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Eye Contact and Social Anxiety Disorder

by

Julia Langer

A dissertation presented to the
Graduate School of Arts & Sciences
of Washington University in
partial fulfillment of the
requirements for the degree
of Doctor of Philosophy

August 2015
St. Louis, Missouri

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Washington University in St. Louis
2015

ABSTRACT OF THE DISSERTATION

Eye Contact and Social Anxiety Disorder

by

Julia Kane Langer

Doctor of Philosophy in Psychology

Washington University in St. Louis, 2015

Professor Thomas L. Rodebaugh, Chairperson

The psychoevolutionary theory of social anxiety disorder (SAD) predicts that individuals with SAD will avoid eye contact to communicate submissiveness. However, direct testing of gaze avoidance in individuals with higher social anxiety through behavioral observation or measurement has produced mixed findings. The goals of this dissertation are to test one of the components of the psychoevolutionary theory, namely, that gaze avoidance is employed by people with SAD, as well as to test whether positive affect may play a role in regulating gaze avoidance. Specifically, based on prior research supporting the role of positive affect in regulating exploratory behavior, I hypothesized that positive affect would mediate the relationship between diagnosis and eye contact.

A sample of community participants who either met criteria for generalized social anxiety disorder (GSADs; n = 65) or showed no signs of the disorder (NOSADs; n = 50) completed conversation tasks with a friend in which they took turns discussing a personal characteristic to change (social support conversations). In between the two social support conversations, participants also completed a conversation in which they discussed something that the primary

participant wanted the friend to change (conflict conversation). The conversations were recorded and coded for amount of eye contact.

Diagnosis significantly predicted eye contact in two out of the three conversations such that participants with GSAD made less eye contact than participants with NOSAD, ps < .012. This effect was especially apparent for GSAD participants who were randomly assigned to discuss something they would like to change after the conflict conversation. Against expectation, positive affect did not significantly mediate the relationship between diagnosis and eye contact, $p = .188$.

The current study's finding of higher gaze avoidance in individuals with GSAD is the first behavioral observation study to find such a difference in a diagnosed sample. It appears that the effect was strongest during the conflict conversation and the second social support conversation. I theorize that gaze avoidance increased once fears of rejection were activated and that this influence continued into the final conversation, particularly for GSAD participants assigned to discuss a personal characteristic to change in this conversation.

CHAPTER 1

Eye Contact and Social Anxiety Disorder

Social anxiety disorder (SAD) is characterized by a fear of negative evaluation that is usually associated with avoidance of social situations or social stimuli. One framework for trying to understand avoidance in the context of problematic levels of social anxiety is to consider the evolutionary origin of the behaviors. The psychoevolutionary theory of SAD (e.g., Gilbert, 2001) attempts to explain how symptoms of the disorder are rooted in instinctual behaviors that are adaptive under certain circumstances. That is, the theory offers up a framework for conceptualizing avoidant behaviors as tactics that were adaptive in ancestral times and are either only adaptive under certain circumstances in modern times or are no longer adaptive. For example, avoidant behaviors may be adaptive when an individual perceives a threat of physical harm or social exclusion. The avoidant behaviors become maladaptive when they are over-applied or applied in situations that do not pose a threat of physical harm or social exclusion. Testing this theory is important because there is a critical distinction between conceptualizing avoidant behaviors as behaviors that are primarily maladaptive and illogical and conceptualizing these behaviors as potentially adaptive behaviors being used in a maladaptive way. The results of this testing will help us to understand the potential forces, such as instinctual forces, that a person with SAD may be working against when undertaking psychological treatment.

Despite much theoretical work on the psychoevolutionary theory of SAD, direct testing of the theory is lacking. One of the hallmark features of the psychoevolutionary conceptualization of SAD is the prediction that individuals with higher social anxiety will engage in submissive behaviors as a way to avoid social ostracization (Gilbert, 2001). Avoidance of direct eye contact is theorized to be one of the submissive behaviors that allows individuals

with higher social anxiety to avoid competition and de-escalate social interactions that are perceived to be threatening. This type of submissive gesture has been documented in non-human primates (Coss, Marks, & Ramakrishnan, 2002), and has been endorsed via self-report by people with the disorder (Schneier, Rodebaugh, Blanco, Lewin, & Liebowitz, 2011). However, direct testing of gaze avoidance through behavioral observation or measurement has produced mixed findings (Farabee, Holcolm, Ramsey, & Cole, 1993; Horley, Williams, Gonsalvez, & Gordon, 2004; Moukheiber et al., 2010; Walters & Hope, 1998; Weeks, Heimberg, & Heuer, 2011). Before the psychoevolutionary theory of SAD can be applied in clinical practice, more direct testing of the predictions of the theory is required. The prediction that people with the disorder tend to avert their gaze provides a very specific and testable hypothesis with which to begin to test the theory.

The goals of this dissertation are to test one of the components of the psychoevolutionary theory, namely, that gaze avoidance is employed by people with SAD, as well as to develop an overall model of this behavior that includes additional components of the theory. In particular, I tested whether positive affect, gender, dominance, and diagnosis may play a role in regulating gaze avoidance. In terms of the role of positive affect, positive affect is theorized to regulate social engagement (Price, 1972), and, for individuals of lower perceived rank, lower levels of positive affect would lead to reduced exploratory behaviors and help the individual to avoid risky encounters (Gilbert, Allan, Brough, Melley, & Miles, 2002). For example, for an individual who may be unlikely to win competitions (i.e., an individual who has lost social standing), a reduction in positive affect may be beneficial in that it would lead to less reward-seeking behavior such as searching for food or mates because those potentially-rewarding activities would seem less enticing. In this way, the individual would be less likely to be exposed to risky encounters that

might come with competing for resources. Though this relationship was initially thought to be more related to depression, people with SAD also report lower positive affect (Brown, Chorpita, & Barlow, 1998) and believe that they are of lower social rank (Gilbert, 2000). Indeed Gilbert et al. (2002) demonstrated that anhedonia and perceptions of lower rank are associated with both anxiety and depression. Although both lower positive affect and gaze aversion are theorized to be related to SAD, it is unclear how these two constructs relate to each other, particularly over time. That is, prior studies have tended to study these relationships cross-sectionally, neglecting study of the causal relationships between these constructs. In this dissertation, I tested whether positive affect mediates the relationship between SAD and gaze avoidance (see Figure 1 for a visual depiction of this relationship). Based on theory that men and women may have different levels of investment in hierarchical competition (e.g., Sidanius, Sinclair, & Pratto, 2006), and therefore, may differ on evolutionary-influenced behaviors, I also tested for the influence of gender on these relationships. This testing will help to (a) determine whether the psychoevolutionary theory of SAD is a viable conceptualization of the disorder, and (b) clarify the causal relationship of the various elements of the theory. The results of this testing will inform applications of the theory in clinical interventions. Below, I review previous literature on the various components of my proposed model.

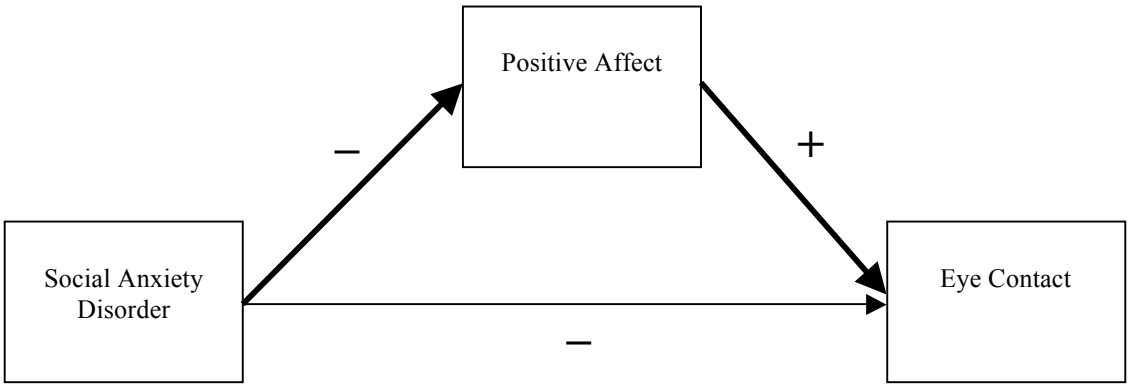


Figure 1. Theoretical mediation model of SAD, positive affect, and eye contact. The bolded arrows are expected to be significant. The non-bolded arrow is expected to be nonsignificant. The bolded pathway is expected to be stronger for men than women.

Literature Review of Gaze Avoidance and Social Anxiety

Gaze avoidance 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 suggesting that individuals with higher social anxiety show differences in gaze behavior relative to individuals with lower social anxiety (Horley et al., 2004; Moukheiber et al., 2010; Schneier, Kent, Star, & Hirsch, 2009), behavioral observation studies have produced mixed results (Farabee et al., 1993; Walters & Hope, 1998; Weeks et al., 2011). In comparison to eyetracking or brain-imaging studies, which tend to find differences in gaze behaviors based on social anxiety level, only one known behavioral observation study found an association between social anxiety and eye contact (Farabee et al., 1993). Though the eyetracking and brain-imaging procedures have the advantage of using more standardized stimuli such as pictures of faces, it is unclear whether results from these studies translate to actual gaze avoidance behavior during live interactions with another person. That is, it is possible that individuals with higher social anxiety only reliably show gaze avoidance when viewing a picture or video of another person relative to a live interaction with another person. To resolve the discrepancies in the literature, further assessment of gaze behavior during live social interactions is needed. Despite some null findings, it is possible that alternative methods of measuring gaze aversion would help to resolve the discrepancy between theory and observation. For example, only one behavioral observation study to date has examined the relationship between eye contact and social anxiety in a diagnosed sample. I will begin by reviewing the psychoevolutionary theory of SAD, which provides the rationale for why we would expect to see less eye contact in people with higher social anxiety. Then I will review the evidence for the importance of eye contact for social functioning in general, before turning to a discussion of the

findings thus far on eye contact and SAD. Lastly, I will discuss the role of positive affect in the relationship between eye contact and SAD.

Psychoevolutionary Theory of Social Anxiety

Trower and Gilbert (1989) have proposed an evolutionary theory that conceptualizes social anxiety as a set of responses to a competitive social environment. According to this theory, individuals who have higher social anxiety feel that they are of lower status and are, thus, unlikely to achieve a dominant status within a social hierarchy. Social anxiety is likely most strongly related to the *perception* of lower social status, rather than actual low social standing. Even if individuals with higher social anxiety are viewed as having a lower social status, they are likely to hold an even more negative view than reality (Alden & Wallace, 1995; Clark & Wells, 1995; Rapee & Lim, 1992; Stopa & Clark, 1993). Further, individuals with higher social anxiety may be more likely to view relationships as hierarchical (Gilbert, 2001), whereas other people may not be as likely to view relationships in this way. Regardless, individuals with higher social anxiety may employ submissive behaviors to avoid competition and communicate to others, *I am not a threat*. Gaze avoidance is one such behavior that has been theorized to serve the purpose of submissive communication. Despite its theoretical appeal, the predictions of the theory lack direct testing. Specifically, it remains unclear whether gaze avoidance is (a) actually employed by people with higher social anxiety and (b) used for the purpose of dominance communication. In the following sections I review the support thus far for (a) and (b). I begin with a general discussion of the relationship between eye contact and social functioning to provide context for how gaze avoidance might impair people with SAD.

Eye Contact

Eye contact has been shown to serve a crucial role in social functioning (Adolphs, 2009;

Dalton et al., 2005; Jawaid, Schmolck, & Schulz, 2008). For example, eye contact coordinates the timing of speech by indicating when someone is listening or about to finish speaking (Kendon, 1967), and humans are faster to detect targets when they are presented with a face with direct gaze, indicating an attentional preference for eye contact (e.g., Senju, Hasegawa, & Tojo, 2005). Hietanen and colleagues (2008) conducted a study of brain activation during visual processing of face photographs, assessed via electroencephalography; faces with direct gaze elicited left-sided frontal activation, whereas averted gaze activated right-sided brain activity. Based on previous research suggesting that greater activation in the left vs. right frontal cortex is indicative of approach tendencies and that greater activation in the right vs. left frontal cortex is indicative of avoidance tendencies (Harmon-Jones, 2004; van Honk & Schutter, 2006). Hietanen et al. noted that these findings provide evidence that direct gaze signals approachability, whereas averted gaze signals others to stay away. It should be noted that, whereas direct gaze can communicate interest or friendliness, it can also communicate threat or aggressive intent depending on the context of the situation (Ellsworth, Carlsmith, & Henson, 1972; Hoehl & Striano, 2008).

Consistent with the social facilitation role of eye contact, individuals with disorders characterized by social functioning difficulties have been found to exhibit atypical gaze behavior. For example, individuals with William's Syndrome, a disorder characterized by hypersociability, tend to employ excessive amounts of eye contact (Jawaid et al., 2008). On the other hand, individuals with autism, a disorder characterized by social communication deficits, tend to employ lower levels of eye contact (Dalton et al., 2004). Individuals with SAD are also thought to avoid eye contact; this theory and supporting research will be explored in the following section.

Gaze Aversion and Social Anxiety

Given the relationship between gaze avoidance and communication deficits, researchers have investigated whether individuals with SAD tend to avoid eye contact. Fear and avoidance of eye contact have been associated with higher social anxiety in studies employing self-report assessments as well as eyetracking and functional magnetic resonance imaging (fMRI; Horley, Williams, Gonsalvez, & Gordon, 2003; Horley et al., 2004; Schneier et al., 2011; Schneier et al., 2009). Horley et al. (2004) found that individuals with higher social anxiety, when viewing a picture of a face, were more likely to scan the whole face repeatedly (hyper-scanning) rather than to look directly at the eyes. 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). In addition to differential eye contact behavior, individuals with SAD have also been shown to exhibit greater signs of fear when viewing pictures of faces that show direct eye contact. Schneier et al. (2009) used fMRI to measure activation of brain regions relevant to SAD during presentation of face photos that simulated either direct or averted gaze. Relative to healthy controls, participants diagnosed with SAD showed greater activation in brain regions related to fear neurocircuitry for both direct and indirect gaze. Direct gaze elicited more activation in comparison to indirect gaze within participants with SAD.

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 women with high and low levels of social anxiety who viewed videos of confederates giving persuasive speeches. Through independent coding of videos, the authors found that participants with higher levels of social anxiety tended to spend less time looking at a disagreeing confederate relative to participants with lower levels

of social anxiety. This effect was not significant for the number of gazes directed towards an agreeing confederate. Walters and Hope tested the psychobiological model of social anxiety that predicts fewer cooperative and dominant behaviors and more submissive and avoidant behaviors in people with SAD. In short conversations with a confederate, participants with SAD exhibited fewer cooperative and dominant behaviors than people without SAD, but did not differ in the frequency of submissive and avoidant behaviors (including gaze avoidance). 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. Finally, 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.

Due to the inconsistent findings regarding eye contact and SAD, more testing is required to determine whether there is support for the psychoevolutionary theory. In addition to conducting this testing, I tested an additional component of this model: the role of positive affect in regulating exploratory behaviors. I outline this role and supporting research in the following section.

Positive Affect, Gender, and Gaze Aversion

In addition to gaze avoidance, positive affect is also purported to serve a key role in regulating behaviors related to dominance hierarchies. In the face of a social threat or the threat of social exclusion, submissive responses are theorized to be associated with a reduction in the reward system such that exploratory and approach behaviors would be reduced (Allen & Badcock, 2003). In this way, a reduction in positive affect would serve to, at least temporarily,

cause a reduction in exploration behaviors that could lead to further competition. This theory lacks direct testing; for example, though the theory predicts that a decrease in positive affect would cause a reduction in exploratory behaviors, this has not been established experimentally. Importantly, theories regarding the role of positive affect in the regulation of reward-seeking behavior have thus far primarily concerned depression. However, given the documented relationship between higher social anxiety and lower positive affect (Brown et al., 1998; Hughes et al., 2006; Kashdan, 2004; Kashdan & Steger, 2006; Naragon-Gainey, Watson, & Markon, 2009; Watson, Clark, & Carey, 1988), I theorize that lower positive affect may serve a similar role for people with higher social anxiety. Very little is known about the function of the relationship between social anxiety and positive affect; that is, does lower positive affect lead to a reduction in exploratory behaviors for people with higher social anxiety? Furthermore, is eye contact one of the exploratory behaviors that is regulated by lower positive affect? Below, I review the findings to date that link positive affect to gaze behavior. Important to this relationship is the consideration of how gender might relate to dominance hierarchies. I, therefore, begin with a discussion of gender and gaze behavior.

We might expect gaze behavior to differ depending on gender if men and women have different levels of investment in hierarchical competition. In support of the notion that men are more invested in competitive hierarchies, 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 (Sidanius et al., 2006). Within these competitive hierarchies, eye contact might serve as an important tool for communicating status. In support of this hypothesis, Larsen and Shackelford (1996) found that men who averted their gaze in photographs were more likely to be emotionally inhibited, overcontrolled, and have psychosomatic and physical symptoms,

suggesting that men of lower status are more likely to avert their gaze. If social hierarchies are more important for men and gaze is used to communicate status within those hierarchies, this could explain why women employ more direct eye contact in social exchanges than men (Exline, Gray & Schuette, 1965); they may not be as worried about inciting competition via direct gaze. Thus, although men might be more likely to use eye contact to enforce a hierarchy, I would expect that men would use less eye contact overall relative to women because they would not want to unnecessarily incite competition. That is, men might be more selective about when to use direct eye contact than women given that it could lead to conflict.

The theory that gaze avoidance may be more tied to dominance communication for men than women is consistent with unpublished data from our lab (Langer & Rodebaugh, 2012). In a recent study, we found an interaction between gender and positive affect in predicting self-reported gaze aversion, such that positive affect was more strongly related to gaze aversion for men than women. Though the data are cross-sectional, it is consistent with our proposed model, which predicts that men are more invested in dominance hierarchies and will thus be more likely to employ gaze avoidance to communicate about dominance. It would follow that positive affect would be more strongly tied to gaze avoidance for men because of the theorized role of positive affect in regulating exploratory behaviors (such as eye contact) that are used to communicate within dominance hierarchies. Though the study did not concern gender differences because all of the participants were men, Weeks et al., (2011) reported effects that are consistent with this model. The authors found that averted gaze related negatively to positive affect (suggesting a positive association between making eye contact and positive affect) during a semi-structured roleplay involving male participants engaged in social competition for the attention of a female peer. Weeks and colleagues proposed that averting gaze during social interactions that elicit

dominance concerns may be triggered or maintained in men by a decrease or deficit in positive affect. That is, when in a social interaction that elicited dominance concerns, lower positive affect may lead to lower levels of eye contact. Notably, though participants were asked to rate how they felt during the roleplay, the ratings of positive affect were completed following the roleplay.

Based on the above findings, I expect that positive affect will be more strongly related to eye contact behavior for men than women. Specifically, men who feel that they are of lower social status would be expected to show (a) lower levels of positive affect such that exploratory behaviors would be reduced and (b) higher levels of averted gaze to communicate submissiveness and avoid conflict. In this way, when faced with a social threat, a reduction in positive affect would prompt a reduction in eye contact for people who feel that they are of lower social status (i.e., a person with higher social anxiety). An important next step is to test a model that links all of these constructs together causally. I discuss the suggested model in the following section.

Positive Affect, Gaze Aversion, and Gender Model

Please see Figure 1 for a visual representation of this model (page 6). I discuss the elements in the model in the order that I would expect them to unfold over time. That is, I begin with the most distal causal elements and work towards more proximal constructs. I propose that the first element in a psychoevolutionary model of social anxiety in terms of causation is gender because I assume that evolutionary forces are likely to differ based on gender. I predict that the following pathways in the model will be stronger or more likely to be present for men. The next causal element in the model is a perceived position of low rank or status. This status could be generally operationalized as higher submissiveness or higher social anxiety. Although I do not

expect higher submissiveness and higher social anxiety to be exactly equivalent, I plan to test both as a way to compare their relative predictive power. In the presence of a social threat, I predict that positive affect would be constrained causing a reduction in exploratory behaviors, and, second, eye contact would decrease as a result of this reduced positive affect. In this way, gaze avoidance is conceptualized as one of many possible exploratory behaviors that are regulated through positive affect.

The Current Study

Data from a completed study provided an opportunity to test the above model in a sample that includes people who have been diagnosed with generalized social anxiety disorder (GSAD) and people who have shown no evidence of SAD (NOSADs). This sample is ideal for testing the proposed model because the majority of previous tests of the relationship between social anxiety and gaze avoidance have utilized undiagnosed undergraduate samples. Given the mixed findings in behavioral observation studies, the possibility remains that gaze avoidance may only be detectable in samples with certain (i.e., clinical) levels of GSAD. Additionally, data from the study include repeated measures of positive affect, partner report of interpersonal styles such as submissiveness, as well as video recordings of conversations between the primary participants and either a friend or romantic partner. Participants completed three conversation tasks: two social support conversations in which one of the partners chose a topic based on a personal characteristic he or she wanted to change and a conflict conversation in which the topic was something that the primary participant wanted the partner to change. The recordings of the videos were coded to obtain a measure of eye contact, and state measures of positive affect were used to test a prospective link between lower positive affect and gaze avoidance. I used diagnosis as a dichotomous measure of social anxiety, but I also tested the model using partner report of

submissiveness in order to test for differences in the model based on self vs. partner report. Given that there could be differences based on whether the participant completed the conversations with a friend or romantic partner, the current study focuses on conversations completed with friends.

I used a novel method for coding eye contact that has shown some preliminary success in one prior study in our lab. The method involves a coder pressing different keys (the keys for left- and right-facing brackets) on the keyboard based on whether a participant is or is not making direct eye contact. This method is similar to other previously-used techniques for measuring eye contact such as use of a pen recorder or a key press (Cook, 1977; Strongman & Champness, 1968). The goal with this method was to obtain a continuous measure of eye contact rather than a forced-choice rating (Walters & Hope, 1998), which may be too blunt a technique for something as fluid as eye contact. It is possible that any differences in eye contact based on social anxiety level (presence of the disorder in the current study) may be subtle in nature, and I theorized that the more precise the method for coding the greater the chance of detecting these subtle differences.

Hypotheses

Hypothesis 1: Participants with GSAD will make less eye contact than participants without SAD (NOSAD group). Despite at least two studies that have not found differences in observed eye contact based on social anxiety level, I expected that the novel method for coding eye contact would allow for a more nuanced assessment of eye contact. Further, the use of a diagnosed sample also allowed me to test whether individuals with higher levels of social anxiety severity are more likely to show lower levels of eye contact.

Hypothesis 2: Participants with GSAD will make the least amount of eye contact in

the conflict conversation, compared to the social support conversations. In line with the psychoevolutionary theory of SAD (Gilbert, 2001), I expected that gaze aversion would be more likely to be used by people with higher social anxiety when concerns about dominance or confrontation are elicited. Therefore, I expected that if gaze avoidance is a submissive behavior, there should be more of it in the conflict conversation than the social support conversations.

Hypothesis 3: Positive affect will mediate the relationship between presence of GSAD and eye contact. I tested a mediation model of social anxiety, positive affect, and eye contact. Specifically, I tested a model that included positive affect and eye contact from two time points: the second (conflict) and third (social support) conversations. I chose to include positive affect and eye contact from these particular time points because I expected that the conflict conversation would be most likely to activate a motivation to reduce exploratory behaviors such as eye contact. The positive affect variables included: Positive Affect 1 (average of positive affect measured right after the conflict conversation and positive affect measured before the last social support conversation) and Positive Affect 2 (positive affect measured after the last social support conversation). The eye contact variables included: eye contact from the conflict conversation (the second conversation that participants completed) and eye contact from the second social support conversation (the third conversation that participants completed). In this way, I was able to test the hypothesized mediation pathway between diagnosis, positive affect, and eye contact as well as whether positive affect significantly predicts eye contact at the second time point above and beyond eye contact at the first time point. Trait positive affect was included to test for the ability of state positive affect to predict eye contact above and beyond trait positive affect. Please see Figure 3 for a visual representation of the proposed model. I also tested this model for gender invariance because previous research suggests that gaze behavior differs based

on gender (Exline et al., 1965). I expected that the model would not be invariant for gender because the hypothesized pathways would be stronger for men than for women.

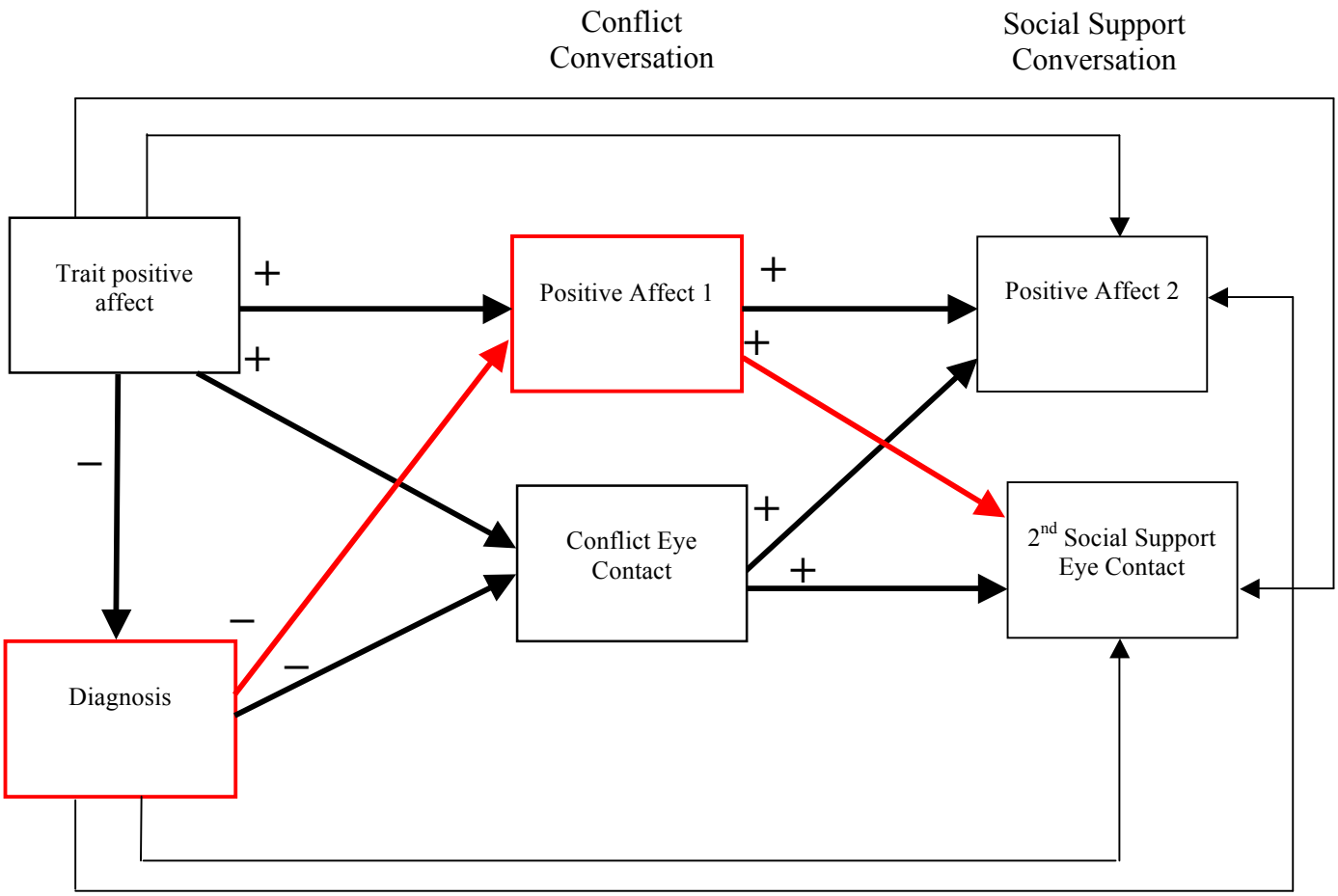


Figure 2. Mediation model with diagnosis, positive affect, and eye contact. The pathway in red is the hypothesized mediational pathway. The bolded arrows are expected to be significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect after the second social support conversation. Diagnosis assessed by SCID; trait positive affect and Positive Affect variables assessed by PANAS; eye contact assessed by coding.

Hypothesis 3a: I expect that ratings of low dominance will predict lower eye contact and lower positive affect. Please see Figure 4 for a visual depiction of this model. To test this hypothesis, I added dominance ratings at two time points: dominance from after the conflict conversation (Dominance 1) and dominance from after the second social support conversation (Dominance 2).

Although SAD is theorized to relate to feelings of low dominance in general, it is consistent with the evolutionary theory to expect that lower positive affect and reduced eye contact would be triggered by in-the-moment feelings of low dominance or submissiveness. Including these ratings allowed me to account for dominance feelings in the moment, in reaction to the partner.

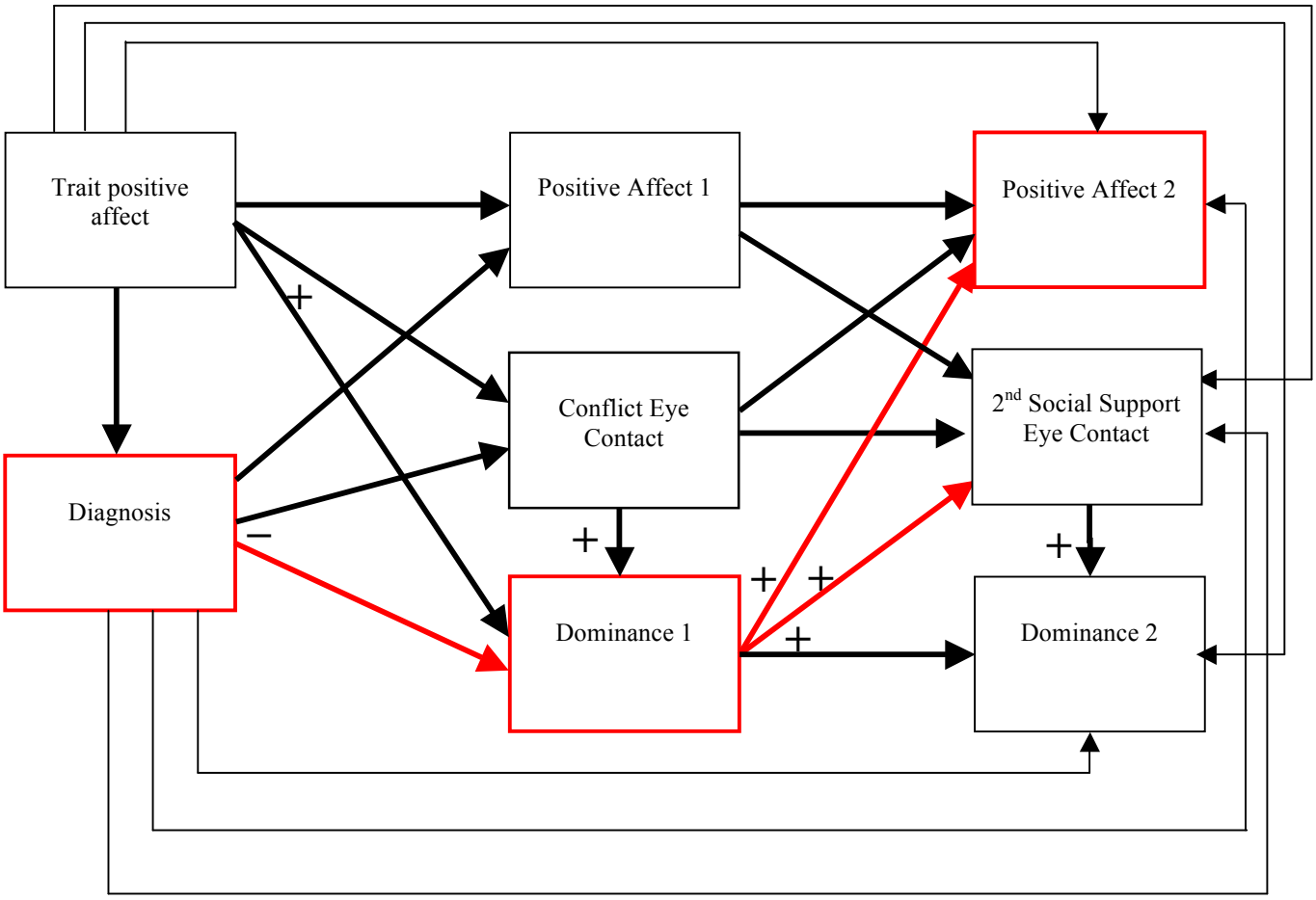


Figure 3. Depiction of full model with dominance ratings. The pathways in red are the hypothesized mediational pathways. The bolded arrows are expected to be significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect after the second social support conversation. Diagnosis assessed by SCID; trait positive affect and Positive Affect variables assessed by PANAS; eye contact assessed by coding; dominance assessed by SAM ratings.

Hypothesis 3b: The magnitude of the effects will differ when partner-reported submissiveness is used compared to the findings when diagnosis is used. I also tested the models from Hypothesis 3 and 3a using partner report of submissiveness from a measure of interpersonal problems in place of diagnosis. Previous research supports that peer report contributes valuable information to understanding the interpersonal problems associated with higher social anxiety (Rodebaugh, Gianoli, Turkheimer, & Oltmanns, 2010). Thus, I expected that asking the partners about the submissive behavior of the primary participants would contribute additional information about this behavior and might result in stronger relationships in some cases. For example, it seems plausible that partner-reported submissiveness would show a stronger relationship with eye contact relative to the relationship between diagnosis and eye contact due to partners being able to observe and experience the submissive behaviors firsthand. This also allowed me to test for differences based on continuous vs. categorical measurement. Please see Figures 5 and 6 for visual depictions of the models with partner-reported submissiveness in place of diagnosis.

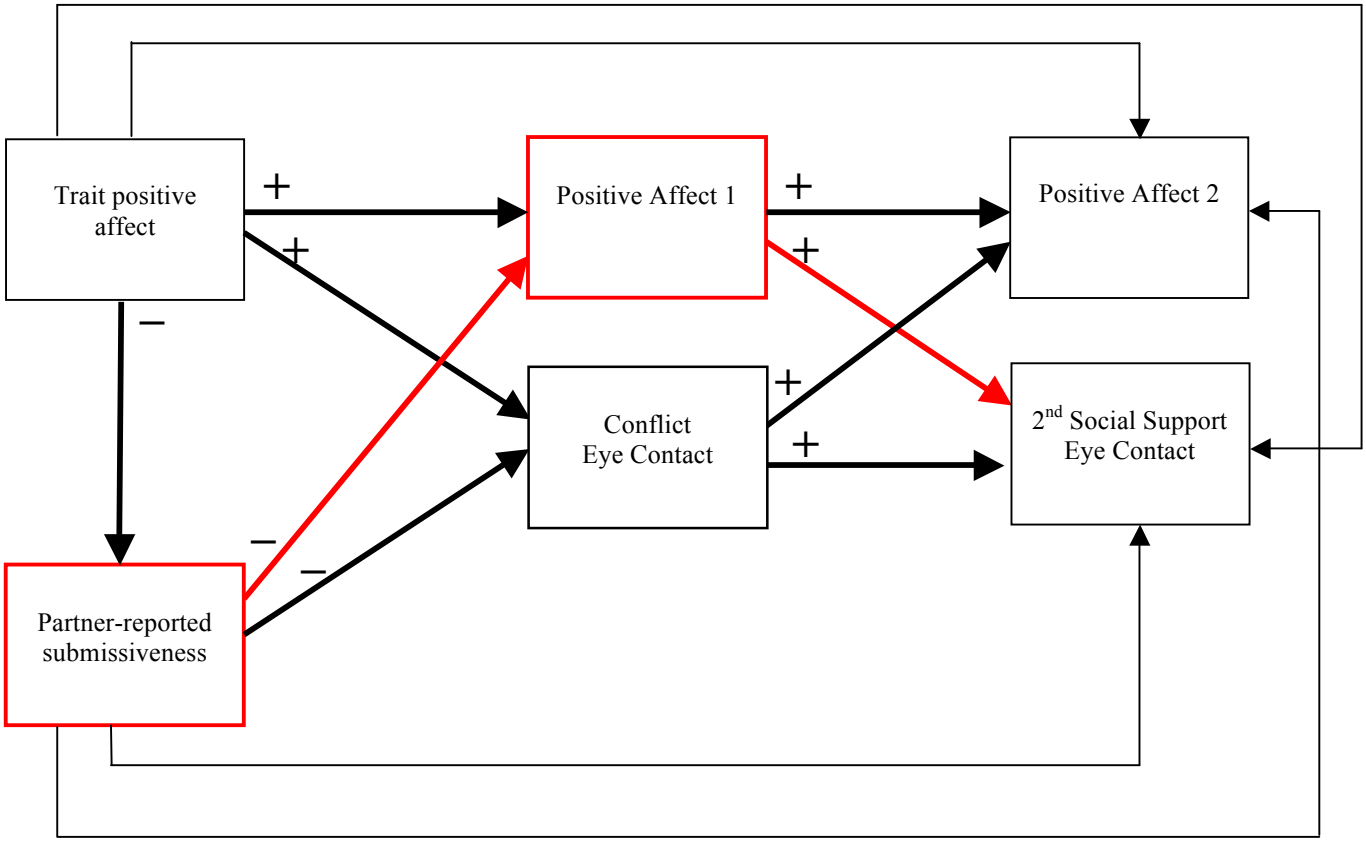


Figure 4. Mediation model with partner-report of submissiveness, positive affect, and eye contact. The pathway in red is the hypothesized mediational pathway. The bolded arrows are expected to be significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect after the second social support conversation. Partner-reported submissiveness assessed by IIP; trait positive affect and Positive Affect variables assessed by PANAS; eye contact assessed by coding.

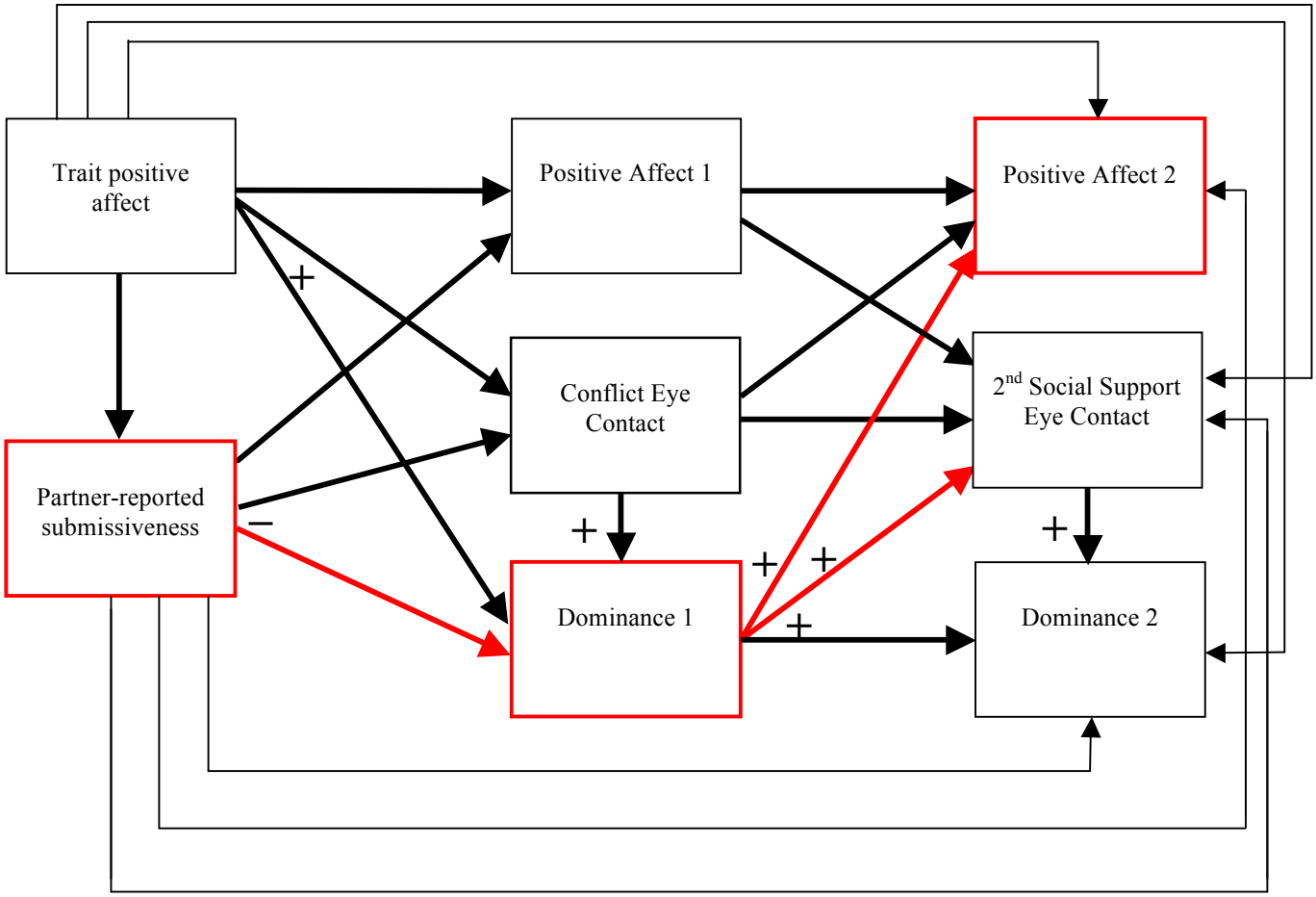


Figure 5. Depiction of full model with dominance and partner-reported submissiveness. The pathways in red are the hypothesized mediational pathways. The bolded arrows are expected to be significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect after the second social support conversation. Partner-reported submissiveness assessed by IIP; trait positive affect and Positive Affect variables assessed by PANAS; eye contact assessed by coding; dominance assessed by SAM ratings.

CHAPTER 2

Method

Power

Power analyses were conducted for each analysis using effect sizes from previous research, including pilot work. The expected effect size for the relationship between SAD and positive affect is near-medium (r = -.28; Brown & Barlow, 2009), and the expected effect size for the relationship between positive affect and eye contact is between small and medium (r = .21; Langer & Rodebaugh, 2012). A power analysis was conducted using G*Power version 3.1.3 (Faul, Erdfelder, Buchner, & Lang, 2009). Based on these effect sizes, and the expected sample size of 115 primary participants, I determined that I would have good power (87%, α = .05, two-tailed, ρ = -.28) to detect the medium effect size of the relationship between SAD and positive affect and lower power to detect the small to medium effect of the relationship between positive affect and eye contact (63%, α = .05, two-tailed, ρ = .21).

Participants

Participants were selected from a larger study on the basis of whether they completed one or more follow-up visits. Participants from the larger study (N = 136) were recruited from the St. Louis area using fliers, online advertisements, and print advertisements. Participants in the current study (N = 115) included individuals who met criteria for generalized social anxiety disorder (GSADs; n = 65) and individuals who showed no signs of generalized social anxiety disorder (NOSADs; n = 50) who completed one or more follow-up visits with either a friend, a romantic partner, or both. Participants were primarily women (n = 83; 72.2%) and White (n = 64; 55.7%) with a mean age of 39.23 (Range = 18 to 69; SD = 13.80). Other races reported included American Indian or Alaskan Native (n = 1; 0.9%), Asian or Pacific Islander (n = 4; 3.5%), Black

(n = 40; 34.8%), and Multiracial (n = 6; 5.2%). Three individuals (2.6%) reported that they were of Hispanic origin. There were no significant differences between the groups on any of these demographic variables, ps > .106.[1]

Measures

Inventory of Interpersonal Problems-32 (IIP-32; Horowitz, Alden, Wiggins, & Pincus, 2000) is a measure of persistent interpersonal difficulties. I used the 32-item version of the IIP, which is a subset of the larger number of IIP items that were selected on the basis of a principal components analysis and the interpersonal circumplex model (Wiggins, 1979). The interpersonal circumplex is a circular array of personality characteristics that consists of four quadrants formed by the dimensions of dominance and affiliation, two traits that are thought to be important for understanding interpersonal interactions (Gurtman, 1993; Leary, 1957). These traits are theorized to be orthogonal dimensions that indicate the quality of interpersonal behavior. Warmth is characterized by nurturance, communion, love, and affiliation, and dominance is characterized by status and agency (Gurtman, 1993). The scale consists of eight subscales: domineering/controlling, vindictive/self-centered, cold/distant, socially inhibited, nonassertive, overly accommodating, self-sacrificing, and intrusive/needy. Horowitz et al. (2000) report good internal consistency, good test-retest reliability for the majority of the subscales, and high correlations between the shorter 32-item version and the longer 64-item version. This measure was completed by both primary participants and their partners (friends or romantic partners). Participants completed a version regarding their own behavior as well as a version assessing their opinion on their partner's behavior. The present study utilized the partner's report of the primary participant on the nonassertive subscale as the indicator of submissiveness. In the

[1] Due to expected cell counts less than 5, only the Black and White racial groups could be compared by group. Similarly, I was not able to compare the number of Hispanic participants between groups due to the low frequency of this group.

current study, internal consistency for the nonassertive subscale items regarding the primary participants was good (α = .80).

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 six times during the conversations. The trait version (*how you feel in general*) of the scale was administered in a self-report packet. Internal consistency for the trait and state positive affect ratings was excellent (αs > .92).

The Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 2002) is a semi-structured interview that assesses current and lifetime Axis I disorders including the mood and anxiety disorders, substance use disorders, psychosis, and antisocial personality disorder. It is considered to be the gold-standard instrument for the assessment of Axis I psychopathology. Training for all interviewers included observation of trained interviewers as well as being observed until there was no disagreement with a trained interviewer. Ratings from the SCID were used to inform the dichotomous diagnosis variable which was coded 0 for NOSAD and 1 for GSAD.

Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) is a standard clinician-administered interview assessing social anxiety symptoms. The LSAS has demonstrated excellent convergent and divergent validity (e.g., Heimberg et al., 1999), and scores on the LSAS can distinguish between patients with GSAD, non-generalized SAD, and controls without SAD (Mennin et al., 2002). In the current study, internal consistency was excellent (α = .99).

Self-Assessment Manikin (SAM; Hodes, Cook, & Lang, 1985; Lang, 1980) is a visual analog scale representing the dimensions of pleasure, arousal, and dominance. The pleasure scale ranges from a figure displaying a very happy expression to a figure displaying a very unhappy expression; the arousal scale ranges from an excited, wide-eyed figure to a relaxed, sleepy figure; and the dominance dimension ranges from a very small figure to a very large figure. SAM ratings have demonstrated high correlations with longer assessments of affective experience (Bradley & Lang, 1994). The SAM ratings will be used as a measure of state dominance in the current study. Because the SAM dominance rating is only one item, I was unable to calculate internal consistency. I calculated correlations between the various administrations of the SAM dominance ratings. All six administrations were significantly related (rs > .68, ps < .001).

Eye contact coding. Totals of the number of symbols representing making eye contact were used as the measure of eye contact. For the coding procedure, see **Video coding procedure.** I calculated two-way random intraclass correlation coefficients (ICCs) for the consistency of the average rating to evaluate the likely reliability of the coding method. The reliability of the coding for the three conversations was excellent (ICCs > .95).

Procedure

Recordings of conversations from a completed study were coded for eye contact. The procedure for the study is described below, starting with a description of the diagnostic procedure. The procedure for the experimental sessions is described with a focus on the conversation portions. Lastly, I describe the procedure for the coding of the videos.

Diagnosis. Participants in the GSAD group had to qualify for GSAD based on the SCID and had to have an LSAS score greater than or equal to 60. Participants in the NOSAD group could not meet criteria for either SAD or GSAD based on the SCID and had to have an LSAS

score less than 30. The cut-offs on the LSAS were based on Mennin et al.'s (2002) finding that scores greater than or equal to 60 indicate likely GSAD and scores below 30 indicate that the individual likely has neither SAD nor GSAD.

Study Procedure. The conversations used for the current project were a part of a larger two- to three-session study. Participants completed an initial session in which a SCID was conducted in addition to other measures not included in the current study. Participants were asked to bring either a friend or romantic partner to the next session of the study. During this session, participants and their friend or romantic partner completed additional self-report measures as well as further structured clinical interviewing measures. Following the interviews and measures, participants completed three conversation tasks together. The conversations were video recorded.

Prior to beginning the conversations, participants were introduced to state measures that were used to assess reactions during the conversations; these measures included the PANAS and the SAM as well as one other state measure not used in the current study. Participants and their partners completed these measures before and after each conversation. After completing the first set of state measures, participants were introduced to the social support conversation task (the first of three conversation tasks). Participants were randomly assigned to either be the helpee first (the person who picked the topic of the conversation) or the helper first. The helpee was asked to choose something that he or she wanted to change about him- or herself as the topic for the first conversation. The helper was asked to be involved in the conversation in whatever way he or she wished. Once the helpee selected a topic, the experimenter repeated the topic aloud and then left the room. The participant and the partner were left alone to talk for 10 minutes. After 10 minutes, the experimenter re-entered the room and asked the participants to complete another set

of the state measures. Then the participants were given a 10-minute break. There was no structure imposed on what participants could do during the break; participants typically conversed with their partner, used the restroom, ate a snack, or continued to work on other measures. After the break, participants completed another set of the state measures and the second conversation (conflict task) was introduced. For this conversation, the experimenter introduced a topic that the primary participant had selected earlier in the session. The possible topics were things that the primary participant wanted the friend or partner to do or change or do more of, such as *treat me better*, or *be more patient*. The experimenter introduced the topic and then left the room. After 10 minutes, the experimenter re-entered the room and had the participants complete another set of the state measures. Following another 10-minute break, participants completed another set of the state measures and the third conversation was introduced. This conversation was the same format as the first but the roles were reversed. This conversation lasted 10 minutes and then participants completed the final set of state measures. Please see Figure 7 for a visual depiction of the conversation procedure.

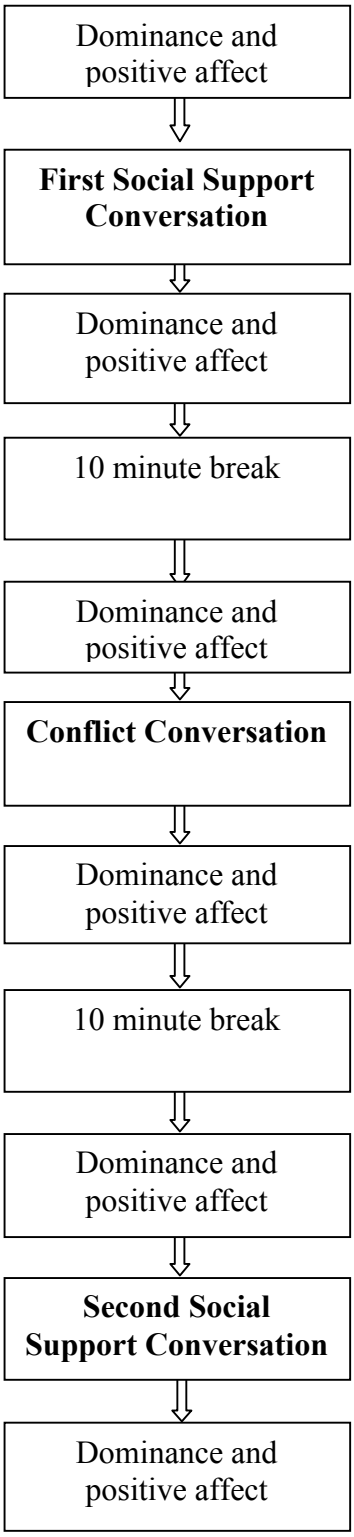


Figure 6. Visual depiction of conversation portion of experimental procedure.

Video coding procedure. Three people coded the video recordings of the conversations. The sound remained on during coding to help reduce boredom and keep the coder engaged. All coders were undergraduate research assistants who were not involved with running the experimental sessions and were blind to the study hypotheses. To obtain a continuous measure of eye contact, the coders performed a novel method of assessing eye contact. Coders held down one key on the keyboard ("[") when the participant was making eye contact with his or her conversation partner and held down another key ("]") when the participant was looking away. The number of each type of symbol was counted after the coding to obtain a number representing the amount of time spent looking and the amount of time spent looking away. Each coder tended to use the same computer for his or her coding, but there was some variety in terms of the computers used. It is important to note that there are slight differences in the repeat rate (how fast the characters appear) between computers. Thus, these differences likely introduced some noise in the coding variables, but the coders were still highly reliable with each other. Recordings of the conversations were divided into three parts: the first social support conversation, the conflict conversation, and the second social support conversation. Coders were not told that there was any difference between the three conversations, though it is possible they could deduce the topic of the conversations from the content of the conversation in some cases. Coders received training and demonstrations for how to conduct the coding. Coders also completed practice codings before coding videos with actual participants.

Data Analytic Procedure

A complication to the conversation data is that some participants had conversation data with friends, some had conversation data with romantic partners, and some had both. I focused my analyses on the conversations with friends, and, for participants who completed a follow-up

visit with a romantic partner, but not a friend, I treated any variables that would have been measured at a friend visit as missing and I estimated these variables. In these cases, I included relevant variables from the romantic partner visit in the data set used for missing data estimation so that these variables could help inform the missing data estimation. Participants who did not complete a friend visit *or* a romantic partner visit were excluded due to concerns about trying to estimate variables collected during the conversations for participants who completed no conversation tasks. This strategy maximized power but also accounted for differences in the conversations based on the interaction partner type (friend vs. romantic partner). Five participants (all in the GSAD group) reported that they did not have a current close friend (these participants completed a romantic partner visit). I, therefore, tested the relationship between diagnosis and eye contact with and without these participants to ensure that any results were not due to estimating eye contact data for participants who did not have a current friend. Results were equivalent with and without these participants.

Multiple imputation. I used the statistical program Amelia II (Honaker, Joseph, King, Scheve, & Singh, 1998-2002) to perform the multiple imputation. Two rounds of multiple imputation were performed. First, I imputed missing data from the individual coders' ratings of the video clips (all coders did not complete all videos). This was done separately for each conversation resulting in five imputed data sets for each conversation. The coding data was then entered into a confirmatory factor analysis to combine the data from the coders into one variable (see below). Second, I performed multiple imputation on a full data set including the eye contact factor scores from the three conversations as well as the other variables included in the models. Ratings from sessions with romantic partners were included when available to inform estimation of variables from sessions with friends. These variables were only included to inform missing

data estimation; they were not analyzed. Due to concerns about trying to estimate too many parameters for the sample size, a separate imputation was performed with partner-reported submissiveness in place of diagnosis. That is, including both diagnosis and partner-reported submissiveness in the same imputation analysis would have exceeded the recommended number of parameters for the sample size. Though this method allowed me to avoid trying to estimate too many parameters, this presents a limitation in comparing between models including diagnosis vs. models including partner-reported submissiveness.

Coding data. For the raw coding data from each coder, a confirmatory factor analysis was performed using the maximum likelihood (ML) estimator in the statistical software MPlus (Muthén & Muthén, 1998-2009). This method allowed me to combine the ratings from the three coders into one variable. I ran separate CFAs for each of the 15 imputed data sets (five data sets for each of the three conversations). Thus, each participant had five estimates of their factor score for each of the three conversations; these five estimates were averaged resulting in three averaged factor scores for each participant representing their eye contact in each conversation.

Mediation analyses. Structural equation modeling for the mediation pathways was conducted using MPlus. In determining model fit, global model fit was evaluated using the following: Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), comparative fit index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Steiger & Lind, 1980), and the standardized root mean square residual (SRMR; Bentler, 1995; Jöreskog & Sörbom, 1981). The following values indicate a good fit of the model to the data: TLI and CFI ranging from .95 to 1.0; RMSEA below .06; SRMR below .08 (Hu & Bentler, 1999). I initially planned to conduct tests of indirect effects (i.e., mediation) using bootstrapping in the MPlus program. However, bootstrapping cannot be used when analyzing multiple imputed data sets. Thus, I

calculated the indirect effect by forming a product variable and planned to follow up any significant results by running each imputed data set separately to obtain a range of confidence intervals. For any such bootstrap analyses I planned to implement 5,000 draws as recommended by Hayes (2009). The maximum likelihood estimator with standard errors and a mean-adjusted chi-square test statistic (MLM) in the MPlus program was used to report standardized path estimates. MLM is robust to non-normality and can be used when there are no missing data.

CHAPTER 3

Results

Zero-order correlations

Please see Table 1 for the full intercorrelation table. As expected, diagnosis related significantly with eye contact in the second and third conversations, whereas the relationship between diagnosis and eye contact was not significant in the first conversation. The eye contact variables across the three conversations were significantly related to each other. Counter to expectation, diagnosis was not significantly related to the state positive affect or state dominance variables, whereas diagnosis and trait positive affect were significantly related. Also counter to expectation, the state positive affect variables were not significantly related to the eye contact variables. Both trait and state positive affect were related to the state dominance ratings.

Table 1

Intercorrelations among eye contact, positive affect, and diagnosis

	Diagnosis	Trait Positive Affect	Eye Contact SS 1	Eye Contact Conflict	Eye Contact SS 2	Positive Affect 1	Positive Affect 2	Dom 1	Dom 2
Diagnosis									
Trait Positive Affect	-.49**								
Eye Contact SS 1	-.13	-.15							
Eye Contact Conflict	-.31**	.11	.65**						
Eye Contact SS 2	-.27*	.08	.53**	.82**					
Positive Affect 1	.005	.43**	.10	.07	.16				
Positive Affect 2	-.01	.44**	.01	-.003	.11	.89**			
Dom 1	-.17	.50**	.04	-.06	-.01	.53**	.48**		
Dom 2	-.03	.35**	.07	-.04	-.02	.47**	.50**	.75**	

Note. Eye Contact SS 1 = eye contact in the first social support conversation; Eye Contact Conflict = eye contact in the conflict conversation; Eye Contact SS 2 = eye contact in the second social support conversation; Dom 1 = Dominance 1; Dom 2 = Dominance 2.
** $p < .01$; * $p < .05$

Hypothesis 1

To test the hypothesis that participants with GSAD would make less eye contact than participants without, I regressed eye contact from each conversation on a dummy-coded variable representing diagnosis. The fit indices indicated excellent fit (CFI = 1.00, TLI = 1.00, RMSEA = 0.00, SRMR = 0.00). However, the model was saturated; thus, the fit indices are not meaningful. For the first social support conversation, diagnosis did not significantly predict amount of eye contact (*Estimate* = -.11, p = .454). For the conflict and second social support conversations, diagnosis significantly and negatively predicted the eye contact factor scores (*Estimate* = -.29, p = .003, *Estimate* = -.27, p = .011, respectively).[2] Thus, in support of Hypothesis 1, as the dummy-coded variable increased from 0 (NOSAD) to 1 (GSAD), the eye contact factor score values for the conflict and second social support conversations decreased. Further, the estimate for the conflict conversation was larger relative to the others, leading to a test of whether this was a significant difference as stated in Hypothesis 2.

Hypothesis 2

To test the hypothesis that the difference between GSADs and NOSADs in terms of eye contact would be especially apparent in the conflict conversation, I compared a model in which the relationships between diagnosis and eye contact in each conversation were constrained to be equal to a model in which the relationships were allowed to differ. Because I was using MLM, to compare fit across models, I needed to utilize the scaled difference in chi-squares (SDCS) test (Satorra & Bentler, 1994). However, when using multiply imputed data, a required component of the formula, the scaling factor, is not given. Thus, I ran each imputed data set separately, obtained a chi-square value and scaling factor for each, and ran separate SDCS tests for each

[2] When the five participants without current friends were excluded, results were equivalent (*Estimates* = -.13, -.29, -.28; p values .33, .002, .008 respectively).

data set. An exception to this procedure was comparisons made to the fully unconstrained model. Because this model was saturated, I could use the chi-square value of the comparison model for chi-square difference testing.

The fully constrained model fit was borderline to good (CFI = 1.00, TLI = .99, RMSEA = .12, SRMR = .04), whereas the fully unconstrained model fit was perfect, but saturated. The chi-square of the unconstrained model was significantly different from the constrained model (p = .043), suggesting that allowing the relationships to vary significantly improved model fit. I then tested a series of three models in which one of the conversations was unconstrained in each model. This method allowed me to determine which of the conversations needed to be allowed to vary from the others (i.e., which of the conversations was significantly different from the others). I compared each of the three models to the fully constrained model to test which of the conversations needed to be free to vary in order to improve fit significantly. For the model in which just eye contact in the first social support conversation was allowed to vary, three out of five of the significance values were significant (ps < .02). For the model in which eye contact in the conflict conversation was free to vary, one of the significance values was significant (p = .049). For the model in which eye contact in the second social support conversation was free to vary, none of the significance values were significant (ps > .77). I then compared the model in which the relationship between diagnosis and eye contact was allowed to vary in just the first social support conversation to the fully unconstrained model. The models were not significantly different (p > .499), suggesting that freeing up the relationship in the first conversation was equivalent to allowing the relationship to vary in all conversations. Taken together, these results suggest that the relationship between diagnosis and eye contact in the first social support conversation is most likely to differ significantly from the relationship between diagnosis and

eye contact in the other two conversations; however the lack of consistency of the SDCS tests limits the conclusions that can be drawn from these results.

These findings led to the post hoc hypothesis that eye contact was more influenced by GSAD status once concerns associated with the conflict conversation began. Further, I hypothesized that these concerns (and associated influence on eye contact) continued into the next conversation. To test this hypothesis, the indirect effect of diagnosis on eye contact in the second social support conversation through eye contact in the conflict conversation was included in a later version of the Hypothesis 3 model (see **Indirect effect of diagnosis on eye contact**).

Post hoc test of influence of helpee vs. helper role. Based on the initial results regarding the relationship between diagnosis and eye contact in the three conversations, I theorized that the role of the primary participant in the final conversation may have played a role in the relationship between diagnosis and eye contact. Specifically, I hypothesized that GSAD participants who were assigned to be the helpee role (the one who picks a personal characteristic to work on) would show the lowest levels of eye contact in the final conversation. I theorized that, for GSAD participants, it would be particularly uncomfortable to open oneself up to a discussion about a personal characteristic to change having just brought up something for the partner to change in the conflict conversation. To test this hypothesis, I included an interaction between diagnosis and helpee vs. helper role (coded 1 for helpee and 0 for helper) in predicting eye contact in the final conversation. The model fit was perfect because the model was saturated (CFI = 1.00, TLI = 1.00, RMSEA = 0.00, SRMR = 0.00). Diagnosis and helpee vs. helper showed significant effects (*Estimate* = -.45, p = .001; *Estimate* = -.38, p = .001, respectively) and were qualified by a significant interaction between diagnosis and helpee vs. helper role (*Estimate* = .32, p = .036). The nature of the interaction was that the helpee vs. helper variable was only

significantly related to eye contact for the NOSAD group (*Estimate* = -.38, *p* = .001), whereas the helpee vs. helper variable was not significantly related to eye contact for the GSAD group (*Estimate* = -.01, *p* = .922). NOSAD participants altered their eye contact based on their role in the conversation; more eye contact was made by helpers than helpees. GSAD participants not only made less eye contact overall, they made smaller (nonsignificant) changes in their eye contact behavior based on their role in the conversation.

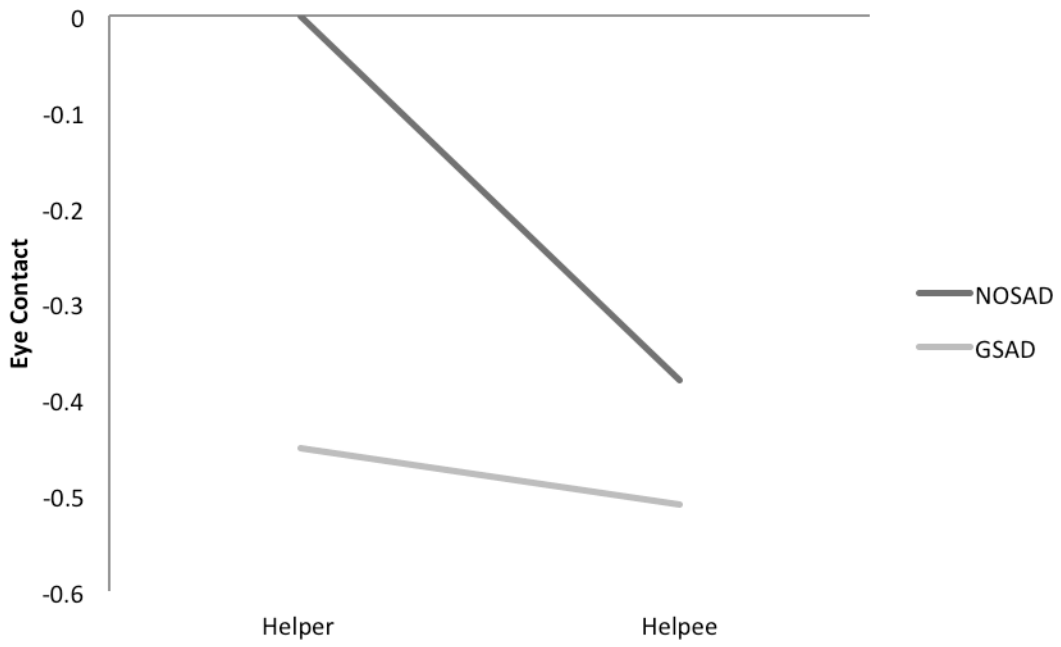
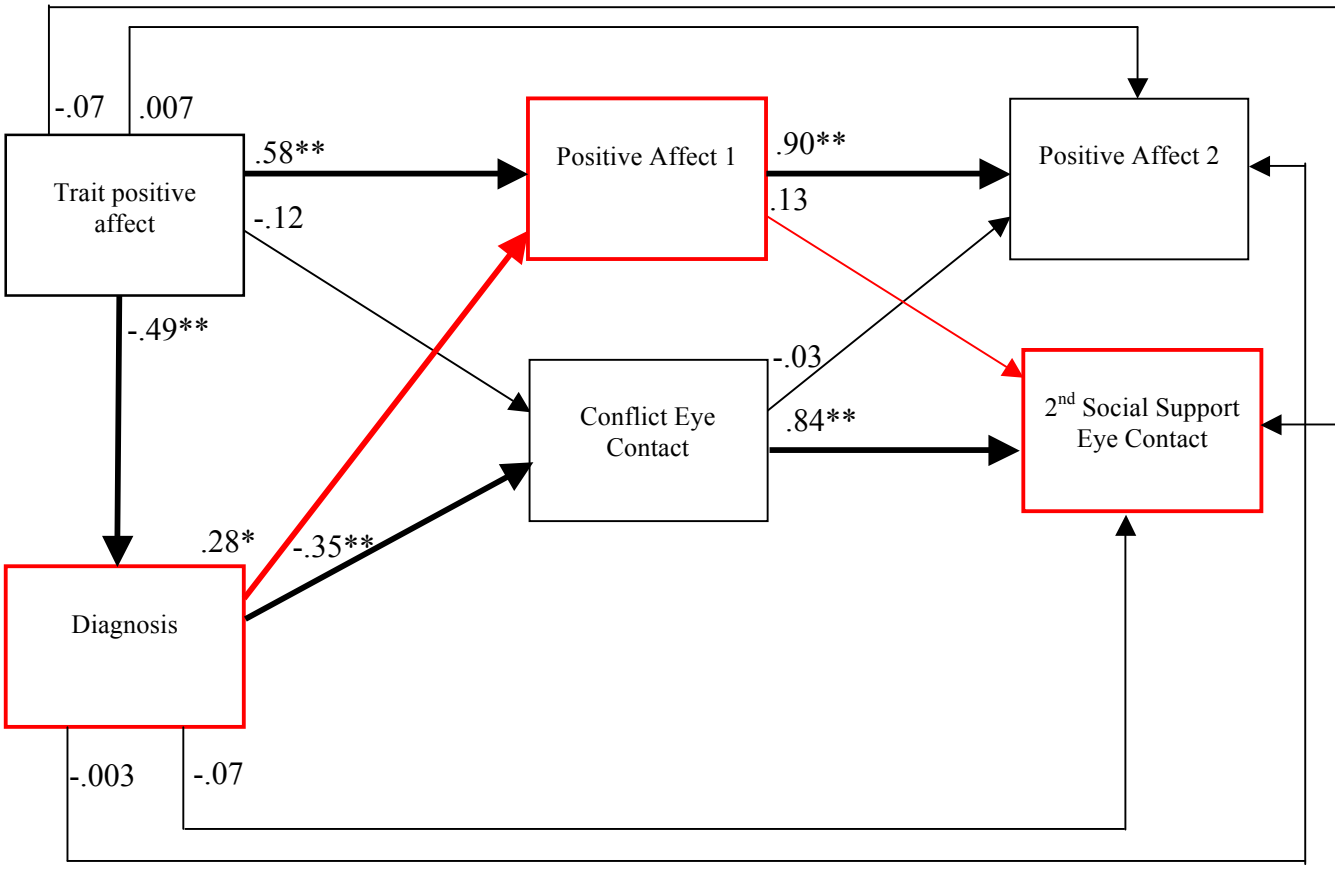


Figure 7. Interaction between diagnosis and helper vs. helpee role predicting eye contact.

Hypothesis 3

To test the hypothesis that positive affect after the conflict conversation (Positive Affect 1) would mediate the relationship between diagnosis and eye contact during the second social support conversation, I included diagnosis, the two state positive affect variables, the two eye contact variables, and trait positive affect in a structural equation model. Because the indirect effect command cannot be run with multiply imputed data, I first tested the overall model and included the product (AB) of the path from diagnosis to Positive Affect 1 (A) and the path from Positive Affect 1 to eye contact in the second social support conversation (B) as an initial way to test for the indirect effect and to get the best path parameters (Kenny, 2014; Muthén, 2009). This model fit well (CFI = 1.00, TLI = .94, RMSEA = .10, SRMR = .04). Counter to expectation, diagnosis showed a positive and significant relationship with Positive Affect 1 (*Estimate* = .28, p = .002), indicating that GSAD participants reported higher state positive affect. This relationship appeared to be a suppressor effect given that the zero-order relationship was near-zero and nonsignificant. Furthermore, the product variable (AB) was not significant (*Estimate* = .04, p = .188), indicating that positive affect did not mediate the relationship between diagnosis and eye contact. Please see Figure 9 for a visual depiction of these results.



Indirect effect estimate = .04, p = .188

Figure 8. Mediation model with diagnosis, positive affect, and eye contact. The pathway in red is the hypothesized mediational pathway. Bolded arrows are significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect rated after the second social support conversation.
*p < .01; **p < .001.

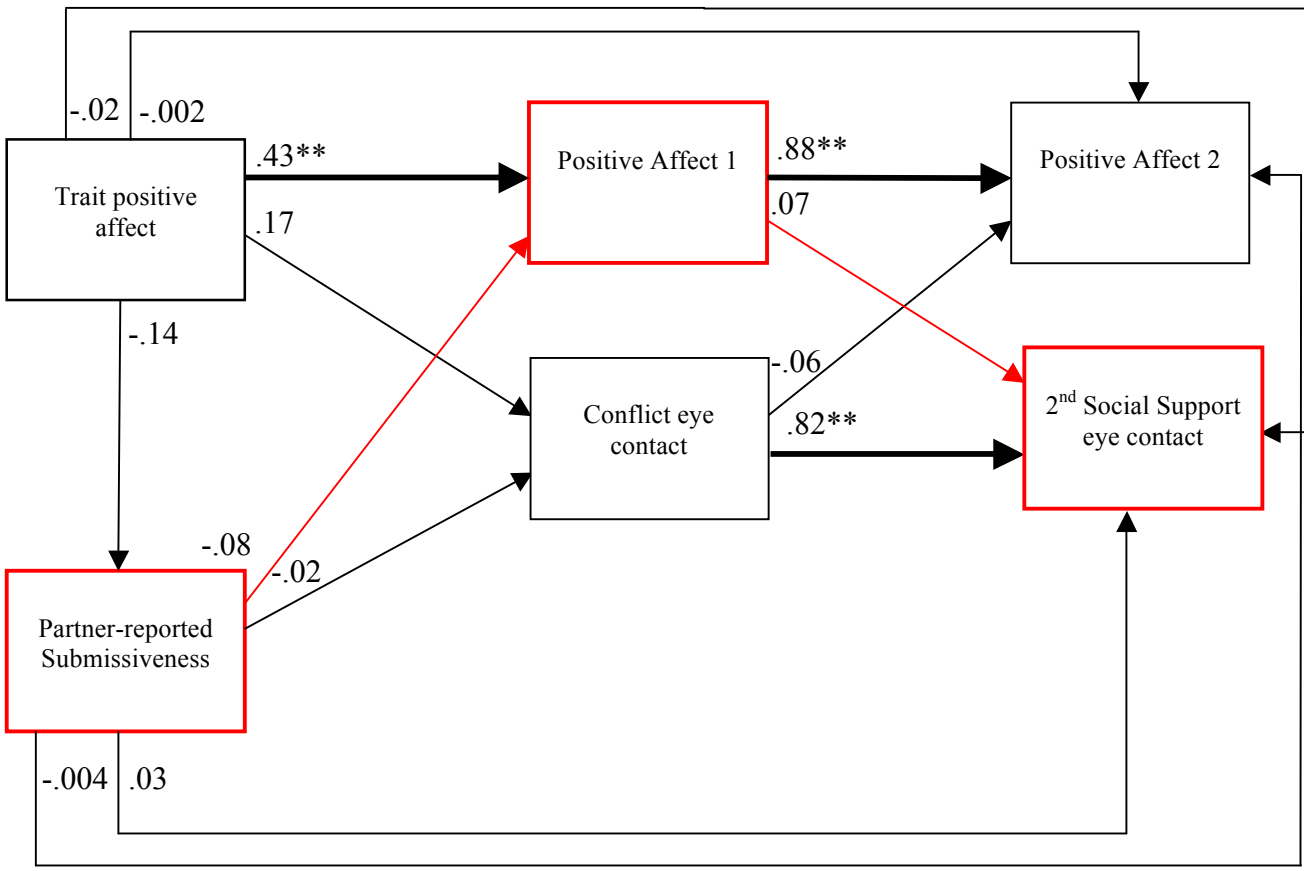
Indirect effect of diagnosis on eye contact. As noted above, the post hoc hypothesis that diagnosis influenced eye contact in the second social support conversation through eye contact in the conflict conversation was tested. This hypothesis was included after noting that the relationship between diagnosis and eye contact was stronger in the latter two conversations. Additionally, it was also noted that the relationship between diagnosis and eye contact in the second social support conversation was no longer significant in the overall model, relative to the zero-order relationship. The same initial model from Hypothesis 3 was tested with the addition of the indirect effect of diagnosis on eye contact in the second social support conversation through eye contact in the conflict conversation. The model fit was borderline to good (CFI = 1.00, TLI = .94, RMSEA = .10, SRMR = .04), and the indirect effect was significant (*Estimate* = -.29, p = .001), suggesting that GSAD status indirectly resulted in lower levels of eye contact in the last conversation through its influence on eye contact in the conflict conversation.

Gender invariance. I tested whether the paths in the model differed significantly by gender as hypothesized. I compared a model in which all paths were constrained to be equal across gender to a model in which they were allowed to vary. Both the constrained model (CFI = 1.00, TLI = 1.002, RMSEA = .02, SRMR = .08) and the unconstrained model (CFI = 1.00, TLI = .98, RMSEA = .08, SRMR = .05) fit well. To obtain more information about whether there was a statistically significant difference between the two models, I examined the SDCS test for each imputed data set. Four out of five of the SDCS tests were not significant (ps > .054), whereas one test was significant (p = .04). The results appear most consistent with the interpretation that the model is invariant for gender, though the lack of complete consistency of the SDCS tests makes this a tentative conclusion. I also tested whether just the eye contact factor scores showed a

difference by gender. I tested correlations between gender and the eye contact factor scores. The relationship between gender and eye contact was significant for the first social support conversation and the conflict conversation (*Estimates* < -.22, *p*s < .018), whereas it was not significant for the second social support conversation (*Estimate* = -.14, *p* = .142). These results suggest that men made less eye contact than women in two out of the three conversations. I also tested for an interaction between diagnosis and gender, but these interaction terms were not significant predictors of eye contact (*p*s > .31). A reasonable question is whether this gender difference represents a meaningful difference in eye contact. To examine the mean levels for each gender group, I examined the eye contact factor scores averaged across the five imputed data sets. For the first social support conversation, the women's mean level of eye contact was 693.10 and the men's mean level of eye contact was -1,435.71. These numbers represent factor scores estimated from the total numbers of brackets that the coders completed. To obtain a sense of whether this mean difference was meaningful, I examined the range of possible eye contact factor scores. For the first social support conversation, the range was -10,639.46 to 7,418.51. Thus, out of a possible range of 18,057 brackets, the difference between the men and women's averages represented 11% (2,128) of this possible range. I also examined the effect size of this difference. In the first social support conversation, gender explained 7.3% of the variance in eye contact. Similarly, in the conflict conversation, gender explained 5.2% of the variance in eye contact.

Partner-reported submissiveness. I tested for the influence of using partner-reported nonassertion (submissiveness) in place of diagnosis. This model fit well (CFI = 1.00, TLI = 1.025, RMSEA = .008, SRMR = .01). The mediation pathway (from submissiveness to Positive Affect 1 to eye contact in the second social support conversation) was not significant (*Estimate* =

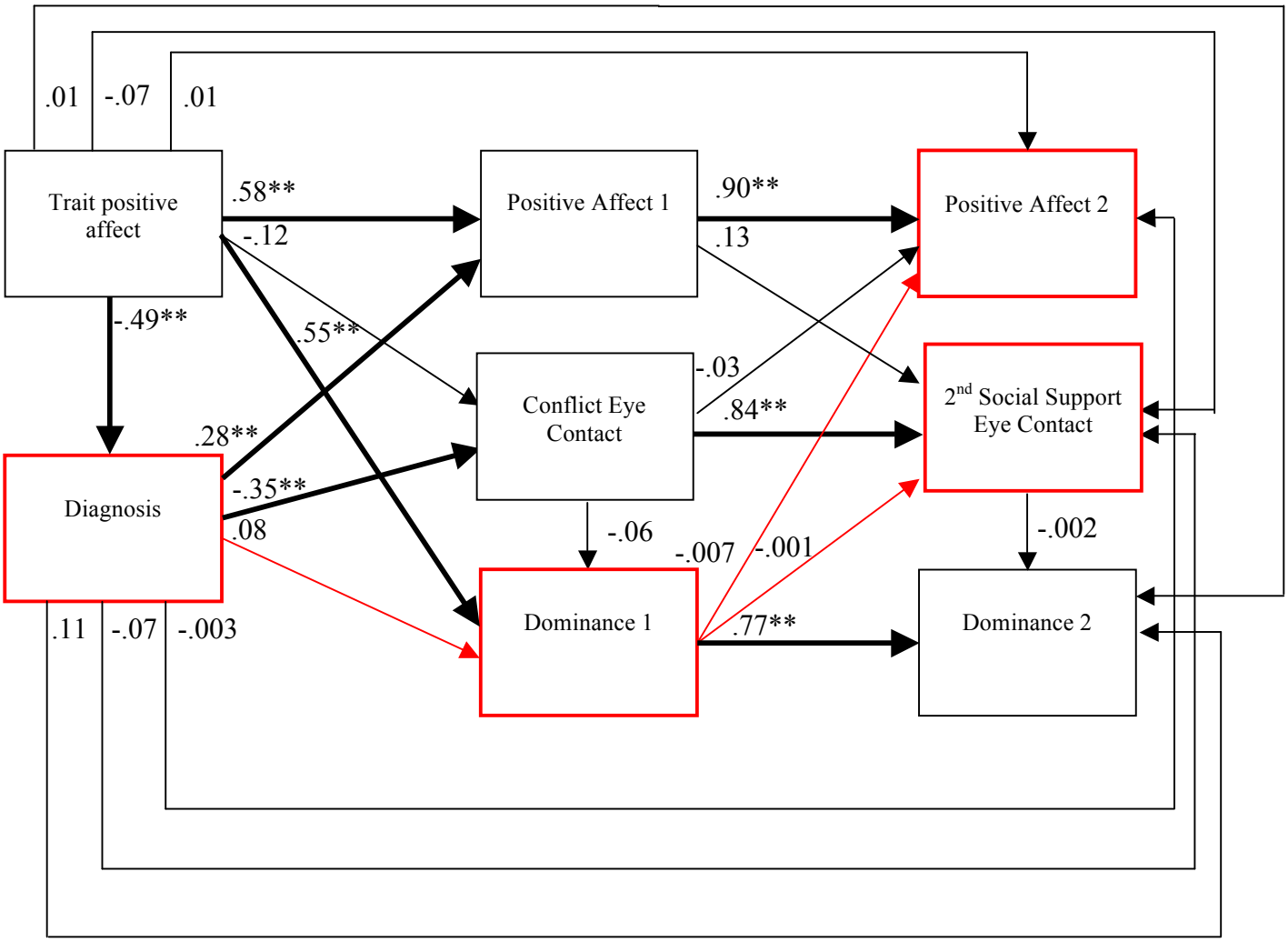
-.01, p = .60), suggesting that the friends' perceptions of the primary participant's submissiveness was not indirectly related to eye contact through positive affect. Please see Figure 10 for a visual depiction of these results.



Indirect effect estimate = -.01, p = .60

Figure 9. Mediation model with partner-report of submissiveness, positive affect, and eye contact. The pathway in red is the hypothesized mediational pathway. Bolded arrows are significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect rated after the second social support conversation. **$p < .001$.

Addition of dominance. I tested for the influence of the state ratings of dominance on the overall model. I included two additional mediation pathways involving dominance: one testing whether Dominance 1 would mediate the relationship between diagnosis and Positive Affect 2 (CD) and one testing whether Dominance 1 would mediate the relationship between diagnosis and eye contact in the second social support conversation (EF). The model did not fit well (CFI = .96, TLI = .77, RMSEA = .20, SRMR = .09). The dominance ratings did not show any significant relationships except for between trait positive affect and Dominance 1 (*Estimate* = .55, $p < .001$) and between the two dominance ratings (*Estimate* = .77, $p < .001$). Further, neither of the mediation pathways involving dominance were significant (*p*s > .91). Please see Figure 11 for a visual depiction of these results.



Indirect effect estimates:
AB = .04, p = .21
CD = .001, p = .913
EF = .000, p = .974

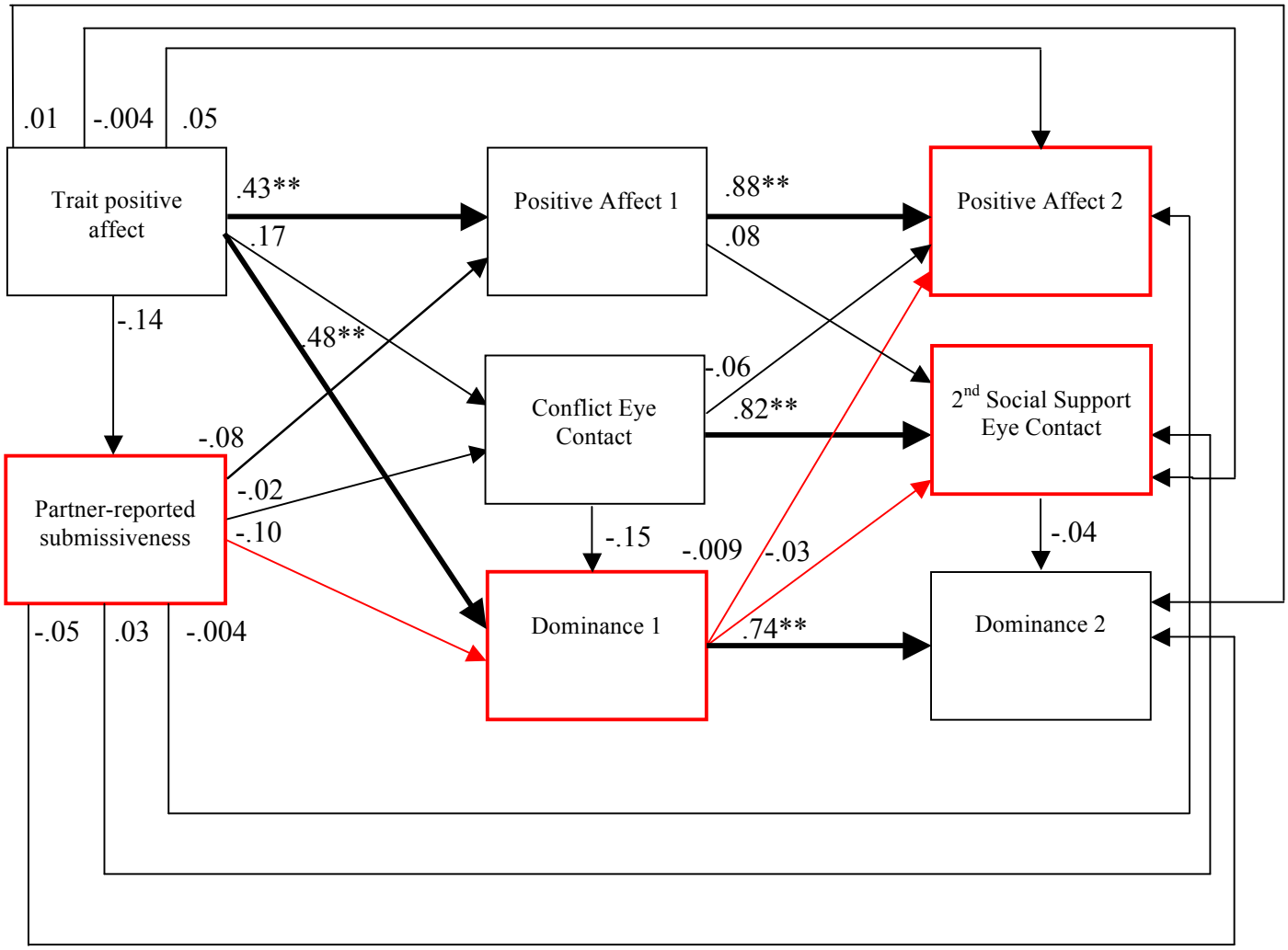
Figure 10. Depiction of full model with dominance ratings. The pathways in red are the hypothesized mediation pathways. Bolded arrows are significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect rated after the second social support conversation.
**p < .001.

Dominance and partner-reported submissiveness. I tested the above model using partner-reported submissiveness in place of diagnosis. This model showed borderline to good fit (CFI = .96, TLI = .80, RMSEA = .18, SRMR = .08), and, similar to the previous model, the dominance ratings only showed significant relationships with each other and with trait positive affect in the case of Dominance 1. The mediation pathways involving dominance were not significant (*p*s > .79). Please see Figure 12 for a visual depiction of these results.

The lack of relationship between diagnosis and the SAM dominance ratings was unexpected. However, I noted that trait positive affect showed a significant and large-sized relationship with Dominance 1. I ran an exploratory test of whether diagnosis would show a significant relationship with Dominance 1 once trait positive affect was removed from the model. Diagnosis positively and significantly predicted Dominance 1 (*Estimate* = .21, p = .029), but not Dominance 2 (*Estimate* = .05, p = .648). Fit was initially very poor for this model (CFI = .74, TLI = .09, RMSEA = .41, SRMR = .21). Clearly nonsignificant relationships were dropped from the model, which improved fit somewhat (CFI = .91, TLI = .63, RMSEA = .28, SRMR = .16).

Further Examination of the Relationship between Diagnosis and State Positive Affect

Given the unexpected lack of relationship between diagnosis and state positive affect during the conversations, I ran exploratory tests of whether diagnosis would relate to other state positive affect ratings collected during the overall experimental procedure. Though the task is not considered in the current study, participants completed state positive affect ratings while completing the Prisoner's Dilemma computer task. Diagnosis significantly and negatively predicted all five state positive affect ratings from the computer task (*r*s < -.29, *p*s < .003).



Indirect effects estimates:
AB = -.007, p = .600
CD = .002, p = .792
EF = .004, p = .813

Figure 11. Depiction of full model with dominance and partner-reported submissiveness. The pathways in red are the hypothesized mediation pathways. Bolded arrows are significant. Positive Affect 1 = average of positive affect from directly after the conflict conversation and right before the second social support conversation; Positive Affect 2 = positive affect rated after the second social support conversation.
**p < .001.

CHAPTER 4

Discussion

I investigated part of the psychoevolutionary theory of SAD, namely that individuals with GSAD engage in gaze avoidance as a way to communicate submissiveness. I also tested whether this behavior is regulated by state levels of positive affect. Though individuals with GSAD did appear to make lower levels of eye contact in two out of three conversations, the role of positive affect as a regulator of this behavior was unsupported. Further, partner-reported submissiveness and dominance did not relate to the constructs of interest as expected. Finally, though there was little evidence for gender differences in the overall model, men made lower levels of eye contact than women in two out of the three conversations, which is consistent with prior research (Exline et al., 1965).

I hypothesized that individuals with GSAD would make lower levels of eye contact, especially in the conflict conversation relative to the social support conversations. However, the pattern of results suggested that GSAD was not significantly related to eye contact in the first social support conversation, but significantly related to eye contact in the conflict and second social support conversations. These results suggest that diagnosis was less related to eye contact in the initial conversation and only significantly related once the concerns associated with the conflict conversation were elicited. I theorize that bringing up and discussing something for the partner to change resulted in increased concerns about rejection, especially for participants with GSAD, resulting in lower levels of eye contact. In line with the psychoevolutionary of GSAD, submissive behaviors should be especially likely during encounters that appear socially threatening. It appears that these concerns, and associated lower levels of eye contact, continued into the next conversation. To test this post-hoc hypothesis, I investigated the indirect effect of

diagnosis on eye contact in the third conversation through its influence on eye contact in the conflict conversation. This effect was significant, suggesting that diagnosis influenced eye contact behavior in the second conversation and this influence carried over into the third conversation.

The current study's finding of higher gaze avoidance in individuals with GSAD is the first behavioral observation study to find such a difference in a diagnosed sample. To my knowledge, there is only one other behavioral observation study to find a difference by social anxiety level (Farabee et al., 1993), whereas the other behavioral observation studies did not find a difference by social anxiety level (Walters & Hope, 1998; Weeks et al., 2011). The evidence for gaze avoidance in individuals with higher social anxiety has thus far come largely from self-report, eye-tracking, and fMRI studies (Horley et al., 2003; Horley et al., 2004; Schneier et al., 2011; Schneier et al., 2009). Thus, prior to this study, it was conceivable that social anxiety tended to influence eye contact primarily during very specific situations (i.e., when viewing a picture of a threatening face or when listening to a persuasive speech). However, the procedure in the current study is arguably more threatening than the paradigms used in the previous behavioral observation studies. That is, participants were asked to discuss a conflict within an established relationship. This situation should be perceived as more threatening because the potential loss is greater: that of a close relationship. Thus, it is possible that the paradigms tested thus far in behavioral observation studies (with the exception of Farabee et al.) have not adequately activated fears of rejection. In fact, in Farabee et al., a difference in gaze behavior based on social anxiety level was only found when participants listened to a confederate giving an opinion that differed from the participant's views. Taken together, these findings suggest that social anxiety only leads to gaze avoidance once fears of rejection have been adequately

activated. However, this theory should be tested directly in future research by asking participants to rate in-the-moment concern about being rejected by their conversation partner.

I predicted that positive affect would mediate the relationship between diagnosis and eye contact. However, the indirect effect of diagnosis on eye contact through positive affect was not significant. Further, the relationship between diagnosis and Positive Affect 1 was, unexpectedly, in the positive direction, indicating that GSAD participants reported higher levels of state positive affect. It appears that this is a suppressor effect due to the presence of trait positive affect in the model; diagnosis showed a positive relationship with the variance in Positive Affect 1 that was left over after the influence of trait positive affect had been accounted for. Indeed, the zero-order correlation between diagnosis and Positive Affect 1 was near-zero and not significant. I also predicted that the paths in the mediation model would be stronger for men. This hypothesis was somewhat dependent on finding a significant mediation pathway; however, I tested for gender invariance to see whether the overall model showed differences by gender. I found little evidence of gender differences in the overall model; however, men made lower levels of eye contact in two out of the three conversations. This finding is consistent with prior research (Exline et al., 1965) as well as theory outlined in this dissertation. I expected that men might be more concerned about dominance hierarchies, and, therefore, more concerned about making direct eye contact. This finding calls for more research on gender differences in eye contact including examining associated motivations for these differences.

In terms of the overall model, other than straightforward and expected effects such as Positive Affect 1 predicting Positive Affect 2, the only other strong effect was for diagnosis predicting eye contact, such that GSAD participants made lower levels of eye contact in the conflict conversation. Diagnosis did not show a significant relationship with eye contact in the

last conversation in the overall model, likely because eye contact from the conflict conversation showed such a strong relationship with eye contact in the second social support conversation. Indeed, diagnosis showed an indirect relationship with eye contact in the second social support conversation through eye contact in the conflict conversation. Against prediction, diagnosis did not show the expected significant relationships with Positive Affect 1 and 2. This finding is surprising given previous research showing a relationship between social anxiety and daily levels of positive affect (Kashdan & Steger, 2006).

Given the unexpected lack of relationship between diagnosis and the state ratings of positive affect, I examined other ratings of state positive affect from the overall experimental procedure. Participants completed the Prisoner's Dilemma computer task at the first experimental session and completed multiple ratings of state positive affect using the PANAS. These ratings were significantly and negatively related to diagnosis. Further, examination of a scatterplot of diagnosis and state positive affect from the conversations revealed that the NOSAD group endorsed a wider range of state positive affect (including lower values) relative to the range of their trait positive affect ratings. Taken together, these findings suggest that there was something about the conversation tasks that elicited state positive affect ratings that were less characteristic of the diagnostic groups. It appears that the NOSAD group endorsed a wider range of positive affect during the conversations relative to the computer task. This range widened to include lower values of positive affect, whereas the upper end of the range was equivalent between the two tasks. Thus, the lack of difference between the groups may stem from less interest in the conversation tasks on the part of the NOSADs; however, the reason for this lesser interest (on average) remains unclear. These findings call for more examination of how different activities and tasks influence the relationship between social anxiety and state positive affect. It

seems plausible that social anxiety only relates to state positive affect under certain conditions, but this hypothesis remains to be tested.

Further, although it may seem evident that social anxiety should show a relationship with state positive affect based on previous research (e.g., Brown et al., 1998; Farmer & Kashdan, 2013; Kashdan & Steger, 2006), a closer examination of the relevant literature reveals a lack of studies examining enjoyment of specific tasks or activities and a lack of specification of the underlying mechanisms of this relationship. Much of the evidence for a relationship between social anxiety and state positive affect comes from experience sampling studies that assess self-report ratings of positive affect made during daily life (Farmer & Kashdan, 2013; Kashdan & Steger, 2006). However, it is unclear from these previous studies whether social anxiety predicts state positive affect above and beyond trait levels of positive affect because it is unclear whether averaged levels of daily positive affect ratings capture state or trait tendencies. Results from these studies also exhibit some inconsistencies in terms of whether social anxiety relates to daily positive affect above and beyond depression. Finally, it is unclear whether we should expect that ratings of daily positive emotions should correspond to how much one will enjoy a particular activity or task. Thus, perhaps the finding of a lack of relationship between diagnosis and state positive affect ratings during the conversations is less surprising given the lack of previous research utilizing ratings tied to a specific task.

I also tested for the influence of using partner-reported submissiveness in place of diagnosis. Overall, the use of partner report appeared to result in fewer significant relationships among the constructs of interest. Surprisingly, partner-reported submissiveness did not predict amount of eye contact in either of the conversations. The hypothesized mediation pathway was also not significant. Similarly, the addition of dominance to the models did not appear to add

much in the way of prediction of the constructs of interest. Though I expected that state levels of dominance might also play a role in the regulation of positive affect and eye contact, these hypotheses were unsupported. And, again, replacing diagnosis with partner-reported submissiveness did not add explanatory power to the model.

It is unclear what accounts for the lack of relationship between partner-reported submissiveness and eye contact. Previous research supports that asking others to report on the primary participant adds valuable information to understanding interpersonal problems associated with higher social anxiety (Rodebaugh, Gianoli, Turkheimer, & Oltmanns, 2010). Thus, I expected that the partners in our study would be valuable sources of information on the submissive behaviors of their friends (the primary participants). Given that eye contact is conceptualized as a submissive behavior, I expected that eye contact would relate to general propensity towards submissiveness. It is unclear whether eye contact is not related to interpersonal problems associated with submissiveness or whether the friends in our study were not good reporters of this behavior in the primary participants. It is possible that the friends were less aware of any interpersonal problems associated with submissiveness, even if they were aware of submissiveness in general. It is also conceivable that friends of individuals with GSAD may be fairly tolerant to submissive behavior given that the friendship has endured.

The lack of relationship between diagnosis, state ratings of dominance, and eye contact was also unexpected given previous theory and research. Previous research suggests that individuals with higher social anxiety should be more sensitive to situations that might elicit social threat (Weeks et al., 2011). Given that the conflict conversation involves the primary participant essentially confronting the friend about an undesirable behavior, I expected this conversation to elicit concerns about dominance, particularly in participants with GSAD. For

example, it seems likely that an individual who believes he or she is of lower social status would feel anxiety about performing what is essentially an assertive behavior. This assertive behavior would stand in contrast to the usual strategy of deferring to others as a way of trying to escape social rejection. Thus, it is surprising that diagnosis did not relate to state dominance ratings. The ratings appear to relate more to positive affect levels rather than diagnosis. That is, participants who reported higher levels of positive affect during the conversations also reported higher dominance. Perhaps enjoyment of the conversations and associated feelings of dominance were more related to factors specific to the individual conversations, rather than diagnostic group.

The results of the current study should be viewed in light of its limitations. Although the study went above and beyond self-report by utilizing coding of eye contact and partner report of submissiveness, the assessments of many of the other constructs were self-report. For example, it would be advantageous to assess state positive affect and dominance with coder ratings in future research. Another limitation of this study was that there were fewer men relative to women, which may have limited our assessment of gender invariance. Future similar studies may benefit from considering how to recruit more men. Finally, both the sample size and missing data presented some challenges. To estimate missing data in multiple imputation without exceeding recommendations for the number of parameters estimated given the sample size, I had to conduct separate rounds of multiple imputation. Thus, the models with diagnosis utilize data from one round and the models with partner-reported submissiveness utilize data from another round. This use of separate missing data estimation results in a limitation in terms of being able to compare between the two models directly. However, this procedure was the most sound in terms of avoiding the estimation of too many parameters within the same multiple imputation analysis.

This study was the second to investigate differences in observable eye contact in a diagnosed sample. This study also built upon previous research on the psychoevolutionary theory of SAD. These results support that individuals with GSAD make lower levels of eye contact during certain social situations. In particular, it appears that the conflict conversation elicited higher gaze avoidance. Presuming that this conversation elicited concerns about being rejected, these results provide further support for the theory that individuals with higher social anxiety employ gaze avoidance to communicate submissiveness as a way of avoiding social ostracization. Though I expected that this behavior would be regulated by state positive affect, this hypothesis was not supported. This finding warrants further testing of the role of positive affect as a regulator of exploratory behavior. It is unclear whether I did not find this relationship because eye contact is not an exploratory behavior, whether the assessment of positive affect did not capture the type of positive affect that performs this role, or whether this theory is incorrect. Given the documented negative effects of gaze avoidance on making a positive impression on others, these results have implications for clinical interventions. Specifically, though gaze avoidance may already be addressed during standard cognitive behavioral treatment, this is only the case should the therapist identify this behavior as a safety or avoidance behavior. An increase in attention to targeting gaze avoidance may be advantageous for facilitating social learning and helping the individual to form social bonds.

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