

Perception of Facial Expressions in Social Anxiety and Gaze Anxiety

By: Aaron Necaie
Faculty Mentor: Dr. Sandra Neer
UCF Department of Psychology

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ABSTRACT: This study explores 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. Some have suggested 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. An improved understanding of the cognitive biases associated with SAD could lead to more efficient intervention and assessment methods. In the present study, I used the Depression Anxiety Stress Scale-21 (DASS-21) and the Social Phobia and Anxiety Inventory-23 (SPAI-23) to measure social anxiety, depression, and overall distress. These forms allowed me to separate participants who reported high socially anxious and depressive traits from those in the normal range. I 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. Although previous research has demonstrated these same biases by socially anxious individuals, gaze anxiety has not been explored extensively. Future research should investigate gaze anxiety's role as a moderating variable.

KEYWORDS: gaze anxiety, social anxiety, perception, gaze avoidance, gaze fear, GARS, face perception, mood, emotion, bias

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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 correlated 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 include 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 may contribute to the maintenance of anxiety symptoms due to operant conditioning processes (Feather, 1963). Not facing fearful situations reinforces avoidance, yet 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. Mutual gaze (direct eye contact) is a commonly reported fear in persons with SAD, 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 influences other behaviors is uncertain. The current study aims 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 where our visual attention is focused. 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 (McCarthy, 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 suggests that the initiation of eye contact serves as an important priming stimulus to prepare observers for the processing of social information.

Considering that gaze is a method of exchanging social information, it is 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 list is not exhaustive and different forms of these many behaviors manifest themselves in persons with SAD, autism, schizophrenia, and Williams syndrome (Guillon, Hadjikhani, Baduel, & Roge, 2014; Schulze et al., 2013; Vaidyanathan et al., 2014). Eye tracking studies have shown that individuals with high levels of 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 is an increased sensitivity in 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, research regarding gaze avoidant behavior by individuals with SAD is inconclusive (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 by persons with SAD is dependent on these moderating factors, the presence of these moderating factors may

explain 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 when 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 direct eye contact is not occurring. Honma (2013) demonstrated this effect through self-reports 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 the eyes in a separate condition. The perceiver was then 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 actually occurred, but these individuals demonstrated heightened physiological arousal in response to this perceived eye contact.

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 could contribute to the feeling of being observed. This feeling could help explain why individuals with SAD typically report fears of being observed during mundane behavior, such as eating (APA, 2013).

FACIAL RECOGNITION IN SOCIAL ANXIETY

While previous literature supports both the misperception and avoidance of gaze by persons with 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 possibility 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 of persons with SAD 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 provide a measurable response in the brain that are 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. The socially anxious group also had a lower threshold for identifying the fearful facial expressions than 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 group 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 detection 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 that focuses on 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 with eyes, perhaps functioning as the most salient emotional cue. However, researchers typically do not examine the perception of the eye region 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 using a facial recognition task. Performance on this task will be measured as a participant's accuracy at labeling emotions and identifying how intense they perceive those emotional expressions to be. The study will also explore the differences in perceiving emotion within only the eye region when compared to perceiving emotions in the entire face.

HYPOTHESIS

I predict that the amount of gaze anxiety reported by socially anxious participants will be negatively related to performance on a facial recognition task. I expect that the experience of anxiety towards the eye region will correlate with 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.

METHODS

Participants

After excluding outliers and incomplete responses, a convenience sample of 392 University of Central Florida psychology students was obtained. There was a total of 104 males and 288 females with an average age of 21.07 ($SD=5.12$). 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—16 male and 73 female—in my sample who reported a high amount of social anxiety traits with an average age of 20.38 ($SD=3.46$). 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 my regression analysis using a moderate effect size of 0.3.

Measures

Depression Anxiety Stress Scale–21 (DASS-21; Lovibond & Lovibond, 1995). Because depression and emotional state is related to facial recognition performance and social anxiety, 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). Participants 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 were 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 me 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 experimental design allowed me 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).

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

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. A total of 24 respondents did not complete the survey, and 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.

Performance on the recognition task was measured as recognition accuracy and average perceived intensity of emotion on a Likert scale of 1-5. After initial analysis, scores on these variables could be further divided depending on the type of emotion presented in the image (anger, fear, happiness, neutrality, and sadness) or 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.

I conducted a series of regression analyses by entering scores on the GARS into the model as a predictor for recognition accuracy and average intensity. For the purposes of these regressions, I split the data into two groups: participants high in social anxiety (≥ 28 on the SPAI-23) and participants in the normal range (<28 on the SPAI-23; Roberson-Nay et al., 2007; Schry et al., 2012). By dividing the data this way, I explored gaze anxiety's relationship to facial perception within only socially anxious individuals ($n=89$). Significant models were further explored by considering the two subscales of the GARS as separate predictors. I conducted

an exploratory correlation analysis to examine the relationship between gaze anxiety and facial recognition accuracy for each of the five emotions presented.

Next, I analyzed the difference between face perception and eye region perception 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 part of this analysis.

RESULTS

Descriptive Statistics

Descriptive statistics and bivariate correlations for the total sample ($n=392$) 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 ($r(392) = .60$, $p < .001$) to scores on the GARS ($M=28.71$, $SD=18.31$). Scores on the GARS were significantly correlated to scores on the DASS-21 ($M=34.83$, $SD=26.74$; $r(392) = .52$, $p < .001$). And finally, scores on the SPAI-23 were significantly correlated to scores on the DASS-21 ($r(392) = .38$, $p < .001$). 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 statistically 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) accuracy at identifying emotion in the eyes, (2) 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 ($p=.48$) or identification accuracy of the entire face ($p=.54$). GARS also did not significantly predict intensity ratings for the partitioned eye region ($p=.078$).

The only significant regression model produced was with GARS total scores as a predictor for the average perceived intensity of emotion in the face (see table 1). 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 were related to higher amount of perceived emotional intensity in faces ($B=.02, \beta=.4, t=4.06, p<.001$; see table 2).

To investigate if the relationship between gaze anxiety and the perception of emotional intensity was indeed different for those with high social anxiety as opposed to just a linear trend for the entire population, I also conducted an additional multiple regression analysis using the total sample, $n=392$. In this model, centered SPAI-23 scores, centered GARS total scores, and a SPAI-23 by GARS interaction term were entered in as predictors for average perceived intensity [$R^2=.05, F(3, 389)=6.25, p<.001$]. There was a significant interaction effect between gaze anxiety and social anxiety ($B=.001, SE_B=.001, \beta=.145, p=.005$).

Correlation between GARS and type of emotion

Next, I conducted a bivariate correlation 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 sadness). 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 table 3). The positive relationship between GARS scores and anger accuracy remained [$r(89) = .27, p=.012$] and the negative relationship between GARS scores and neutral face accuracy remained [$r(89) = -.30, p=.005$].

Comparison of average performance on facial recognition task

The entire sample ($n=392$) was used when comparing average performance on the facial recognition tasks. 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, I conducted a MANOVA 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 the difference between males and females was based on accuracy ($F=6.50, p=.01$). Females demonstrated about 2.84% greater accuracy at

identifying emotion than males ($p < .05$).

DISCUSSION

The purpose of this study was to explore the relationship between gaze anxiety and facial recognition by self-reported socially anxious individuals. It was predicted that gaze anxiety would be related to poorer performance on a facial recognition task, and my results support this hypothesis. Gaze anxiety appears to be related to a socially anxious individual's ability to identify emotional intensity. Additionally, I found relationships between gaze anxiety and the identification accuracy of specific emotions.

Gaze Anxiety

When individuals with high trait social anxiety judged emotional intensity, they perceived images of faces as being more intense the more anxious they were about making eye-contact. The reported tendency to avoid eye-contact (a subscale of the GARS) accounted for the largest amount of variation in response. Past research has demonstrated that socially anxious individuals are hypervigilant towards negative emotions, and these data suggest that these biases are moderated by more specific fear. This might explain why some studies fail to replicate these biases or have small effect sizes.

The way these intensity ratings were derived should be noted. All of the images in the recognition task had either a mild expression or an extreme expression. These represented opposite ends of my 5-point intensity scale and there was no subtle gradation in between the two extremes. I expected average intensity ratings to be around 3, an assumption supported by the results. This result suggests that participants were generally interpreting the faces and the scales correctly. Average intensity ratings above the midpoint of the scale reflect a tendency to rate the mild images as more intense than they actually were. Given this result, my model represents a significant increase in perceived intensity. It was also an effect dependent on the amount of self-reported social anxiety.

While overall accuracy could not be predicted by gaze anxiety, these relationships change when separating emotion by type. Higher gaze anxiety was related to increased accuracy at identifying angry expressions and decreased accuracy at identifying neutral expressions. Similar findings for social anxiety are well documented,

and 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, my findings could be due to changes in social anxiety. However, the relationship between GARS scores, neutral emotion accuracy, and angry emotion accuracy was strengthened when controlling for changes in social anxiety. This suggests that gaze anxiety has a significant relationship to the perceptual biases often experienced by socially anxious individuals.

Facial Recognition

In addition to gaze anxiety, I wanted to compare recognition accuracy when presented with the entire face to accuracy when presented with only the eyes. There is evidence that individuals might pay preferential attention to the eye region depending on a number of factors such as mood or social anxiety (Darby & Harris, 2010; Hills and Lewis, 2011; Gutierrez-Garcia & Calvo, 2014). Avoiding or fixating on one region does not necessarily mean that the rest of the face is visually ignored, but I was interested in measuring how much accuracy is lost when contextual information from the face was absent. When presented with only the eye region, participants were about 8-9% less accurate at identifying emotion. Nevertheless, participants were surprisingly accurate (71%) with only the eyes and the immediate areas around them. An even larger influence on recognition accuracy was gender. Participants were much better at identifying emotions in female faces than they were at identifying emotions in male faces—by about 14%. There were more females than males in our sample, but the difference between the genders of the participants was negligible.

Limitations

Significant results were found despite several factors limiting the strength of my findings. The survey was conducted entirely online with a convenience sample of psychology students—most of which were females. Variance in the data could have been impacted by a lack of attentiveness or motivation on the participants' part. This is expected with online surveys. It is possible that my results would have been more robust if I could have controlled for these factors with a face to face session.

Another limitation was the survey software I used to collect data. I was 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 my questionnaire, by contrast, participants could have lingered on each image. I could control for this afterwards by excluding outliers based on completion time, but I don't know how long participants fixated on each particular image. In addition, the GARS is a newer form with less validation than the other self-reports used in the study. There have been a couple large studies to support the scale's use in college populations (Langer et al., 2014; Schneier et al., 2011), but an objective measurement would have been better. Using an eye-tracker in combination with the self-report would have provided a metric for a participant's perceived anxiety and actual avoidance.

CONCLUSION

In total, these findings provide increasing support for gaze anxiety's relevance to social anxiety. If gaze anxiety is related to the interpretation of emotional intensity, these results have interesting implications. The degree to which someone is sad or happy provides us feedback on how to proceed in a social situation. We use that information when we make the decision to provide comfort or offer an apology. It helps us to respond appropriately, and individuals with social anxiety typically do not respond appropriately. Reducing fear about eye-contact could help improve conversation skills or reduce avoidance behaviors.

It is unclear why anxiety towards eye contact is related to intensity ratings. Gaze anxiety was strongly correlated with depression and stress in my study. Perhaps gaze anxiety is an indicator of an individual's distress level and greater distress is related to bias. A recent study found that socially anxious individuals avoided eye contact more during periods of high state anxiety (Howell, Zibulsky, Srivastav, & Weeks, 2015), and it is reasonable to expect that people who are under distress would more heavily rely on avoidant behavior. Another explanation is that socially anxious individuals are less able to discriminate between varying degrees of emotional expression. A previous study that measured ERP's in response to viewing increasingly fearful faces found that there was less discrimination in the brain response of socially anxious individuals compared to those of healthy volunteers (Frenkel and Bar-Haim, 2011). My survey responses show a similar pattern.

The relationship that gaze anxiety has with psychological distress (depression, anxiety, stress) could provide

meaningful insight on multiple disorders that involve maladaptive gaze behavior, including SAD, autism, and schizophrenia (Guillon, Hadjikhani, Baduel, & Roge, 2014; Schulze et al., 2013; Vaidyanathan et al., 2014). At the self-report level, gaze anxiety might be able to function as an indicator of current emotional state or symptom severity. With the addition of eye-tracking, which can give data on tracking and pupillometry, gaze behavior could provide objective evidence towards assessment. However, further research is needed.

Although it is not an objective measure, 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. My findings provide evidence of the scale's convergent and discriminant validity. However, it was unclear what differences between the GARS' two subscales signify because of the close relationship between gaze fear and gaze avoidance. Future studies should continue to test the scale's psychometric value and gaze anxiety's role as a moderating variable.

Table 1. Regression Analysis: GARS Total Score and Perceived Facial Intensity (n = 89)

Variable	B	Std. Error	β
Constant*	2.839	.139	
GARS Total Score*	.010	.003	.356

Note. $R = .356$. $R^2 = .127$. $*p = .001$.

Figure 1. Regression plot for GARS and Perceived Intensity for those high in social anxious traits

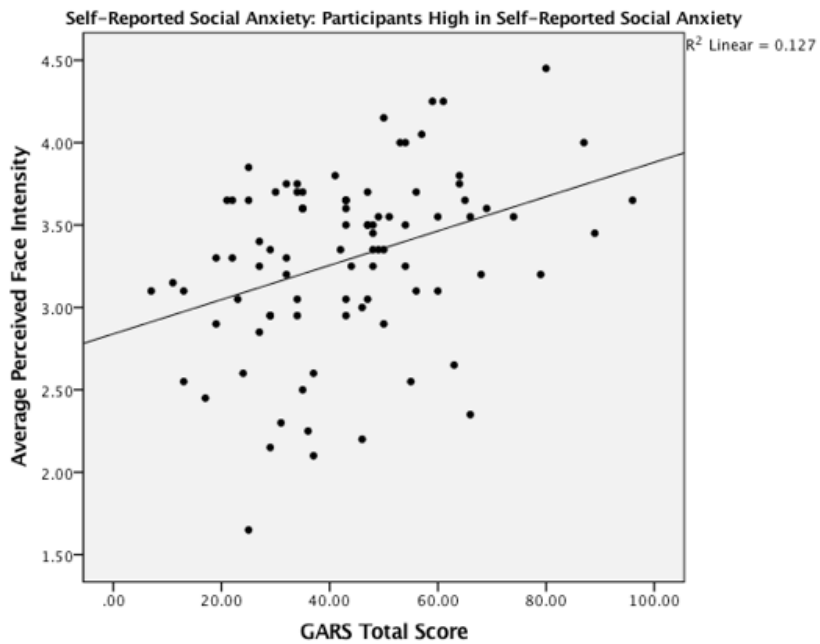


Table 2. Regression Analysis: Avoidance Subscale and Perceived Facial Intensity (n=89)

Variable	B	Std. Error	β
Constant*	2.866	.118	
GARS-Avoidance*	.021	.005	.399

Note. $R = .399$. $R^2 = .159$. * $p < .001$.

Table 3. Partial Correlation with Participants High in Self-Reported Social Anxiety (N=89)

	GARS Fear Subscale	GARS Avoidance Subscale	GARS Total Score	Recognition Accuracy of Anger	Recognition Accuracy of Fear	Recognition Accuracy of Happiness	Recognition Accuracy of Neutrality
GARS Fear Subscale	1.000	.767**	.932**	.294*	-.003	-.010	-.264*
GARS Avoidance Subscale	.767**	1.000	.947**	.213*	.025	-.021	-.295*
GARS Total Score	.932	.947**	1.000	.267*	.013	-.017	-.299*

Note. Partial correlations controlling for SPAI-23 score. * $p < .05$. ** $p < .001$.

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