Perception of Facial Expressions in Social Anxiety and Gaze Anxiety

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PERCEPTION OF FACIAL EXPRESSIONS
IN SOCIAL ANXIETY AND GAZE ANXIETY

by

AARON NECAISE

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Psychology
in the College of Sciences
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ABSTRACT

This study explored the relationship between gaze anxiety and the perception of facial expressions. The literature suggests that individuals experiencing Social Anxiety Disorder (SAD) might have a fear of making direct eye contact, and that these individuals also demonstrate a hypervigilance towards the eye region. It was thought that this increased anxiety concerning eye contact might be related to the tendency of socially anxious individuals to mislabel emotion in the faces of onlookers. A better understanding of the cognitive biases common to SAD could lead to more efficient intervention and assessment methods. In the present study, the Depression Anxiety Stress Scale-21 (DASS-21) and the Social Phobia and Anxiety Inventory-23 (SPAI-23) were used to measure social anxiety, depression, and overall distress. These forms allowed us to separate participants who reported high socially anxious and depressive traits from those in the normal range. We then compared anxiety concerning mutual eye contact as measured by the Gaze Anxiety Rating Scale (GARS) to performance on a facial recognition task. Performance was measured as recognition accuracy and average perceived intensity of onlooker expression on a scale of 1-5. A linear regression analysis revealed that higher GARS scores were related to higher perceived intensity of emotion by socially anxious individuals. An exploratory correlation analysis also revealed that higher gaze anxiety was related to lower accuracy at identifying neutral emotions and higher accuracy at identifying angry emotions. While past research has demonstrated these same biases by socially anxious individuals, gaze anxiety had not been explored extensively. Future research should investigate gaze anxiety’s role as a moderating variable.
DEDICATION

For my mom—Maria—who has provided me with incredible support and encouragement throughout all of my endeavors. Thank you for all of the hard work you have done.

For Rebekah Kanefsky, thank you for the help and support you have given me.
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# TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION ............................................................................................. 1  
Gaze Behavior in Social Anxiety .............................................................................................................. 2  
Facial Recognition in Social Anxiety ....................................................................................................... 5  
Hypothesis ................................................................................................................................................. 7  

CHAPTER TWO: METHODS ....................................................................................................... 8  
Participants ................................................................................................................................................ 8  
Measures ................................................................................................................................................... 8  
Procedure ................................................................................................................................................ 11  
Data Analysis .......................................................................................................................................... 11  

CHAPTER THREE: RESULTS ................................................................................................... 14  
Descriptive Statistics ............................................................................................................................... 14  
Regression Analysis ................................................................................................................................ 14  
Correlation between GARS and type of emotion ................................................................................... 16  
Comparison of average performance on facial recognition task ............................................................. 16  

CHAPTER FOUR: DISCUSSION ............................................................................................... 18  
Gaze Anxiety .......................................................................................................................................... 18  
Facial Recognition .................................................................................................................................. 20  
Limitations .............................................................................................................................................. 20  
Conclusion .............................................................................................................................................. 21  

APPENDIX A: REGRESSION ANALYSIS ............................................................................... 23  
APPENDIX B: PARTIAL CORRELATION ............................................................................... 27  
APPENDIX C: FACIAL RECOGNITION STIMULI ................................................................. 29  
APPENDIX D: IRB APPROVAL LETTER ................................................................................ 34  
REFERENCES ............................................................................................................................. 36
CHAPTER ONE: INTRODUCTION

Social anxiety disorder (SAD) is among the most common mental health issues in the United States. Those with SAD experience an intense fear of scrutiny during social interactions. These individuals may possess beliefs that others are negatively evaluating them, that they appear anxious and fearful to others, or that their behavior is outwardly offensive (American Psychiatric Association [APA], 2013). Social anxiety can lead to limited personal relationships and difficulties in the workplace, and it is highly comorbid with depression and substance abuse (APA, 2013; Cooper, Hildebrandt, & Gerlach, 2014).

Engagement in avoidance behaviors is one method of mitigating social anxiety symptoms. These behaviors involve inflexibly avoiding any situation which provokes fear. Some examples would be turning down a job that requires public speaking, avoiding speaking on the phone, or avoiding asking someone out on a date. The problem with avoidance is that it is believed to contribute to the maintenance of anxiety symptoms because of operant conditioning processes (Feather, 1963). Not facing fearful situations reinforces the avoidance, but the anxiety about the situation is still present. Recent research has shown that greater levels of avoidance correlate with greater levels of anxiety and distress (Panayiotou, Karekla, & Mete, 2014).

Avoidance is not limited to social situations. It can also be demonstrated by the avoidance of specific stimuli. A commonly reported fear in SAD is mutual gaze (direct eye contact), and research has shown that individuals with high social anxiety tend to fixate less on the eye region compared to healthy controls (Schulze, Renneberg, & Lobmaier, 2013). Although avoidance of gaze is a behavior demonstrated across multiple clinical disorders, how it functions to influence other behaviors is uncertain. The purpose of the current study is to explore the
relationship between social anxiety, gaze avoidance, and the perception of onlooker emotion. More specifically, is the avoidance of eye contact by individuals who are socially anxious related to how the facial expression of an onlooker is perceived?

**Gaze Behavior in Social Anxiety**

Where we direct our eyes is an indicator of what we are currently focusing our visual attention on. During social interactions, our eye movement is used as a conversational cue; for example, eye movement provides social facilitation and information on whose turn it is to speak (McCarthey, Lee, Itakura, & Muir, 2006). Eye contact also communicates information about dominance, level of interest in the speaker, attention, comfort level, and emotional state (Schulze et al., 2013; Senju & Johnson, 2009; Weiser, Pauli, Alpers, & Muhlberger, 2009). Senju and Johnson (2016) found that engaging in eye contact—or even viewing pictures of faces with the eyes directed at the observer—may activate a number of brain structures associated with social information processing such as the fusiform gyrus and the amygdala. They found that the activation of this "social brain" may increase performance on socially driven tasks such as gender discrimination (Senju & Johnson, 2009). This suggest that the initiation of eye contact serves as an important priming stimuli to prepare observers for the processing of social information.

Considering that gaze is a method of exchanging social information, it is then not surprising that clinical disorders involving social impairment involve gaze impairment as well. Maladapted gaze behaviors can include avoiding eye contact, fixating on irrelevant stimuli in the visual field, or inefficiently scanning for details. This is not an exhaustive list and different forms of these behaviors manifest themselves in SAD, autism, schizophrenia, and Williams syndrome
Eye tracking studies have shown that individuals high in social anxiety traits will fixate their visual attention less on the eye region compared to the rest of the face, and that this avoidance is preceded by hypervigilant scanning for negative information (Schulze et al., 2013; Terburg, Arts, & Honk, 2012). Hypervigilance describes an increased sensitivity when detecting specific negative stimuli. Participants in these studies reportedly scan for negative social information more intensely and then are quick to avoid it when it is perceived (Terburg et al., 2012).

Despite a recent increase in the use of eye tracking to assess attention bias, support for gaze avoidance in SAD is inconsistent (Schulze et al., 2013). Whether eye contact is actually avoided may be moderated by other factors in addition to anxiety, such as gender of the speaker, cultural context, or distance between speakers (Weiser, Pauli, Grosseibl, Molzow, & Muhlberger, 2010). If the avoidance of eye contact in SAD is dependent on these moderating factors, it offers one possible explanation as to why results concerning gaze avoidance have not consistently shown avoidance of the eye region across all social situations.

Even when avoidance is not present, increased physiological arousal has been noted in response to eye contact. Weiser and colleagues (2009) found that socially anxious individuals had higher cardiac responses to eyes directed towards them compared to individuals who were less socially anxious. In a similar study, Schneier, Pomplun, Sy, and Hirsch (2011) compared the neural response to viewing pictures of faces with the eyes either directed at the observer or with the eyes averted away. Participants who met criteria for SAD were compared to a non-anxious control group. Consistently, direct gaze correlated with greater activation of areas in the brain associated with self-monitoring, self-referential processing, and the processing of
emotional information. After treatment, these activation responses decreased proportionally in intensity. Self-monitoring has particularly interesting clinical implications because individuals with SAD exhibit heightened awareness of their outward appearance (APA, 2013).

Adverse reactions to eye contact are not the only aspects in which gaze is influenced by social anxiety. Individuals experiencing social anxiety might be responding to direct eye contact even when it is not occurring. Honma (2013) demonstrated this effect through self-report and physiological responses. Participants in the experiment were placed face to face and designated to play the role of either the viewer or the perceiver. The viewer was instructed to look at the perceiver’s eyes in one condition or at a set point in between them in a different condition. The perceiver was asked to report when they perceived eye contact, and had their pupil diameter measured during the task. This design allowed experimenters to measure the spatial field in which gaze is perceived as eye contact. Higher self-reported social anxiety on the Liebowitz Social Anxiety Scale (LSAS) was correlated with greater spatial range of eye contact perception. Additionally, perception of mutual gaze was correlated with greater amounts of pupil dilation even when eye contact was not made. Not only did socially anxious participants perceive greater amounts of eye contact than what occurred, but their increased pupil dilation demonstrated their heightened physiological arousal during mutual gaze.

Another study comparing individuals diagnosed with SAD to healthy controls found that increased spatial response to eye contact perception was only present when more than one viewer was looking at the perceiver (Gamer, Hecht, Seipp, & Hiller, 2011). Possessing a greater spatial range in which eye contact is perceived would contribute to the feeling of being observed. This
could help explain why individuals with SAD typically report fears of being observed during normal behavior, such as while eating (APA, 2013).

**Facial Recognition in Social Anxiety**

While past literature supports both the misperception and avoidance of gaze in SAD, it remains unclear what function gaze avoidance serves in the maintenance of anxiety. As with most avoidance behaviors, it is unlikely that this behavior helps to relieve anxiety symptoms in the long term. One thought is that the fear of mutual gaze leads to the misinterpretation of important social information communicated nonverbally through the face or eyes. The literature supports this notion by showing that the perception of facial expressions is biased towards negative interpretations in individuals with SAD (Gutierrez-Garcia & Calvo, 2014; Mohlman, Carmin, & Price, 2007; Yoon & Zinbarg, 2007).

Another possible explanation for the tendency to interpret social information negatively is that individuals experiencing high social anxiety operate with a lower threshold for detecting negative stimuli. That is to say, socially anxious individuals are more likely to detect negative stimuli at lower levels of intensity that might otherwise be ignored by individuals who are not socially anxious. Frenkel and Bar-Haim (2011) found support for this hypothesis when evaluating neural responses to small changes in the level of fear intensity in faces. Pictures of faces that gradually expressed a more fearful facial structure were presented while participants’ brain activity, in the form of event related potentials (ERPs), were measured. ERPs provided a measurable response in the brain that were highly sensitive to the specific events of interest (e.g., gradual changes in facial expressions). Unlike the control group which had a graded response, those who were socially anxious did not demonstrate much discrimination in brain response to
subtle changes in facial structure. Low levels of fear were processed with similar intensity as high levels of fear. It also took less intense expressions for the socially anxious group to identify the fearful expression compared to the control group. Similar results have been found in regards to anger. Socially anxious participants detected angry expressions at lower intensity levels than both a control and a group of individuals with depression (Joormann & Gotlib, 2006).

Detecting emotional states at lower levels of intensity may be related to previous findings that show socially anxious individuals have a tendency to judge ambiguous information as negative (Yoon & Zinbarg, 2007). For instance—although socially anxious individuals can identify angry facial expressions with greater accuracy than controls—they are more likely to misidentify neutral faces as angry (Mohlman et al., 2007). If a lower threshold for threat is operating, it makes sense that ambiguous information (such as neutrality) triggers the misidentification of anger or fear during such recognition tasks. Regardless, an attentional bias to negative information is likely operating when individuals high in social anxiety process information.

Considering that social anxiety appears to influence face perception, it is important to account for how facial expressions are processed. The region of the face that is the focus of attention might depend on both the emotional state of the face being viewed and that of the viewer. A greater proportion of visual attention is spent on the eyes when the face is perceived as negative (Scheller, Büchel, & Gamer, 2012) and the experience of embarrassment or social anxiety in the viewer is correlated to even greater attentional biases involving the eye region (Darby & Harris, 2010; Gutierrez-Garcia & Calvo, 2014). Hills and Lewis (2011) have shown that mood is also related to preferential processing of the eye region. Participants induced to feel
sad failed at detecting subtle changes in the eye region, while those induced to feel happy performed better at detecting eye changes than detecting changes on the rest of the face.

It seems likely that processing of the eye region is of preferential importance when evaluating the overall expression of a face, perhaps functioning as the most salient emotional cue. However, in research, the perception of the eye region is typically not examined independently—most likely due to the loss of contextual information contributed by the rest of face. Even though the literature suggests socially anxious individuals exhibit hypervigilance and avoidance towards the eye region (Terburg et al., 2012), few studies have explored how gaze avoidance and eye region perception interact when processed by socially anxious individuals (Horley, Williams, Gonsalvez, & Gordon, 2004).

The current study will evaluate the perception of emotion by participants high in self-reported social anxiety and gaze avoidant behavior. A facial recognition task will be used to compare participants’ gaze anxiety to their performance on a facial recognition task. Performance is defined as a participant’s accuracy at labeling emotions and how intense they perceive those emotional expressions to be. The study will also explore the differences in perceiving emotion only within the eye region when compared to perceiving emotions in the entire face.

Hypothesis

It is predicted that amount of gaze anxiety reported by socially anxious participants will be negatively related to performance on a facial recognition task. It is expected that the experience of anxiety towards the eye region will relate to lower accuracy when detecting emotional state in faces. In addition, participants with higher levels of gaze anxiety are predicted to perceive facial expressions as being more intense than they actually are.
CHAPTER TWO: METHODS

Participants

A convenience sample of 392 University of Central Florida psychology students—age 18 and older—was obtained. There was a total of 104 males and 288 females. Recruitment took place through the UCF online SONA research participation system in which psychology students can receive class credit for their participation in research studies. There were 89 participants in our sample who reported a high amount of social anxiety traits. Based on a power analysis, a sample size of 105 participants high in social anxiety traits was required to achieve 95% power at alpha 0.05 in our regression analysis.

Measures

Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995). Because depression and emotional state is related to facial recognition performance and is often comorbid with SAD, the DASS-21 was administered (Hills & Lewis, 2011; Joormann & Gotlib, 2006; APA, 2013). The scale’s inclusion provided a comprehensive look at current emotional state measured along three subscales for depression, anxiety, and stress. The DASS-21 has demonstrated strong psychometric qualities, and scores on the DASS-21 correlate with scores on the Beck Depression Inventory (BDI) and the Beck Anxiety Inventory (BAI; Lovibond & Lovibond, 1995; Antony, Bieling, Cox, Enns, & Swinson, 1998). There are seven items on each of the three subscales asking participants how much each item relates to them on a scale of 0 (“Did not apply to me at all”) to 3 (“Applied to me very much or most of the time”). The subtotals are then doubled and summed for an aggregate score. Lovibond & Lovibond (1995) recommend a score of 28 on the depression
subscale as indicative of displaying severely depressed traits. Use of the brief form was to reduce fatigue effects, and the maximum score on the DASS-21 is 126 with 42 on each subscale.

Social Phobia and Anxiety Inventory-23 (SPAI-23; Roberson-Nay, Strong, Nay, Beidel, & Turner, 2007). Students were assessed for social anxiety using the SPAI-23, a brief version of the Social Phobia and Anxiety Inventory. Scores on this measure, as well as subscale scores on the DASS-21, were used to account for anxiety severity. The SPAI-23 has been found to have good convergent validity to similar self-report forms, as well as correlating highly with scores on the full-length SPAI (Schry & Roberson-Nay, 2012). Additionally, it can be completed in about two minutes (Roberson-Nay et al., 2007). The SPAI-23 asks participants to report traits related to both social anxiety and agoraphobia. Because agoraphobia and social anxiety occur in similar situations, the total score on the SPAI-23 is calculated by subtracting the total score on the agoraphobia subset from the social phobia subset (Roberson-Nay et al., 2007; Schry et al., 2012). Under these scoring guidelines, the maximum obtainable difference score is 48.

Gaze Anxiety Rating Scale (GARS; Schneier et al., 2011). Gaze avoidance and fear was assessed with the GARS. This is a relatively new instrument that measures self-reported anxiety and avoidance of eye contact in various social situations. Although many social anxiety self-reports include items that ask about gaze anxiety, few take into account gaze anxiety as an independent construct. The GARS assessed both anxiety and avoidance of gaze which allowed us to explore the relationship between gaze anxiety and facial perception. Initial investigations have provided evidence for the GARS’s reliability and convergent validity within an undergraduate sample (Langer, Rodebaugh, Menatti, Weeks, & Schneier, 2014; Schneier et al., 2011). The questionnaire contains two subscales measuring the fear of mutual gaze and the avoidance of
mutual gaze. Individuals are asked to note their level of fear and their level of avoidance on a scale of 0 (“No anxiety”/“No avoidance”) to 3 (“A lot of anxiety”/“Avoid a lot”) in 17 different social situations. The maximum obtainable total score is 102 with 51 on each subscale.

Facial Recognition Questionnaire. In order to measure participants’ ability to identify emotion in faces, a facial recognition task was generated. In this facial recognition task, participants were asked to identify the emotional expressiveness of two different groups of facial stimuli. The first group consisted of pictures of the eye region independent from the face. This region was sectioned off to include the entire eyebrow as well as the upper portion of the cheek. The forehead and everything below the nostrils was excluded. The second group of images consisted of pictures of the entire face. This allowed us to examine if the information processed from the eye region differed from that of the entire face.

Each group of images contained male and female faces expressing anger, fear, happiness, neutrality, or sadness. Further, there was a mild and extreme version of each emotion. There was a total of 20 female images (4 for each emotion with two pictures at each intensity level) and 20 male images divided in the same fashion. These stimuli were retrieved with permission from a previous study conducted on facial recognition in Asperger’s Disorder and Social Phobia (Wong, 2010). Participants were asked to identify which emotion was expressed in each picture using multiple choice answer selection. Participants were also asked to assess the relative intensity of the emotion being expressed on a five point scale ranging from 1 (mild) to 5 (extreme). Although faces in the recognition tasks only contained a mild or extreme intensity, this rating scale allowed for better evaluation of the self-perceived intensity level.
Procedure

Participants were screened for their age after signing up for the study through the SONA online system. Qualifying participants were redirected to complete the DASS-21, the SPAI-23, the GARS, and the facial recognition tasks on Qualtrics (Provo, UT). The order of the forms was random for each participant. Participants were instructed to complete each form in a timely manner, not dwelling on one specific image for a prolonged period of time.

Data Analysis

Performance on the recognition task was measured as recognition accuracy and average perceived intensity of emotion on a Likert scale of 1-5 in both sets of images (images of partitioned eye regions and images of entire faces). After initial analysis, scores on these four variables could be divided depending on the type of emotion presented (anger, fear, happiness, neutrality, and sadness) and the gender of the stimuli face. Average accuracy ratings are reported in percentages and average perceived intensity ratings are reported out of a maximum score of five.

A series of regression analyses were conducted by entering scores on the GARS into the model as a predictor variable for each of the four variables derived from the facial recognition tasks. For the purposes of these regressions, the data was split into two groups: participants high in social anxiety (≥ 28 on the SPAI-23) and participants in the normal range (<28 on the SPAI-23). By doing this, we explored gaze anxiety’s relationship to facial perception within only socially anxious individuals (n=89). Significant models were examined by considering the two subscales of the GARS as separate predictors. An exploratory correlation analysis was conducted
to examine the relationship between gaze anxiety and facial recognition accuracy for each of the
five emotions presented.

The potential difference between face perception and eye region perception was analyzed
by conducting paired t-tests and MANOVA analyses. Paired t-tests compared facial recognition
versus eye region recognition and male versus female imagery. To test if there were any
significant effects for participant gender, the MANOVA considered gender as the fixed factor
and facial recognition and perceived intensity as the dependent variables. Because this test is
sensitive to unequal group sizes, a simple random sample of 104 female data points were chosen
to match the male participant group as a part of these analysis.

After excluding participants for non-completion of the survey, blatant response error, and
high DASS-21 depression scores, a total sample size of 392 participants was collected. The
decision to exclude a portion of completed participant data was made on the basis of response
times and the nature of the outliers. Six participants who completed the online survey in an
unreasonable amount of time (< seven minutes) were excluded from data analysis in order to
control for response bias. This cutoff time was determined by preliminary survey completion
rates. Given the large amount of questions within the survey—four separate self-reports and 158
items—completing all questions truthfully and accurately was unlikely in seven minutes or
under. Median completion time was 13 minutes. In addition, extreme outliers were excluded
using a two-step procedure. Outliers were initially flagged using the boxplot outlier labeling rule
for normal distributions on scores from the facial recognition tasks (Banerjee & Iglewicz, 2007).
These flagged data points were examined on a case by case basis in order to make a decision on
their validity and influence. The 10 excluded outliers presented obvious response patterns;
responding with all 0’s or all 1’s for more than two self-reports. Finally, in order to control for the potential confounding effects of depression, 14 participants who scored 28 or higher on the depression subscale of the DASS-21 were excluded. A total of 30 cases were excluded using these criteria.
CHAPTER THREE: RESULTS

Descriptive Statistics

Descriptive statistics and bivariate correlations were calculated from scores on the SPAI-23, DASS-21, and GARS. Scores on the SPAI-23 ($M=19.28$, $SD=11.76$) were significantly correlated ($r (392) =.60$, $p=.00$) to scores on the GARS ($M=28.71$, $SD=18.31$). Scores on the GARS were significantly correlated to scores on the DASS-21 ($M=34.83$, $SD=26.74$; $r (392) =.52$, $p=.00$). And finally, scores on the SPAI-23 were significantly correlated to scores on the DASS-21 ($r (392) =.38$, $p=.00$). Looking at the subscales of the DASS-21 and GARS separately, participants scored higher on the DASS-21 Stress subscale ($M=14.27$, $SD=10.29$) than they did on the Anxiety subscale ($M=10.30$, $SD=9.46$) and the Depression subscale ($M=10.26$, $SD=9.92$). Participants also reported more fear of eye contact ($M=15.72$, $SD=9.51$) than they reported avoidance of eye contact ($M=13.00$, $SD=9.52$) as measured by the GARS. These differences were not significant.

On the facial recognition tasks, the average accuracy at identifying emotions was 71.10% ($SD=9.90$) when the eye region was presented individually and 79.94% ($SD=8.36$) when the entire face was presented. Images of the partitioned eye regions received an average intensity rating of 3.14 ($SD=0.50$), and images of the entire face received an average intensity rating of 3.29($SD=0.47$).

Regression Analysis

The suggested cutoff score for high social anxiety on the SPAI-23 is 28 (Schry et al., 2012). Of the 392 valid participants, 89 had a SPAI-23 score above this cutoff. The results from
the regression and correlation analysis below present findings when only including these 89 participants. Four linear regressions were conducted with GARS total scores entered into the models as the predictor variable. The four outcome variables for these regressions were (1) the accuracy at identifying emotions in the eyes, (2) the accuracy at identifying emotion in the entire face, (3) the average perceived intensity of emotion in the eyes, and (4) the average perceived intensity of emotion in the entire face. Given the number of hypotheses tested, a Bonferroni correction was calculated, and the required p-value was $p=.01$.

GARS total scores did not significantly predict identification accuracy of the eye region $[F(1, 88) = 0.50, p=.48]$ or identification accuracy of the entire face $[F(1, 88) = 0.39, p=.54]$. When GARS scores were entered as the predictor variable for the average perceived intensity of the eye region, the model was trending towards significance $[F(1, 88) = 3.18, p=.078]$ with a low $R^2$ of .04.

The only significant regression model produced was with GARS total scores as a predictor variable for the average perceived intensity of emotion in the face (See appendix A). This model produced a significant $R^2$ of .13 $[F(1, 88) = 12.63, p=.001]$. GARS total scores were positively related to perceived intensity ($B=.01, \beta=.36, t=3.55, p=.001$). When examining these results by subscale, another significant linear model was produced with gaze avoidance as the predictor and perceived facial intensity as the outcome $[R^2=.16, F(1, 88) = 16.47, p<.001]$. Higher amounts of gaze avoidance was related to higher amount of perceived emotional intensity in faces ($B=.02, \beta=.4, t=4.06, p<.001$).
It should also be noted that no significant linear relationships were found between GARS scores and facial recognition performance for individuals below the cutoff score for high social anxiety traits.

**Correlation between GARS and type of emotion**

A bivariate correlation was conducted comparing GARS total scores, GARS subscales (fear and avoidance), and the average accuracy of identifying each of the five emotions presented in the recognition task (anger, fear, happiness, neutral, and sad). Participants were more accurate at identifying angry emotions when they reported higher GARS total scores \( r (89) = .21, p = .045 \) and higher GARS fear scores \( r (89) = .24, p = .027 \). Participants were less accurate at identifying neutral faces when they had higher GARS total scores \( r (89) = -.22, p = .04 \) and higher GARS avoidance scores \( r (89) = -.23, p = .033 \).

A partial correlation controlling for changes in social anxiety as measured by the SPAI-23 was then conducted (see Appendix B). The positive relationship between GARS scores and anger accuracy increased \( r (89) = .27, p = .012 \) and the negative relationship between GARS scores and neutral face accuracy increased \( r (89) = -.30, p = .005 \).

**Comparison of average performance on facial recognition task**

The entire sample (n=392) was used when comparing average performance on the facial recognition tasks without separating those with high social anxiety traits from those without. A series of paired samples t-tests were conducted comparing recognition performance of participants when they were shown only the eye regions to when they were shown the entire face. There was a significant difference in accuracy when participants were only presented the
eye region \((M=71.12, SD=9.90)\) compared to when they were presented the entire face \((M=79.89, SD=8.41; t (391) =-14.94, p<.001)\). There was also a very marginal difference between the average intensity ratings of eyes \((M=3.14, SD=0.50)\) and the average intensity ratings of faces \((M=3.29, SD=0.47; t (391) = -7.85, p<.001)\). When it came to differences between the gender of the image presented, participants were significantly more accurate at identifying female faces \((M=86.89, SD=9.97)\) than they were at identifying male faces \((M=72.88, SD=11.79; t (391) = -20.01, p<.001)\).

In order to assess whether there were performance differences depending on the gender of the participant, a MANOVA was conducted with gender as the fixed factor and average perceived intensity and accuracy as the dependent variables. There was a significant difference in facial recognition performance depending on the gender of the participant [Wilks’ \(\lambda = .95, F\) \((4,202) = 2.85, p =.02\)]. Between subjects effects revealed that there was a significant difference between males and females on facial accuracy \((F=6.50, p=.01)\). Females demonstrated about 2.84% more accuracy at identifying emotion than males \((p<.05)\).
CHAPTER FOUR: DISCUSSION

The purpose of this study was to explore the relationship between gaze anxiety and facial recognition within self-reported socially anxious individuals. It was initially predicted that gaze anxiety would be related to poorer performance on a facial recognition task. For the most part, our results were in line with our predictions. Gaze anxiety appears to be related to a socially anxious individual’s ability to identify emotion, and our results were corroborated by previous findings. However, certain emotions seem to be more prone to processing errors than others.

Gaze Anxiety

Results from our regression analysis provided partial support for our hypothesis. When socially anxious individuals judged emotional intensity, they perceived emotions in faces as being more intense the higher their gaze anxiety was. Not only was the strength of this relationship moderately strong, but the GARS gaze avoidance subscale accounted for a sizeable amount of the variation in average intensity ratings. This is particularly true considering the large amount of other factors that could influence facial perception: gender of the participant, gender of the onlooker, current emotional state, motivation, arousal level, and time spent processing.

Interpreting these results is a little less straightforward than interpreting differences in accuracy. It is important to note how these intensity ratings were derived to better understand their meaning in the context of this study. All of the images in the recognition task possessed either a mild expression or an extreme expression (opposite ends of our 5-point scale). There was no subtle gradation in between the two extremes, and the decision to ask for emotional intensity on a five points scale was for the purpose of the analysis. We expected average intensity ratings
to be around 3; an assumption supported by the results. Average intensity ratings above the midpoint of the scale reflect a tendency to rate the mild image to be more intense than it actually is. Considering this, our regression model represents a significant increase in perceived intensity as the amount of gaze avoidance increases. It was also an effect not present in individuals below the SPAI-23 cutoff for high social anxiety traits; possibly suggesting that this relationship is unique to the experience of social anxiety. However, further research is needed.

Past research has already demonstrated that socially anxious individuals display hypervigilance towards negative emotion in the facial region. Socially anxious individuals also may react physiologically to low intensities of emotions with similar strength to high intensities of emotion. However, it is unclear why gaze avoidance may be related to increased intensity perception. Perhaps the more anxious someone is about making eye contact, the more negative their expectations are about the expressions of onlookers. They are anxious about making eye contact because they are expecting a negative face, and these expectations bias perception.

Overall accuracy could not be significantly predicted by gaze anxiety, but separating accuracy by emotion revealed a new set of relationships. Higher self-reported gaze anxiety was related to better accuracy when identifying angry expressions and lower accuracy when identifying neutral expressions. Similar findings for social anxiety are well documented. It is typically attributed to hypervigilance. Socially anxious individuals are better at identifying angry faces but more likely to misjudge a neutral face as negative. Because of this, it was thought that our findings were due to changes of social anxiety but not gaze anxiety. However, the relationship between GARS scores, neutral emotion accuracy, and angry emotion accuracy was strengthened when controlling for changes in social anxiety. Together, these results suggest that
gaze anxiety has a strong relationship to the perceptual biases often experienced by socially anxious individuals. Gaze anxiety appears to function as a moderating variable.

**Facial Recognition**

There is evidence that individuals who are socially anxious or emotionally distressed may pay preferential attention to the eye region of onlookers. These individuals tend to divert their gaze after the first sign of negativity. In our study, the eye region was sectioned off from the entire face in order to examine what happens when the contextual information from the rest of the face is lost. We were interested in the potential effects of not properly processing the entire face during recognition. When presented only the eyes, participants were about 9% less accurate at identifying emotion; they were surprisingly accurate at recognizing emotion when only provided with the eyes. In fact, there was a bigger difference in recognition accuracy depending on the gender of the face in the image.

Participants were much better at identifying emotions in female faces than they were at identifying emotions in male faces—by about 14%. However, it is unclear why. Perhaps the combination of female faces presented in our study were simply easier to identify than the male faces. With twenty different female faces and twenty different male faces this is unlikely but possible. Differences related to the gender of the participant were much smaller and negligible.

**Limitations**

Although some interesting effects were found, our results were limited. The survey was conducted entirely online consisting of a convenience sample of psychology students—most of which were females. Variance in the data could be attributable to a lack of attentiveness and
motivation; something to be expected when trials aren’t held face to face. To demonstrate that point, a portion of data were excluded from analysis because some participants tended to give up near the end of the survey. Drop outs would begin to leave questions blank, provide patterned responses, or exit the survey completely when on the last couple of forms. It is possible that our results would have been more robust if we could control for these variables.

Another limitation was the survey software we used to collect data. We were unable to limit the amount of time participants spent on each facial image. Past research on attention, perception, and social anxiety has been conducted by only briefly exposing participants to facial stimuli. In our questionnaire, participants could have lingered on each image—some of them took up to an hour on the entire survey. In addition, the Gaze Anxiety Rating Scale is a newer form with less validation than the other self-reports used in the study. Without eye-tracking, this form was the best option for measuring gaze anxiety as an independent construct. Eye-tracking would have ideally been used in conjunction with the GARS. This would have provided an objective measure of gaze avoidance, and it would have revealed patterns in eye-movement dependent on self-reported fear.

Finally, the number of images contained in the recognition task limited our external validity. There were twenty images of the entire face, and eight images of each emotion type. Including more images covering subtle changes in facial structure, affect and intensity would have strengthened the external significance of our results.

Conclusion

In total, these findings provide support for gaze anxiety’s relevance to the experience of social anxiety and gaze anxiety’s function as a moderating variable. Gaze anxiety may be more
important of a construct to address in research than previously thought. Some of the common perceptual biases demonstrated by individuals with SAD were related to increases in gaze anxiety when differences in social anxiety traits were held the same. If these findings hold true, reducing the fear that clients might have of making direct eye-contact then might help control the negative biases that contribute to the maintenance of their social anxiety. It also might receive increased priority during an exposure treatment. In addition, gaze anxiety was strongly correlated with self-reported depression, anxiety, and stress. Considering our research looked at trait anxiety, further research needs to be conducted to assess the function of gaze anxiety within clinical populations. Improved understanding of gaze behavior could improve intervention and assessment accuracy. If eye-tracking patterns, for instance, could help differentiate between co-morbid disorders and healthy populations, they would provide an objective and easy assessment technique. Eye-tracking is a technique that can even be utilized at home via a consenting participant’s webcam.

The development of the Gaze Anxiety Rating Scale provides an easy to use measurement of avoidance behaviors for studies unable to utilize eye tracking or trying to conserve experimental resources. Our findings provide additional evidence for the scales convergent and discriminant validity. However, it was unclear what differences in the GARS’ two subscales actually signified because of the close relationship between gaze fear and gaze avoidance. Future studies should continue to test the scale’s psychometric value and functional usefulness.
APPENDIX A: REGRESSION ANALYSIS
**Figure A1. Regression Analysis: GARS total and Perceived Facial Intensity**

**Model Summary**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>.356</td>
<td>.127</td>
<td>.117</td>
<td>.50145</td>
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</table>

b. Predictors: (Constant), GARS Total Score

**Coefficients**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Correlations</th>
<th>Collinearity Statistics</th>
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<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Zero-order</td>
<td>Partial</td>
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<tr>
<td>(Constant)</td>
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<td>.139</td>
<td></td>
<td>20.479</td>
<td>.000</td>
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<td>GARS Total Score</td>
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<td>.003</td>
<td>.356</td>
<td>3.554</td>
<td>.001</td>
<td>.356</td>
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</table>

**Diagram:**
- **Self-Reported Social Anxiety:** Participants High in Self-Reported Social Anxiety
- **Average Perceived Face Intensity** vs. **GARS Total Score**
- $r^2$ Linear = 0.127
- $r = 0.84$ (p < 0.01)
**Figure A2.** Regression Analysis: Avoidance subscale and Perceived Facial Intensity

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.159</td>
<td>.149</td>
<td>.49207</td>
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</table>

a. Self-Reported Social Anxiety = Participants High in Self-Reported Social Anxiety

b. Predictors: (Constant), GARS Avoidance Subscale

### Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Std. Error</td>
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<td>(Constant)</td>
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<td>GARS Avoidance Subscale</td>
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<td>.005</td>
<td>.399</td>
<td>4.058</td>
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</table>

a. Self-Reported Social Anxiety = Participants High in Self-Reported Social Anxiety
APPENDIX B: PARTIAL CORRELATION
### Figure B1. Partial Correlation

<table>
<thead>
<tr>
<th>Control Variables</th>
<th>GARS Fear Subscale</th>
<th>GARS Avoidance Subscale</th>
<th>GARS Total Score</th>
<th>Recognition Accuracy of Anger</th>
<th>Recognition Accuracy of Fear</th>
<th>Recognition Accuracy of Happiness</th>
<th>Recognition Accuracy of Neutrality</th>
<th>Recognition Accuracy of Sadness</th>
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<td>Correlation</td>
<td>Correlation</td>
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<td></td>
<td>Significance</td>
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<td>.000</td>
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<td></td>
<td>(2-tailed)</td>
<td>(2-tailed)</td>
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<td>-.295</td>
<td>-.109</td>
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<td></td>
<td>.000</td>
<td>.000</td>
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<td>.932</td>
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<td></td>
<td>.000</td>
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<td>.012</td>
<td>.906</td>
<td>.877</td>
<td>.005</td>
<td>.670</td>
<td></td>
</tr>
</tbody>
</table>

a. Self-Reported Social Anxiety = Participants High in Self-Reported Social Anxiety
APPENDIX C: FACIAL RECOGNITION STIMULI
Figure C1. Eye Region Stimuli. Mild intensity images are presented to the left and severe to the right. Males are presented on the first row and females on the second.

Sad:

Neutral:

Happy:

Fearful:
Angry:

Figure C2. Face Stimuli. Mild intensity images are presented to the left and severe to the right. Males are presented on the first row and females on the second.

Sad:
Neutral:

Happy:
Fearful:

Angry:
APPENDIX D: IRB APPROVAL LETTER
Approval of Exempt Human Research

From: UCF Institutional Review Board
#1 FWA00000351, IRB00001138

To: Sandra M. Neer and Co-PI: Aaron Necaise

Date: October 07, 2015

Dear Researcher:

On 10/07/2015, the IRB approved the following activity as human participant research that is exempt from regulation:

- **Type of Review:** Exempt Determination
- **Project Title:** Perception of Facial Expressions in Social Anxiety and Gaze Anxiety
- **Investigator:** Sandra M Neer
- **IRB Number:** SBE-15-11640
- **Funding Agency:** Grant Title: Research ID: N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual. On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 10/07/2015 11:54:29 AM EDT

IRB Manager
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