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Title: Reduced reciprocal giving in social anxiety – evidence from the Trust Game

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Abstract

Background and Objectives: Social anxiety is known to impair interpersonal relationships. These impairments are thought to partly arise from difficulties to engage in affiliative interactions with others, such as sharing favors or reciprocating prosocial acts. Here, we examined whether individuals high compared to low in social anxiety differ in giving towards strangers in an economic game paradigm.

Methods: One hundred and twenty seven non-clinical participants who had been pre-screened to be either particularly high or low in social anxiety played an incentivized Trust Game to assess trustful and reciprocal giving towards strangers in addition to providing information on real life interpersonal functioning (perceived social support and attachment style).

Results: We found that reciprocal, but not trustful giving, was significantly decreased among highly socially anxious individuals. Both social anxiety and reciprocal giving furthermore showed significant associations with self-reported real life interpersonal functioning.

Limitations: Participants played the Trust Game with the strategy method; results need replication with a clinical sample.

Conclusions: Individuals high in social anxiety showed reduced reciprocal, but intact trustful giving, pointing to a constraint in responsiveness. The research may contribute to the development of new treatment and prevention programs to reduce the interpersonal impairments in socially anxious individuals.

Keywords: Social anxiety, interpersonal processes, trust, reciprocity, trust game

1 Introduction

Social Anxiety Disorder (SAD) – and maladaptive social anxiety more generally – is known to impair interpersonal relationships (reviewed in Alden & Taylor, 2004). For instance, highly socially anxious individuals are more likely to be unmarried, to report lower levels of perceived romantic relationship and friendship quality, or to be lacking a close friend after all (Davidson, Hughes, George, & Blazer, 1994; Porter & Chambless, 2014; Rodebaugh, 2009). Given the significance of close social relationships to psychological well-being, general health, and even mortality (House, Landis, & Umberson, 1988; Steptoe, Shankar, Demakakos, & Wardle, 2013), it is important to understand the pathway(s) by which social anxiety affects friendships and other social bonds in a negative way.

It has been suggested that the interpersonal impairments associated with social anxiety may partly arise from difficulties of socially anxious individuals to engage in warm, affiliative interactions with others, such as sharing favors or reciprocating prosocial acts (reviewed in Alden & Taylor, 2004). Empirical results are in line with this notion. For example, socially anxious individuals have been shown to be less cooperative in a social role-play (Walters & Hope, 1998), to experience more discomfort in response to friendly giving by others (Fernandez & Rodebaugh, 2011), and to show both decreased reciprocity in smiling behavior (Heerey & Kring, 2007) and self-disclosure in conversations with strangers, which in turn predicted less liking and more discomfort on the side of their conversation partners (Meleshko & Alden, 1993). Furthermore, socially anxious individuals have been shown to react less supportively towards their romantic partners when the partners shared good news with them, both in a behavioral observation in the laboratory and in real life (Kashdan, Ferssizidis, Farmer, Adams, & McKnight, 2013). Importantly, lower reciprocity towards their partner in socially anxious individuals was not only associated with current relationship satisfaction and commitment in both partners, but also predicted termination of the relationship and reported decline in relationship quality by the partner six months later.

Recent studies have tried to advance the understanding of interpersonal impairment in social anxiety in more controlled experimental settings by using behavioral economic tasks such as the Trust Game (e.g., Sripada et al., 2009) and the Prisoner's Dilemma Game (e.g., Rodebaugh, Klein, Yarkoni, & Langer, 2011). In these paradigms, each player must make a choice whether or not to cooperate with other individuals by sharing their own monetary resources; each player's individual payoff is then determined depending on their own and the other players' decisions.

For instance, applying a multi-round version of the Trust Game, one study with functional magnetic resonance imaging (fMRI) revealed that brain activation patterns differed between SAD patients and matched healthy controls when making the decision to trust or not, suggesting altered neural processing in SAD patients during this social decision-making task (Sripada et al., 2009). Specifically, whereas healthy participants showed higher activation in the medial prefrontal cortex – a brain region that is known to be involved in mentalizing (reviewed in Frith & Frith, 2006) – when they believed that they were interacting with another person as opposed to a computer, no such difference was found in SAD patients. Furthermore, another study that also applied a multi-round version of the Trust Game together with fMRI demonstrated that healthy participants showed a significantly stronger activation in the ventral and lateral region of the striatum – a brain region that has been shown to be important for reward processing (reviewed in Schultz, 2000) – in receipt of reciprocity when they were interacting with a partner who had been cooperative in earlier rounds of the game compared to when their interaction partner had frequently defected, whereas this modulation of striatal activation by partner reputation was absent in SAD patients (Sripada, Angstadt, Liberzon, McCabe, & Phan, 2013). However, no significant behavioral differences in interpersonal trust between SAD patients and healthy controls were found in either study, maybe partly due to the relatively small sample sizes in both studies ($n = 26$ and $n = 35$ per group, respectively). Alternatively, the result might indicate that patients with SAD activate different neural

networks and perhaps employ different cognitive-motivational strategies when making decisions on trustful investments compared to non-anxious individuals.

Another series of studies used a modified version of the Prisoner's Dilemma that simulated a repeated interaction with a friend in a series of studies to test whether generosity / giving in close personal relationships may be constricted in socially anxious individuals (Rodebaugh, Heimberg, Taylor, & Lenze, 2016; Rodebaugh, Klein, Yarkoni, & Langer, 2011; Rodebaugh et al., 2013). Evidence provided by these studies was mixed: Social anxiety was found to be indirectly related to giving through participants' self-reported attitudes towards friendship in an undergraduate student sample (Rodebaugh et al., 2011), and diagnosed SAD patients showed significantly reduced giving compared to healthy controls in another study (Rodebaugh et al., 2013), although the latter effect failed to replicate in two further investigations (Rodebaugh et al., 2016). Results suggested, however, that SAD patients with more severe social anxiety symptoms raised their stakes more gradually throughout the game than SAD patients with less severe symptoms, potentially indicating that severity of social anxiety is associated with a lack of interpersonal responsiveness (rather than a general constraint in generosity; Rodebaugh et al., 2016). Moreover, a vindictive interpersonal style was shown to predict lower initial giving across patient groups (SAD and general anxiety disorder) and healthy control participants (Rodebaugh et al., 2016).

The present investigation

In the current study, we set out to examine whether individuals who are particularly high compared to low in social anxiety differ in giving towards strangers, applying an incentivized, one-shot anonymous Trust Game in both player roles (see Figure 1). In so doing, we aimed to conceptually replicate and extend the existing evidence with regards to four points. First, we confronted individuals who were high versus low in social anxiety with real interaction partners and their decisions had real life financial consequences for both parties – contrary to

the prior studies of Rodebaugh et al. (2011, 2013, 2016), where participants were aware that they were not actually playing with another individual but a simulated interaction partner. Second, we observed participants in interactions with strangers while prior studies primarily looked at interactions with friends (Rodebaugh et al. (2013, 2016). Third, we assessed interpersonal constraint using the Trust Game in both player roles, which allowed us to compare the effects of social anxiety on two different facets of giving (trustful initial giving vs. reciprocation). Fourth, we asked for a linkage between the economic game behaviors and self-reported measures of general interpersonal functioning, attachment style and perceived social support, again to inform about the real-life implications of the observed behavioral probes; these two particular measures have been selected as they are known to be substantially associated with level of impairment in social anxiety and to be crucial for life satisfaction and well-being more generally (e.g., Eng, Heimberg, Hart, Schneier, & Liebowitz, 2001; House et al., 1988; Steptoe et al., 2013). For control purposes, we additionally measured nonsocial risk-taking in an incentivized task. This allowed us to compare nonsocial risk-taking preferences between groups, thereby addressing the specificity of the expected outcomes in the Trust Game for the social domain.

In investigating extreme groups of the normal population (as opposed to clinically diagnosed patients in comparison with healthy controls) we minimized the potentially confounding effects that the diagnosis of SAD itself might have on participants' behaviors and self-reports, be it in the form of a self-fulfilling prophecy or other reactive influences. At the same time, investigating extreme groups increases test power compared to examining individuals across the whole continuum of social anxiety scores, thereby improving cost-efficiency when available funds are limited (Preacher, Rucker, MacCallum, & Nicewander, 2005).

Building on previous evidence, we hypothesized that both trustful and reciprocal giving would be decreased in individuals high in social anxiety, whereas we did not expect to find a

difference in nonsocial risk-taking between groups. In accordance with prior observations that apparent effects of SAD on giving may primarily be a result of interpersonal characteristics / impairments (Rodebaugh et al., 2016) and that constricted positive reciprocity in socially anxious individuals predicted less favorable relationship outcomes (Kashdan et al., 2013; Meleshko & Alden, 1993), we furthermore hypothesized that cooperation towards strangers in the economic game situation would be positively associated with perceived social support and negatively associated with insecure attachment.

Methods

Participants

A total sample of $N = 790$ undergraduate students at Goethe University Frankfurt from various disciplines (excluding Psychology) were screened with the Social Phobia Inventory (SPIN; Connor et al., 2000; German version: Stangier & Steffens, 2002); the internal consistency of this measure was $\alpha = 0.93$. Individuals who scored either in the upper (SPIN score ≥ 19) or lower 25th percentile (SPIN score ≤ 8) were contacted via email and invited to participate in the main study, resulting in a final sample of $N = 127$ participants (81 females) who agreed to come to the laboratory for the group testing. The choice of whether or not to participate in the main test session remained fully voluntary upon invitation to the test session (as it had been clearly stated in the consent form for the screening); the response rate was substantially higher for individuals high in social anxiety (high SA; $n = 85$) compared to individuals low in social anxiety (low SA; $n = 42$). As expected, high SA participants scored significantly higher than low SA participants on the Social Phobia Scale (SPS) and the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), whereas age and gender distributions did not differ significantly between the two groups (for detailed information about participant characteristics, see Table 1). Data on ethnicity were not recorded; however, the large majority of students ($> 95\%$) at Goethe University Frankfurt are Caucasian.

Participation in the main study took approximately 30 minutes and was rewarded with a financial compensation of €5 plus the individual earnings from the economic games. Written informed consent was provided by all participants. The study protocol was approved by the faculty's ethics review board.

Measures and procedures

Groups of four to eight participants were scheduled for each test session, which consisted of the following measures, always completed in the presented order:

Trust Game. All participants played the Trust Game twice, first in the investor role ('trustful giving') and then in the trustee role ('reciprocal giving'; see Figure 1 for a schematic depiction of the Trust Game). Both indicators show satisfactory retest-reliability, and correlate highly with other economic games measuring cooperation (Peysakhovich, Nowak, & Rand, 2014) that in turn correlate with self-reported cooperation values (Mischkowski & Glöckner, 2016; Peysakhovich et al., 2014) and prosocial personality traits (Thielmann & Hilbig, 2015; Zettler, Hilbig, & Heydasch, 2013). Some research even points to a genetic component specifically for both trustful and reciprocal giving as shown in the Trust Game (Cesarini et al., 2008).

The Trust Game was played in a paper-pencil version, with written instructions adapted from Cesarini and colleagues (2008). In both rounds, players started with an initial endowment of €5 each. The investor could choose to transfer between €0 and €5 (only integers) to the trustee. The transferred amount was tripled by the experimenter and credited to the trustee.

In accordance with previous research (e.g., Cesarini et al., 2008; Peysakhovich et al., 2014), we used the strategy method to measure reciprocal giving, that is, trustees indicated how much money they would send back to the investor for every possible amount the investor could have sent to them; prior studies suggest that results obtained with the strategy method

are generally comparable to results obtained with the direct response method, for which the trustee directly responds to the investor's offer (reviewed in Brandts & Charness, 2011).

After completion of the task, each participant was randomly and anonymously matched with two other participants from the same test session (one investor and one trustee) and all players were paid according to the payoff scheme for both player roles. No deception was used, so the participants were fully aware of the rules and payoff scheme of the Trust Game prior to making their decisions. None of the participants expressed any doubts about the interactive nature of the game.

Lottery Task. Potentially confounding effects of the participants' nonsocial risk preferences on their decisions in the Trust Game were assessed in a lottery task. In this task, participants could choose to invest any amount between €0 and €5 (only integers) in a lottery with a 50:50 chance to win (determined by a coin toss). If they won, the invested amount would be doubled by the experimenter and given back to the participant; if they lost, they would lose the invested money.

Attachment Style Questionnaire. The Attachment Style Questionnaire (ASQ; Feeney, Noller, & Hanrahan, 1994; German version: Hexel, 2004) is a self-report instrument for the assessment of adult attachment dimensions. It measures attachment style in social relationships in general (as opposed to attachment style in a specific relationship such as in a romantic couple). The ASQ consists of 40 Likert-type items (1 = *totally disagree* to 6 = *totally agree*), yielding five subscales. These subscales can be understood using the concepts of anxious attachment (i.e., the tendency to crave acceptance and to show vigilance to cues that signal possible rejection) and avoidant attachment (i.e., the propensity to show discomfort with closeness and to use avoidant strategies to regulate one's relationships). Need for approval, preoccupation with relationships and (low) confidence reflect anxious attachment; discomfort with intimacy and relationships as secondary reflect avoidant attachment; concurrent low levels in both anxious attachment and avoidant attachment are indicative of

secure attachment (e.g., DeWall et al., 2012). In accordance with prior research (e.g., DeWall et al., 2012), we used the higher order factors anxious attachment ($\alpha = .81$) and avoidant attachment ($\alpha = .81$) for analyses.

Social Support Questionnaire ('F-SozU K-22'). The F-SozU K-22 (Sommer & Fydrich, 1991) is a 22-item self-report instrument in German language for the assessment of social support. Its 22 Likert-type items (1 = *totally disagree* to 5 = *totally agree*) yield a total score, reflecting an individual's perceived level of social support. The measure showed high internal consistency in our sample ($\alpha = .90$).

Social Interaction Anxiety Scale. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998; German version: Stangier et al., 1999) is a 20-item self-report measure to assess the presence and severity of social anxiety symptoms in social interaction situations such as meeting new people at a party, employing a 5-point Likert-type scale (0 = *not at all* to 4 = *extremely*). The internal consistency of the measure in our sample was good ($\alpha = .84$).

Social Phobia Scale. The Social Phobia Scale (SPS; Mattick & Clarke, 1998; German version: Stangier et al., 1999) is a 17-item self-report measure to assess the presence and severity of social anxiety symptoms in social situations that do not have a direct interpersonal interaction component such as eating in the presence of others, employing a 5-point Likert-type scale (0 = *not at all* to 4 = *extremely*). The measure showed an internal consistency of $\alpha = .91$ in our sample.

After completion of all measures,¹ participants were paid, debriefed about the detailed aims of the study, and thanked for their efforts.

Statistical analysis

¹ In addition, we obtained saliva samples from participants for genotyping of a common single nucleotide polymorphism in the oxytocin receptor gene (rs53576) for an unrelated research question; details on this measure can be obtained upon request from the corresponding author.

Statistical analyses were performed on the amount that the investor transferred to the trustee (interpreted as measure of trustful giving) and on the amount that the trustee decided to return in response to the maximum trust level (interpreted as measure of reciprocal giving), and investment in the lottery task (interpreted as nonsocial risk-taking), in accordance with the literature (Boksem et al., 2013).

Normality assumptions were violated for trustful giving, reciprocal giving, and nonsocial risk-taking, so non-parametric Mann–Whitney U tests were used to compare these measures between the two anxiety groups (high and low SA).

To examine possible bivariate associations between Trust Game and lottery task indices, social anxiety symptoms, and perceived social support and attachment style, we furthermore computed bivariate Spearman rank-order correlations between these measures within each subsample (high and low SA). We used an alpha level of .05 for all statistical tests.

Results

Trustful giving

The Mann–Whitney U test between the two social anxiety groups did not reveal a significant difference in trustful giving between the high SA ($Mdn = 3.0$; $IQR = 2.0–4.0$) and the low SA group ($Mdn = 4.0$; $IQR = 2.0–5.0$), $p = .35$. As can be seen in Table 2, trustful giving was also not significantly correlated with any of the social anxiety symptom or interpersonal measures in either subsample.

Reciprocal giving

The Mann–Whitney U test comparing reciprocal giving between social anxiety groups revealed a significant difference, with lower giving in the high SA ($Mdn = 6.0$; $IQR = 4.5–9.0$) compared to the low SA group ($Mdn = 10.0$; $IQR = 5.0–10.0$), $p = .009$. As depicted in Table 2, reciprocal giving furthermore showed a positive association with perceived social

support within each subsample; this association was significant for the high SA group, $\rho(85) = .30, p = .015$, and marginally significant for the low SA group, $\rho(42) = .26, p = .052$.

Furthermore, reciprocal giving was significantly negatively correlated with anxious attachment (but not avoidant attachment) in the high SA group, $\rho(85) = -.29, p = .007$, and with avoidant attachment (but not anxious attachment) in the low SA group, $\rho(42) = -.46, p = .002$.

Nonsocial risk-taking

Nonsocial risk-taking, as measured in the lottery task, did not differ significantly between the high SA ($Mdn = 3.0; IQR = 2.0-4.0$) and the low SA group ($Mdn = 2.5; IQR = 2.0-4.0$), $p = .71$, when compared in a Whitney U test. However, nonsocial risk-taking was significantly negatively correlated with perceived social support in both the high SA, $\rho(85) = -.25, p = .024$, and the low SA group, $\rho(42) = -.33, p = .032$, and positively associated with the SIAS score in the high SA group only, $\rho(85) = .26, p = .016$ (Table 2).

Discussion

In the present study, we investigated whether trustful and reciprocal giving towards strangers, as assessed by decisions in an anonymous one-shot Trust Game, differ between individuals with high compared to low levels of social anxiety in a subclinical sample. In line with our expectations, we found that reciprocal giving was decreased in highly socially anxious individuals, but, contrary to our predictions, trustful giving was not. Notably, we furthermore found a significant positive correlation between reciprocal giving and perceived social support within high SA individuals and a marginally significant positive correlation between the same measures within low SA individuals, with comparable effect sizes. Moreover, anxious attachment was significantly negatively associated with reciprocal giving

within high SA individuals only, whereas avoidant attachment was significantly negatively associated with reciprocal giving within low SA individuals only.

The significantly reduced reciprocal behavior we observed in highly socially anxious individuals is generally consistent with prior evidence on constraints in prosocial giving related to social anxiety (Rodebaugh et al., 2013). However, our failure to find consistent differences in trustful giving between individuals high and low in social anxiety questions these authors' original assumption that giving is generally constricted in individuals with maladaptive social anxiety (see Rodebaugh et al., 2011, 2013). Instead, and in line with recent findings from the same lab, (Rodebaugh et al., 2016), our pattern of results points to constricted prosocial giving in highly socially anxious individuals specifically in situations that require a *reaction* to another individual's prosocial investment, maybe partly because they perceive this act as less gratifying (cf. Sripada et al., 2013). This interpretation is consistent with previous reports on alterations in reactive smiling (Heery & Kring, 2007), reciprocal self-disclosure (Meleshko & Alden, 1993), and emotional reactions to friendly giving by others (Fernandez & Rodebaugh, 2011) in individuals with social anxiety. However, in contrast to these studies, where responsiveness towards specific individuals had been measured (a specific conversation partner: Heery & Kring, 2007; a romantic partner: Meleshko & Alden, 1993; a friend: Fernandez & Rodebaugh, 2011; Rodebaugh et al., 2011, 2013, 2016), we measured reciprocal giving towards anonymous strangers, without knowledge of the specific amount of money these strangers had transferred to them; therefore our results may point to a more generalized tendency for constricted reciprocity in socially anxious individuals than has been previously shown. Importantly, the constraint has not been observed in the nonsocial lottery task, suggesting that it is not a function of anxiety *per se*, but relates to the social nature of the reciprocity task.

The observed correlations between reciprocal giving and both attachment style and perceived social support in combination with the differences in these measures between the

two SA groups correspond with previous findings indicating that constricted giving in SAD patients may be a secondary result of maladaptive interpersonal behavioral styles as opposed to the social anxiety itself (cf. Rodebaugh et al., 2016) and therefore support our notion that positive reciprocity towards strangers tends to be shown preferentially against the background of a secure attachment style and healthy social bonds. Alternatively (or additionally), together with previous evidence showing that decreased reciprocity in socially anxious individuals is predictive of adverse interpersonal relationship outcomes (Kashdan et al., 2013; Meleshko & Alden, 1993), these findings may suggest that a failure to show positive reciprocity in socially anxious individuals may hinder the establishment of healthy social bonds, potentially leading to a vicious circle. Notably, an interesting dissociation between the two groups was found: High SA participants showed reduced reciprocal giving in the context of anxious attachment, while low SA participants did so in the context of avoidant attachment. This dissociation should be replicated in an independent sample, but tentatively suggests that anxiety characterizes both, general relationships as well as sporadic reactions to strangers, in the high SA group, but not in the low SA group. In a sense, the low SA group indicates that avoidant attachment style comes with the capability to reciprocate less in the absence of social anxiety.

Generally, the correlations show that Trust Game behavior shown in the lab is predictive for perceptions of social relations outside of the lab. When interpreting these effects, it is however noteworthy that our cross-sectional design without an experimental manipulation of conditions prevents from drawing any directional or even causal conclusions about the observed relationships. Future studies may aim at clarifying the direction of the observed associations between social anxiety, reciprocal giving, attachment style, and social support in longitudinal investigations, ideally combined with a double-blind, placebo-controlled reciprocity training intervention. This line of research may contribute to the development of new treatment and prevention programs to reduce the interpersonal impairments in socially anxious individuals.

In contrast to most prior studies examining relationships between social anxiety and interpersonal constraints (e.g., Rodebaugh et al., 2011, 2013, 2016), the present investigation did not solely rely on self-report or simulated interactions, but observed actual giving behavior towards others in a real economic context. This extension is important as multiple studies – including investigations examining cooperation in the Prisoner’s Dilemma game – have demonstrated considerable discrepancies between self-reported / hypothetical and actual behaviors (e.g., Epley & Dunning, 2000) – whether this effect may be due to a desire to convey a positive image of oneself to others, self-serving biases, an inability to access the affective experience that occurs during real-life situations, or a combination of these and other factors (e.g., Epley & Dunning, 2000; Teper, Inzlicht, & Page-Gould, 2011). Especially since processing of self-referential information is known to be substantially altered in SAD (for a review, see Spurr & Stopa, 2002), an actual behavioral measure is required.

The present investigation furthermore extends previous findings in showing that constricted interpersonal responsiveness in maladaptive social anxiety is not limited to behavior in close social relationships such as friendships, as shown in previous studies (Rodebaugh et al., 2011, 2016), but generalizes to behavior towards strangers. This finding is consistent with prior evidence derived from self-report (e.g., Fernandez & Rodebaugh, 2011) and observation of conversations of socially anxious individuals with strangers (e.g., Meleshko & Alden, 1993), but has, to the best of our knowledge, not yet been demonstrated in the more standardized setting of a behavioral economics task.

Additionally, our study demonstrates that findings on giving in social anxiety are not restricted to the specific game structure of the iterated Prisoner’s Dilemma used by Rodebaugh and colleagues (2011, 2013, 2016), but can be generalized to behavior in another commonly applied behavioral economics task – a one-shot Trust Game. This game differs from an iterated Prisoner’s Dilemma at least in two important aspects: First, by having two different player roles, the Trust Game allows to differentiate cleanly between proactive and

reactive giving within the same paradigm: While the investor's decision on how much money to transfer to the other player reflects proactive giving (requiring trust), the trustee's decision on how much money to return represents reactive giving without any strategic or trust component. In the Prisoner's Dilemma on the other hand, cooperation in the first round is mainly based on trust, whereas decisions in all other rounds reflect a combination of trust (that the other player cooperates as well) and reciprocity (in response to the other player's previous moves), making it impossible to isolate the reciprocity component. Second, individuals in our paradigm interacted only once with every partner instead of repeatedly. While this prevented us from comparing the course of actions and reactions across repeated trials, it enabled us to strictly keep apart the proactive (investor) and reactive (trustee) aspects of the decision to give – in contrast to decisions in repeated interactions, which always constitute a combination of reactive and proactive facets as well as an additional strategic component. Crucially, by covering different facets of giving / cooperative behavior than previous investigations, our study renders it possible to compare the paradigms to gain a better understanding of what social function components are indeed altered in highly socially anxious individuals and what others remain intact.

More generally, our study adds to the increasing literature demonstrating the potential of behavioral economics tasks for the systematic assessment and quantification of interpersonal impairments in psychiatric disorders and other conditions relevant to mental health and well-being (for more detailed discussions, see e.g., King-Casas & Chiu, 2012; Sharp, Monterosso, & Montague, 2012). On the long run, the use of behavioral economics paradigms in clinical psychological research may not only provide us with an opportunity to better understand those conditions and their associated social impairments, but also to identify new treatment targets for prevention and therapy.

Limitations

Some methodological limitations should be taken into account when interpreting the present findings, including the fact that our findings rely on a subclinical, undergraduate student sample as opposed to clinically diagnosed SAD patients, thereby preventing us from drawing strong conclusions about clinical levels of social anxiety. It should be noted though that empirical evidence supports the conceptualization of social anxiety as a continuum, with diagnosable SAD reflecting particularly high scores along this dimension rather than a discrete category, and that dimensional severity ratings of social anxiety were demonstrated to even outperform categorical *DSM-IV* diagnosis for SAD in predicting clinically relevant outcomes and life events (Ruscio, 2010). Notably, response rates upon invitation to the main test session were higher in the high compared to the low SA group, speculatively out of a higher commitment and / or fear to disappoint expectations in the high SA group.

In a similar vein, we did not measure symptoms of other psychiatric disorders that frequently co-occur with social anxiety and that are also associated with interpersonal impairments. In consequence, we cannot fully rule out that the presented findings may partly be explained by potential comorbidities such as other anxiety or mood disorders. Notably, however, prior studies suggest that individuals with a history of bipolar disorder or major depressive disorder (current or in remission) in fact share money with strangers more compared to healthy non-psychiatric controls; this is true for different economic paradigms including the Trust Game (Destoop, Schrijvers, De Grave, Sabbe, & De Bruijn, 2012; Ong, Zaki, & Gruber, 2017); this renders it unlikely that comorbid depressive symptoms account for the observed results. Nevertheless, future research should systematically investigate Trust Game behaviour across psychopathologies.

Moreover, our participants played the Trust Game with the strategy method, that is, when they were in the trustee role, they decided for every amount that the investor could give to them how much to transfer back – without any knowledge about the actual amount that the investor would send to them. While this procedure undoubtedly decreased the interactive

component of the game to a certain degree, it allowed us to compare the trustees' decisions in response to the maximum trust level in all participants without having to deceive them. Prior studies have generally confirmed the sensitivity of the strategy method, albeit with some limitations (reviewed in Brandts & Charness, 2011), and in agreement with these authors, we are not aware of any example where a treatment effect that was observed using the strategy method could not be replicated with the direct response method. In addition, the behavioral differences between high SA and low SA individuals were specific to reciprocal giving in the trust game, whereas no effect was found for either trustful giving or nonsocial risk-taking; therefore, we suggest that our observed pattern of results cannot be explained in terms of more general differences in response strategy between the two groups.

Conclusions

In conclusion, the present findings suggest that reciprocal (but not trustful) giving during a social interaction with a stranger is decreased in individuals high in social anxiety, pointing to a constraint in responsiveness. Both social anxiety symptoms and reciprocal giving were furthermore associated with two self-report measures of real-life interpersonal impairment, perceived levels of social support and attachment style. Future studies may aim at clarifying the direction of the observed associations between social anxiety, reciprocal giving, and real-life social functioning. This line of research may contribute to the development of new treatment and prevention programs to reduce the interpersonal impairments often associated with problematic levels of social anxiety.

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TablesTable 1. *Participant characteristics.*

	High SA (<i>n</i> = 85)	Low SA (<i>n</i> = 42)	<i>p</i>
Demographics			
Women (<i>n</i> , %)	57 (67%)	24 (57%)	.33
Age (<i>Mdn</i> , IQR)	21.0 (20.0–23.0)	21.0 (20.0–23.0)	.35
Social anxiety measures			
SPIN (<i>Mdn</i> , IQR)	26.0 (24.5–31.0)	6.0 (5.0–7.0)	<.001
SIAS (<i>Mdn</i> , IQR)	28.0 (21.0–36.5)	9.0 (6.0–11.0)	<.001
SPS (<i>Mdn</i> , IQR)	20.0 (12.0–30.5)	4.0 (2.0–7.3)	<.001
Interpersonal measures			
F-SozU (<i>Mdn</i> , IQR)	4.1 (3.7–4.4)	4.5 (4.0–4.7)	<.001
ASQ-Anxiety (<i>Mdn</i> , IQR)	3.5 (3.2–3.9)	2.4 (2.3–2.9)	<.001
ASQ-Avoidance (<i>Mdn</i> , IQR)	3.1 (2.6–3.5)	2.5 (2.1–2.8)	<.001

Note: High SA = high social anxiety group; Low SA = low social anxiety group; SPIN = Social Phobia Inventory; SIAS = Social Interaction Anxiety Scale; SPS = Social Phobia Scale; F-SozU = Social Support Questionnaire (*‘Fragebogen zur sozialen Unterstützung’*); ASQ = Attachment Style Questionnaire; ASQ-Anxiety = ASQ factor anxious attachment; ASQ-Avoidance = ASQ factor avoidant attachment. For categorical variables, values depict the number of participants, the percentage (of those responding, in parentheses) and *p*-values for a Chi-square test comparing the two groups. For non-categorical variables, values depict the median (*Mdn*), inter-quartile range (IQR: 25th–75th percentile; in parentheses) and *p*-values for a non-parametric Mann–Whitney U test comparing the two anxiety groups.

Table 2. *Bivariate correlations between Trust Game indices, lottery task, interpersonal, and symptom measures within subsamples.*

	Trust	Reciproc.	Lottery	F-SozU	ASQ-Anx.	ASQ-Avoid.	SIAS	SPS
High SA								
Reciproc.	.38 ^{***}							
Lottery	.24 [*]	.23 [*]						
F-SozU	-.04	.26 [*]	-.25 [*]					
ASQ-Anx.	-.11	-.29 ^{**}	.18 [†]	-.43 ^{***}				
ASQ-Avoid.	.08	-.13	.14	-.55 ^{***}	.28 ^{**}			
SIAS	.16	-.03	.26 ^{**}	-.34 ^{**}	.54 ^{***}	.35 ^{**}		
SPS	.15	.04	.17	-.24 [*]	.40 ^{***}	.27 [*]	.67 ^{***}	
SPIN	-.01	-.26 [*]	-.02	-.34 ^{***}	.40 ^{***}	.24 [*]	.46 ^{***}	.25 [*]
Low SA								
Reciproc.	.42 ^{**}							
Lottery	.26 [†]	-.02						
F-SozU	-.001	.30 [†]	-.33 [*]					
ASQ-Anx.	-.003	-.16	.10	-.42 ^{**}				
ASQ-Avoid.	-.15	-.46 ^{**}	.17	-.39 [*]	.05			
SIAS	-.07	-.27 [†]	-.05	-.45 ^{**}	.53 ^{***}	.06		
SPS	-.26 [†]	-.20	.14	-.19	.34 [*]	-.13	.58 ^{***}	
SPIN	-.13	.02	-.19	-.01	.14	.09	.15	.19

Note: High SA = high social anxiety group; Low SA = low social anxiety group; Trust = Investor giving in the Trust Game; Reciproc. = Trustee giving in the Trust Game (in response to the maximum trust level); F-SozU = Social Support Questionnaire (*‘Fragebogen zur sozialen*

Unterstützung’); ASQ = Attachment Style Questionnaire; ASQ-Anx. = ASQ factor anxious attachment; ASQ-Avoid. = ASQ factor avoidant attachment; SIAS = Social Interaction Anxiety Scale; SPS = Social Phobia Scale; SPIN = Social Phobia Inventory. Due to non-normality of Trust Game indices, Spearman correlations are displayed.

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

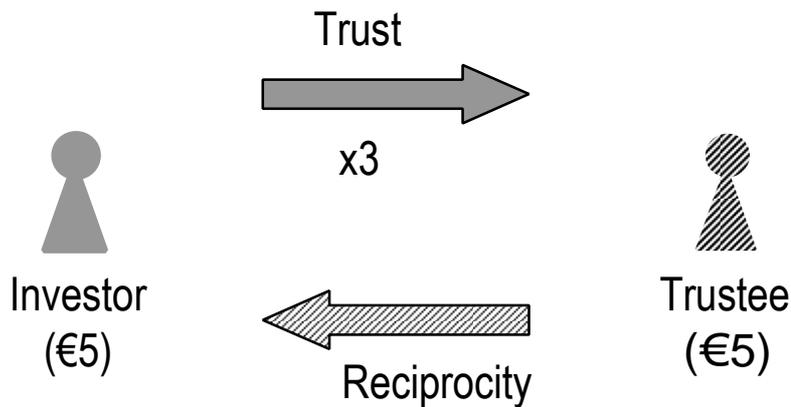


Figure 1. *Schematic depiction of the Trust Game.* Both the Investor (gray) and the Trustee (dashed) start with an initial endowment of €5. The Investor can decide to transfer any amount between €0-5 (“Trust”; only integers) to the Trustee; this amount is tripled by the experimenter and credited to the Trustee who then has the initial endowment plus the tripled investment by the Investor at his / her disposal (i.e., €5 + 3 x Trust). The Trustee decides for any possible amount (€0-5) that he/ she might get from the Investor, how much he / she would like to return to the Investor (“Reciprocity”; only integers). This amount is *not* tripled by the experimenter. Each participant is randomly and anonymously paired with another participant from the same test session (once in the Investor, once in the Trustee role) and paid in accordance with the rules described here.

Highlights

- Giving behavior in social anxiety was investigated in an incentivized Trust Game.
- Individuals with high social anxiety showed reduced reciprocal giving.
- Interpersonal trust did not differ between social anxiety groups.
- Results provide evidence for constrained responsiveness in social anxiety.

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ACCEPTED MANUSCRIPT