly giving. *Journal of Anxiety Disorders*, *25*, 326-334. doi:10.1016/j.janxdis.2010.10.005

Fitness, J. (2001). Betrayal, rejection, revenge, and forgiveness: An interpersonal script approach. In M. Leary (Ed.), *Interpersonal rejection* (pp. 73-103). New York, NY: Oxford University Press.

Gilbert, P. (2001). Evolution and social anxiety: The role of attraction, social competition, and social hierarchies. *Psychiatric Clinics of North America*, *24*, 723-751. doi:10.1016/S0193-953X(05)70260-4

Griffiths, P. E. (1990). Modularity, and the psychoevolutionary theory of emotion. *Biology and Philosophy*, *5*, 175-196. doi:10.1007/BF00127486

Hartup, W. W. (1998). Cooperation, close relationships, and cognitive development. In W. M. Bukowski, A. F. Newcomb, & W. W. Hartup (Eds.), *The company they keep: Friendships in childhood and adolescence* (pp. 213-237). New York: Cambridge University Press.

Hartup, W. W. (1989). Social relationships and their developmental significance. *American Psychologist*, *44*, 120. doi:10.1037/0003-066X.44.2.120

Headey, B., Holmstrom, E., & Wearing, A. (1985). Models of well-being and ill-being. *Social Indicators Research*, *17*, 211-234. doi:10.1007/BF00319311

Heimberg, R. G., Mueller, G. P., Holt, C. S., Hope, D. A., & Liebowitz, M. R. (1992). Assessment of anxiety in social interaction and being observed by others: The Social Interaction Anxiety Scale and the Social Phobia Scale. *Behavior Therapy*, *23*, 53-73. doi:10.1016/S0005-7894(05)80308-9

Hinde, Robert A. (2002). *Why good is good: The sources of morality*. London: Routledge.

Horowitz, L. M., Alden, L. E., Wiggins, J. S., & Pincus, A. L. (2000). *Manual for the Inventory of Interpersonal Problems*. San Antonio, TX*:* The Psychological Corporation.

Kachin, K. E., Newman, M. G., & Pincus, A. L. (2001). An interpersonal problem approach to the division of social phobia subtypes. *Behavior Therapy*, *32*, 479-501. doi:10.1016/S0005-7894(01)80032-0

King-Casas, B., Sharp, C., Lomax-Bream, L., Lohrenz, T., Fonagy, P., & Montague, P. R. (2008). The rupture and repair of cooperation in borderline personality disorder. *Science*, *321*, 806-810. doi:10.1126/science.1156902

Komorita, S. S., & Parks, C. D. (1995). Interpersonal relations: Mixed-motive interaction. *Annual Review of Psychology*, *46*, 183-207. doi:10.1146/annurev.ps.46.020195.001151

Larzelere, R. E., & Huston, T. L. (1980). The Dyadic Trust Scale: Toward understanding interpersonal trust in close relationships. *Journal of Marriage and the Family*, *42*, 595-604. doi:10.2307/351903

Levinson, C. A., Langer, J. K., & Rodebaugh, T. L. (2013). Reactivity to exclusion prospectively predicts social anxiety symptoms in young adults. *Behavior Therapy*, *44*, 470-478. doi:10.1016/j.beth.2013.04.007

Luce, R. D., & Raiffa, H. (1957). *Games and decisions: Introduction and critical survey*. Mineola, New York: Courier Dover Publications.

Mallott, M. A., Maner, J. K., DeWall, N., & Schmidt, N. B. (2009). Compensatory deficits following rejection: The role of social anxiety in disrupting affiliative behavior. *Depression and Anxiety*, *26*, 438-446. doi:10.1002/da.20555

Maner, J. K., DeWall, C. N., Baumeister, R. F., & Schaller, M. (2007). Does social exclusion motivate interpersonal reconnection? Resolving the "porcupine problem." *Journal of Personality and Social Psychology*, *92*, 42-55. doi:10.1037/0022-3514.92.1.42

Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy, 36*, 455-470. doi: 10.1016/S0005-7967(97)10031-6

Mealey, L. (1995). The sociobiology of sociopathy: An integrated evolutionary model. *Behavioral and Brain Sciences*, *18*, 523-541. doi:10.1017/S0140525X00039595

Meleshko, K. G., & Alden, L. E. (1993). Anxiety and self-disclosure: Toward a motivational model. *Journal of Personality and Social Psychology*, *64*, 1000-1009. doi:10.1037/0022-3514.64.6.1000

Moscovitch, D. A., Orr, E., Rowa, K., Reimer, S. G., & Antony, M. M. (2009). In the absence of rose-colored glasses: Ratings of self-attributes and their differential certainty and importance across multiple dimensions in social phobia. *Behaviour Research and Therapy*, *47*, 66-70. doi:10.1016/j.brat.2008.10.007

Nesse, R. M. (1990). Evolutionary explanations of emotions. *Human Nature*, *1*, 261-289. doi:10.1007/BF02733986

Papsdorf, M., & Alden, L. (1998). Mediators of social rejection in social anxiety: Similarity, self-disclosure, and overt signs of anxiety. *Journal of Research in Personality*, *32*, 351-369. doi:10.1006/jrpe.1998.2219

Parks, C. D., & Komorita, S. S. (1998). Reciprocity research and its implications for the negotiation process. *International Negotiation*, *3*, 151-169. doi:10.1163/15718069820848166

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*, 741-756. doi:10.1016/S0005-7967(97)00022-3

Rapoport, A., & Chammah, A. M. (1965). *Prisoner's dilemma: A study in conflict and cooperation*. Ann Arbor: Univ. of Michigan Press.

Roberts, G., & Sherratt, T. N. (1998). Development of cooperative relationships through increasing investment. *Nature*, *394*, 175-179. doi:10.1038/28160

Rodebaugh, T. L. (2009). Social phobia and perceived friendship quality. *Journal of Anxiety Disorders*, *23*, 872-878. doi:10.1016/j.janxdis.2009.05.001

Rodebaugh, T. L., Gianoli, M. O., Turkheimer, E., & Oltmanns, T. F. (2010). The interpersonal problems of the socially avoidant: Self and peer shared variance. *Journal of Abnormal Psychology*, *119*, 331-340. doi:10.1037/a0019031

Rodebaugh, T. L., Heimberg, R. G., Brown, P. J., Fernandez, K. C., Blanco, C., Schneier, F. R., & Liebowitz, M. R. (2011). More reasons to be straightforward: Findings and norms for two scales relevant to social anxiety. *Journal of Anxiety Disorders*, *25*, 623-630. doi: 10.1016/j.janxdis.2011.02.002

Rodebaugh, T. L., Heimberg, R. G., Taylor, K. P., & Lenze, E. J. (2016). Clarifying the

behavioral economics of social anxiety disorder effects of interpersonal problems and symptom severity on generosity. *Clinical Psychological Science, 4*, 107-121. doi:10.1177/2167702615578128

Rodebaugh, T. L., Klein, S. R., Yarkoni, T., & Langer, J. K. (2011). Measuring social anxiety related interpersonal constraint with the flexible iterated prisoner's dilemma. *Journal of Anxiety Disorders*, *25*, 427-436. doi:10.1016/j.janxdis.2010.11.006

Rodebaugh, T. L., Shumaker, E. A., Levinson, C. A., Fernandez, K. C., Langer, J. K., Lim, M. H., & Yarkoni, T. (2013). Interpersonal constraint conferred by generalized social anxiety disorder is evident on a behavioral economics task. *Journal of Abnormal Psychology*, *122*, 39-44. doi:10.1037/a0030975

Rodebaugh, T. L., Woods, C. M., & Heimberg, R. G. (2007). The reverse of social anxiety is not always the opposite: The reverse-scored items of the Social Interaction Anxiety Scale do not belong. *Behavior Therapy, 38*, 192-206. doi:10.1016/j.beth.2006.08.001

Rodebaugh, T. L., Woods, C. M., Heimberg, R. G., Liebowitz, M. R., & Schneier, F. R. (2006). The factor structure and screening utility of the Social Interaction Anxiety Scale. *Psychological Assessment, 18*, 231-237. doi:10.1037/1040-3590.18.2.231

Ryff, C. D., & Singer, B. (1996). Psychological well-being: Meaning, measurement, and implications for psychotherapy research. *Psychotherapy and Psychosomatics*, *65*, 14-23. doi:10.1159/000289026

Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (2003). The neural basis of economic decision-making in the ultimatum game. *Science*, *300*, 1755-1758. doi:10.1126/science.1082976

Segrin, C. (1993). Interpersonal reactions to dysphoria: The role of relationship with partner and perceptions of rejection. *Journal of Social and Personal Relationships*, *10*, 83-97. doi:10.1177/0265407593101006

Seyfarth, R. M., & Cheney, D. L. (2012). The evolutionary origins of friendship. *Annual Review of Psychology*, *63*, 153-177. doi:10.1146/annurev-psych-120710-100337

Shackelford, T. K. & Buss, D. M. (1996). Betrayal in mateships, friendships, and coalitions. *Personality and Social Psychology Bulletin, 22*, 1151-1164. doi:10.1177/01461672962211006

Silk, J. B. (2003). Cooperation without counting. In P. Hammerstein (Ed.), *Genetic and cultural evolution of cooperation* (pp. 37-54). Cambridge, Massachusetts: The MIT Press.

Sloan, D. M., Marx, B. P., Bradley, M. M., Strauss, C. C., Lang, P. J., & Cuthbert, B. C. (2002). Examining the high-end specificity of the Beck Depression Inventory using an anxiety sample. *Cognitive Therapy and Research, 26*, 719-727. doi:10.1023/A:1021233215457

Taylor, C. T., & Alden, L. E. (2006). Parental overprotection and interpersonal behavior in generalized social phobia. *Behavior Therapy*, *37*, 14-24. doi:10.1016/j.beth.2005.03.001

Tooby, J., & Cosmides, L. (1996). Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. *Proceedings of the British Academy, 88*, 119-143.

Trivers, R. (2006). Reciprocal altruism: 30 years later. In P. Kappeler & C.P. van Schaik (Eds.), *Cooperation in primates and humans: Mechanisms and evolution* (pp. 67-83). New York: Springer.

Trivers, R. L. (1971). The evolution of reciprocal altruism. *Quarterly Review of Biology*, *46*, 35-57.

Vittengl, J. R., Clark, L. A., & Jarrett, R. B. (2003). Interpersonal problems, personality pathology, and social adjustment after cognitive therapy for depression. *Psychological Assessment*, *15*, 29. doi: 10.1037/1040-3590.15.1.29

Vorauer, J. D., & Sasaki, S. J. (2009). Helpful only in the abstract? Ironic effects of empathy in intergroup interaction. *Psychological Science*, *20*, 191-197. doi: 10.1111/j.1467-9280.2009.02265.x

Walsh, A. (2000). Evolutionary psychology and the origins of justice. *Justice Quarterly*, *17*, 841-864. doi: 10.1080/07418820000094781

Walster, E., & Walster, G. W. (1975). Equity and social justice. *Journal of Social Issues, 31*, 21-43.

Walters, K. S., & Hope, D. A. (1998). Analysis of social behavior in individuals with social phobia and nonanxious participants using a psychobiological model. *Behavior Therapy*, *29*, 387-407. doi: 10.1016/S0005-7894(98)80039-7