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Clarifying the Behavioral Economics of Social Anxiety Disorder: Effects of Interpersonal Problems and Symptom Severity on Generosity

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Abstract

Social anxiety disorder is associated with lower interpersonal warmth, possibly explaining its associated interpersonal impairment. Across two samples, we attempted to replicate previous findings that the disorder's constraint of interpersonal warmth can be detected via behavioral economic tasks. We also tested the test-retest stability of task indices. Results indicated that factors associated with social anxiety disorder (and not the disorder itself), such as the severity of social anxiety and more extreme interpersonal problems, lead to less generous behavior on the economic task examined. Results were clearest regarding fine-grained indices derived from latent trajectories. Unexpectedly, the combination of generalized anxiety disorder and higher depression also restricted generosity. Two of three indices showed acceptable test-retest stability. Maladaptive giving behavior may be a treatment target to improve interpersonal functioning in psychiatric disorders; therefore, future work should more precisely characterize behavioral economic tasks, including basic psychometric work (i.e., tests of reliability and validity).

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Authorship

T.L.R. designed the studies (with input from R.G.H. and E.J. L.), helped supervise Study 1 data collection, conducted final data analyses, and wrote the majority of the manuscript. R.G.H. had early input into the manuscript and provided oversight of elements of Study 2. K.P.T. supervised Study 2 with some input from T.L.R., collected most of the data, and assembled the initial dataset. E.J.L. was the primary supervisor for Study 1 data collection, as well as participant screening and diagnosis. All authors contributed to the current manuscript in regard to writing, editing, and guidance of the overall form of the manuscript, including critical revisions. All authors approved the final form of the manuscript.

Keywords

Social anxiety; behavioral economics; psychometrics; test-retest stability; generalized anxiety disorder; interpersonal processes

Abundant evidence suggests that social anxiety disorder (SAD) impairs relationships (Aderka et al., 2012; Schneier et al., 1994; Whisman, 2007). This impairment has clear public health implications because social isolation and low perceived social support have a strong impact on health outcomes, including depression (e.g., Thompson, Rodebaugh, Perez, Schootman, & Jeffe, 2013) and mortality (e.g., Steptoe, Shankar, Demakakos, & Wardle, 2013). A series of laboratory studies suggests that the interpersonal impairment conferred by SAD may arise in part from a general lack of positive, warm reactions to other people (see, e.g., Alden & Taylor, 2010, for a review). Indeed, this interpretation was supported recently by findings suggesting that social anxiety either indirectly or directly constrained giving behavior on prisoner's dilemma tasks that simulated interactions with friends (Rodebaugh, Klein, Yarkoni, & Langer, 2011; Rodebaugh et al., 2013).

The prisoner's dilemma is a commonly-used type of behavioral economic task in which participants must choose to cooperate or not (Axelrod & Hamilton, 1981). In studies reported by Rodebaugh, Klein, et al. (2011) and Rodebaugh et al. (2013), the number of tokens or coins shared with a friend during the task was interpreted as an indicator of warmth. Investigation of interpersonal processes via simulations such as the prisoner's dilemma is appealing in part because similar tasks have been used in a wide variety of basic science and neuroscience applications. Integrating the study of interpersonal aspects of SAD with behavioral economics research could be useful in generating new hypotheses regarding SAD, as well as developing new assessment and treatment methods. However, before examining previous research regarding SAD in more detail, it will be useful to set up some broader issues regarding behavioral economic tasks.

The Promise and Limits of Behavioral Economic Tasks

The issues at hand are thrown into sharpest relief by concentrating on neuroeconomics. We should be quite clear that the current study does not focus on neuroeconomics, but we nevertheless believe that discussion of that field is useful here (in part because our studies could be taken as a precursor to neuroeconomic work). *Neuroeconomics*, which essentially refers to the use of behavioral economics tasks in functional neuroimaging, has been described as holding considerable promise for progress in the understanding of mental disorders (Kishida, King-Casas, & Montague, 2010; Sharp, Monterosso, & Montague, 2012). Such studies potentially reveal the neural mechanisms associated with economic decision making and might have considerable impact in understanding human behavior. Indeed, early neuroeconomic findings regarding SAD suggest that the tools of that field may yield new insights into the disorder and its interpersonal features. For example, Sripada and colleagues (2013) examined neural response to a trust game in which participants with and without SAD decided whether or not to invest in players with varied trustworthiness. Participants without SAD showed greater ventral striatum responses to trustworthy (vs. untrustworthy) partners, whereas participants with SAD did not show this differential

activation. The implication is that participants with SAD may not feel as rewarded (in comparison to people without SAD) by interactions with trustworthy people. Neuroeconomics seems particularly well-suited to detecting and explicating such phenomena.

Neuroeconomic findings could be greatly enhanced by better understanding of the correlates of economic games. Economic tasks are commonly interpreted as having relevance to behavior outside the laboratory, such that, for example, cooperation in a behavioral economics task is interpreted as relevant to cooperation between individuals (and even nations) in the real world (Axelrod & Hamilton, 1981; Gintis, Bowles, Boyd, & Fehr, 2005; Tazelaar, Van Lange, & Ouwerkerk, 2004; Van Lange et al., 2002). There are some limited findings that support such inference (Majolo et al., 2006; Saslow et al., 2012), but overall surprisingly little direct evidence has been marshalled demonstrating that tendencies on behavioral economic tasks have links to behavior outside the laboratory. Establishment of such links would greatly support inference. Even such basic issues as whether behavior on such tasks is stable across time have received no attention of which we are aware. Findings that individual differences correlate with behavior on such tasks are similarly difficult to find in the literature. More specifically in the case of SAD, it is essential to determine whether SAD itself or some correlate of SAD produces behavior on or reactions to economic tasks. The need to address these questions is, in our opinion, not limited to SAD, although that disorder is our focus here.

A Closer Look at SAD and the Prisoner's Dilemma: Effects of Disorder or Correlates?

In an initial study regarding social anxiety and a prisoner's dilemma task, the flexible iterated prisoner's dilemma (FIPD), Rodebaugh and colleagues found little indication of a direct effect of social anxiety on giving or cooperation; instead, an indirect effect of social anxiety was described, through a rating of attitudes toward friendship (Rodebaugh, Klein, et al., 2011). Unfortunately, their use of cross-sectional data makes inferences regarding indirect effects of questionable utility (Cole & Maxwell, 2003; Maxwell & Cole, 2007). In a later study, Rodebaugh and colleagues found that participants with the generalized subtype of SAD gave less to simulated friends than did normal controls (Rodebaugh et al., 2013). However, closer examination revealed that giving behavior correlated just as much or more highly with self-report ratings related to friendship quality, interpersonal coldness, and severity of social anxiety as it did with diagnostic group. Such findings speak well of the validity of the FIPD task but suggest caution regarding a diagnostic effect. Overall, then, findings suggest correlates of SAD, including social anxiety severity and interpersonal styles, may influence behavior on the FIPD more than SAD itself.

In interpreting these studies, it is important to note that social anxiety severity and impairment due to social anxiety are related, but not necessarily isomorphic constructs. The diagnosis of SAD itself depends on both constructs. Thus, effects apparently due to SAD may be due to social anxiety severity, impairment, or both. It seems plausible to us that severity of *problematic* social anxiety might lead to different behavior on a behavioral economic task than similarly severe social anxiety without impairment. For example, as

implied by reviews of the interpersonal literature (e.g., Alden & Taylor, 2010), constrained warmth might be a defensive strategy adopted due to concerns about one's ability to have positive interactions with others (e.g., due to one's social anxiety). Severity of social anxiety thus might only relate to constrained warmth for people who have experienced impairment due to social anxiety and have thus adopted a strategy of constrained interpersonal behavior. In contrast, moderately high social anxiety that does not cause impairment might have little or no effects on constraint of behavior on the task.

The results of the previous studies by Rodebaugh and colleagues (2011, 2013) are completely consistent with this interpretation. In their first study, which examined the entire range of social anxiety in an unselected student sample, social anxiety showed no direct effect on giving behavior (Rodebaugh et al., 2011). Their second study compared participants with relatively severe SAD to participants without SAD who also scored below a cut-off for social anxiety severity. That second study demonstrated an apparent diagnostic difference that could conflate severity and impairment (Rodebaugh et al., 2013). It would thus be ideal to examine both severity of social anxiety *and* impairment due to social anxiety in the same study, which was not done in either previous FIPD study. Here, we focus on diagnosis of SAD as a measure of impairment, although notably such a dichotomous indicator could be improved by measuring impairment on a dimensional scale.

It is also important to note that both previous studies examined an index of giving across multiple trials of a prisoner's dilemma task. Such an index is analogous to totaling behaviors across the length of an entire interaction: Many more fine-grained indices could be investigated. Several studies have examined either total giving on certain types of trials or results of a single trial, both of which are more fine-grained (e.g., McClure et al., 2007; McClure-Tone et al., 2011; Sripada et al., 2009, 2013), but most such studies have focused on dichotomous decisions, limiting the ability to observe changes in participant behavior over time, as well as the statistical power that can be obtained. The psychometric properties of such indices are therefore unlikely to be ideal. A promising approach that could be applied to the FIPD is a latent trajectory approach that would allow the decomposition of giving tendencies into individual baseline differences (intercept) and the tendency to increase or decrease giving over time (slope; see, e.g., Curran & Hussong, 2003). Importantly, however, such indices are subject to similar concerns about psychometrics, making some establishment of psychometric properties crucial.

In the current two studies, we examined the degree to which SAD or its severity, versus interpersonal correlates related to SAD, may be responsible for previously identified behavior on the FIPD. In both studies, we examined multiple indices derived from the FIPD, with Study 1 focusing primarily on the psychometrics of these indices. In Study 2 we examined multiple predictors of FIPD behavior to determine whether it is SAD itself or something correlated with SAD that produces such behavior. Notably, both studies were conducted outside the laboratory of the first author (i.e., where the Rodebaugh et al., 2011 and 2013 studies were conducted), making them each partially independent replications.

Study 1

Method

Participants—Participants included 24 participants with an anxiety disorder (of whom 14 had the generalized subtype of social anxiety disorder) and 25 participants without an anxiety disorder (*control participants*), recruited for a variety of lab tasks; findings regarding the FIPD have not been reported previously. We focus here on the participants with (a) mixed anxiety disorders, (b) the subset of those participants with generalized SAD, and (c) the control participants. Participants responded to posted advertisements and advertisements on web pages; participants without an anxiety disorder were also recruited from a volunteer registry. Participants with anxiety disorders were included if they met criteria for one of the following anxiety disorders: panic disorder with or without agoraphobia, agoraphobia with or without history of panic disorder, post-traumatic stress disorder (PTSD), SAD, or GAD. Participants with an anxiety disorder met criteria for current diagnoses of generalized SAD ($n = 14$), panic disorder and/or agoraphobia ($n = 14$), GAD (without exclusion due to current mood disorder: $n = 9$), obsessive compulsive disorder ($n = 6$), unipolar mood disorder (major depressive disorder or dysthymia, $n = 6$), and PTSD ($n = 4$); participants frequently had more than one anxiety disorder.

Control participants were included if they did not meet criteria for any anxiety disorder, past or present. None of the control participants met criteria for a current mood disorder (although mood disorder was not an exclusion criterion). Participants with or without anxiety disorders were excluded if they demonstrated: History of psychosis in any form, history of bipolar disorder, substance abuse or dependence in the past three months, chronic use of psychotropic medication that might affect attention (including antidepressants and benzodiazepines), or inability to speak or read English sufficiently well to complete the protocol. Participants who reported as-needed use of a benzodiazepine were included if they agreed not to take a dose of the medication on the day of each experimental session. These exclusions were required to prevent interference with study tasks, including those not reported here (e.g., attention tasks).

Participants did not differ across anxiety disorders (mixed) versus control or SAD versus control based on age, gender, years of education, or ethnicity (all associated $ps > .65$). Most of the sample were women ($n = 36$, 75%), and white ($n = 34$, 72%), with additional participants reporting their ethnicity as African American ($n = 9$, 19%), and Asian/Pacific Islander ($n = 3$, 6%) not included in the provided list ($n = 2$, 3%). Participants had a mean age of 38.46 years ($SD = 12.91$) and had, on the average, attended some college (years of education: $M = 14.70$, $SD = 2.80$). No other data were collected regarding socioeconomic status.

Measures—The following measures, among others not relevant to the current study, were administered.

For purposes of diagnosis, the Structured Clinical Interview for the DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1996) was employed: The SCID assesses current and lifetime anxiety and other psychiatric disorders and is typically considered a gold-standard

instrument for the assessment of Axis I psychopathology. Training for the interviewer (a research assistant) included watching training videos, observing SCIDs conducted by a trained interviewer (i.e., an experienced research clinician with a master's degree in social work), and conducting supervised SCIDs.

FIPD task—The same general FIPD program used by Rodebaugh, Klein and colleagues (2011) and Rodebaugh and colleagues (2013) was used here; we describe the program briefly and highlight procedures specific to this study. On each of 15 turns, participants were asked to divide 10 tokens between their partner and themselves. Decisions were made simultaneously (e.g., by both the participant and computer). Prior to and during decisions, participants were shown the results of the prior trial. Tokens given to the other player were worth 2 points *to each player*, and tokens kept were worth 3 points to the individual player only. Thus, the payoff matrix entailed a tension between the benefits of cooperating (up to 40 tokens per turn for complete cooperation between players) versus attempting to exploit the partner (up to 50 tokens if the partner completely cooperates but the participant does not cooperate at all).

Each participant played a single round of 15 turns per visit with the modified Raise the Stakes strategy described by Rodebaugh and colleagues (MRTS; Rodebaugh, Klein, et al., 2011, based on Roberts & Sherratt, 1998). The MRTS strategy was used as a plausibly friendly strategy that gave more than the participant had given on the last turn except when the participant undercut the other player, in which case the MRTS strategy gave the same amount that the participant gave on the last turn. Fifteen turns appeared ideal for producing a brief task that maximized potential validity, given that Rodebaugh and colleagues (2013) reported that the first 10 turns of their longer task showed the strongest signs of validity, although later turns continued to show the same effects overall. We thus elected to include 15 turns because we expected this to offer a good balance between validity and stability.

Participants' choices as well as computer responses were affected by simulated *communication errors* on 10% of trials causing anywhere between a 3-token decrease to a 3-token increase in intended donation within the bounds of 0 to 10 tokens. Information about errors affecting participant (but not computer) decisions was presented on the feedback screen. The errors were randomly generated, and it was intended that each participant would receive errors that were randomly distributed at the time of playing. The program did not execute this function properly and instead used the same turns for almost all trials (as it also did in Rodebaugh et al., 2013). However, neither participants nor experimenters were aware of the turns on which errors were most likely. The communication errors were thus effectively random, in addition to not representing a difference of procedure between this study and that of Rodebaugh et al. (2013). Because communication errors were systematically implemented for most participants after turns 4 and 6, latent trajectory models used only the first four turns (see *Latent trajectory models*).

Giving derived from the FIPD: Intended giving (ignoring communication errors) across the round at each visit was totaled and interpreted as a measure of giving. Slope and intercept of giving was also extracted from each visit using latent trajectory models.

Procedure—The protocol was approved by the Washington University institutional review board and was carried out in accordance with the provisions of the World Medical Association Declaration of Helsinki. The study was remotely directed by the first author, but conducted outside his lab (in the laboratory of EJL). Potential participants were first screened over the phone. Participants who appeared to meet criteria were invited to participate in the study. Participants came into the laboratory, provided informed consent, and completed the SCID, as conducted by a research assistant. Participants then completed self-report measures as well as a number of tasks not reported here.

Task visits: Participants who met full criteria based on the SCID were invited to return for Visit 1, in which they completed a number of tasks, including the FIPD. Participants were then oriented to the FIPD task, described as a social dilemma game. Participants were asked to act as if they were playing with a friend in general (e.g., not a specific friend). Although no attempt was made to hide the fact that they were playing a computer, the experimenter always referred to the other player as a friend. The pay-off matrix, including the relative benefit of sharing vs. keeping tokens was explained, as was the possibility of communication errors. The experimenter showed participants an example of how each player would receive points in a hypothetical turn in which both players shared 5 tokens and kept 5 tokens. Participants were intermittently asked to provide ratings, not used here, associated with the task. Those participants who returned for Visit 2 were asked to complete the task a second time under the same conditions. Participants were scheduled for Visit 2 no earlier than 11 days after Visit 1, with an average of 21.70 days between visits ($SD = 7.32$, Range = 11–45). Participants were compensated for their participation at an approximate rate of \$10 per hour (\$25 or more per visit), and typical participation involved 6 or more hours of participation across multiple visits. The FIPD task itself took fifteen minutes or less for each administration.

Latent trajectory models: Intercept and slope were estimated for the first four turns of the FIPD, with partly piecewise slope parameters specifying an initially linear trajectory (0, 1, 2) and allowing the model to freely estimate the third parameter due to expectations that the trajectory might begin as linear (e.g., as participants acclimate to the task) and then potentially become curvilinear (e.g., participants might potentially increase giving more rapidly or level off). Because of the modest sample size, we outputted plausible values for the intercepts and slopes for analysis using *t*-tests and regression. Plausible values are a means of extracting factor scores from models in Mplus using Bayesian methods (Muthén & Muthén, 1998–2012). We analyzed the median of the plausible values. We consulted the following fit indices to determine global model fit using the Satorra-Bentler chi-square (referred to as MLM in Mplus) prior to outputting factor scores using Bayesian estimation: (a) Tucker-Lewis incremental fit index (TLI) (Tucker & Lewis, 1973), (b) comparative fit index (CFI) (Bentler, 1990), (c) root mean square error of approximation (RMSEA) (Steiger & Lind, 1980), and (e) the standardized root mean square residual (SRMR) (Bentler, 1995; Jöreskog & Sörbom, 1981). To determine a good fit of the model to the data, the following values were used: TLI and CFI ranging from .95 to 1, RMSEA below 0.6 and SRMR below .08 (cf. Hu & Bentler, 1999).

Results

Latent trajectory models—For both visits, the model fit reasonably well once the slope variance was set to a small positive value (.01), because an initial model resulted in a nonsignificant negative slope variance (CFIs > .96, TLIs > .96, RMSEAs < .10, SRMRs < .06). For the first visit, the final slope parameter was 3.03, whereas for the second visit it was 1.87. When outputting plausible values for use as factor scores, the constraint on the slope variance was relaxed; with Bayesian estimation, the slope variance was appropriately small and positive without constraint.

Test-retest stability of giving index of FIPD—The stability of the giving total was high, whether measured by correlation coefficient ($r = .83, p < .001$) or the more restrictive intraclass correlation coefficient (two-way random) for the absolute agreement of the single measure (ICC = .82, $p < .001$). The stability of the intercept of giving was moderately high ($r = .65, p < .001$; ICC = .56, $p < .001$). Because these results indicate that both giving and the giving intercept at each time point serves as a good estimate of the index at the other time point, further analyses were conducted using the average of the indices across the two time periods (estimated by the index at a single time period for those participants who did not complete the measure twice, $n = 3$). In contrast, the slope parameter showed no indication of stability across time points ($r = .10, p = .505$; ICC = .10, $p = .265$). Slope was therefore examined at each visit.

Differences in giving—Contrary to hypothesis, there was no significant difference between participants in the SAD group and control participants (without anxiety disorders) regarding total giving; further, the effect was nonsignificantly in the opposite direction of participants with SAD giving more than control participants, $d = 0.52, t(37) = 1.63, p = .111$. The same pattern was evident when the average of intercepts was analyzed instead, $d = .55, t(37) = 1.60, p = .117$. Neither slope showed any indication of a diagnostic effect ($ps > .310$).

Discussion

The current results indicate that giving on the FIPD, as well as the intercept of giving across the first four turns, are reasonably stable over a period of approximately 2 to 3 weeks. This finding is important to rule out alternative explanations for any effects found for these indices (e.g., effects might otherwise be due to the amount of state anxiety evinced by an encounter with a new task). More broadly, we have not found any other demonstrations in the literature of test-retest stability for any behavioral economic task. In contrast, the slope parameter showed no indications of stability, which suggests that findings regarding slope from an initial administration may not generalize beyond an initial encounter with the task. Although this fact does not rule out the possibility that slope conveys important information, it does indicate that the information it conveys may change with experience of the FIPD task (or, potentially, similar tasks).

The other primary result from this study was a failure to replicate the diagnostic effect seen in Rodebaugh et al. (2013). Instead of SAD being associated with constrained giving on the task, participants with SAD trended toward giving more overall, as well as having higher

intercepts. Notably, the measures in this study did not allow examination of friendship quality and interpersonal problems, which served as better explanations of FIPD behavior in Rodebaugh et al.'s (2013) study than diagnostic differences. However, the hypothesis that SAD leads to reduced giving (either overall or in terms of the intercept) received no support in this study. As noted in the introduction, it remains possible that severity of social anxiety has an effect *within* participants with SAD, which we did not test here due to the small sample size, only sufficient for examining test-retest stability.

Several explanations for the apparent contradiction between this study and the conclusions of Rodebaugh et al. (2013) present themselves. These explanations include the small sample size, sampling differences (e.g., extent of advertising and payment), and the possibility that apparent effects for SAD are due to features associated with SAD, or are better captured by more specific indices than a simple total of giving. We therefore designed Study 2 to test a selection of these explanations. Study 2 again represented an attempt to replicate Rodebaugh et al.'s (2013) finding, but in Study 2 recruitment focused on participants with SAD and GAD, with a smaller number of control participants without significant anxiety disorders (referred to as normal control participants). The GAD participants provide a useful clinical control for any SAD effects found, especially given (a) an indication that GAD may also contribute to friendship impairment in some instances (Rodebaugh, Fernandez, & Levinson, 2012) and (b) a consistent pattern of findings linking chronic worry and GAD to interpersonal difficulties (Borkovec, Newman, Pincus, & Lytle, 2002; Eng & Heimberg, 2006; Erickson & Newman, 2007). Study 2 included assessment of interpersonal problems and a larger sample size, allowing tests of other potential explanations for FIPD behavior as well as closer examination of the details of FIPD behavior, above and beyond a simple index of giving.

Our hypotheses were that diagnosis of SAD would show no specific effect on overall giving, consistent with Study 1. We expected instead that severity of social anxiety within individuals with SAD would have an effect on giving. We also hypothesized that self-report of interpersonal problems would predict both slope and intercept of giving, with general effects for warmth and submissiveness relating to more giving and faster increases in giving.

Study 2

Method

Participants—The sample primarily consisted of participants who were seeking treatment for either SAD ($n = 48$) or GAD ($n = 44$) at the Adult Anxiety Clinic of Temple University in Philadelphia. Participants frequently had both GAD and SAD ($n = 28$). We focus on principal diagnosis groups because these groups were recruited for separate programs of research; however, we report below when results differ if, for example, SAD regardless of GAD is focused on. Many participants were recruited for a variety of treatment studies and responded to advertisements for those studies; additional participants sought treatment in general. As such, participants in the current sample will partially overlap with a variety of studies of treatment, but none of those studies will report FIPD-related findings. Additional participants were recruited as normal control participants ($n = 19$) for purpose of comparison; these participants were included if they had no more than a specific phobia

diagnosis according to clinical interview (see **Measures**). The normal control participants were primarily recruited for comparison with the GAD group, but also appear potentially informative for this study.

The principal diagnosis groups (principal SAD versus principal GAD versus normal controls) did not differ significantly in regard to ethnicity, years of education, or annual household income ($ps > .34$), but did differ in regard to gender, $\chi^2(2) = 8.61, p = .013$, and trended toward a difference in age, $F(2, 108) = 2.41, p = .095$. Participants seeking treatment for SAD tended to be younger and were significantly more likely to be male in comparison to the other two groups. In contrast, the GAD and normal control groups were demographically equivalent ($ps > .35$), as intended. The difference in gender between GAD and SAD appears plausibly due to the known tendency of men with SAD to be more likely to seek treatment (Heimberg & Juster, 1995). Further, when principal diagnosis was ignored, and participants with and without SAD and GAD were contrasted within the sample, there were no significant differences for age or gender ($ps > .13$). Thus, although analyses focusing on principal diagnosis are vulnerable to concerns about demographic nonequivalence regarding age and gender, analyses focusing on presence of SAD and presence of GAD are not. Overall information about the sample, by principal diagnosis group, is presented in Table 1.

Measures—Measures included both diagnostic and self-report measures. Other measures were as follows.

The Anxiety Disorders Interview Schedule for DSM-IV-Lifetime Version (ADIS-IV-L; DiNardo, Brown, & Barlow, 1994) was used to render diagnoses. The ADIS-IV-L is a semi-structured clinical interview for assessing the diagnostic criteria for anxiety, depressive, and substance use disorders set forth in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994). Training criteria for interviewers outlined by Brown, Di Nardo, Lehman, and Campbell (2001) were satisfied by all interviewers in the present study.

To assess social anxiety severity, we used the Social Interaction Anxiety Scale-Straightforward items (SIAS-S; Rodebaugh et al., 2011) drawn from the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998): The SIAS is a 20-item self-report questionnaire that measures anxiety-related reactions to different social interactions (e.g., *I get nervous if I have to speak with someone in authority [teacher, boss]*). It uses a 0 (*not at all*) to 4 (*extremely*) Likert-type scale. Rodebaugh, Heimberg and colleagues (2011) have reported that the 17 straightforwardly-worded items of the SIAS are more valid indicators of social interaction anxiety than the reverse-scored items in undergraduate, community, and clinical samples. This 17-item score, hereafter referred to as the SIAS-S score, has demonstrated excellent internal consistency ($\alpha = .93$) and factorial validity in undergraduate samples and has demonstrated strong construct validity in both undergraduate and clinical samples (Rodebaugh et al., 2007). Internal consistency for the SIAS-S items in the current sample was excellent ($\alpha = .97$). One participant failed to complete this measure.

Beck Depression Inventory—II (BDI-2; Beck, Steer, & Brown, 1996) is a 21-item self-report instrument that measures depressive symptoms. Each symptom is rated for severity based on endorsement of one of a series of statements arranged in order from least to most symptomatic. Scores obtained from the BDI-2 have exhibited strong psychometric properties across a variety of sample types, including outpatients in treatment for mental disorders (Dozois, Dobson, & Ahnberg, 1998; Steer, Ball, Ranieri, & Beck, 1997). In the current sample, the BDI-2 had excellent internal consistency ($\alpha = .93$).

The Inventory of Interpersonal Problems-64 (IIP-64; Horowitz, Alden, Wiggins, & Pincus, 2000) measures interpersonal difficulties based on a circumplex model of personality (Wiggins, 1979), which proposes that human behavior can be understood in part through tendencies toward warmth and affiliation, on one axis, and tendencies toward dominance on another axis (Gurtman, 1993). The IIP-64 includes eight scales based on the two axes (warmth and affiliation), with each scale assessed by 8 items. The scales of most importance to the results given below are Cold (problems due to aloof behavior or difficulty in caring for other people) and Vindictive (problems due to self-centered behavior toward others). The scales of the IIP-64 have shown good psychometric properties, including good internal consistency, test-retest reliability, convergent reliability, and factor structure (Horowitz, et al., 2000). In the current sample, internal consistency was at least good for all scales (α s $> .79$).

Procedure—The protocol was approved by the Temple University institutional review board and was carried out in accordance with the provisions of the World Medical Association Declaration of Helsinki. After providing informed consent, all participants completed the ADIS-IV-L in an initial interview and subsequently completed the self-report forms used here, among other measures. Exact procedures for client participants then varied depending upon the larger treatment study in which they took part, but data collection for this study took place prior to treatment. Participants in the normal control group were invited to participate after being screened over the phone; participants were excluded if they met criteria for any disorder except specific phobia. These participants also completed a number of tasks, most of which are not reported here. Normal control participants were paid \$10 per hour for their participation, whereas clinical participants generally participated for minimal or no compensation, with the exception of provision of free treatment. As in Study 1, the total amount of intended giving was analyzed; individual turns on the FIPD were also examined in this study.

The FIPD task was administered in the same manner as in Study 1, and the program functioned in the same way. Thus, as in Study 1, the communication errors were not implemented in a truly random fashion. However, because this pattern was not discovered until after the data collection was completed, the communication errors were effectively random for the purpose of internal validity.

Data Analytic Procedure—Although FIPD data were complete, individual self-report measures had sporadic missing data. The largest amount of missing data for a single scale was for the SIAS-S, for which 18 participants (16%) did not complete the entire measure. Missing data were estimated using multiple imputation (MI) performed in Amelia II

(Honaker, King, & Blackwell, 2006–2008). To aid in imputation, for the SIAS-S and BDI-2, we included the available items with the highest item-total correlations and least missing data in the dataset used for MI. Overall, then, the data used for MI included all totals used in analyses below, with the exception that participant behavior on the FIPD was not used, but rather added into the MI datasets after MI had been conducted. This procedure was used because (a) the FIPD data had no missing data and (b) the inclusion of the FIPD data resulted in too many parameters to be estimated. Similarly, MI with scale items was not plausible due to the sample size. We investigated the ability of the Amelia II program to appropriately produce multiply imputed datasets by examining several diagnostics it provides; please see Honaker et al. for details regarding these diagnostic procedures, each of which examine a potential way that imputation might fall short of the goal of properly representing the likely values of the missing data. Diagnostics indicated good MI overall. Full details of the MI diagnostics are available from the first author. Except for *t*-tests and analysis of variance (ANOVA) between diagnostic groups, tests were conducted in Mplus 7.11 (Muthén & Muthén, 1998–2012), using the Satorra-Bentler chi-square; Mplus handles latent trajectory models and the combination of MI datasets efficiently (Muthén & Muthén, 1998–2012). Latent trajectory models were implemented as described in Study 1, except that prediction of slope and intercept was conducted within the latent trajectory model itself, due to the larger sample size.

Results

Neither diagnosis nor severity predicted total giving in the entire sample—In accordance with hypothesis and Study 1, but contrary to the findings of Rodebaugh et al. (2013), there was no indication using *t*-tests or ANOVA as appropriate that principal diagnosis, presence versus absence of SAD or GAD, or severity of social anxiety (as measured by the SIAS-S in the entire sample) had any relationship with total giving (all *ps* > .41).

Latent trajectory model—A model with an intercept and a partially piecewise slope fit excellently once a nonsignificant negative variance for giving at time 4 was set to zero (CFI = 1.00, TLI = 1.05, RMSEA = 0.00, SRMR = .04). The slope parameter estimated for Turn 4 was 6.38, indicating a curvilinear increase above the previous slope parameters of 0, 1, and 2. Thus, the overall slope began in a linear fashion with a curvilinear increase for Turn 4.

We first fit the model across all participants, regardless of diagnostic group. The mean of the intercept was 4.02 ($z = 22.40, p < .001$), indicating that, on the average, participants shared about 4 (of 10) tokens at Turn 1. However, participants also significantly varied around this mean (variance = 2.46, $z = 3.58, p < .001$), indicating considerable diversity in initial giving. The mean of the slope was positive and significant ($M = 0.46, z = 4.64, p < .001$), indicating that, on the average, participants increased their giving by about 1 token from Turn 1 to Turn 3, and by about another 2 tokens from Turn 3 to Turn 4. However, participants also varied significantly in their slopes (variance = 0.11, $z = 2.17, p = .030$), indicating that many participants diverged from this typical pattern. The intercept and slope correlated moderately and negatively ($r = -.39, p < .001$).

Giving behavior was stable across groups as reflected in slope and intercept of giving:

We next fitted the model across diagnostic groups (with Time 4 fixed at 6.38 rather than freely estimated) and then constrained the intercept and slopes across groups. We conducted these tests across principal diagnosis groups, followed by tests across groups defined as those participants diagnosed with SAD versus those not, as well as those participants diagnosed with GAD versus those not. If model fit significantly decreased in any of these constrained models, it would indicate that intercept and slope varied across groups, as would be expected, for example, if participants in the SAD principal diagnosis group were slower to increase giving. None of the constrained models had significant chi-square tests (all $ps > .20$), indicating that diagnostic group itself had no effect on how participants began playing or to what extent they increased their sharing over time.¹ These results held whether principal diagnostic group or presence versus absence of SAD or GAD were the units of analysis.

Test of whether severity of social anxiety predicts slope and intercept across groups:

Social anxiety symptoms, as measured by the SIAS-S, were used to predict the slope and intercept across the principal diagnosis groups. The SIAS-S showed no tendency to predict either slope or intercept in the normal control and GAD principal diagnosis groups ($ps > .20$). In the SAD principal diagnosis group, however, the SIAS-S significantly predicted slope and intercept; when the BDI-2 was added to prediction, the SIAS-S continued to predict both slope ($b^* = -.28, z = 2.26, p = .024$) and intercept ($b^* = .29, z = 2.36, p = .018$). In other words, social anxiety severity did predict course of giving in the SAD principal diagnosis group despite not predicting overall giving in the full sample. The prediction was such that higher social anxiety predicted more initial giving, yet less increase in giving over time. In contrast, for the GAD principal diagnosis group, the BDI-2 predicted only slope ($b^* = -.33, z = 2.32, p = .021$), such that within that diagnostic group, higher depression was related to slower increases in giving.

Figure 1 displays predicted giving for groups of interest given the significant factors identified above. That is, Figure 1 shows the pattern of giving the model predicts for participants with certain characteristics. As can be seen in the figure, on the average (that is, across the entire sample), participants showed a midrange intercept (initial giving at Turn 1) followed by a positive slope. Participants with a principal diagnosis of SAD but lower social anxiety severity, as well as those with a principal diagnosis of GAD and low depression are not displayed in the figure because they showed a very similar intercept as well as a strongly positive slope that was very similar to the trajectory for the sample as a whole. Thus, participants in these groups would not necessarily start with a high amount of giving, but would be likely to increase their giving strongly over initial turns.

Participants with a principal diagnosis of SAD and high social anxiety severity are depicted in Figure 1 with a separate line. These participants tended to give more on Turn 1, yet not increase their giving as much over time: Their *intercept* was higher, yet their *slope* was

¹For simplicity, we did not conduct chi-square difference tests because (a) the constrained model cannot have worse fit than an unconstrained model if it does not have worse fit than a perfect model, as was true in all cases here and (b) due to limitations in the MLM estimator using MI data, a total of 15 tests would need to be conducted and reported.

lower. Similarly, participants with a principal diagnosis of GAD and higher depression scores, as depicted with a third line, were less likely to increase giving over time than those with lower depression scores. That is, although their intercept was not significantly predicted, higher depression scores predicted a lower slope. Of the factors identified thus far, the presence of a principal diagnosis of GAD in conjunction with high depression was most likely to produce lower giving overall (e.g., if turns were totaled). In comparison, high social anxiety severity in the group of participants with a principal diagnosis of SAD was most associated with reduced *change* in giving, even though total giving may have been slightly higher.

When the above tests were repeated comparing participants (a) with SAD to those without (regardless of principal diagnosis) and (b) with GAD to those without (again, regardless of principal diagnosis), the findings for the SIAS-S were not significant ($ps > .20$), but the findings for the BDI-2 in participants with GAD remained significant ($b^* = -.39$, $z = 3.06$, $p = .002$). That is, findings for social anxiety were restricted to the principal diagnosis analysis, whereas the effect for depression was associated with GAD and not GAD as the principal diagnosis per se (i.e., the effect remained when those with a principal diagnosis of SAD and a secondary diagnosis of GAD were included in the GAD group).

Because the SAD principal diagnosis group tended to differ on age and gender from the other groups, we also examined these factors as predictors. When age and gender were added as predictors, gender did predict the intercept in the SAD principal diagnosis group, such that women tended to start by giving more; yet SIAS-S continued to predict both intercept and slope ($ps < .05$). Age and gender did not have any other significant effects ($ps > .20$), making it unlikely that our effects were due to age or gender differences between samples. The finding that the SIAS-S predicted giving in the SAD principal diagnosis group was broadly in support of our hypothesis, although the specific manner in which it predicted giving was not hypothesized.

Tests of interpersonal problems as predictors of intercept and slope: Because the IIP-64 has eight scales that intercorrelate moderately, we first examined overall R^2 values for prediction of slope and intercept across the three principal diagnosis groups, SAD, GAD, and normal controls. That is, we examined significance of the R^2 values for slope and intercept as omnibus tests of effect for the IIP-64 scales. The IIP-64 scales as a whole predicted both slope ($R^2 = .65$, $p < .001$) and intercept for controls ($R^2 = .40$, $p = .027$), intercept for those with a principal diagnosis of SAD ($R^2 = .32$, $p = .006$), and trended to predict the intercept for those with a principal diagnosis of GAD ($R^2 = .27$, $p = .054$). Given statistical significance for 3 of 6 omnibus tests, including two effects that would survive correction for multiple tests, we conducted further tests to understand the source of these effects.

Because the findings for the intercept seemed very similar across groups, we tested whether it was acceptable to constrain the prediction of the intercept by the IIP-64 scales by group; it was, given that the constrained model did not vary from perfect fit.² In the model with intercept prediction constrained, the only IIP-64 predictor with a unique effect was Vindictive ($b^* = -.34$, $z = 2.43$, $p = .015$), such that participants who reported more

problems due to being self-centered and vindictive, regardless of diagnostic group, were likely to give less initially than those who did not report such problems. Note specifically that because the raw score was entered for Vindictive, the parameter means that any value greater than zero (which was a possible value) would indicate the prediction of a lower intercept.

In regard to prediction of slope for normal controls, the only unique effect was for the Cold subscale ($b^* = .78$, $z = 2.56$, $p = .010$), such that normal controls who reported more problems due to being interpersonally cold were more likely to increase giving over time. Due to the substantial intercorrelations among the scales, we tested whether findings were in the same direction and statistically significant in the same manner when only Vindictive and Cold were included as predictors. The findings for Vindictive were similar, but Cold no longer predicted slope without additional predictors ($ps > .128$). However, when the SIAS-S and BDI-2 were added as competing predictors, Vindictive maintained its unique prediction and Cold was again a unique predictor, this time for the Control and GAD group in the same direction as originally found in the Control group. The SIAS-S and BDI-2 also maintained their unique effects.

In Figure 1, the trajectory predicted for the principal SAD participant with the highest SIAS-S score is depicted, now taking into account the participant's Vindictive score (which was relatively high, at 26). As can be seen in the figure, when participants in the principal SAD diagnosis group had high SIAS-S scores and elevated Vindictive scores, their initial giving, slope of giving and giving overall was predicted to be lower. These findings were generally consistent with our hypothesis, with the exception of the finding for the Cold subscale in controls, which is against the hypothesis that subscales indicating low warmth should relate to decreased giving.

Reanalysis using the first 10 turns: Finally, we tested the same predictive model (including SIAS-S, BDI-2, Vindictive, and Cold) in a model in which the latent trajectories of the first 10 turns were estimated, at the suggestion of an anonymous reviewer. Results should be interpreted with caution because we could not obtain good model fit for any models including more than 4 turns, plausibly because of the systematic communication errors. Findings for prediction were nearly identical, with the exception that the SIAS-S predicted slope for all groups in the same direction: For all participants, higher SIAS-S scores predicted lower slopes ($ps < .034$).

Comment on Study 2 and Reanalysis of Rodebaugh et al. (2013)

The above findings suggest that a combination of severity of social anxiety (among people with a principal diagnosis of SAD), level of depression (among people with GAD), and vindictiveness (among all participants) show the strongest effects on FIPD behavior. Ideally these effects will eventually be tested in a new sample. For current purposes, we reanalyzed the data from Rodebaugh et al. 2013 to determine whether the same factors appeared

²Please see footnote 1. In addition, the fit of the constrained model had to be estimated using the MLR estimator, which has similar properties to the MLM estimator, because the chi-square statistic could not be computed due to a non-positive trace. The parameters provided are from the same analysis using MLM, but are similar using MLR.

plausible in that dataset. Specifically, it would be expected that vindictiveness and the interaction between diagnosis of GAD and depression should reduce overall giving, whereas an interaction between diagnosis of SAD and severity of social anxiety should predict change in giving, such that those with both SAD and high severity of social anxiety would show the smallest change in giving.

We briefly present the results of this reanalysis here; information about the original study and analyses are available in the report of Rodebaugh et al. (2013). In short, the only effect that showed a tendency to remain consistent was for vindictiveness, which did show a tendency ($p = .087$) to predict above and beyond diagnosis of SAD, which was no longer a significant predictor when Vindictive was added to the regression ($p = .114$). As in Study 2, vindictiveness predicted reduced giving. Although other factors were not supported in this reanalysis, it must be noted that the small sample size and limited sample diversity of the previous study (Rodebaugh et al., 2013) would make it challenging to find effects for severity of social anxiety or a combination of GAD and depression.

Overall Discussion

SAD is associated with interpersonal impairment (Aderka et al., 2012), and early behavioral economics studies with SAD (Rodebaugh, Klein, et al., 2011; Rodebaugh et al., 2013; Sripada et al., 2009; Sripada et al., 2013) suggest that such paradigms might be helpful in determining how the behavior of people with SAD might lead to such impairment (e.g., via constrained warmth). However, replications in this area are nonexistent, and existing data suggest that it is not SAD itself, but rather features associated with SAD that lead to maladaptive behavior on behavioral economics tasks. Across two studies of individuals with SAD, we found that giving on a behavioral economic task simulating an interaction with a friend failed to show a simple relationship with diagnosis of SAD. Instead, giving on the task, particularly when assessed in terms of initial giving and increase in giving over time, correlated with severity of social anxiety in a group of participants with a principal diagnosis of SAD. Further, self-report of problems due to interpersonal vindictiveness correlated with a tendency to give less initially. This latter finding also received some support in a reanalysis of the data reported in Rodebaugh et al. (2013), despite the much smaller sample in that study. Overall, the findings highlight the need for replication and close characterization of the causes and correlates of behavior in economic tasks.

The current findings do not support the interpretation of Rodebaugh and colleagues' (2013) findings as indicating a diagnostic effect of SAD. However, our current findings are consistent with the original finding, in that vindictiveness and severity of social anxiety might explain the apparent diagnostic effect. When a SAD group is particularly severe or a comparison group is relatively free of interpersonal problems, apparent diagnosis differences might emerge. However, the current results indicate that such a diagnosis effect may be due to multiple characteristics that are associated with, but not identical to, SAD. Participants with SAD who have very high levels of social anxiety and rate themselves as having high levels of interpersonal problems related to vindictiveness (not uncommon in samples of participants with SAD; cf. Kachin, Newman, & Pincus, 2001) would be expected to give

less than participants without SAD who report less vindictiveness, thus producing an apparent diagnostic difference (cf. the highest-severity high-vindictiveness line in Figure 1).

Although we did not observe direct effects of SAD, we did observe effects of social anxiety severity within the SAD group. Notably, however, the specific findings for severity of social anxiety were not as hypothesized. First of all, in our main analyses these effects were only for those participants who were seeking treatment for SAD, which may indicate that these effects are only notable for people who find their social anxiety distressing or impairing, plausibly in part due to its severity. Second, these effects were such that higher severity of social anxiety increased initial giving but led to a flatter slope for giving across the first 4 turns. Although this certainly constitutes an effect on giving behavior, it does not suggest a general lack of giving, cooperativeness, or warmth, but rather a restriction in responsiveness.

A pattern of interpersonal inflexibility in the face of friendly behavior is, in fact, quite consistent with the available literature on interpersonal effects of SAD. The clearest parallel may be with the findings of Meleshko and Alden (1993), who examined an interaction with a confederate who either increased intimacy of conversation topics or maintained a relatively stable level of intimacy during a discussion. Participants higher and lower in social anxiety were randomly assigned to one of the two confederate behavior conditions. When the confederate did not increase intimacy during the conversation, participants with higher social anxiety were not less likely to reveal more about themselves; in fact, the means were nonsignificantly in the opposite direction. In contrast, when the confederate escalated intimacy, higher social anxiety was associated with less disclosure during the task.

Plausibly, then, integrating the findings of Meleshko and Alden (1993) and the current findings, people with higher social anxiety (perhaps particularly when that anxiety is troublesome for them) may not show immediate interpersonal constraint. Instead, people with these difficulties may even tend to somewhat indiscriminately behave in a slightly excessively warm manner toward people in general. In everyday social interactions, for example, such individuals might be quite friendly during initial and superficial small talk. However, when another person attempts to engage in a more meaningful conversation, become closer, or develop a friendship, that other person may find these overtures to be met with less of an escalation in warmth than they would expect. If this interpretation is correct, it suggests a fundamental problem with the use of the FIPD paradigm to examine responses to a simulated friend only: *Contrasts* in behavior between stranger and friend or between unfriendly and friendly stranger, especially with a focus on early aspects of the interaction, may be more likely to capture the ways in which interpersonal processes are disrupted by SAD or severity of social anxiety.

Findings regarding GAD were unexpected and may represent a fruitful path for future research. The GAD group was included partially as a clinical control group for comparisons with the SAD group, yet previous findings regarding interpersonal problems in participants with excessive worry (e.g., Borkovec, et al., 2002; Erickson & Newman, 2007) suggested that findings specific to GAD might exist. In Study 2, participants with GAD and depression (whether GAD was the principal diagnosis or not) showed reduced giving compared to participants without this combination. Although this specific effect was not hypothesized,

some existing findings are consistent with the effect. Although SAD was the only disorder uniquely related to friendship impairment in the analyses reported by Rodebaugh and colleagues (2012), GAD and depression contributed the next strongest effects. It might be that the combination of GAD and depression is particularly problematic for friendships, and participant behavior on the FIPD merely tracked their tendencies in their friendships.

Overall, the results suggest that behavioral economic tasks likely produce indices that are affected by multiple dimensional constructs, both within and across diagnostic groups. Although some such indices may be stable over time (total giving and initial giving) other indices may not be (slope of giving). Our findings for slope, for example, may only be relevant for initial reactions to the FIPD and not reactions when presented with the task again. Further, examining the time course of such tasks may be essential to understanding how they relate to individual differences. Existing studies of behavioral economic tasks, despite their many positive features, almost without exception proceed without any establishment of the psychometric characteristics of the tasks used. The FIPD is unusual in this regard, having shown test-retest stability for total giving and initial giving in Study 1, as well as some previous evidence of internal consistency and convergent validity (Rodebaugh, Klein, et al., 2011; Rodebaugh et al., 2013), but even the FIPD has relatively limited evidence of validity compared to the standards preferred for self-report measures. The assumptions (a) that economic behavior is fungible across tasks and, further, (b) that economic exchange is synonymous with more general interpersonal exchange may seem reasonable from the viewpoint of economics as a discipline. However, use of these tools in psychological study demands greater precision in our attempts to link behavioral economic task behavior with psychological constructs and neural responses relevant to psychological disorders. The current results do not completely solve this problem in regard to the FIPD, but we believe they offer a step in the right direction. More generally, the current results provide a warning in the use of economic tasks: Effects may be more complex than they initially appear.

The current studies have limitations that must be considered, including limited sample size (particularly for Study 1). At the same time, the sample size for Study 2 represents the largest sample of SAD or GAD participants completing a behavioral economic task in the literature of which we are aware, and Study 1 was adequately powered for one of its primary tests (of stability of FIPD indices). Diagnostic reliability was not specifically assessed in either study; this concern may be offset somewhat by the fact that both studies used diagnostic instruments that are known to have good to excellent reliability. A limitation that we find most pressing is the fact that both studies (as well as Rodebaugh et al., 2013) focused on a single playing partner in the FIPD. The current results suggest that effects for SAD in particular may be more evident when differences between playing partners are examined, as well as trajectories of play during the tasks. This suggestion has some indirect support in the finding of differential ventral striatum activation across partner types noted by Sripada and colleagues (2013). Notably, Sripada et al. (2013) did not find behavioral differences; however, the type of task used severely limited power to find differences in behavior, because participants could only choose to trust or not (and not how much to trust). Ideally, a well-characterized behavioral economic task that shows clear behavioral correlates

(i.e., outside the game itself) related to SAD would be developed for use in further neuroeconomic investigations.

In summary, the current studies yielded several findings that could advance the use of behavioral economic tasks to study social anxiety and interpersonal behavior, as well as in mental health research in general. First, some behavioral economic task indices can be quite stable over time and can be predicted by several indices of psychopathology and interpersonal dysfunction. However, the initial conclusion presented by Rodebaugh et al. (2013) of a simple diagnosis effect for SAD on overall giving was not supported. Instead, the current results suggest that several factors, including diagnosis (of SAD and GAD), severity of SAD symptoms, depression, and interpersonal vindictiveness may combine to predict the course of giving across a behavioral economic task that simulates interaction with a friend. Overall, the available data regarding the FIPD suggests that it is not SAD, but social anxiety severity and interpersonally relevant factors associated with SAD, that primarily impact performance on the task. Further tests should examine the possibility that SAD or SAD-related constructs may be even more related to contrasts in behavior between relationship types (e.g., stranger versus friend; trustworthy stranger versus untrustworthy stranger; cf. Sripada et al., 2013). Further, characterizing the determinants of behavior on such tasks stands to complement other approaches, such as neuroeconomic studies. Integrating the findings from multiple approaches, with the unified methodology of behavioral economic tasks, may help clarify mechanisms and treatment targets for the interpersonal impairment associated with SAD and potentially other disorders.

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Figure 1.

Comparison of expected slopes across groups and participants of interest: Each line represents the predicted giving pattern when the predictors are at given levels. † = The intercept (starting point at Turn 1) was significantly predicted for this line; * = The slope (change over time) was significantly predicted for this line. SAD = Social anxiety disorder; GAD = Generalized anxiety disorder. Overall sample line shows the slope that fit well for the entire sample (which also fit well for each principal diagnosis subsample). For each relevant line, the predicted line for the participant with the highest score in that group is plotted. In the case of the high vindictiveness line, the observed score for Vindictive (which happened to be high) was entered for the principal SAD participant with the highest severity score to generate the predicted values. Severity in the principal SAD group was measured by the straightforward items of the Social Interaction Anxiety Scale. Depression was measured by the Beck Depression Inventory-2. Vindictiveness was measured by the Vindictive subscale of the Inventory of Interpersonal Problems-64.

Table 1

Characteristics of Participants in Study 2

Diagnosis	Ethnicity				Employment					Age
	Women	White	African American	Asian American	Other Ethnicities	Annual Income	Employed full-time	Unemployed	Other	
SAD Principal (n = 48)	n = 20, 42%	n = 31, 65%	n = 10, 21%	n = 2, 4%	n = 4, 8%	38694.44 (43443.77)	n = 22, 47%	n = 8, 18%	n = 17, 36%	30.17 (10.21)
GAD Principal (n = 44)	n = 29, 66%	n = 37, 84%	n = 3, 7%	n = 2, 5%	n = 2, 5%	43430.56 (37580.65)	n = 19, 43%	n = 7, 16%	n = 18, 41%	34.41 (13.27)
Normal Controls (n = 19)	n = 14, 74%	n = 14, 74%	n = 3, 16%	n = 1, 5%	n = 0, 0%	26466.67 (17033.02)	n = 7, 15%	n = 5, 11%	n = 4, 25%	36.83 (14.66)

Note. Total sample size was 111. For categorical variables, both the number of participants and the percentage (of those responding) is given. For non-categorical variables, information given is the mean (standard deviation). Participants frequently failed to provide information regarding employment ($n = 4$), education ($n = 4$), and income ($n = 24$); information is given based on the participants who responded. SAD principal = Principal diagnosis of social anxiety disorder; GAD principal = Principal diagnosis of generalized anxiety disorder. Many participants ($n = 28$) were diagnosed with both SAD and GAD. Annual income is given in dollars (USA). For Employment, the category of Other includes participants with part-time employment, as well as those who were retired or homemakers.