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LOSS OF MNEMIC NEGLECT AMONG SOCIALLY ANXIOUS INDIVIDUALS

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The relation between social anxiety and memory for self-threatening information was investigated in the context of the *mnemic neglect* paradigm (Sedikides & Green, 2000). It was hypothesized that those high in social anxiety would evince a loss of mnemic neglect: They would show a reduced likelihood of poor memory for central, negative, and self-referent behaviors (i.e., behaviors that reflected social ineptness and untrustworthiness), and would do so because these behaviors are especially threatening to socially anxious individuals and fit well with their self-views. Results from three studies were consistent with the hypothesis. The loss of mnemic neglect observed in two of the studies could not be accounted for by depression, nor was it limited to a social threat context. The results were mixed as to whether the loss of mnemic neglect in socially anxious individuals was limited to behaviors that reflected social ineptness, or whether it also emerged in memory for behaviors that reflected untrustworthiness. Implications for social anxiety, the self, and memory are discussed.

Theory regarding the expected relation between social anxiety and explicit memory for negative information (Mellings & Alden, 2000; Smith, Ingram, & Brehm, 1983) contains divergent views. Beck, Em-

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ery, and Greenberg, (1985; also see Rapee & Heimberg, 1997) suggested that socially anxious individuals will be especially attuned to evidence that confirms their negative self-beliefs, which should improve memory for anxiety-provoking negative information. In contrast, Mogg, Mathews, and Weinman (1987) proposed that socially anxious individuals will be especially unlikely to elaborate on anxiety-evoking evidence, producing minimization of recall for the negative anxiety-provoking information.

Relevant empirical findings have not converged (Coles & Heimberg, 2002; Heinrichs & Hofman, 2001). For example, the results of a meta-analysis examining the relation between anxiety and recall (Mitte, 2008) concluded that a memory bias favoring recall for negative information emerged in those individuals evincing high (vs. low) anxiety, but only in between-subjects paradigms in which participants were exposed either to positive stimuli or negative stimuli. Mitte (2008) noted that there was no evidence for this anxiety-recall enhancement effect when participants who differed in anxiety were exposed both to positive stimuli and negative stimuli. Such findings caused Mitte (2008, p. 900) to report the concern that results from the within-subjects studies might be flawed by the nonsimilarity of the positive stimuli and the negative stimuli.

ENTER THE MNEMIC NEGLECT PARADIGM

An alternative empirical approach to the study of relations between social anxiety and memory can be found in research that capitalizes on the mnemonic neglect memory paradigm (Sedikides & Green, 2009). Participants are especially likely to have poor memory for negative information when the information is central to the self and is thus believed to be especially threatening to the self. For example, a trait dimension that is typically central (i.e., important) to how individuals see themselves is trustworthiness. Imagine that, while receiving information, a person encounters the untrustworthy behavior “would be unfaithful when in an intimate relationship.” If this untrustworthy behavior is made highly relevant to the perceiver (e.g., via the statement “This behavior is something that individuals who know you well all said that you certainly could do”), the behavior should threaten the perceiver’s sense of self. Given the propensity to protect and defend the self from threat (Sedikides, 2012), the perceiver should shallowly process the threatening be-

havior and recall it poorly (Sedikides & Green, 2000). In the mnemonic neglect paradigm, such memory effects are observable when recall in this self-threat condition is compared to recall in a condition in which the perceiver thinks that the behavior describes someone else (a prototypical peer, the androgynously-named Chris).

However, the tendency to avoid processing self-threatening information might be overcome under circumstances in which the information has often been encountered in the past or when a person sees a high degree of fit between their own self-view and the behavior (Gomez, Jetten, & Swann, 2014) perhaps due to the plausibility or credibility of such behaviors (Gregg, 2008). Such information may possess a processing fluency advantage, allowing it to be easily linked to existing memory structures, and thus, be easily recalled. Given the highly social nature of the trustworthiness trait dimension (Schneider, 1973), behaviors linked to untrustworthiness might also be especially relevant, familiar, or credible to socially anxious individuals (Turner, Johnson, Beidel, Heiser, & Lydiard, 2003). As these behaviors are typically perceived as highly self-relevant, individuals who are socially anxious may be especially likely to link threatening untrustworthy behaviors to the self instead of divorcing such behaviors from the self. These self-linking tendencies should promote recall of threatening information. Hence it was hypothesized that in socially-anxious individuals, both of these tendencies (fluency, self-linking) should work against the tendency for defensive processing to produce mnemonic neglect, therefore producing loss of mnemonic neglect. These ideas were tested in three studies.

STUDY 1

In Study 1, participants who varied in their level of social anxiety were exposed to the mnemonic neglect paradigm. It was expected that participants who evinced low social-anxiety would show the usual mnemonic neglect effect. However, if the theoretical reasoning is correct, then this mnemonic neglect effect should be reduced or eliminated (loss of mnemonic neglect) in participants who evince high social anxiety.

The potential specificity of this loss of mnemonic neglect was also explored. The Mitte (2008) meta-analysis results suggested (p. 897) that loss of mnemonic neglect in socially-anxious individuals might be particularly strong for behaviors that are especially indicative of

social anxiety. For example, those high in social anxiety often report awkwardness or ineptness in social interactions. Accordingly, in addition to the use of the usual untrustworthy behaviors in the mnemonic neglect paradigm, some central negative behaviors to which participants were exposed reflected ineptness in social interactions. This change to the mnemonic neglect paradigm made it possible to evaluate whether a loss of mnemonic neglect would emerge equally in socially-anxious individuals for both untrustworthy behaviors and socially inept behaviors, or whether the loss of mnemonic neglect in socially-anxious individuals would be even stronger for socially-inept behaviors than for untrustworthy behaviors.

PARTICIPANTS

Participants ($N = 373$) were U.S. university students attending one of several psychology courses. Signup materials for the study requested that participants be native English speakers who were at least 18 years of age. Participants received course credit as compensation. The compensation type and amount was separately determined by each course instructor.

A total of 22 participants were excluded from data analyses because: (a) they were nonnative English speakers ($n = 10$), (b) they did not complete the recall task ($n = 6$), or (c) the software program crashed ($n = 6$). The 351 remaining participants ranged in age from 18 to 60 years ($M = 20.75$, $SD = 4.14$), 206 (58.7%) were female, and most (61.5%) were Caucasian (22.8% Black American, 6.8% Latino, 4.0% Asian American, .3% Native American, 4.6% no ethnicity reported).

METHOD

Behaviors and Traits. In a typical mnemonic neglect experiment, behaviors vary on four dimensions: behavior centrality (central, peripheral), behavior valence (positive, negative), behavior referent (self, Chris), and replication (behaviors pertaining to trait 1, behaviors pertaining to trait 2). This replication variable was replaced with a trait dimension variable. To construct the variable, traits were used for the study that each primarily reflected one of two dimensions: social interaction or social responsibility. Two traits, one cen-

tral (social adeptness/ineptness) and one peripheral (introversion/extraversion), exemplified the social interaction trait dimension. Two other trait dimensions, one central (trustworthiness/untrustworthiness) and one peripheral (predictability/unpredictability), exemplified the social responsibility dimension. For simplicity, in the remainder of this article, the individual trait dimensions will be referred to by using the dimension's positive trait (i.e., trustworthiness, social adeptness, predictability, and extraversion).

The designation of each trait as central or peripheral was determined in pretests (complete results are available on request). These pretests followed procedures introduced by Sedikides and Green (2000). For example, one pretest ($N = 74$) assessed properties of the traits on 9-point (0 to 8) response scales. Results established that participants rated central traits ($M = 6.64$, $SD = 1.33$) as more personally important than peripheral traits ($M = 3.99$, $SD = 1.62$), $t(72) = 14.80$, $p < .001$, $d = 1.73$.

Behaviors (see Appendix) were chosen to exemplify each of the eight traits noted above. The behaviors exemplifying the traits trustworthy and untrustworthy were drawn from past research (Sedikides & Green, 2000). The remaining traits were either borrowed or modified from other sources or new behaviors were written specifically for the current studies.

During the behavior pretesting process, participants ($n = 110$ for the social responsibility dimension and $n = 74$ for the social interaction dimension) rated each behavior (again on 0 to 8 scales, except for valence, which was a -4 to +4 scale) on: (a) how important it was to perform or to not perform the behavior, (b) how positive or negative the behavior was, and (c) how descriptive of the intended trait the behavior was.

Crucially, participants perceived the behaviors to be well-descriptive of each trait (trustworthy $M = 7.23$, $SD = 1.36$; untrustworthy $M = 5.65$, $SD = 2.74$; predictable $M = 6.31$, $SD = 1.85$; unpredictable $M = 5.46$, $SD = 2.28$; socially adept $M = 6.62$, $SD = 1.52$; socially inept $M = 5.41$, $SD = 2.67$; extraverted $M = 6.77$, $SD = 1.40$; introverted $M = 5.03$, $SD = 2.80$). The pretest ratings also corroborated the central/peripheral trait designations by indicating that participants regarded some trait-relevant behaviors as more important to the self than others. For example, participants rated: (a) trustworthy behaviors ($M = 3.48$, $SD = .66$) as more important to perform than predictable behaviors ($M = 0.79$, $SD = 1.07$), $t(104) = 22.69$, $p < .001$, $d = 2.21$; (b) untrustworthy behaviors ($M = -3.07$, $SD = 1.34$) as more important

not to perform than unpredictable behaviors ($M = -1.94$, $SD = 1.43$), $t(104) = -7.50$, $p < .001$, $d = -2.47$; (c) socially adept behaviors ($M = 2.47$, $SD = 1.21$) as more important to perform than extraverted behaviors ($M = 1.44$, $SD = 1.34$), $t(69) = 6.53$, $p < .001$, $d = .78$, and (d) socially inept behaviors ($M = -2.67$, $SD = 1.55$) as more important not to perform than introverted behaviors ($M = -2.28$, $SD = 1.30$), $t(71) = -2.10$, $p = .04$, $d = -.25$.

Procedure. Participants were guided through the computerized experiment by MediaLab software (Empirisoft, v2002.1.0.4). The mnemonic neglect paradigm was presented first. The procedures used are typical for the paradigm.

On arrival at the laboratory, participants were randomly assigned to a self or Chris condition. Participants were instructed to "Consider the following descriptions of YOURSELF [a person named CHRIS]. Think of the description as being based on actual knowledge of people who know YOU [CHRIS] well. Think of the description as real." They then saw the behaviors depicted in the Appendix framed in the first [third] person; these were presented one at a time. Each behavior description was displayed for 6s before moving on to the next [a total presentation time of $32 \times 6s$ (192s)]. The order in which behaviors were presented was randomly determined for each participant. Following behavior presentation, participants engaged in a distracter task. They were allotted 2.5 min to list as many U.S. States as possible.

Participants next encountered a surprise recall task. They attempted to remember as many behaviors as possible in the order in which they came to mind without worrying about recalling the behaviors verbatim. After each recalled behavior was entered into a response box, the screen was cleared and a new empty response box appeared. Participants typed their recalled behaviors into the response boxes provided until they could not recall any more behaviors or the allotted 5 minutes for this task had passed.

Finally, before participants were debriefed, they: (a) assessed each trait's perceived modifiability; (b) completed various individual difference measures, including the Social Interaction Anxiety Scale (SIAS; see Rodebaugh, Woods, Heimberg, Liebowitz, & Schneider, 2006) and the Beck Depression Inventory (BDI; see Beck, Steer, & Garbin, 1988), and (c) provided demographic data. The trait modifiability ratings were collected to assess the possibility that they might influence the extent to which social anxiety moderated mne-

mic neglect (for elaboration of this idea, see: Saunders, 2013). However, results from analyses using this variable were uninformative and are therefore not included in this article (results are available on request).

RESULTS AND DISCUSSION

Memory Coding. As in prior research (Green & Sedikides, 2004; Sedikides & Green, 2000), a recorded memory was considered to provide evidence of recall if the gist of the recorded memory matched the gist of one of the presented behaviors. The items recalled were independently coded by two judges. They evinced a 95.0% agreement rate and resolved discrepancies through discussion.

The resulting numbers of behaviors correctly recalled were separately tabulated for each cell of the within-subjects portion (Behavior Centrality \times Behavior Valence \times Trait Dimension) of the design by using proportions. Each within-cell total was divided by the number of behaviors in each cell (4) that could have been recalled. The proportion of recalled behaviors was the dependent measure entered into all analyses.

Replication of the Mnemic Neglect Effect. To conduct one set of analyses, the proportions of recalled behaviors in each cell of the Behavior Centrality \times Behavior Valence design matrix (averaging across trait dimension) were entered into a Behavior Referent \times Behavior Centrality \times Behavior Valence mixed model ANOVA in which behavior referent was the lone between-subjects variable. The ANOVA yielded the Behavior Referent \times Behavior Centrality \times Behavior Valence interaction that would be expected from the mnemonic neglect literature, $F(1, 349) = 4.36, p = .037, \omega^2 = .002$.

The proportions of recalled behaviors sorted by behavior referent, behavior centrality, and behavior valence are displayed in Table 1. Expected was a reduction in recall for self-referent central negative behaviors relative to the rate at which Chris-referent central negative behaviors were recalled. The predicted pattern emerged and was confirmed by subsidiary analyses. For example, an ANOVA conducted only on recall rates for central behaviors yielded a significant interaction between behavior referent and behavior valence, $F(1, 349) = 17.55, p < .001, \omega^2 = .009$. Decomposition of this interaction into simple effects evinced the usual pattern: Participants recalled significantly fewer central negative behaviors referring to the

TABLE 1. Means and Standard Deviations of Recall Proportions by Trait Centrality, Behavior Valence, and Behavior Referent in Study 1

	Central Traits		Peripheral Traits	
	Positive	Negative	Positive	Negative
Behavior Referent				
Self-referent	.22 (.16)	.16 (.12)	.18 (.16)	.29 (.19)
Chris-referent	.21 (.15)	.23 (.15)	.20 (.15)	.34 (.18)

self ($M = .16$, $SD = .12$) than central negative behaviors referring to Chris ($M = .23$, $SD = .15$), $t(349) = 5.04$, $p < .001$, $\omega^2 = .029$. This between-referent difference did not emerge for positive central behaviors, $t(349) = -0.67$, $p = .506$, $\omega^2 = -.001$.

However, as seen in Table 1, the recall of peripheral behaviors is atypical of past mnemonic neglect research. This recall rate was high in Study 1, whereas it has been low in past research. Moreover, the usual null effects observed in mnemonic neglect research were not obtained: Recall for peripheral negative behaviors was higher than for peripheral positive behaviors, $F(1, 349) = 118.47$, $p < .001$, $\omega^2 = .068$. Yet, the Behavior Referent \times Behavior Valence interaction was not significant, $F(1, 349) = 1.07$, $p = .302$, $\omega^2 < .001$, indicating no substantial recall reduction for self-referent peripheral negative behaviors. Nonetheless, the directional support indicates the possibility of a minor reduction in recall for peripheral negative self-referent behaviors relative to peripheral negative Chris-referent behaviors. Though nonsignificant, this echoes the pattern observed for the central behaviors (and is noteworthy because a similar pattern is significant in Study 2).

Memory in the peripheral conditions drove the significant Behavior Referent \times Behavior Valence interaction yielded by the main overall ANOVA, $F(1, 349) = 11.81$, $p < .001$, $\omega^2 = .003$. Subsidiary ANOVAs decomposing this interaction revealed that behavior referent was irrelevant to the recall of positive behaviors (Self: $M = .20$, $SD = .12$; Chris: $M = .20$, $SD = .12$; $F[1, 349] = .21$, $p = .645$, $\omega^2 < .001$), but was relevant to the recall of negative behaviors: In this case, recall was poorer for self-referent ($M = .22$, $SD = .12$) than Chris-referent ($M = .28$, $SD = .14$) behaviors, $F(1, 349) = 18.30$, $p < .001$, $\omega^2 = .016$. However, interpretation of this interaction is qualified by the previously-described 3-way interaction that emerged from the main ANOVA.

Social Anxiety Moderates the Mnemic Neglect Effect. Next, the analyses were expanded to include as predictors of memory both the trait dimension variable and the individual difference measure of social anxiety obtained from the SIAS. Two questions were considered: (1) "Was the mnemic neglect effect that emerged from the initial analyses moderated by level of social anxiety?", and, if so, (2) "Was this social anxiety moderation effect further moderated by the trait dimension relevant to each behavior?" These moderation effects implied 4-way and 5-way interactions, for which all the important action should occur in the recall of self-referent/central/negative behaviors. If a 4-way interaction were to emerge, one would expect it to show that social anxiety should be (positively) related to recall only for self-referent/central/negative behaviors. If a 5-way interaction were to emerge, one would expect it to show that the social anxiety moderation pattern emerges only for behaviors that reflect social ineptness (as opposed to untrustworthiness).¹

The main analysis was conducted as a hierarchical mixed-model regression. The within-subjects components of the regression model (all effects involving behavior centrality, behavior valence, and trait dimension) were evaluated against a pooled error term that was determined by assigning a dummy code to each participant, using those codes to calculate between-subjects variance, and extracting that between-subjects variance from the overall model variance. In these analyses, the SIAS score was a continuous variable. The variables of behavior centrality, behavior valence, and trait dimension were treated as categorical two-level within-subjects variables and the behavior referent variable was treated as a categorical two-level between-subjects variable.

For the between-subjects portion of this analysis, the recall scores were averaged for each participant across all the within-subject cells. These averages were then entered into a two step regression. In the first step, recall was predicted by behavior referent and social anxiety; in the second step, the Behavior Referent \times Social Anxiety interaction was added to the model containing the main effects. To conduct the within-subjects portion of the analyses, in an initial step the dummy codes assigned to each participant were

1. Some readers may express doubt that predictions about such high-order interactions can be sensibly made. For those who retain such doubt, we note that these studies are carried out as a part of a Master's thesis project and that these predictions, and the rationales for such predictions, are explicitly laid out in the Master's thesis proposal. The proposal document is available upon request.

entered to control for between-subjects effects. In a second step, the main effects for the within-subjects variables (behavior centrality, behavior valence, trait dimension) were entered. Subsequent steps in the analysis consisted of the inclusion of higher order interactions at additional steps, proceeding from the 2-way interactions to the 5-way interaction. To avoid redundancy and to simplify presentation, the description of results from these regression analyses focuses on those effects in which the basic 3-way mnemonic neglect interaction was moderated by the trait dimension variable and/or the social anxiety variable.

The 5-way interaction among social anxiety, trait dimension, behavior centrality, behavior valence, and behavior referent was not significant, $F(1, 2429) = 0.02, p = .875, \omega^2 = .001$. However, the Social Anxiety \times Behavior Centrality \times Behavior Valence \times Behavior Referent interaction was significant, $F(1, 2430) = 9.25, p = .002, \omega^2 = .002$. Decomposition of this interaction, presented in Figure 1, shows that the interaction was largely driven by a positive relation between social anxiety and behavior recall only in the case of negative behaviors which were also central and self-referent. That is, as expected, loss of mnemonic neglect emerged among participants high in social anxiety: Compared to participants low in social anxiety, high social anxiety participants experienced heightened recall for both self-referent socially inept behaviors and self-referent untrustworthy behaviors, $t(348) = 3.06, p = .002, \omega^2 = .023, b = .048$.

The Moderation of Mnemonic Neglect By Social Anxiety Cannot Be Accounted For By Depression. Two analyses were conducted to explore whether the social anxiety moderation effect that emerged from the second set of analyses could be accounted for by levels of depression, which tends to be co-morbid with social anxiety. In one analysis, the relation between a participant's SIAS and memory was evaluated after adjusting (via residualization) the SIAS-memory relation for each participant's BDI score. The BDI predicted in separate models a participant's SIAS score and the recall variable. The respective residuals from these models were then used in place of the SIAS and the behavior recall proportion variable in the main hierarchical regression analysis. Thus, these residualization analyses examined the extent to which variance in the memory measure that could not be explained by the BDI might be exclusively predicted by the SIAS. Thus, this analysis allowed the SIAS-memory relation to be evaluated after controlling for the BDI score. The 4-way inter-

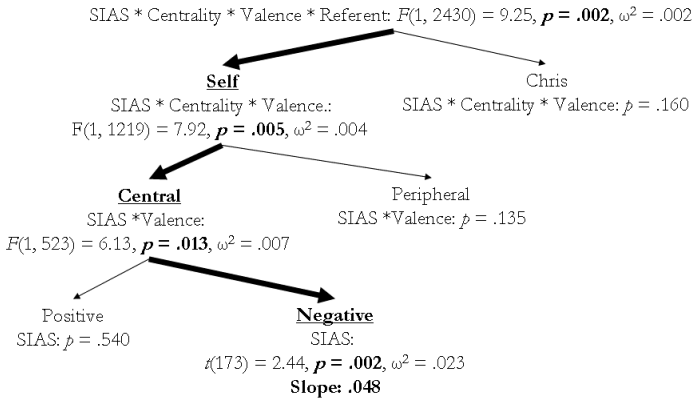


FIGURE 1. Breakdown of 4-way SIAS \times Trait Centrality \times Behavior Valence \times Behavior Referent Interaction for Study 1.

action among social anxiety, behavior centrality, behavior valence, and behavior referent remained significant, $F(1, 2430) = 8.62, p = .002, \omega^2 = .002$, and the form of this interaction was essentially unchanged from that depicted in Figure 1. This result suggests that depression does not account for the loss of mnemonic neglect exhibited by socially-anxious participants.

In the second analysis, the BDI score was entered into the regression model as a full moderator variable. Here, the main effect of depression on memory was assessed, as well as interactions between depression and all other variables in the model. In this analysis, relations between memory and depression, as reflected in either the depression main effect or the interactions of depression with other variables, might account for the moderation of the mnemonic neglect effect by the SIAS. Such results did not emerge. Instead, the SIAS variable moderated the mnemonic neglect effect, $F(1, 2411) = 8.81, p = .003, \omega^2 = .002$, and the form of this moderation matched the diagram depicted in Figure 1. This result again suggests that depression does not explain the loss of mnemonic neglect observed among participants high in social anxiety.

STUDY 2

The goals of Study 2 were to: (a) attempt to replicate Study 1's finding of mnemonic neglect loss in participants exhibiting high levels of

social anxiety; and (b) find out if the mnemonic neglect loss among socially-anxious individuals is further moderated by the trait dimension variable and/or the presence of a social threat. This second goal was based on Mansell and Clark (1999). They reported that, when individuals are exposed to a socially threatening situation, those who are high in social anxiety will be especially likely to remember negative information. This finding implies that, when engaging in a mnemonic neglect memory paradigm, those who are both high in social anxiety and exposed to a social threat will be especially likely to exhibit loss of mnemonic neglect. Moreover, resurrecting the specificity hypothesis that was not supported in Study 1, it is also possible that, for socially-anxious individuals, the social threat manipulation might work selectively on recall for the socially-inept behaviors. This suggests that, in the social threat condition, the relation between social anxiety and loss of mnemonic neglect for self-referent socially inept behaviors would be especially strong (relative to loss of mnemonic neglect for self-referent untrustworthy behaviors). Note that, despite the possible emergence of higher order interactions (4-way, 5-way, and even a 6-way), the key condition in these interactions is the central/negative/self-referent cell. It is in this cell, and only in this cell, that social anxiety should be related to recall (producing loss of mnemonic neglect, as in Study 1). The core questions in Study 2 are whether the loss of mnemonic neglect evinced by socially-anxious individuals in this cell will depend on the trait dimension exemplified by the behavior and/or the presence of a social threat.

METHOD

Participants and Design. Participant recruitment, compensation, and participation restrictions duplicated those of Study 1.

Data from 57 of the 427 recruited participants were excluded for one of the following reasons: (a) they were nonnative English speakers ($n = 21$), (b) they did not complete the task ($n = 21$), (c) they failed a manipulation check and could not recall instructions they had received at the beginning of the study ($n = 3$), (d) they had been in the study in a prior semester and were mistakenly allowed through the protocol a second time ($n = 2$), (e) the researcher erred in delivering instructions ($n = 4$), or (f) the software program crashed without reporting any data ($n = 6$). The ages of the remaining 370 partici-

pants ranged from 18 to 67 years ($M = 20.64$, $SD = 4.65$), 230 were female (62.2%), and most (57.0%) identified themselves as Caucasian (26.5% Black Americans, 7.8% Latino, 4.9% Asian Americans, .5% Native American, 3.2% no ethnicity indicated).

Materials and Procedure. As in Study 1, the variables of behavior valence (positive, negative), behavior centrality (central, peripheral), behavior referent (self, Chris), and trait dimension (social interaction, social responsibility) were manipulated.

Study 2 included a manipulation of social threat. At the beginning of the study, participants who were randomly assigned to the social threat condition were told that they would be expected to give a speech in front of an audience at the end of the study. They were informed that they would receive the topic for the speech after the computer-assisted part of the study and would then have one minute to prepare a 2-minute speech. In the no threat condition, participants were told at the beginning of the experimental procedure that they would watch a 2-minute video clip depicting such speech-making activity at the end of the study.

Next, participants completed the same mnemonic neglect memory protocol used in Study 1. Following completion of the mnemonic neglect protocol, participants were guided into a separate room. As a manipulation check, they were asked if they remembered what was supposed to happen in the second part of the study. Subsequently, participants completed the assigned tasks (speech vs. watching video), thus avoiding the use of deception. A debriefing concluded the study.

RESULTS AND DISCUSSION

Memory Coding and Tabulation. Data coding proceeded as described in Study 1. Rater agreement was 94.2%, and discrepancies were resolved through discussion. The proportions of behaviors recalled were tabulated for each cell of the within-subjects portion of the design (Behavior Centrality \times Behavior Valence \times Trait Dimension; Trait Centrality \times Behavior Valence for the replication of the mnemonic neglect effect). These proportions of recalled behaviors were the dependent measures.

Replication of Mnemonic Neglect. As in Study 1, the tabulated recalled behavior proportions were entered into a Behavior Referent \times Behavior Centrality \times Behavior Valence mixed model ANOVA in

which behavior centrality and behavior valence were within-subjects variables, and behavior referent was the only between-subjects variable.

The characteristic element of the mnemonic neglect effect is the Behavior Centrality \times Behavior Valence \times Behavior Referent interaction. This effect was not significant in Study 2, $F(1, 368) = .17, p = .679, \omega^2 < .001$. However, the recall data displayed in Table 2 reveal that the poor recall for central/negative/self-referent behaviors (compared to recall for central/negative/Chris-referent behaviors) that emerged in Study 1 was indeed replicated in Study 2. Further, Table 2 illustrates that this decrease in recall also emerged for peripheral/negative/self-referent behaviors (relative to peripheral/negative/Chris-referent behaviors). This overall recall pattern reflects the significant Behavior Valence \times Behavior Referent interaction, $F(1, 368) = 10.66, p = .001, \omega^2 = .003$, yielded by the ANOVA (note that this same interaction also emerged in Study 1). Results from a subsidiary analysis using only the peripheral behaviors confirm the interpretation of this interaction: This analysis also yielded a Behavior Referent \times Behavior Valence interaction, $F(1, 368) = 3.71, p = .054, \omega^2 = .002$. Additional decompositions of the Behavior Referent \times Behavior Valence interaction that emerged from the main analysis showed that recall of positive behaviors was not influenced by behavior referent (Self: $M = .18, SD = 0.21$; Chris: $M = .20, SD = .21$), $F(1, 368) = 3.10, p = .078, \omega^2 = .001$, but recall for negative behaviors was poorer when the behaviors referred to the self ($M = .20, SD = .22$) instead of to Chris ($M = .27, SD = .24$), $F(1, 368) = 31.77, p < .001, \omega^2 = .020$. Hence, the usual memory deficit in recall for central/negative/self-referent behaviors in the mnemonic neglect paradigm was again observed in Study 2, but it was accompanied by a similar memory deficit in recall for peripheral/negative/self-referent behaviors.

Finally, as in Study 1, recall rates for peripheral behaviors were unusually high. In particular, recall for peripheral negative behaviors was higher relative to recall for peripheral positive behaviors, $F(1, 368) = 79.27, p < .001, \omega^2 = .044$. Although not directly relevant to the mnemonic neglect effect, this heightened recall for unpredictable behaviors may be especially instructive for researchers who may use the mnemonic neglect paradigm.

Social Anxiety Moderates Mnemic Neglect. Next, again as in Study 1, hierarchical regression analyses were conducted. These tested the

TABLE 2. Means and Standard Deviations of Recall Proportions by Trait Centrality, Behavior Valence, and Behavior Referent in Study 2

	Central Traits		Peripheral Traits	
	Positive	Negative	Positive	Negative
Behavior Referent				
Self-referent	.19 (.16)	.15 (.14)	.18 (.16)	.25 (.19)
Chris-referent	.22 (.15)	.23 (.15)	.18 (.15)	.31 (.18)

possibility that mnemonic neglect (poor recall for self-referent socially inept behaviors and self-referent untrustworthy behaviors) was moderated by social anxiety, the trait dimension that is relevant to a behavior, and/or the presence of social threat. These analyses were conducted in a manner similar to that described for Study 1.

The analysis did not yield a significant $SIAS \times Trait Dimension \times Behavior Centrality \times Behavior Valence \times Behavior Referent \times Threat Condition$ interaction, $F(1, 2534) = 1.51, p = .220, \omega^2 < .001$. However, the analysis did yield a significant $SIAS \times Trait Dimension \times Trait Behavior \times Behavior Valence \times Behavior Referent$ interaction, $F(1, 2535) = 4.13, p = .042, \omega^2 = .001$. The a priori expectation was that such an interaction should be especially driven by the extent to which social anxiety was related to recall for self-referent socially inept behaviors. Decomposition of the interaction (Figure 2) exactly confirmed this expectation: The interaction effect reflects a positive relation between social anxiety and behavior recall for self-referent socially inept behaviors, $t(184) = 3.57, p = .001, \omega^2 = .059, b = .071$. A subsidiary test showed that this social anxiety-recall relation in the context of self-referent untrustworthy behaviors was not significant, $t(184) = -1.32, p = .189, \omega^2 = .004, b = -.033$. Hence, as in Study 1, social anxiety moderated the mnemonic neglect effect. However, in Study 2, social anxiety was linked to loss of mnemonic neglect only for recall of self-referent socially-inept behaviors, and not for recall of self-referent untrustworthy behaviors.

In contrast to Mansell and Clark's (1999) suggestion, this moderation of mnemonic neglect by social anxiety did not directly depend on the presence of social threat, a finding that also aligns with the Mitte (2008) meta-analysis results. This finding was not due to the threat manipulation being ineffective: The social threat manipulation did moderate memory. This effect was revealed in a significant $SIAS \times Behavior Valence \times Behavior Referent \times Threat Condition$ interac-

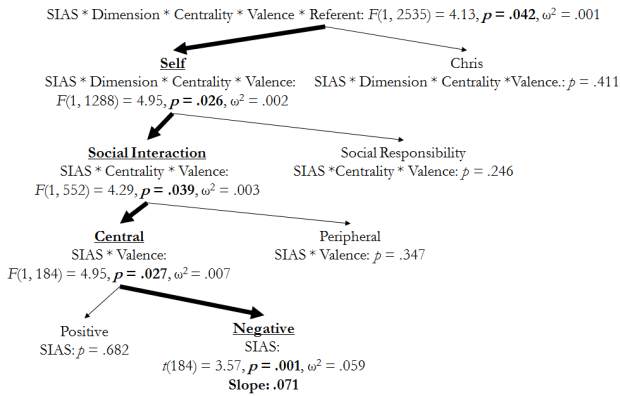


FIGURE 2. Breakdown of 5-way SIAS \times Trait Dimension \times Trait Centrality \times Behavior Valence \times Behavior Referent Interaction for Study 2.

tion, $F(1, 2541) = 5.21, p = .023, \omega^2 = .001$, that emerged from the regression analyses. Decompositions of this interaction indicated that, in the absence of threat, there was a positive relation between the SIAS score and recall for negative and self-referent behaviors, $t(366) = 1.86, p = .063, \omega^2 = .007, b = .035$. This effect echoes the same positive relation that emerged in Study 1, although this effect was limited to behaviors that exemplified central traits. This moderation of recall for self-referent negative events by a participant's SIAS score was not present in the threat condition. Thus, the threat manipulation might have been potent enough to prompt high social anxiety in many participants, wiping out any effect that might have otherwise been due to a participant's pre-existing level of trait social anxiety.

The Moderation of Mnemic Neglect By Social Anxiety Cannot Be Accounted For By Depression. Regression analyses similar to those of Study 1 were carried out to find out if the 5-way interaction that emerged from the main ANOVA could be accounted for by participant depression. It could not. The effect remained significant when depression was entered as full moderator in the design, $F(1, 2486) = 5.18, p = .023, \omega^2 = .001$, or when depression was controlled for in an analysis using the residualization technique described in Study 1, $F(1, 2535) = 4.98, p = .026, \omega^2 = .001$.

STUDY 3

One straightforward idea that can help to understand the results of Studies 1 and 2 is that (a) behavior memory is partially determined by one's perception of the extent to which behaviors fit with one's self view (Gomez et al., 2014) perhaps due to their plausibility or credibility (Gregg, 2008), and (b) central negative behaviors are perceived as an especially good fit to the self-view of those who evince high social anxiety. This idea was tested in Study 3a.

METHOD OF STUDY 3A

Participants. Participants were recruited through Amazon's Mechanical Turk (www.mturk.com) and received 25 cents as compensation for their participation. Only data from those participants who completed all measures and who passed the attention probes inserted in the question list (e.g., "please select the lowest rating here") were included in the analysis. Validly responding participants ($N = 77$) ranged in age from 18 to 66 ($M = 36.32$, $SD = 11.78$) and were predominately female (57.1%) and Caucasian (77.9%; 9.1% African American, 6.5% Latino, 2.6% Asian Americans, 2.6% multiracial, and 1.3% other).

Materials and Procedure. Participants received a link to a survey hosted by SurveyMonkey (www.surveymonkey.com). There they were asked five questions (Table 3) about each of the same 32 behaviors used in Studies 1 and 2 (all behaviors were framed in terms of self-actions; behavior referent was not included as a variable). These five questions were developed to assess the extent to which a participant perceived each behavior as a fit to their self-view. Participants responded to 7-point scales for which the extreme anchors and the midpoint were labeled. Additionally, participants completed: (a) the Social Interaction Anxiety Scale (SIAS; Rodebaugh et al., 2006), and (b) demographic information.

RESULTS AND DISCUSSION OF STUDY 3A

Responses to the items were highly inter-correlated (Table 3), suggesting that the responses reflected a common underlying construct. Hence, the items were combined into an index by averaging

TABLE 3. Inter-Item Correlations for Self-Relevance Questions of Study 3a

	1.	2.	3.	4.	5.
1. How well does this behavior fit with your own current social self-image	1	.629**	.539**	.712**	.471**
2. If the right circumstances presented themselves, how likely is it that you could act in the manner described by the behavior?		1	.712**	.779**	.603**
3. If someone wrote a story about you and described this behavior in the story, how easy would it be for readers who know you well to believe that the behavior was true?			1	.768**	.635**
4. To what extent is the described behavior similar to other kinds of social behaviors that you actually have engaged in?				1	.701**
5. Imagine that a computer game designer crafted an avatar for you in his game that was supposed to act like you. Imagine that the game designer had the avatar engage in this behavior in his computer world. How well would you say that the game designer captured your social personality in this behavior?					1

Note. ** $p < .001$

each participant's five responses to each behavior. Reliability calculations produced separately for each of the 32 behaviors indicated good reliability for this index, regardless of the behavior for which the index was calculated (Cronbach's alphas: high value = .959, low value = .751, M value = .899).

Analyses of the index values tested the idea that one reason for the loss of mnemonic neglect for central + negative behaviors in socially-anxious individuals in Study 1 and for central + negative + socially inept behaviors in Study 2 was that those behaviors were seen by socially anxious individuals as a good fit to their self-conceptions. Table 4 presents the results of regression analyses in which each participant's average index score for the four behaviors in each of the 8 cells formed from the Trait Dimension \times Trait Behavior \times Behavior Valence matrix was predicted by the participant's SIAS score.

The fit perspective suggests that the SIAS score ought to predict positively ratings for either (or both) social interaction + central + negative behaviors and social responsibility + central + negative behaviors. The results suggest that this was the case (though the latter effect is significant only if one employs a one-tailed directional

TABLE 4. Study 3: SIAS Score as a Predictor (Beta Values) of Various Measured Properties Of Imagined Self-Enacted Behaviors Separately for Each Cell of the Trait Dimension x Trait Behavior x Behavior Valence Matrix

	Measured Behavior Property						
	Self-Fit Index	Familiarity With Behavior	Self-Relevance If True	Importance to Perform or Not	Pleased or Upset If Seen as Typical	Positive or Negative	
Social Interaction Central Negative	.23	.09	.10	-.01	.07	.11	
Social Responsibility Central Negative	.22	.11	.08	< .01	.11	.12	
Social Interaction Peripheral Negative	.26	.12	.10	.01	.10	.12	
Social Responsibility Peripheral Negative	.23	.19	.13	.02	.18	.16	
Social Interaction Central Positive	.11	-.02	.03	-.06	.02	.08	
Social Responsibility Central Positive	.19	.07	.08	-.02	.09	.10	
Social Interaction Peripheral Positive	.12	< .01	.04	-.07	.06	.09	
Social Responsibility Peripheral Positive	.19	.11	.10	.02	.11	.12	

Note. bold = $p < .05$; italics = $p < .10$

test, which would be logically appropriate in this case). The data also support the fit perspective in that the SIAS did not significantly predict the fit index score for any of the positive behaviors (though the relation approached significance for both types of social responsibility + positive behaviors). However, the fit perspective is weakened by the fact that the SIAS also predicted the fit index score for both social interaction + peripheral + negative behaviors and social responsibility + peripheral + negative behaviors. Note that the SIAS did not predict memory for these negative peripheral behaviors, so the fact that the SIAS predicted the perceived fit of these behaviors to the self does not correspond with the notion that fit to the self substantially affects behavior recall.

Of course, perceived fit to the self may not be the only variable that was responsible for the loss of mnemonic neglect observed in Studies 1 and 2. Using a method similar to that employed in Study 3a, Study 3b explored some of the other behavior characteristics that may have contributed to the loss of mnemonic neglect observed in Studies 1 and 2. The selection of these characteristics was guided by both the mnemonic neglect pretest conducted by Sedikides and Green (2000) and by theoretical ideas about how the perceived behavior characteristics might vary by social anxiety. These characteristics were the extent to which a participant: (a) perceived themselves to be familiar with the behavior; (b) saw the behavior as self-relevant if the behavior was true; (c) perceived the behavior as important to perform or not; (d) was pleased or upset if someone saw the behavior as typical of the participant; and (e) saw the behavior as positive or negative.

METHOD OF STUDY 3B

Participants. Participants were recruited from Amazon's Mechanical Turk (www.mturk.com). As in Study 3a, data for analysis was retained only from those participants who completed all measures and who did not fail any attention probes. The 94 validly responding participants ranged in age from 18 to 72 ($M = 37.46$, $SD = 14.03$) and were predominantly female (71.3%) and Caucasian (72.3%; African American = 6.4%, Latino = 5.3%, Asian American = 3.2%, multiracial = 7.4%, other = 2.1%, declined to answer = 3.2%).

Materials and Procedure. The method closely resembled that used in Study 3a. The only difference was the set of questions that par-

ticipants responded to after reading and the scale that was used to respond the questions (scales taken from Sedikides & Green, 2000). The questions were: (a) "How familiar are you with the following behaviors?", (b) "How relevant would it be for you if the behaviors below were true?", (c) "How important is it for you to perform (or not perform) the following behaviors?", (d) "How pleased or upset would you be if someone suggested the following behaviors as typical of you?", and (e) "In your opinion, how positive or negative for you are the following behaviors?".

RESULTS AND DISCUSSION

Table 4 presents the results of regression analyses in which each participant's average response to the four behaviors in each of the eight cells formed from the Trait Dimension \times Trait Behavior \times Behavior Valence matrix was predicted by the participant's SIAS score. If any of these five properties were responsible for the loss of mnemonic neglect observed in Studies 1 and 2, one would expect that the SIAS would predict these properties when the behaviors were negative and central. They did not. The SIAS had predictive power only when predicting the familiarity with, and the extent to which a person was pleased or upset with, social responsibility-linked peripheral negative behaviors, and even those effects merely approached significance. It is therefore unlikely that social anxiety-related differences in perceptions of behavior familiarity, importance to perform or not perform, valence, self-relevance, are the driving factors behind the loss of mnemonic neglect, nor are social anxiety-related differences in emotional responses to behaviors a likely cause for such effects.

GENERAL DISCUSSION

The studies presented in this article show that recall for negative information was enhanced by social anxiety. Specifically, social anxiety was related to loss of mnemonic neglect: The higher the social anxiety, the better the recall for negative behaviors that typically pose a strong threat to the self.

The clarity of our results suggests that some of the inconsistency in prior work exploring the relation between social anxiety and mem-

ory might be attributed to lack of control over the self-relevance of stimuli and the extent to which stimuli posed a self-threat (an assertion supported by Mitte, 2008). We corrected this potential problem by establishing in a pre-test the extent to which self-referent behaviors threatened the self, and by establishing in a post-test the extent to which behaviors were seen as a fit to the self. It was exactly these behaviors (high threat, high fit) whose recall increased for individuals high in social anxiety. The importance of stimulus self-relevance to this social anxiety-recall relation is evidenced by the fact that the relation emerged only when the behaviors were framed in terms of the self (not in terms of Chris). This finding fits with Mitte's (2008) assertion that some results in this area can be contaminated by a host of nonanxiety-related variables that might be linked to stimulus recall. Much safer would be to compare across the same stimuli the recall of socially-anxious participants to the recall of nonsocially-anxious participants, as we did in the current work. This practice minimizes many confounds that might influence the results of a given study. In this regard, we note that the mnemonic neglect paradigm helps to minimize such confounds in the study of social anxiety and memory. It does so by examining recall for exactly the same behavior by comparing recall for the behavior when it is self-framed versus other framed. It is this self vs. other comparison that is crucial: As our data show, comparisons of recall across types of events (e.g., central vs. peripheral) are potentially affected by many of the additional properties of the stimuli (e.g., unexpectedness, typicality) than can affect recall.

One promising direction for future investigations would be to examine the mechanisms that likely act on memory for self-referent negative behaviors. The mnemonic neglect effect is thought to reflect the action of the motives to self-enhance and self-protect, and is believed to be based on how deeply the presented information is processed. However, the exact cognitive mechanisms by which these motives act on memory in the context of this paradigm remain somewhat unclear, although progress has been made (Newman, Sapolsky, Ying, & Bakina, 2014; Pinter, Green, Sedikides, & Gregg, 2011; Saunders, 2011, 2013; Sedikides & Green, 2000, Experiment 3).

While the use of the mnemonic neglect paradigm can thus provide further insights into the effect of social anxiety on recall, it also comes with its own set of limitations. For example, the paradigm does not assess if social anxiety influences how much attention par-

ticipants pay to the behavior descriptions and how that might affect encoding and thus recall.

The studies described in this article emphasize the idea that recall of the events and behaviors that occur in a person's life does not happen in a vacuum. Individuals recall events and forget events for many reasons, including the need to engage in emotion regulation. From this viewpoint, it makes sense that individuals may have difficulty recalling negative behaviors. However, negativity seems to be insufficient to produce this recall deficit. Also important to poor recall of negative behaviors are whether a behavior was self-enacted and is central to the self. The mnemonic neglect phenomenon suggests that behaviors that possess these three characteristics (self-referent/central/negative) are infrequently recalled. Crucially, our findings suggest that high social anxiety produces loss of mnemonic neglect, prompting enhanced recall of such behaviors. Hence, understanding recall requires an understanding of the motives that protect and enhance the self. It also requires an understanding of the cognitive mechanisms by which these motives exert their influence. Research has only begun to address these important issues, and we expect to encounter many more enlightening findings as future research on this topic proceeds.

APPENDIX

Behaviors selected from pretest results and used for Study 1 and Study 2

Socially-Adept Behaviors

1. X would look comfortable and relaxed when being interviewed for a new job.
2. Everyone would rave about how natural X's performance appeared to be after X gave a speech in front of 1,000 people at the convention.
3. X would laugh along with everyone else at the embarrassing stories from when X was young that X's dad was telling about X to everyone at the wedding reception.
4. X would be promoted to the manager's job because X is the person that everyone seemed to listen to and respond to.

Socially-Inept Behaviors

5. X would fidget in the library whenever a new person walked by.

6. X would start to invite the new person in the office for a cup of coffee but would abruptly stop talking.
7. X told X's friends that X would be mentally exhausted after even the briefest conversation with others.
8. X would dial the phone but hang up before being connected to speak with the city clerk about overcharges in X's electricity bill.

Extraverted Behaviors

9. X would walk up and introduce themselves/myself to the stranger at the party.
10. X would join in on an ongoing conversation on modern music groups.
11. X's friends would characterize X's favorite activity as being among people.
12. X would volunteer for the job of campus guide and say that X did so because X was excited to be able to talk to all the new students.

Introverted Behaviors

13. X would spend most of X's time alone in X's room.
14. X would frequently go outside where it is quiet when attending a wedding celebration.
15. X would often eat alone in the cafeteria.
16. X would decline all offers to dance at the party.

Trustworthy Behaviors

17. X would keep secrets when asked to.
18. X would follow through on a promise made to friends.
19. A teacher would leave X alone in a room while taking a test and not be afraid that X would cheat.
20. People would be willing to tell X embarrassing things about themselves in confidence.

Untrustworthy Behaviors

21. X would borrow other people's belongings without their knowledge.
22. X would be unfaithful when in an intimate relationship.
23. X would often lie to X's parents.
24. An employer would not rely on X to have an important project completed by the deadline.

Predictable Behaviors

25. X would be so consistent about taking a walk that X's neighbors could set their clocks by it.
26. X would have a fixed day on which X always did the laundry.
27. X would get about the same grade in X's sociology class in every test throughout the semester.
28. X would go to bed between 11 and 11:30 at most nights.

Unpredictable Behaviors

29. Even without being on the schedule X would give a toast at a wedding.
30. X would sometimes turn in X's term papers early and sometimes late.
31. X would not contact X's friends for months and then invite them over three times a week.
32. After being invited out, it was only 50–50 as to whether X would actually show.

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