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Social Anxiety and Gaze Aversion: Manipulating Eye Contact in a Social Interaction

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by

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Abstract

Although gaze aversion has been proposed to relate to higher social anxiety (Schneier et al., 2011), behavioral observation studies have produced mixed findings (Farabee et al., 1993; Walters & Hope, 1998; Weeks et al., 2011). The goals of the current study were to test the validity of a self-report measure of gaze aversion (the GARS; Schneier et al., 2011) and to test the theory that individuals with higher social anxiety avoid eye contact in an effort to regulate state anxiety. Participants completed a short social interaction with another undergraduate participant in which eye contact was manipulated halfway through the interaction. Participants were instructed to make either more, less, or continue as before. As expected, the GARS and self-reported social anxiety were related to self- and partner-report of eye contact. Contrary to expectation, being asked to make less eye contact was the most anxiety-provoking condition for participants with higher social anxiety. We propose that avoiding eye contact in an effort to regulate state anxiety is an ineffective strategy for individuals with higher social anxiety.

Keywords: social anxiety, gaze aversion, Gaze Aversion Rating Scale, eye contact

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Social Anxiety and Gaze Aversion: Manipulating Eye Contact in a Social Interaction

Gaze aversion has been proposed as a construct that is important to the understanding and treatment of social anxiety (Gilbert, 2001; McManus, Sacadura, & Clark, 2008). Despite some evidence from eyetracking and brain-imaging studies that link gaze avoidance to social anxiety (Horley, Williams, Gonsalvez, & Gordon, 2004; Moukheiber et al., 2010), behavioral observation studies have produced mixed results (Farabee, Holcolm, Ramsey, & Cole, 1993; Walters & Hope, 1998; Weeks, Heimberg, & Heuer, 2011). Only one known study found an association between social anxiety and observable gaze aversion (Farabee et al., 1993). Despite some null findings, it is possible that alternative methods of measuring gaze aversion would help to resolve the discrepancy between theory and observation. The Gaze Aversion Rating Scale (GARS; Schneier, Rodebaugh, Blanco, Lewin, & Liebowitz, 2011) is a self-report measure that was developed to measure the amount of anxiety one has about making eye contact and to what extent one avoids eye contact across various social situations. In the current study we tested the ability of this measure to relate to partner and self-rating of eye contact in a social interaction. This was an important step in testing the predictive validity of the measure and in clarifying the relationship between social anxiety and gaze aversion. Because this measure includes anxiety and avoidance about making eye contact across a variety of social situations, it may provide a more thorough assessment of gaze anxiety and avoidance in comparison to other measures of social anxiety that may include at most one item about eye contact. Therefore, the GARS may provide a better measure with which to test the link between self-report of eye contact anxiety and avoidance and observable eye contact behavior.

The link between self-report measures of social anxiety and observable eye contact has been tested by previous researchers. Gaze avoidance and anxiety have been associated with

higher social anxiety in studies using eyetracking and functional magnetic resonance imaging (fMRI; Horley, Williams, Gonsalvez, & Gordon, 2003; Horley et al., 2004; Schneier, Kent, Star, & Hirsch, 2009). Horley et al. (2004) found that individuals with higher social anxiety, when viewing a picture of a face, were more likely to repeatedly scan the whole face (hyper-scanning) than look directly at the eyes, particulary when viewing an angry face. People with higher social anxiety also tended to make a reduced number of fixations (pausing on certain features of the face), particularly when viewing neutral or sad faces (Horley et al., 2003). Schneier et al. (2009) used fMRI to measure activation of brain regions relevant to social anxiety disorder during presentation of face photos that simulated either direct or averted gaze. Participants diagnosed with social anxiety disorder showed greater activation in brain regions related to fear neurocircuitry relative to healthy controls for both direct and indirect gaze. Direct gaze elicited more activation in comparison to indirect gaze within participants with social anxiety disorder.

In contrast to the above findings, behavioral observation studies of live social interactions have produced inconsistent findings (Farabee et al., 1993; Walters & Hope, 1998; Weeks et al., 2011). Farabee et al. measured gaze behavior in participants with high and low levels of social anxiety during a persuasive speech. Through independent coding of videos, the authors found that participants with higher levels of social anxiety tended to spend less time looking at, and directed fewer gazes towards, confederates' faces during a persuasive speech relative to participants with lower levels of social anxiety. Furthermore, this effect was even stronger for the number of gazes directed towards a confederate's face who had expressed a differing opinion. Walters and Hope tested the psychobiological model of social anxiety that predicts fewer cooperative and dominant behaviors and more submissive and avoidant behaviors in those with higher social anxiety. In short conversations with a confederate, participants with higher social

anxiety exhibited fewer cooperative and dominant behaviors than those with lower social anxiety, but did not differ in the frequency of submissive and avoidant behaviors (including gaze aversion). Notably, gaze behavior was coded by independent raters using forced-choice decisions at 10 second intervals. It is unknown whether other methods of coding would be preferable for detecting gaze behavior differences. Weeks et al. investigated the use of submissive behaviors by male participants during social competition for a female confederate. The authors found support for an association between social anxiety and two submissive behaviors: body collapse and vocal pitch peak elevation, but no support for an association with gaze avoidance.

Despite some documentation of an association between social anxiety and gaze aversion from eyetracking and brain-imaging studies, the function of this behavior for those with higher social anxiety remains to be tested. There are several theories that may relate to the function of gaze aversion. Psychobiological or ethological theories of social anxiety suggest that gaze aversion is as a way to communicate submissiveness to others (Gilbert, 2001). This theory is supported by studies that show that in many primate societies, including humans, dominance hierarchies are communicated through gaze behavior (Coss, Marks, & Ramakrishnan, 2002; Strongman & Champness, 1968). In such societies, an individual of lower status, when confronted by a more dominant individual, will lower his or her gaze to signal acceptance of the other's dominance and reduce the likelihood of aggression (Coss et al., 2002; Strongman & Champness, 1968).

If gaze aversion is, in part, an evolutionary tactic designed to communicate submissiveness within competitive social hierarchies, we might expect gaze behavior to differ depending on gender. In support of gender differences in dominance-related behaviors, men are more likely than women to hold a Social Dominance Orientation, defined as the extent to which

one prefers relations to be hierarchical rather than equal (Sidanious, Sinclair, & Pratto, 2006). This finding could indicate that men are more concerned about status within a hierarchy due to the higher level of competitiveness between men in comparison to that between women. Within these competitive hierarchies, eye contact might serve as an important tool for communicating status. If social hierarchies are more important for men, and gaze is used to communicate status within those hierarchies, this could explain why men employ less mutual gaze in social exchanges than women (Exline, Gray & Schuette, 1965); men may be more worried about inciting competition via direct gaze. Women, in turn, may be more motivated by other evolutionary tactics such as *tend-and-befriend* behaviors (Taylor, 2006). These behaviors are categorized as adaptive strategies used to reduce the distress associated with deficits in social contact and are associated with nurturing and forming friendships (Taylor et al., 2000). Eye contact has been shown to serve a crucial role in regulating and facilitating social interactions (Hietanen, Leppänen, Peltola, Linna-aho, & Ruuhiala, 2008; Kendon, 1967; Senju, Hasegawa, & Tojo, 2005); women may employ this behavior at a higher frequency relative to men because they are more motivated to enhance social relationships.

Based on theories of the role of attentional bias in social anxiety, gaze aversion may also serve as a threat avoidance technique. People with higher social anxiety are thought to have an attention bias towards signs of social threat, meaning they tend to be more aware of signs from others that may indicate social rejection (e.g., facial expressions; Rapee & Heimberg, 1997). The eyes may be the most fear-inducing of these signs of social threat because the eyes can convey information about social status or dominance. People with higher social anxiety may show an attentional bias towards facial expressions because they represent social threat (for example to the eye region of a threatening face). However, over time, higher social anxiety would be

expected to relate to less overall eye contact (e.g., Garner, Mogg, & Bradley, 2006); because, although people with higher social anxiety are more aware of signs of social threat, they also strive to avoid these signs to reduce anxiety.

In line with the idea that attention biases may serve to reduce anxiety, gaze aversion may function as a part of this anxiety-reducing mechanism. In support of this theory, previous research has shown that people with higher social anxiety attempt to behave in social interactions in ways that will reduce or hide their anxiety (McManus et al., 2008). For example, individuals with higher social anxiety might avoid eye contact to hide their anxious expression or keep their hands in their pockets to hide their shaking. These behaviors are sometimes called safety behaviors (Salkovskis, 1991) and researchers suggest that although individuals believe these behaviors to be helpful, instructing them to drop their safety behaviors can be beneficial (McManus et al., 2008; Morgan & Raffle, 1999). Gaze aversion could be seen as a type of safety behavior that allows one to reduce anxiety by avoiding eye contact and hiding anxious expressions.

We do not find the above theories incompatible because they all suggest reasons why making eye contact may be anxiety-provoking for individuals with higher social anxiety: whether it be to avoid competition, avoid a sign of social threat, or hide anxiety, avoiding eye contact should serve to reduce anxiety according to all of these theories. Therefore, we propose that testing whether gaze aversion functions as an anxiety-reduction mechanism will provide a useful step in testing these theories.

In the current study, we aimed to test whether gaze aversion provides an anxiety-reducing function in those with higher social anxiety by manipulating eye contact behavior in a social interaction. A second aim was to test whether the GARS would relate to eye contact behavior in

a social interaction and whether it would provide additional predictive power in testing the relationship between social anxiety and gaze aversion. We measured gaze aversion through two methods (self-report and partner-report) to determine which method best captures this behavior and which are related to meaningful outcomes such as the quality of the interaction. During short social encounters with another undergraduate participant, participants were instructed to either increase their eye contact, decrease their eye contact, or continue as before. We hypothesized that both measures of gaze aversion (self-report and partner report) would relate to measures of social anxiety and the GARS. We also expected that social anxiety, the GARS, and eye contact would relate to perceptions of the social interaction and the participant, such as the partner's desire to be friends with the other participant and enjoyment of the interaction. In accordance with the hypothesis that eye contact regulates social anxiety for those more prone to it, we hypothesized that social anxiety, type of eye contact manipulation (more, less, or same) and their interaction would relate to the level of state anxiety reported after the interaction. We predicted that participants with high trait levels of social anxiety told to increase their eye contact would report higher levels of state anxiety than such participants who were told to either decrease their eye contact or told to continue in the same manner. Based on previous findings (Exline et al., 1965), we also hypothesized that men and women would exhibit differences in eye contact behavior. Based on these same findings, we planned to test whether the type of dyad (two women, two men, or mixed gender) would influence eye contact, predicting that participants in dyads with two women would report more eye contact than either mixed dyads or dyads with two men. Finally, we predicted that being asked to change one's eye contact would influence state mood ratings of positive and negative affect, especially for participants with higher social anxiety.

Method

Participants

Participants were 127 undergraduates at Washington University in St. Louis. The majority of the participants were female (n = 79; 63.2%) and white (n = 73; 59.3%) with a mean age of 18.92 (SD = 1.74). Other reported ethnicities were Asian or Pacific Islander (n = 30; 24.4%), Black (n = 8; 6.5%), Hispanic (n = 8; 6.5%), and Multiracial (n = 3; 2.4%). Participants were compensated with course credit for their participation. Participant social anxiety, as measured by the straightforward total (i.e., sum of all items that are not reverse-scored) of the Social Interaction Anxiety Scale (M = 18.88, SD = 10.63), ranged from 0 to 57 out of a possible 0 to 68. Recent psychometric research suggests that a straightforward score of 28 is analogous to a total score of 34, which has been previously found to indicate possible social anxiety disorder (Rodebaugh et al., 2011). Therefore, it is likely that clinically significant levels of social anxiety exist in our sample.

Due to missing data, the number of cases included in each analysis varies. Partially missing data occurred in 24% (n = 17) of the participants that were randomly-assigned to either make more eye contact, make less eye contact, or make no changes to eye contact (n = 72). Much of the missing data were due to participant confusion in answering the post-task questionnaire questions. The eye contact questions were particularly vulnerable to this problem. Excluding these variables, 7% (n = 5) of the primary participants had partially missing data. Because of this variation, the number of participants is noted for each analysis.

Procedure

For a visual depiction of the experimental procedures please see Figure 1. Experimental sessions were conducted in the Psychology building at Washington University in St. Louis by

one of three undergraduate research assistants or a graduate student. The conversation portions of the sessions were video-recorded. Sessions were arranged so that two participants could sign up to participate at the same time. The first person who signed up was designated as the *first* participant and the second person to sign up was designated as the *second* participant. Every other session, the *first* participant was the one to be randomly-assigned and the *second* participant was assigned to Condition 3. The designation of who was to be randomly-assigned rotated each session so that if the *first* participant was randomly-assigned to Condition 1, 2, or 3 in one session, the *second* participant would be randomly assigned in the next session and so on. To determine which condition the randomly-assigned participant was assigned to, we created a random number list so that 1, 2, and 3 were randomized in groups of three to guarantee equal numbers in each condition. Each participant gave informed consent and was introduced to the experimental tasks. The participants were also introduced to each other. In the event that only one participant either signed up for or attended the session, a research assistant took on the role of the other interaction partner (described below).

After being introduced, participants completed packets of questionnaires in separate rooms. Once both participants had completed the packets, the experimenter brought them to the conference room for the interaction portion of the experiment. Participants were told that they would be having a get-to-know-you conversation. Participants completed two state measures before starting the interaction (and at various intervals throughout): the Brief State Anxiety Measure (BSAM) and the Positive and Negative Affect Schedule- State version (PANAS). Participants were informed that they would hear a knock on the door partway through the interaction and that they should fill out the next sheet in their packets (second administration of the BSAM) at this point.

The experimenter left the room after introducing the task and told the participants to begin their conversation. After 2.5 minutes, the experimenter knocked on the door to indicate that the participants should fill out the second BSAM. Participants resumed their interaction for another 2.5 minutes after completing the second BSAM. Then the experimenter re-entered the room and had the participants fill out the third BSAM and the second PANAS. At this point, the experimenter instructed the participants to open a Word document entitled *Instructions* that was saved on the desktop of their laptops. The document contained instructions based on each participant's condition. For Condition 1, the instructions read: During the next part of the interaction please alter your eye contact so that you are making *more* eye contact than you usually would (more than you had been using during the first part of the interaction); Condition 2 read: During the next part of the interaction please alter your eye contact so that you are making *less* eye contact than you usually would (less than you had been using during the first part of the interaction), and Condition 3 read: Please continue to get to know your interaction partner. After reading the instructions, participants completed the fourth BSAM and the third PANAS. Then the experimenter told the participants to continue their conversation and to fill out the next page in their packets (the fifth BSAM) when they heard the knock. The experimenter left the room and timed the interaction for another 5 minutes, knocking at 2.5 minutes and pausing the timer until the participants resumed their conversation.

After the second interaction, the experimenter re-entered the room and asked the participants to complete the next two pages in their packets (the sixth BSAM and the fourth PANAS) and a post-task questionnaire spreadsheet on the laptops. Participants were debriefed and thanked for their participation. Participants completed a few other task-related measures that are not described here because they were not used in the present analyses.

For sessions in which the experimenter was the interaction partner for the participant, the experimenter remained in the room for the entire duration of the interactions. The experimenter timed the interaction and instructed the participant on when to fill out the various measures. In these instances, the participants were aware that their partner was an experimenter.

Experimenter training. Undergraduate research assistants received training in how to interact with the participants when they played the role of the other interaction partner. They were instructed to adopt a friendly, but not overly eager, demeanor. They were told to try to pause at the beginning of the conversation to allow the interaction partner to begin the conversation (they were told they could say something if the other person did not after a few seconds). They were also told to avoid dominating the conversation and to try to create a balance in the conversation in terms of the number of questions asked and the amount of information given. They were told to employ their usual amount of eye contact and to try to keep their demeanor and eye contact as consistent across sessions as possible. Undergraduate research assistants were observed by a graduate student during a practice interaction and received feedback on their demeanor. We chose this method instead of a specific script because we wanted the interactions with the experimenter to be similar to those with another participant. For this reason, we did not want to increase any artificiality by restricting the conversation to certain topics. In keeping the interactions as close as possible to real-world interactions, we hoped to enhance the generalizability of our findings.

Measures

Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) is a 20-item measure employing a 0 to 4 Likert-type scale. The scale items concern anxious states experienced across a variety of social situations. The SIAS has shown good psychometric

properties including reliability and discriminant and construct validity (Brown, Turovsky, Juster, Brown, & Barlow, 1997; Heimberg, Mueller, Holt, & Hope, 1992). Rodebaugh et al. (2011) review evidence that suggests that the reverse-scored items fail to load on the same factor as the other items and are less related to social anxiety and more related to extraversion than is desirable. Furthermore, the authors show that the validity of the reverse-scored items is moderated by age and level of education. For these reasons, the three reverse-scored items were omitted in the present analyses. In the current study, internal consistency for the straightforward items was good ($\alpha = .91$).

Gaze Aversion Rating Scale (GARS; Schneier et al., 2011) is a measure of the amount of anxiety and avoidance one experiences around making eye contact in social situations. There are 17 items describing a variety of situations (e.g., *Giving a speech*, *Speaking to someone you find attractive*, *Receiving a compliment*). The format of the measure is similar to the format of the Liebowitz Social Anxiety Scale; respondents rate fear and avoidance of each situation. Scores range from 0 (*no anxiety*) to 3 (*a lot of anxiety*) for anxiety making eye contact, and from 0 (*no avoidance*) to 3 (*avoid a lot*) for avoidance. Schneier et al. (2011) reported that the avoidance and anxiety subscales were found to be highly correlated ($r = .75$, $p < .001$). In the current study, the subscales were also highly correlated ($r = .68$, $p < .001$) and internal consistency for the total was good ($\alpha = .90$).

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) contains two 10-item scales employing a 1 (*very slightly or not at all*) to 5 (*extremely*) Likert-type scale. Positive activated affect (*e.g., excited, proud*) and negative activated affect (*e.g., upset, scared*) are each measured with 10 items. The scales have shown good internal consistency and good convergent and discriminant validity (Watson et al., 1988). The state (*how*

you feel right now) version of this scale was administered four times during the interaction. The internal consistency was good for all four administrations (αs > .89).

Brief State Anxiety Measure (BSAM; Berg, Shapiro, Chambless, & Ahrens, 1998) is a 6-item version of the original 20-item State-Trait Anxiety Inventory (STAI; Spielberger, 1993). The items (*relaxed, steady, strained, comfortable, worried, tense*) capture anxiety experienced in the present moment and are rated on a 1 (*not at all*) to 4 (*very much so*) Likert-type scale. Berg et al. (1998) reported that Berg developed the measure in pilot work and that the measure displayed good internal consistency (α = .83) in this work. Berg et al. (1998) also reported that the measure was highly correlated with the full 20-item scale (*r* = .93). In the current study, internal consistency was good for all seven administrations (αs > .73).

Social Comparison Rating Scale (SCRS; Allan & Gilbert, 1995) contains 11 bipolar dimensions such as *inferior vs. superior* and *unattractive vs. attractive* that are meant to capture qualities that are used to make social comparison judgments. Respondents are asked to rate the items based on how they feel in relation to others on a 1 to 10 Likert-type scale. Allan and Gilbert (1995) reported good internal consistency, both in an undergraduate (α = .91) and clinical sample (α = .88). All 11 items were totaled together to create a general measure of social comparison across a variety of personal qualities. In the current study, internal consistency for the self and partner version of the measure was good (α = .87, α = .89, respectively).

Post-task Questionnaire is a 17-item questionnaire that was developed for the purpose of assessing responses relevant to the interaction task. This questionnaire was administered one time after both interactions were completed. The questionnaire assessed self-report of eye contact and effort in complying with the instructions, as well as assessment of the partner's eye contact behavior. For eye contact, participants were asked to rate their own eye contact overall,

as well as in each of the interactions (first and second). They also made these same ratings for their partner's eye contact. For the first seven sessions of the study, eye contact was only assessed with the *overall* question; we later added in the two additional questions referring to the first and second interaction. The variable of eye contact in the first interaction is limited in that it was rated *after* both interactions. We therefore expected it to be influenced by knowledge of the manipulation instructions for participants in Conditions 1 and 2. The questionnaire also assessed how the participant felt about his or her partner in terms of wanting to get to know better, liking, desire to be friends, and enjoyment of the interaction. The questionnaire also covered to what extent the partners knew each other and had interacted with each other before. This possibility will be evaluated in the **Manipulation Checks** section. Responses to these questions were assessed using a 1 to 7 Likert-type scale. The anchors of this scale varied from *not at all* to *very much* or from *very little* to *very much* depending on the question.

Data Analytic Procedure

All of following analyses focus on the primary participant: the participant from each dyad who was randomly assigned to either Condition 1, 2, or 3 (n = 72). Analyses also include responses from the partner (participant who could only receive Condition 3); these are used as sources of information about the primary participant. The only exception to this is the **Manipulation Checks** section; some of these analyses include all participants so we could evaluate compliance and prior interaction with the partner in the whole sample.

To represent the variable of Condition in multiple regression, we used two dummy-coded variables: one that represented the contrast between Conditions 1 and 2 vs. Condition 3 (Condition 1 and 2 were coded 1 and Condition 3 was coded 0) and one that represented Condition 1 vs. Conditions 2 and 3 (Condition 1 was coded 1 and Conditions 2 and 3 were coded

0).

For all multiple regression analyses, we initially included variables to test for the potentially confounding variables of dyad type (two men vs. two women vs. man and woman) and whether the partner was another participant or an experimenter. We created a contrast variable that compared dyads with two women to all other dyads (mixed gender and dyads with two men). We chose this contrast because there were only eight dyads with two men and because previous research suggests that women make more eye contact than men (Exline et al., 1965). Therefore, we expected that dyads with two women, compared to either mixed gender dyads or two men, would have the most mutual eye contact. We first conducted each equation with the variable representing dyad type to test whether any findings differed based on the dyad type. We also included two-way interactions between the variable representing dyad type and the other predictors in the equation as well as three-way interactions between the dyad variable and the other predictors. Variables were considered nonsignificant when $p > .05$; given the number of tests that were run, effects with p values above .05 were ignored. The dyad type variable and its interactions with the other predictor variables were not significant across all tests (ps > .057) so these variables were removed from the equations. We then conducted the equations with a contrast variable representing whether participants interacted with another participant or an experimenter. We did this so that we could test whether our results differed depending on the type of interaction partner. We included the relevant two and three-way interactions in the manner described above. In all cases, the variables including the contrast between interacting with another participant or an experimenter were nonsignificant (ps > .053) and were dropped.

For all significant interactions in multiple regression the nature of the interaction was investigated by calculating the predicted values of the dependent variable based on condition and

high vs. low social anxiety (plus or minus one standard deviation from the mean, respectively). We used the statistic SDBETA (Neter, Wasserman, & Kutner, 1989) to test for cases that were exerting disproportionate influence on the regression line. In cases where SDBETA was above the absolute value of 1, we excluded these participants and the equation was rerun. These instances are noted below where relevant.

Results

Manipulation Checks

We conducted a MANOVA to test whether eye contact varied by condition both for self- and partner-report of eye contact in the second interaction ($n = 58$). The multivariate effect was significant, Wilk's $\Lambda = .44$, $F(4, 108) = 13.66$, $p < .001$, $\eta_p^2 = .34$. Eye contact varied by condition for both self-report, $F(2, 55) = 33.68$, $p < .001$, $\eta_p^2 = .55$, and partner-report, $F(2, 55) = 4.11$, $p = .022$, $\eta_p^2 = .13$. More eye contact was reported in Condition 1 for both self-report ($M = 6.05$, $SD = 1.08$) and partner-report ($M = 5.42$, $SD = 1.46$) and less eye contact was reported in Condition 2 for both self-report ($M = 3.20$, $SD = 1.36$) and partner-report ($M = 4.15$, $SD = 1.53$). The amount of eye contact reported both for self- ($M = 5.47$, $SD = .96$) and partner-report ($M = 4.84$, $SD = 1.12$) in Condition 3 was between that reported for Condition 1 and 2.

We also tested to what extent interaction partners had interacted with each other prior to the session (the experimenter's response for this question was included when the experimenter interacted with the participant). The majority of participants (92.8% of 139) indicated that they had not interacted with their partner before the session (rating of 1 [*not at all*] on a scale of 1 to 7). A minority of participants (7%) reported that they had interacted with their partner before; five participants gave a rating of 2 and five participants gave a rating of 6. One participant left this item blank (0.8%).

We also tested self-report of effort put forth in getting to know the partner and in complying with instructions (n = 124). Effort put forth in getting to know the partner was also fairly high (M = 5.69, SD = 1.19). Though responses ranged from 1 to 7, only 8 participants gave a rating below 4. Effort in complying with the instructions was fairly high (M = 5.50, SD = 1.60). Though responses ranged from 1 (*not at all*) to 7 (*very much*), only 15 participants gave a rating below 4. For each regression result reported in the following sections we also conducted the equation with those who reported giving low effort in complying with instructions (score of 2 or lower on this item) excluded. Substantive results were equivalent in all cases, so results are reported with all participants included.

Initial Equivalence

We tested all variables of importance that were collected prior to randomization to condition to assess for equivalence on these variables in each condition. We tested the relationship between social anxiety, condition, and their interactions predicting state anxiety after the first interaction in multiple regression (n = 71). We conducted this analysis to test whether random assignment was successful in rendering equivalent groups at baseline. The SIAS was the only significant predictor of state anxiety after the first interaction (part r = .52, p < .001). The contrast between Condition 1 and 2 vs. 3 (part r = .10, p = .340), its interaction with the SIAS (part r = .10, p = .367), the contrast between Condition 1 vs. Condition 2 and 3 (part r = -.11, p = .31), and its interaction with the SIAS (part r = -.05, p = .635) were not significant predictors.

We also tested whether participants varied by condition on pre-manipulation variables. Because eye contact was assessed after condition assignment and might therefore be affected by it, we did not include eye contact in the following analysis.[1] We conducted a MANOVA to test whether the SIAS, the GARS, and age varied by condition (n = 70). The multivariate effect was

not significant, Wilk's $\Lambda = .95$, $F(10, 194) = 1.78$, $p = .067$, $\eta_p^2 = .02$. The univariate effects were not significant; the SIAS, $F(2, 67) = .31$, $p = .733$, $\eta_p^2 = .01$, the GARS, $F(2, 67) = .27$, $p = .761$, $\eta_p^2 = .01$, and age, $F(2, 67) = .64$, $p = .529$, $\eta_p^2 = .02$, did not differ by condition. Ethnicity did not vary by condition, $\chi^2(8, N = 69) = 5.06$, $p = .752$. Whether participants interacted with another participant or an experimenter did not vary by condition, $\chi^2(2, N = 72) = .514$, $p = .773$.

Zero-Order Correlations

See Table 1 for the full inter-correlation table of the following results. Due to missing data, the *n* for the following analyses ranged from 55 to 70. As expected, the SIAS was negatively and significantly correlated with self-report of overall eye contact, self-report of eye contact in the first interaction and second interaction, partner-report of overall eye contact, and partner-report of eye contact in the second interaction. Partner- and self-report of overall eye contact were positively correlated. As expected, the SIAS and the GARS were positively correlated. Also as expected, the GARS was negatively correlated with self-report of overall eye contact. Contrary to expectation, the GARS was not related to any of the partner-rated eye contact questions (overall, first, second). We theorized that the eye contact variables may have been influenced by assignment to condition because they were all rated after the interactions were over. We decided to retest the relationship between the GARS and partner-rated eye contact in participants in Condition 3 only because this was the only condition in which participants were not given instructions about eye contact. When we limited the analysis to participants in Condition 3 (*n*s from 19 to 21), the GARS was significantly related to partner-report of overall eye contact ($r = -.45$, $p = .042$) and partner-report of eye contact in the first interaction ($r = -.48$, $p = .037$), though the relationship with partner-report of eye contact in the second interaction was not significant ($r = -.25$, $p = .301$). Consistent with the hypothesis that social anxiety and eye

contact would influence the partner's perception of the participant, the SIAS was negatively and significantly correlated with partner's rating of wanting to get to know the other participant better and partner's liking, and the GARS was negatively and significantly related to partner's liking.

Gender Differences

Because we hypothesized that eye contact may differ depending on gender, we tested eye contact rating differences between men and women. The *n* for the following analyses ranged from 62 to 72. Men were rated by their partners as making less overall eye contact ($M = 4.46$, $SD = 1.30$) than women ($M = 5.38$, $SD = 1.15$), $t(60) = 2.88$, $p = .005$. Men also tended to rate their partner's overall eye contact as lower ($M = 4.52$, $SD = 1.33$) than did women ($M = 5.44$, $SD = .96$), $t(66) = 3.31$, $p = .002$. However, men ($M = 4.88$, $SD = 1.31$) and women ($M = 5.23$, $SD = 1.03$) did not differ in self-reported overall eye contact, $t(60) = 1.14$, $p = .258$. Due to the noted limitations of the eye contact variables, we also conducted this analysis in participants in Condition 3 only. The results were equivalent.

Condition and Dyad Effects using Multiple Regression

To test our hypothesis that condition and the SIAS would interact to predict state anxiety, we entered condition, the SIAS, and their interactions in a multiple regression equation predicting the BSAM at the end of the second interaction. The *n* for the following analysis was 66. We entered the SIAS, the two condition contrast variables, and relevant interactions into a multiple regression equation predicting state anxiety at the end of the second interaction. One participant was excluded due to an SDBETA greater than 1; the equation was rerun after this exclusion. As expected, in the final equation, the SIAS (part $r = .52$ $p = < .001$) and the contrast between Condition 1 vs. 2 and 3 (part $r = -.27$, $p = .015$) were significant predictors, but were

qualified by a significant interaction between this variable and the SIAS (part r = -.22, p = .048). The contrast between Condition 1 and 2 vs. 3 (part r = .30, p = .008) was a significant predictor and the interaction between this variable and SIAS (part r = .21, p = .057) approached significance. Interactions were such that, for individuals with lower social anxiety, state anxiety levels were similar across conditions (predicted values from 7.01 to 7.45), whereas for individuals with higher social anxiety, state anxiety differed by condition with more state anxiety predicted when participants were asked to make less eye contact (Condition 2; 16.56) than when asked to make more eye contact (Condition 1; 10.56) and when participants were not told to change eye contact (Condition 3; 10.77). The pattern of results was identical when we used change from baseline (i.e., state anxiety prior to the first interaction subtracted from state anxiety at the end of the second interaction) as the predicted variable. See Figure 2 for a depiction of the interaction between Condition and social anxiety predicting state anxiety at the end of the second interaction.

The pattern of results was similar when we used state anxiety from the mid-point of the second interaction as the predicted variable: the SIAS (part r = .49, p < .001) and the variable contrasting Condition 1 and 2 vs. Condition 3 (part r = .24, p = .033) were significant predictors (n = 66). The interaction between the SIAS and the contrast variable of Condition 1 and 2 vs. Condition 3 (part r = .18, p = .107), the contrast between Condition 1 vs. 2 and Condition 3 (part r = -.17, p = .133), and its interaction with the SIAS (part r = -.15, p = .181) were not significant predictors. Although the interaction variables were not significant, we investigated the nature of the interaction to determine whether the overall pattern of findings was similar to those with state anxiety at the end of the second interaction. Overall the pattern of results was similar; Condition 2 appeared to result in the highest state anxiety for those with higher social anxiety.

To test whether dyad type (two women vs. two men vs. man and woman) influenced eye contact in the interaction, we entered the dyad contrast variable, the GARS, and their interaction into multiple regression predicting partner-report of eye contact in the first interaction (n = 56). The interaction term was dropped from the equation due to nonsignificance (part r = -.17, p = .19). The dyad contrast variable (part r = .24, p = .075) and the GARS (part r = -.01, p = .956) were not significant predictors.

We repeated this equation with self-rated eye contact in the first interaction as the predicted variable. One participant was excluded due to an SDBETA greater than 1; the equation was rerun after this exclusion (n = 63). The main effects of the GARS (part r = -.14, p = .255) and the contrast variable (part r = .10, p = .399) were not significant, but were qualified by a significant interaction between the GARS and the dyad contrast variable (part r = -.27, p = .030). The nature of the interaction was such that participants in dyads with two women tended to differ in self-reported eye contact depending on GARS score, whereas participants in either mixed gender or two men dyads had similar levels of self-reported eye contact for both high and low GARS score. See Figure 3 for a depiction of the interaction between the GARS and dyad type predicting self-report of eye contact in the first interaction.

To test our hypothesis that change in eye contact influenced the partner's desire to be friends, we entered the SIAS, the contrast between Condition 1 and 2 vs. Condition 3, the contrast between Condition 1 vs. Condition 2 and 3, and their interactions into a multiple regression equation predicting the partner's friend rating (how much the partner wants to be friends with the participant). Two participants were excluded due to an SDBETA greater than 1; the equation was rerun after these exclusions (n = 61). Significant main effects from the SIAS (part r = -.36, p = .004), the contrast between Condition 1 and 2 vs. Condition 3 (part r = -.30, p

= .017), and the contrast between Condition 1 vs. Condition 2 and 3 (part r = .25, p = .040) were qualified by significant interactions between the contrast between Condition 1 and 2 vs. Condition 3 and the SIAS (part r = -.32, p = .011) and the contrast between Condition 1 vs. Condition 2 and 3 and the SIAS (part r = .30, p = .016). The nature of the interaction results was such that for participants with higher social anxiety, the partner's desire to be friends was equivalent when participants were asked to increase eye contact (Condition 1) and when they were not told to make any changes to eye contact (Condition 3; desire to be friends values of 4.47 and 4.54 respectively), but lower when participants were asked to make less eye contact (Condition 2; 1.07). For participants with lower social anxiety, the partner's desire to be friends was similar across Conditions 1, 2, and 3 (values of 5.58, 6.41, and 5.74, respectively). See Figure 4 for a depiction of the interaction between Condition and social anxiety predicting the partner's desire to be friends.

To test our hypothesis that change in eye contact would influence change in self-reported positive affect from before the first interaction to after the second interaction, we conducted a multiple regression equation with the same predictors as above with positive affect before the first interaction as another predictor variable and change in positive affect as the predicted variable. Two participants were excluded due to an SDBETA greater than 1; the equation was rerun after these exclusions (n = 64). Positive affect before the first interaction (part r = -.21, p = .077), the SIAS (part r = -.23, p = .058), the contrast between Condition 1 and 2 vs. Condition 3 (part r = -.10, p = .379), and the contrast between Condition 1 vs. Condition 2 and 3 (part r = .04, p = .758) were not significant predictors, but were qualified by significant interactions. The interaction between the SIAS and the contrast between Condition 1 and 2 vs. Condition 3 (part r = -.33, p = .007) and the interaction between the SIAS and the contrast between Condition 1 vs.

2 and Condition 3 (part $r = .24$, $p = .045$) were significant predictors. The nature of these interactions was such that for participants with higher social anxiety, positive affect tended to be higher at the beginning of the session and this effect was strongest when participants were asked to make less eye contact (Condition 2; positive affect value of -11.81), followed by when participants were asked to make more eye contact (Condition 1; -4.87) and when participants were not asked to change eye contact (Condition 3; -2.00). For participants with lower social anxiety, positive affect tended to be higher at the end of the interaction, particularly for participants in Condition 2 (value of 7.00), followed by Condition 1 (1.42), and Condition 3 (0.85). See Figure 5 for a depiction of the interaction between Condition and social anxiety predicting the change in positive affect from before the first interaction to after the second interaction.

Discussion

We investigated the relationship between eye contact behavior and social anxiety during a short social interaction. We also sought to test the ability of a new measure of gaze aversion, the GARS, to relate to self- and partner-report of eye contact in a social interaction. We found support for an association between social anxiety (measured by the SIAS) and self-report of overall eye contact and partner-report of overall eye contact. The predictive validity of the GARS was supported by a significant relationship with self-report of eye contact and by associations with partner-reported eye contact when restricting analyses to primary participants who did not receive an eye contact manipulation. Both the GARS and the SIAS were related to the partner's liking. Although we expected that being asked to make more eye contact would be the most anxiety–provoking of the conditions for individuals with higher social anxiety, it appears that being asked to make *less* eye contact was the most anxiety-provoking. For

participants with higher social anxiety, this condition also appeared to have the greatest impact on the participant's self-reported positive affect and the partner's desire to be friends with the participant.

In line with Farabee et al. (1993), the relationship between social anxiety and gaze aversion was supported by an association with self-report of eye contact. Although the GARS was not related to partner-report of eye contact when all primary participants were included, the GARS did relate to partner-report of overall eye contact and partner-report of eye contact in the first interaction when only primary participants in Condition 3 were considered. We believe that the participants in Conditions 1 and 2 were likely influenced by the manipulation instructions in making their ratings of eye contact. For example, a participant who received instructions to make less eye contact may have later rated his or her eye contact in the first interaction as higher so as to create a greater contrast with the second interaction eye contact rating. Participants may not have consciously decided to alter their ratings based on the Condition instructions, but they were likely influenced in some way by the instructions. Participants in Condition 3 would not have been influenced by the instructions in the same way because their instructions did not mention eye contact and they were not told to make any changes. It is unclear why the SIAS was more related to the eye contact variables when all conditions were considered. It seems that both variables are related to eye contact, but the manipulation likely influenced the eye contact ratings in such a way as to obscure the relationship between the GARS and eye contact. Both the SIAS and the GARS were related to the partner's liking, suggesting that that there was something about higher scores on these measures that was observable to the partner and was associated with less liking. It is possible that the responses on the liking question represent negative reactions from the partner to visible signs of anxiety, which might include gaze aversion. This explanation

remains to be specifically tested.

We also found evidence of gender differences in eye contact. Men were rated as making less contact by their partners than were women, and men also rated their partner's eye contact lower than did women. These differences were further supported by regression results with dyad type and the GARS predicting self-report of eye contact in the first interaction. It appears that in dyads with two women, self-reported eye contact differed depending on GARS score with more eye contact associated with lower GARS scores and less eye contact associated with higher GARS scores. In dyads with either two men or a man and a woman, self-reported eye contact did not differ depending on GARS score. These results are consistent with the previous finding indicating that men tend to make less eye contact (Exline et al., 1965).

Based on relevant theories (Gilbert, 2001; McManus et al., 2008; Rapee & Heimberg, 1997), we hypothesized that being asked to make more eye contact would be the most anxiety-provoking condition for individuals with higher social anxiety. However, our results suggest that being asked to make *less* eye contact was the most anxiety-provoking condition. This result is somewhat unexpected because it seems logical that if gaze aversion serves an anxiety-reducing function, being told to make less eye contact should result in anxiety levels lower than or at least equivalent to making one's chosen amount of eye contact (Condition 3). However, although the theories on the function of gaze aversion suggest that it is employed as an anxiety-regulating mechanism, this does not mean that this strategy is effective over time. In fact, many safety behaviors that are used by an individual to hide or regulate anxiety paradoxically maintain anxiety over time (e.g., McManus et al., 2008). For example, one may choose to look down in the moment to regulate anxiety, but, over time, this may result in increased anxiety because the individual misses opportunities to disconfirm his or her fears. The lack of eye contact may also

make a negative impression on the partner. Additionally, with the knowledge that a certain level of eye contact is socially desirable, being asked to make less eye contact may have increased fears of social rejection for participants with higher social anxiety. We propose that employing gaze aversion as an anxiety-reducing tactic may only be effective when the avoided stimulus really is threatening. This hypothesis could explain the mixed findings in the literature on gaze aversion and social anxiety. An association between gaze behavior and social anxiety has been easier to detect in studies using pictures of faces or other simulated social interactions (Horley et al., 2003; Horley et al., 2004; Schneier et al., 2009), relative to studies involving live social interactions (Farabee et al., 1993; Walters & Hope, 1998; Weeks et al., 2011). One difference between these studies is that eyetracking or fMRI studies tend to include at least some stimuli with very threatening faces, whereas live social interactions rarely include threatening faces. Perhaps gaze aversion is more readily and effectively employed by individuals with higher social anxiety to regulate state anxiety when stimuli are more obviously potentially threatening.

The theory that gaze aversion is ineffective over time, especially in a nonthreatening situation, could explain why state anxiety was not higher for participants with higher social anxiety when they were asked to make more eye contact (Condition 1). Making more eye contact may have resulted in some anxiety initially, but the anxiety may have subsided after the participant was able to disconfirm his or her fears and engage in a behavior that was likely regarded as positive by the partner. Together, these factors may have resulted in a net level of anxiety equivalent to making no changes to eye contact (Condition 3). That is, participants in Condition 1 may have experienced some of the benefit of dropping safety behaviors that has been documented in the literature (McManus et al., 2008; Morgan & Raffle, 1999), thus mitigating any initial increase in anxiety.

Being asked to make less eye contact also influenced the participant's positive affect and the partner's desire to be friends. It appears that for participants with higher social anxiety, being asked to make less eye contact (Condition 2) resulted in lower ratings from the partner in terms of their desire to be friends relative to the other conditions. For participants with lower social anxiety, the partner's desire to be friends was similar across conditions. This finding raises the question of whether the partners were reacting to the participant's heightened anxiety or whether making less eye contact was more damaging for participants with higher social anxiety relative to participants with lower social anxiety. Additionally, positive affect tended to deteriorate from the beginning to the end of the interaction for participants with higher social anxiety. This effect was most pronounced in Condition 2. In contrast, positive affect tended to increase over the course of the interaction for participants with lower social anxiety. These findings are in line with previous research indicating an association between employing safety behaviors (gaze aversion, in this case) and making a negative impression on others (McManus et al., 2008). It seems plausible that the increased state anxiety in Condition 2 and the lower ratings from the partner could be linked. The partner could have reacted negatively to the reduction in eye contact, which could have resulted in an increase in state anxiety for the participant. The participant's positive affect may also have been impacted by signs of negative perceptions from the partner.

Our results should be interpreted in light of the study's limitations. Our use of a sample of undergraduate participants who were participating for credit in a psychology course limits the generalizability of our findings. Our results are also somewhat limited by our methods for assessing eye contact. We assessed eye contact at the end of the interactions rather than assessing separately after each interaction. We determined that inquiring about eye contact during the

interactions would have had the undesirable effect of bringing attention to this behavior. However, participants would likely have been more accurate had we assessed after each interaction. Finally, the addition of independent observer coding of eye contact would enhance the findings based on self- and partner-report.

Our results suggest that eye contact behavior is related to social anxiety and to important variables such as an interaction partner's liking. Social anxiety and the GARS were related to self-report of eye contact and social anxiety was related to partner-report of eye contact. The GARS was related to partner-report of the eye contact variables when only primary participants in Condition 3 were included. Our results suggest that, although participants with higher social anxiety reported employing gaze aversion, this was not an effective strategy for reducing anxiety. Future researchers should investigate the theory of gaze aversion as an anxiety-regulating technique in more threatening or intimidating social interactions. Because individuals with higher social anxiety are likely to be influenced by factors other than just a desire to regulate anxiety and these factors are likely to vary depending on the type of social situation, it may be important to consider the relative influence of the desire to appear socially appropriate versus the desire to avoid anxiety across a variety of social encounters. Taken together, our findings suggest that eye contact behavior does differ depending on social anxiety level in a short social interaction. Our test of gaze aversion as an anxiety-reducing mechanism produced results that suggest that if gaze aversion is employed to regulate anxiety, this is an ineffective strategy over time in a casual social interaction. This strategy may be more effective in situations that are more potentially threatening and in situations with little perceived chance of social rejection.

Footnote

[1] When eye contact was included in this analysis, self-reported eye contact in the first interaction did vary by Condition, $F(2, 53) = 7.19$, $p = .002$; more eye contact was reported by those in Condition 2 ($M = 5.85$, $SD = 1.14$) and those in Condition 3 ($M = 5.11$, $SD = .90$) than in Condition 1 ($M = 4.67$, $SD = .84$). Partner-report of eye contact in the first interaction did not vary by condition, $F(2, 53) = 1.26$, $p = .292$.

Table 1

Intercorrelations among Eye Contact and Social Anxiety Variables

	GARS	SIAS	EC SR	EC SR 1st	EC SR 2nd	EC PR	EC PR 1st	EC PR 2nd	KB PR	L PR
GARS	.90									
SIAS	.67***	.91								
EC SR	-.28**	-.37**	n/a							
EC SR 1st	-.24*	-.24**	.40***	n/a						
EC SR 2nd	-.20	-.26**	.81***	-.02	n/a					
EC PR	-.08	-.30**	.38***	.30**	.23*	n/a				
EC PR 1st	.01	-.14	.12	.23*	.06	.62***	n/a			
EC PR 2nd	-.07	-.26**	.26**	.26*	.40***	.66***	.19	n/a		
KB PR	-.12	-.34***	.09	-.09	.11	.18	.07	.28**	n/a	
L PR	-.30**	-.40**	.19	-.01	.18	.26**	.17	.32**	.77***	n/a

Note. GARS = Gaze Aversion Rating Scale; SIAS = Social Interaction Anxiety Scale; EC SR = overall eye contact self-report; EC SR 1st = eye contact self-report in first interaction; EC SR 2nd = eye contact self-report in second interaction; EC PR = overall eye contact partner's rating; EC PR 1st = eye contact partner rating in first interaction; EC PR 2nd = eye contact partner rating in second interaction; KB PR = want to get to know better partner's rating; L PR = liking partner's rating. Internal consistency is listed on the diagonal.
*p<.10; **p<.05; ***p< .01.

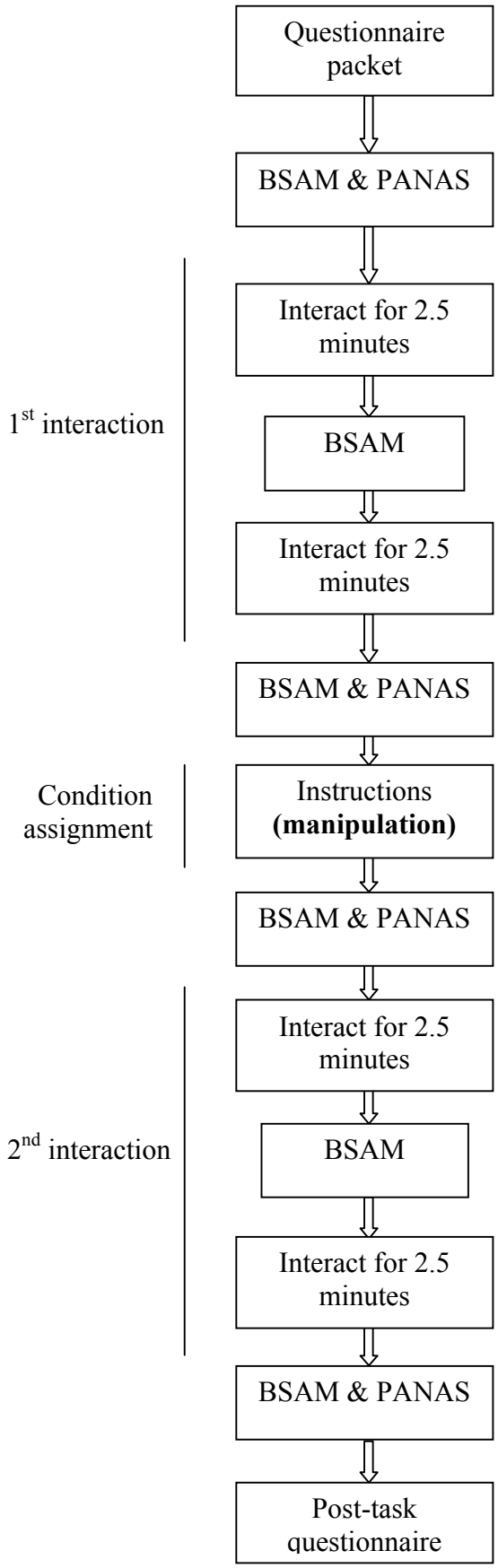

Figure 1. Depiction of experimental procedure.

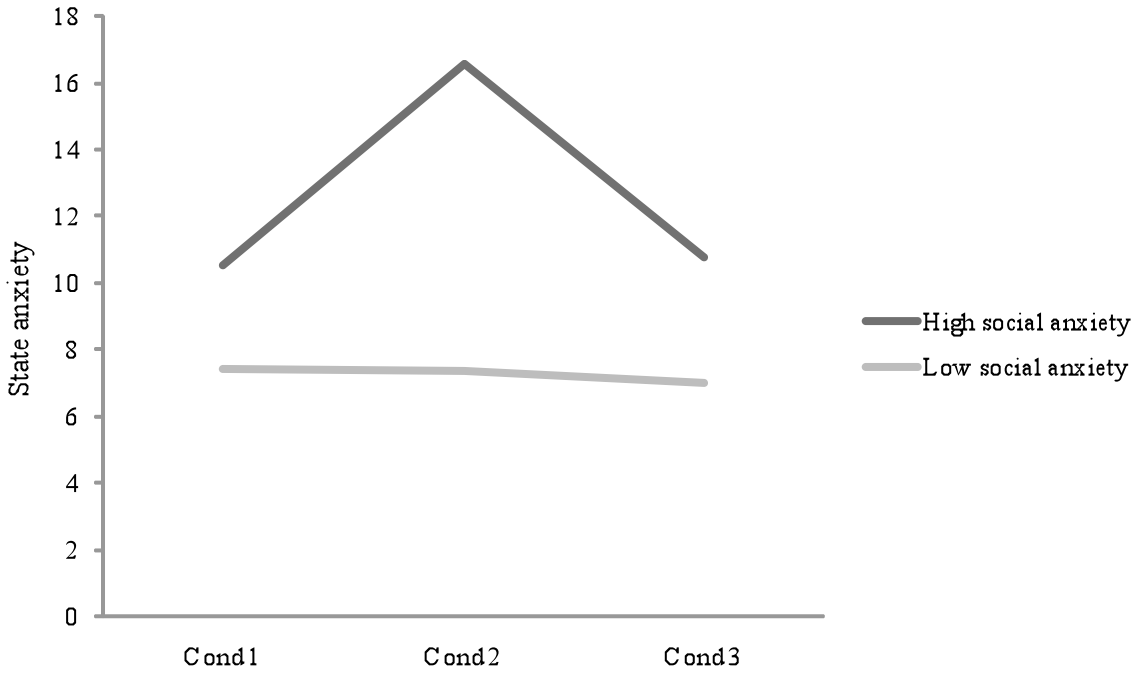

Figure 2. State anxiety at the end of the second interaction predicted by the interaction between social anxiety and condition. State anxiety measured by the BSAM. High and low social anxiety values are one standard deviation above and below the mean of social anxiety (measured by the SIAS).

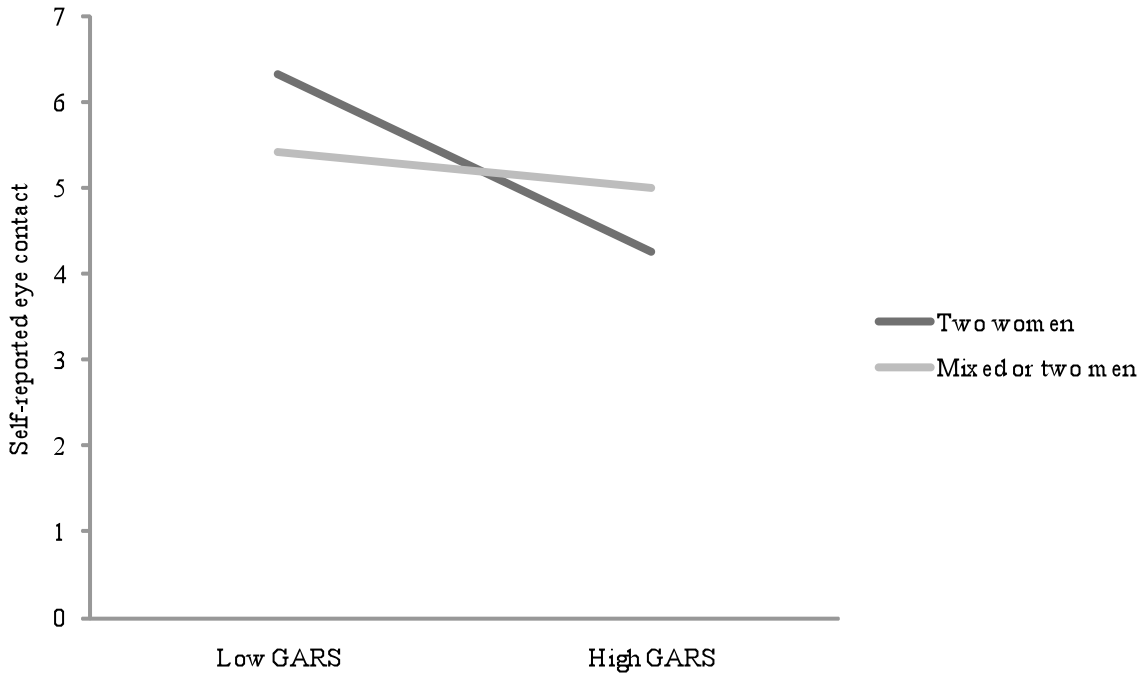

Figure 3. Self-reported eye contact in the first interaction predicted by the interaction between GARS score and dyad type. High and low GARS values are one standard deviation above and below the mean of the GARS.

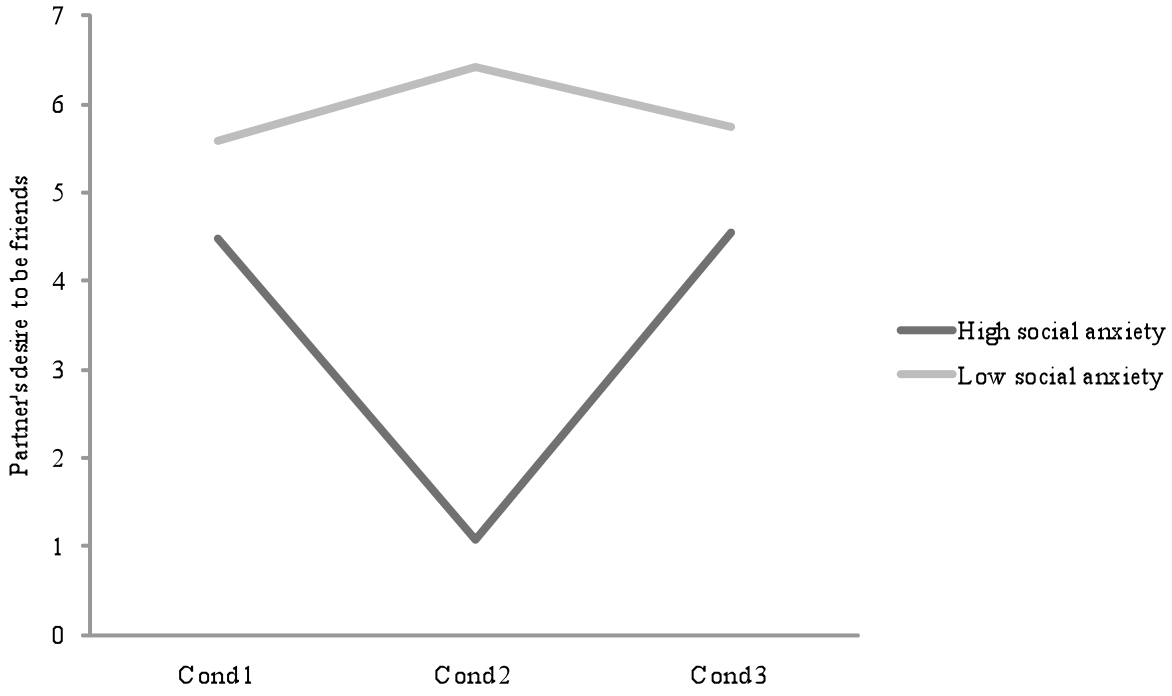

Figure 4. Partner's desire to be friends predicted by the interaction between social anxiety and condition. High and low values of social anxiety are one standard deviation above and below the mean of SIAS.

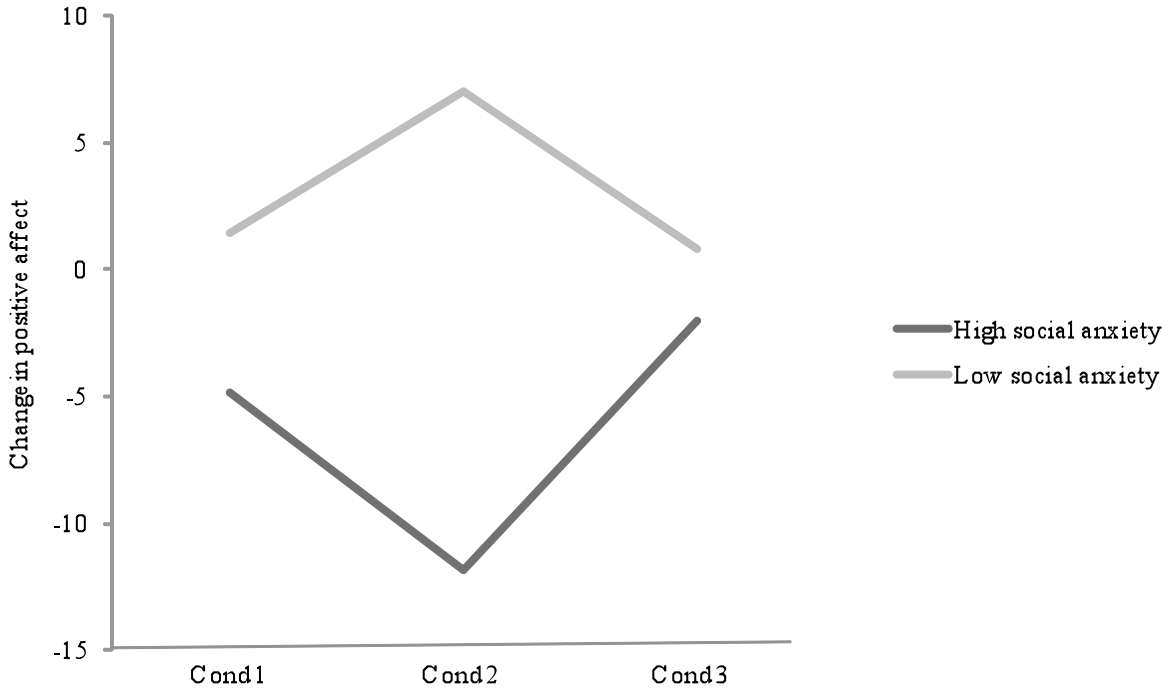

Figure 5. Change in positive affect from before the first interaction to after the second interaction predicted by the interaction between social anxiety and condition. High and low values of social anxiety are one standard deviation above and below the mean of the SIAS score.

References

Allan, S., & Gilbert, P. (1995). A social comparison scale: Psychometric properties and relationship to psychopathology. *Personality and Individual Differences, 19,* 293-299.

Berg, C. Z, Shapiro, N., Chambless, D. L., Ahrens, A. H. (1998). Are emotions frightening? II: An analogue study of fear of emotion, interpersonal conflict, and panic onset. *Behavior Research and Therapy, 36,* 3-15.

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

Coss, R. G., Marks, S., Ramakrishnan, U. (2002). Early environment shapes the development of gaze aversion by wild bonnet macaques. *Primates, 43,* 217-222.

Daly, S. (1978). Behavioural correlates of social anxiety. *British Journal of Social and Clinical Psychology, 17,* 117-120.

Exline, R., Gray, D., & Schuette, D. (1965). Visual behavior in a dyad as affected by interview content and sex of respondent. *Journal of Personality and Social Psychology, 1,* 201-209.

Farabee, D. J., Holcolm, M. L., Ramsey, S. L., & Cole S. G. (1993). Social anxiety and speaker gaze in persuasive atmosphere. *Journal of Research in Personality, 27,* 365-376.

Garner, M., Mogg, K., & Bradley, B. P. (2006). Orienting and maintenance of gaze to facial expressions in social anxiety. *Journal of Abnormal Psychology, 115,* 760-770.

Gilbert, P. (2001). Evolution and social anxiety: The role of attraction, social competition, and social hierarchies. *Psychiatric Clinics of North America, 24*, 723-751.

Heimberg, R. G., Mueller, G. P., Holt, C. S., & Hope, D. A. (1992). Assessment of anxiety in social interaction and being observed by others: the Social Interaction Anxiety Scale and the Social Phobia Scale. *Behavior Therapy, 23,* 53-73.

Hietanen, J., Leppänen, J., Peltola, M., Linna-aho, K., & Ruuhiali, H. (2008). Seeing direct and averted gaze activates the approach-avoidance motivational brain systems. *Neuropsychologia, 46*, 2423-2430.

Horley, K., Williams, L., Gonsalez, C., & Gordon, E. (2003). Social phobics do not see eye to eye: A visual scanpath study of emotional expression processing. *Journal of Anxiety Disorders, 17*, 33-44.

Horely, K., Williams, L. M., Gonsalvez, C., & Gordon, E. (2004). Face to face: Visual scanpath evidence for abnormal processing of facial expressions in social phobia. *Psychiatry Research, 127,* 43-53.

Kendon, A. (1967). Some functions of gaze-direction in social interaction. *Acta Psychologica, 26*, 22-63.

Mattick, R. P. & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy, 36,* 455-470.

McManus, F., Sacadura, C., Clark, D. M. (2008). Why social anxiety persists: An experimental investigation of the role of the safety behaviors as a maintaining factor. *Journal of Behavior Therapy and Experimental Psychiatry, 39,* 147-161.

Morgan, H., & Raffle, C. (1999). Does reducing safety behaviors improve treatment response in patients with social phobia? *Australian and New Zealand Journal of Psychiatry, 33,* 503-510.

Moukeiber, A., Rautureau, G., Perez-Diaz, F., Soussignan, R., Dubal, S., Jouvent, R., & Pelissolo, A. (2010). Gaze avoidance in social phobia: Objective measure and correlates. *Behavior Research and Therapy, 48,* 147-151.

Neter, J., Wasserman, W., & Kutner, M. G. (1989). *Applied linear regression analysis.* Homewood, IL: Irwin.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behavior research and therapy, 8,* 741-756.

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

Salkovskis, P. M. (1991). The importance of behavior in the maintenance of anxiety and panic: A cognitive account. *Behavioural Psychotherapy, 19,* 6-19.

Senju, A., Hasegawa, T., & Tojo, Y. (2005). Does perceived direct gaze boost detection in adults and children with and without autism? The stare-in-the-crowd effect revisited. *Visual Cognition, 12,* 1474-1496.

Sidanius, J., Sinclair, S., & Pratto, F. (2006). Social dominance orientation, gender, and increasing educational exposure. *Journal of Applied Social Psychology, 36,* 1640-1653.

Schneier, F. R., Kent, J. M., Star, A., & Hirsch, J. (2009). Neural circuitry of submissive behavior in social anxiety disorder: A preliminary study of response to direct eye gaze. *Psychiatry Research: Neuroimaging, 173*, 248-250.

Schneier, F. R., Rodebaugh, T. L., Blanco, C., Lewin, H., & Liebowitz, M. R. (2011). Fear and avoidance of eye contact in social anxiety disorder. *Comprehensive Psychiatry, 52*, 81-87.

Strongman, K. T., & Champness, B. G. (1968). Dominance hierarchies and conflict in eye contact. *Acta Psychologicam Amsterdam, 28,* 376-386.

Taylor, S. E. (2006). Tend and befriend: Behavioral bases of affiliation under stress. *Current Directions in Psychological Science, 15,* 273-277.

Taylor, S. E., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A. R., & Updegraff, J. A. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review, 107*, 411-429.

Walters, K. S., & Hope, D. A. (1998). Analysis of social behavior in individuals with social phobia and nonanxious participants using a psychobiological model. *Behavior Therapy, 29,* 387-407.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063-1070.

Weeks, J. W., Heimberg, R. G., & Heuer, R. (2011). Exploring the role of behavioral submissiveness in social anxiety. *Journal of Social and Clinical Psychology, 30,* 217-249.