



The behavioral economics of social anxiety disorder reveal a robust effect for interpersonal traits



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ABSTRACT

Recent evidence suggests that reduced generosity among individuals with social anxiety disorder (SAD) in behavioral economic tasks may result from constraint in changing behavior according to interpersonal contingencies. That is, people with SAD may be slower to be more generous when the situation warrants. Conversely, more global effects on generosity may be related to interpersonal vindictiveness, a dimension only somewhat related to SAD. A total of 133 participants, 73 with the generalized form of SAD, completed self-report instruments and a behavioral economic task with simulated interpersonal (friend, romantic partner, stranger) interactions. In a separate visit, friends ($n = 88$) also came to the lab and rated participants on vindictiveness. Interpersonal vindictiveness was associated with reduced initial and overall giving to simulated friends. SAD predicted a lack of increased giving to a simulated friend, and attenuated an increase in giving to simulated known versus unknown players compared to participants without SAD. Friend-reported vindictiveness predicted in the same direction as diagnosis. However, the findings for SAD were less robust than those for vindictiveness. SAD is perhaps weakly related to behavioral constraint in economic tasks that simulate interpersonal interactions, whereas vindictiveness is strongly related to lower overall generosity as well as (via friend report) behavioral constraint. Further study is needed to better characterize the construct of vindictiveness. Our findings dovetail with the suggestion that SAD is related to impairment in the proposed affiliation and attachment system, but further suggest that direct study of that system may be more fruitful than focusing on disorders.

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1. The behavioral economics of social anxiety disorder reveal a strong role for interpersonal traits

Social anxiety disorder (SAD) has been described as an essentially interpersonal disorder (Alden & Taylor, 2010), and much recent work has investigated behavioral economic tasks as a potential means to better understand the disruption of social behavior and its underlying neural sources (see, e.g., Carter, 2012; for a review). Accordingly, researchers have turned to a variety of economic tasks to understand the disrupted interpersonal behavior typical of SAD in particular (e.g., Sripada, Angstadt, Liberzon,

McCabe, & Phan, 2013; Sripada et al., 2009). These investigators are part of a larger group that has expressed optimism that behavioral economic tasks may detect differences between disorders or be helpful in generating new biomarkers for disorders (Carter, 2012; Kishida, King-Casas, & Montague, 2010; Sharp, Monterosso, & Montague, 2012).

Initial observations that SAD is associated with reduced giving behavior on behavioral economic tasks led to hypotheses that the disorder itself may cause reductions in generosity (Rodebaugh, Heimberg, Taylor, & Lenze, 2016; Rodebaugh et al., 2013). However, recent work has challenged these hypotheses and instead suggests that common correlates of SAD might better account for the associations observed in the initial study. More specifically, interpersonal vindictiveness was associated with overall reduced giving, yet neither social anxiety symptoms nor a diagnosis of SAD were (Rodebaugh et al., 2016). Interpersonal vindictiveness was measured using the Inventory of Interpersonal Problems (Horowitz, Alden, Wiggins, & Pincus, 2000), and its name could be

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argued to be misleading. Rather than referring to vengefulness per se, the scale refers to a combination of interpersonal coldness and dominance (Horowitz et al., 2000). That is, the items seem to refer to experiencing problems due to a tendency to put oneself first and be detached from others rather than be hurtful or angry per se.

Thus, Rodebaugh et al. (2016) found that effects expected to be due to SAD were instead due to an interpersonal correlate of SAD. In contrast, higher SAD severity was related to a *slow rate of increased giving*. Thus, in accordance with findings involving live interpersonal interactions, Rodebaugh et al. (2016) found evidence that SAD involves more constrained responses to interpersonal interactions, possibly representing an attempt at self-protection, and not a lack of generosity per se (cf., e.g., Meleshko & Alden, 1993). In other words, SAD plausibly involves a subdued reaction to interpersonal cues related to signals of friendliness. A similar constrained *neural* responsiveness to trustworthy versus untrustworthy strangers has been reported in an imaging study (Sripada et al., 2013). In that study, although behavior did not differ between diagnostic groups, people with SAD showed constrained response to the potential rewards of interacting with trustworthy versus untrustworthy strangers.

The recent findings of Rodebaugh et al. (2016) suggest that additional constructs or factors might predict behavior on economic tasks, with implications for our understanding of SAD and how it influences interpersonal behavior. The assumption that behavior on economic tasks parallels interpersonal behavior is nearly ubiquitous (see, e.g., Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005; among many others). However, few studies demonstrate a consistent relationship between giving on economic tasks and individual differences thought to be related to interpersonal behavior. The findings of Rodebaugh and colleagues regarding vindictiveness, as described above, are unusual in that they have support from multiple studies (i.e., Study 2 and reanalysis of a previous study, both reported in Rodebaugh et al., 2016). However, even this finding can easily be questioned: It is unclear to what extent self-report of vindictiveness can be expected to translate to interpersonal behavior. Such findings would be far more convincing as evidence of interpersonal functioning relating to economic behavior if the measure of interpersonal functioning was not restricted to self-report. For example, if informant-report predicted in a similar manner, it would be more convincing that the observed effect is due to interpersonal behavior rather than factors purely associated with self-report.

In the current study, we examined which aspects of interpersonal economic behavior are related to social anxiety and SAD, versus correlates of the disorder. To this end, we asked participants with and without SAD to complete a behavioral economic task as well as interviews and self-report measures. Further, we asked informants to provide ratings of participants to better assess interpersonal traits. Our hypotheses, as suggested by the results of Rodebaugh et al. (2016), were as follows: First (Hypothesis 1), we expected that diagnosis alone would *not* predict overall giving to simulated friends. Second (Hypothesis 2), we expected that interpersonal vindictiveness would predict overall and baseline tendencies toward giving to simulated friends (i.e., total giving and intercept of giving), whereas social anxiety severity would predict more gradual increases (i.e., shallower slope) in giving in the SAD group. In addition (Hypothesis 3), extending the previous findings, we hypothesized that informant-reported (i.e., friend-reported) vindictiveness would predict in the same manner as self-reported vindictiveness, consistent with the effect being due to interpersonal tendencies, as opposed to merely a tendency toward rating oneself in a negative manner (which is common in SAD; Moscovitch, Orr, Rowa, Reimer, & Antony, 2009).

The above hypotheses involve replications or extensions of

previous results and thus focus on giving to simulated friends only (i.e., because giving to simulated friends only was the focus of the previous studies by Rodebaugh et al., 2013, 2016). However, in this study we collected data on responses to simulated strangers and simulated romantic partners as well. Thus, following speculations of Rodebaugh et al. (2016) and the imaging findings of Sripada et al. (2013), we also hypothesized (Hypothesis 4) that SAD (versus absence of the disorder) would be related to lack of responsiveness to different simulated partner types (known versus unknown). Finally, in exploratory analyses we tested whether any effects for diagnosis were better explained by social anxiety symptom severity or depression, which is a common comorbidity of social anxiety disorder (Kessler, Chiu, Demler, Merikangas, & Walters, 2005).

Further, we tested whether attachment style, both in terms of attachment anxiety and attachment avoidance, might better explain any diagnosis effects. We considered both attachment anxiety and avoidance to be interpersonal traits rather than symptoms of mental disorders (e.g., in the same way that vindictiveness is interpersonal). We examined attachment because it represents the Research Domain Criteria (RDoC; Cuthbert & Kozak, 2013) construct most clearly associated with cooperative behavior: *affiliation/attachment*. Notably, the RDoC matrix suggests that a preference for certain individuals is a crucial behavioral dimension for the affiliation/attachment construct. Because we tested preferential giving to simulated known versus unknown individuals, our behavioral economic tasks are arguably a plausible behavioral indicator of the affiliation/attachment dimension. Thus, although our study was not designed to evaluate RDoC constructs, the behavioral task used is plausible as a measure of this RDoC construct.

2. Method

2.1. Participants

Participants ($N = 133$) with generalized SAD (GSAD; $n = 73$) and without the disorder (NOSAD; $n = 60$) completed a behavioral economic task, clinical interviews, and self-report measures.² The GSAD group was recruited through community advertising and the NOSAD group was recruited through a participant registry to match groups on demographic features. Participants meeting diagnostic criteria were included if they were 18 years or older and willing to bring a friend or romantic partner to a later part of the study; participants were excluded if they were currently psychotic, manic, or actively suicidal, or if they had abused or been dependent on any substances in the past two months. A portion of the present sample was included within several prior publications that did not report on the behavioral economics task, the testing of which was one of the primary goals of the study. The most notable previous study was a study assessing friendship-related variables (Sample 2 in Rodebaugh et al., 2014) that reported the diagnostic procedure in detail. A full list of studies using these participants is available from the first author.

Table 1 details demographic data comparisons across groups. Groups did not significantly differ on age, ethnicity, race, or gender, although there was a trend ($p = 0.090$) toward a difference in age. Further, GSAD participants received relatively less education and were less likely to be married; these differences are expected given epidemiological data (Ruscio et al., 2008). We included age and interactions with age in all analyses including group as a predictor; these are not reported because no effect achieved statistical significance (i.e., all ps were > 0.05). Participants who brought a friend

² Two additional participants who were unable to complete the study due to sickness and a lack of task understanding are not included.

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