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Interpreting facial expressions: The influence of social anxiety, emotional valence, and race

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Abstract

Social anxiety is posited to be linked to interpersonal skills deficits, including accurate interpretation of emotional social cues, such as facial expressions. However, empirical support for an interpersonal skills deficit model of social anxiety is lacking. Studies of information processes indicate that socially anxious individuals may be more accurate at identifying threatening facial expressions in particular. In the present study, undergraduates who self-identified as Caucasian (N = 158) completed a task assessing facial expression accuracy. Relevant parameters such as emotional valence as well as race of the target were assessed. As predicted, socially anxious individuals were overall more accurate at identifying facial expressions. Whereas participants were more accurate overall at identifying Caucasian faces, there were differences in the extent of this discrepancy based on emotional valence. Implications for integration of information processing data and evolutionary models of social anxiety are discussed.

Keywords

Social anxiety; Social phobia; Faces; Race; Skills deficits; Social skills; Information processing

1. Introduction

Social anxiety is among the most common types of anxiety (Kessler et al., 2005) and is characterized by persistent fear and avoidance of social situations involving possible negative evaluation by other people (American Psychiatric Association, 1994). Such high prevalence rate is particularly problematic given that social anxiety tends to be a chronic condition with an early age of onset and low rates of recovery (Davidson, Hughes, George, & Blazer, 1993). Further, social anxiety is associated with other serious conditions including suicidal ideation and suicide attempts, depression, and problematic substance use (Buckner, Bernert, Timpano, Joiner, & Schmidt, 2008; Buckner, Mallott, Schmidt, & Taylor, 2006; BucknerS et al., 2008; Davidson et al., 1993; Grant et al., 2005; Kessler et al., 1997; Kessler, Stang, Wittchen, Stein, & Walters, 1999). Individuals with social anxiety experience marked impairment in multiple domains of functioning (e.g., education, employment, interpersonal relationships; Schneier et

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al., 1994; Stein, Torgrud, & Walker, 2000) and the dysfunction experienced by those with social anxiety result in substantial public health costs (Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). Identifying cognitive processes implicated in the etiology and maintenance of this prevalent and debilitating condition remains an important research and clinical aim, particularly given that psychotherapies that include cognitive techniques are efficacious for the treatment of pathological social anxiety (Butler, Chapman, Forman, & Beck, 2006; Taylor, 1996).

Some models of social anxiety emphasize the role of interpersonal skills deficits (e.g., misinterpreting the emotional valence of facial expressions) in the etiology and/or maintenance of this condition (Rapee & Heimberg, 1997; Schlenker & Leary, 1982). For instance, individuals with high social anxiety are thought to be more likely to misinterpret vague or neutral social cues (e.g., facial expressions) as negative (Rapee & Heimberg, 1997). Recurrences of such misinterpretations are posited to increase social anxiety and avoidance. Similarly, Rapee and Spence (2004) suggest that repeated experiences of interpersonal failure, partially caused by social skill deficits (including the misinterpretation of facial expressions), can increase social anxiety. Empirical examinations of facial recognition accuracy in children and adults with high social anxiety have thus far produced mixed findings. Battaglia et al. (2004) asked Italian second and third graders to identify facial expressions of emotion as either joy, anger, disgust, sadness, fear, surprise, or neutral on pictures of children their own age. Higher observer-rated social anxiety was associated with higher rates of misidentification of emotional expressions. Additionally, higher social anxiety was particularly associated with the identification of non-angry emotions as anger. However, other studies have failed to find deficits in facial expression recognition among socially anxious children (McClure & Nowicki, 2001; Melfsen & Florin, 2002).

Comparably equivocal findings have been reported with adult samples (e.g., Merckelbach, Van Hout, Van den Hout, & Mersch, 1989; Winton, Clark, & Edelmann, 1995). Most recently, Philippot and Douilliez (2005) demonstrated no difference in overall facial expression identification accuracy between people with social anxiety disorder (SAD) compared to people with other anxiety disorders and non-anxious controls. There also were no significant differences between groups based on the valence of the emotion displayed (happiness, anger, sadness, disgust, and fear). Mullins and Duke (2004) found participants with high social anxiety who were engaging in a speech task responded faster to angry and fearful faces than individuals with low social anxiety, suggesting differences between individuals with high and low social anxiety in processing negative emotional expressions. Individuals with SAD also appear more accurate than non-anxious controls in recognizing when a group of faces includes slightly more negative faces than neutral or positive faces (Gilboa-Schechtman, Presburger, Marom, & Hermesh, 2005). In addition, compared to individuals with low social anxiety, those with high social anxiety have been found to be more accurate at identifying negative audience behaviors while giving a speech to a live audience (Perowne & Mansell, 2002; Veljaca & Rapee, 1998).

In sum, despite theoretical models suggesting that social anxiety is associated with deficits in the identification of facial expressions, the data remain equivocal. Disparate findings may be at least in part due to the failure to consistently examine the valence of facial expression in accuracy tasks. Although socially anxious individuals may misinterpret ambiguous or neutral expressions as negative, they may be at least as accurate as those with lower levels of social anxiety in the identification of negative expressions. In fact, accumulating evidence indicates that the valence of the facial expression may be important to consider (Battaglia et al., 2004; Gilboa-Schechtman et al., 2005; Simonian, Beidel, Turner, Berkes, & Long, 2001). There may be no overall differences in accuracy, but there may be differences in emotions that represent threat (in particular anger).

Disparate findings in the accuracy of facial expression recognition in social anxiety may also be, in part, due to differences in study procedures. In particular, studies that reported no differences in facial recognition accuracy between individuals with high and low social anxiety did not limit the amount of time participants viewed the stimuli before making a decision about the emotion displayed (Mullins & Duke, 2004; Philippot & Douilliez, 2005). However, other information processing literature suggests differences in processing emotional stimuli, including identifying threat, are likely to be in the initial interpretation of facial expressions (Battaglia et al., 2004; Gilboa-Schechtman et al., 2005; Simonian et al., 2001). Thus, having unlimited time may obfuscate differences occurring at initial processing of facial expressions.

Another potential limitation to understanding facial expression interpretation in social anxiety is the dearth of research examining how characteristics of the target face may affect accuracy. Yet considerable theory and data suggest race of the target face is an important variable (Elfenbein & Ambady, 2002).[1] According to ecological or evolutionary theories of perception, members of out-groups (e.g., individuals of different races) represent a specific threat warranting special attention (McArthur & Baron, 1983). It has been suggested that it is evolutionarily adaptive to accurately detect threat cues from individuals from different groups (McArthur & Baron, 1983). Given data suggesting that social anxiety may be associated with more accurate identification of social threat cues (Battaglia et al., 2004; Gilboa-Schechtman et al., 2005; Perowne & Mansell, 2002; Simonian et al., 2001; Veljaca & Rapee, 1998) combined with the theory that social threat cues displayed by out-group members represent particularly threatening stimuli (McArthur & Baron, 1983), it follows that individuals with high social anxiety may be especially accurate identifying facial expressions on out-group members, in particular angry or hostile expressions. However, in a meta-analysis describing 97 separate studies, Elfenbein and Ambady (2002) found a significant in-group advantage in the accurate identification of facial expressions of emotion. The majority of the studies cited examined Caucasian and African American people in the United States; yet, whether across or within national borders, participants were more accurate at identifying emotion on same-race target faces than other-race faces.

A dialect or familiarity model of inter-group interactions may explain this in-group advantage in facial expression accuracy. This model posits that because people are less likely to interact with out-group members, they are less familiar with subtle cultural differences in the expression and interpretation of emotion and, as a result, less accurate at identifying out-group facial expressions (Elfenbein, Beaupre, Levesque, & Hess, 2007). It may therefore be the case that individuals with high social anxiety are particularly accurate at identifying negative or threatening facial expressions within their own race, but not necessarily among faces of different races. Yet we know of no studies that have tested this hypothesis.

In sum, it has been suggested that existence of accuracy deficits in the ability to interpret facial expressions contributes to the development, maintenance, and exacerbation of social anxiety (Rapee & Heimberg, 1997; Schlenker & Leary, 1982). The facial recognition literature, however, does not clearly suggest accuracy differences between adults with high and low social anxiety (Merckelbach et al., 1989; Philippot & Douilliez, 2005; Winton et al., 1995). At the same time, some data suggest that rather than deficits in facial recognition, individuals with higher levels of social anxiety respond more quickly than those with low social anxiety to threatening facial expressions (e.g., Gilboa-Schechtman, Foa, & Amir, 1999). Further, it seems that social anxiety is related to greater accuracy identifying facial expressions of emotions, especially those that are threatening (Perowne & Mansell, 2002; Veljaca & Rapee, 1998).

[1]Ethnicity generally refers to the social–psychological sense of collectiveness, and the term “race” is more conventionally used to describe physical differences (Sue, Kuraski, & Srinivasan, 1999). We will use the word “race” because the study is concerned with group designations based on skin color.

Equivocal findings in the facial recognition literature may be partially due to the failure to examine accuracy on the level of specific emotions that represent threat, in particular anger. Moreover, we know of no studies that have attempted to assess the impact of both the level of social anxiety and the race of the target face, despite a preponderance of evidence to suggest race affects the accurate recognition of facial expressions (Elfenbein & Ambady, 2002). There is also important overlap in evolutionary theory of anxiety and ecological models of social perception that warrants a combined investigation of these processes.

The present study set out to clarify the role of social anxiety in the ability to interpret facial expressions of emotion in several ways. First, we examined accuracy. Consistent with prior work (Gilboa-Schechtman et al., 1999; Horley, Williams, Gonsalvez, & Gordon, 2004; Veljaca & Rapee, 1998), we expected a main effect of social anxiety such that individuals with high social anxiety would demonstrate greater overall accuracy in overall emotional expression identification. Further, we examined differences in accuracy at the level of specific emotions. Given data indicating that social anxiety is associated with greater accuracy for social threat cues (Battaglia et al., 2004; Gilboa-Schechtman et al., 2005; Perowne & Mansell, 2002; Simonian et al., 2001; Veljaca & Rapee, 1998), it was hypothesized that individuals with high social anxiety would demonstrate greater accuracy identifying angry faces compared to individuals with low social anxiety. Second, we examined the role of race in these processes. Consistent with a number of previous studies (Elfenbein & Ambady, 2002), we expected to find participants (regardless of social anxiety) more accurate in identifying facial expressions on in-group target faces than on out-group faces. Additionally, we examined the role of race on facial expression identification among those with high and low social anxiety. We conducted exploratory analyses to determine how accuracy advantage for social anxiety is affected when viewing out-group faces. Conceivably, out-group faces should have increased threat value that is heightened in the context of an angry countenance. Because of this, we predicted that individuals with high social anxiety would demonstrate less attenuation of accuracy for threatening out-group faces than individuals with low social anxiety.

2. Method

2.1. Participants

The study was approved by the institutional review board of the university. Only those participants who reported their race as White/Caucasian (n = 158; 52.7% female) were eligible for the present study. Participants were introductory psychology undergraduate students who received research credit for participation. No eligible participant refused participation. The mean age of the sample was 18.71 years (S.D. = 0.98).

2.2. Measures

Self-report measures—Social anxiety was measured using the Social Phobia Scale (SPS; Mattick & Clarke, 1998). The scale demonstrates high levels of internal consistency across clinical, community, and student samples (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Mattick & Clarke, 1998; Osman, Gutierrez, Barrios, Kopper, & Chiros, 1998) and test-retest reliability in clinical and non-clinical samples (Heimberg et al., 1992; Mattick & Clarke, 1998). Individuals with SAD score higher than individuals with other anxiety disorders and non-anxious individuals on this measure (Brown et al., 1997). To identify participants with clinically meaningful social anxiety, a clinical cutoff score (SPS $\geq$ 24) was utilized (Heimberg et al., 1992). In addition, the trait form of the *State-Trait Anxiety Inventory* (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) was administered to allow for the examination of trait anxiety as a covariate because previous research has shown a relationship between scores on this measure and accuracy in facial recognition tasks (Philippot & Douilliez, 2005). The STAI-T is a 20-item measure on which individuals rate on a 4-point likert scale the

extent to which they "generally feel" various symptoms of anxiety. Finally, given that social anxiety is highly correlated with depression (Kessler, 1995) and that depression can affect the ability to interpret facial expressions (Joormann & Gotlib, 2006), participants also completed the *Beck Depression Inventory-II* (BDI; Beck, Steer, & Brown, 1996). The BDI is a 21-item measure that uses a 4-point scale to assess the extent to which specific depressive symptoms have been experienced in the past 2 weeks. It has well documented reliability and validity (Beck et al., 1996).

Measure of facial expression recognition—Accuracy identifying facial expressions was measured using two versions of the *Diagnostic Analysis of Non-verbal Accuracy* (*DANVA*). The adult facial expressions form (DANVA2-AF; Nowicki & Carton, 1993) includes 24 pictures of Caucasian faces exhibiting one of four facial expressions: happy, sad, angry, or fearful. Similarly, the African American version of the adult facial expressions form (DANVAAAAF; Nowicki, Glanville, & Demertzis, 1998) has 24 pictures of African American faces with one of the same four facial expressions. Before presentation of the DANVA, participants were told that they would briefly see faces on a large screen at the front of the classroom. They were instructed to circle how they think the target face feels (happy, sad, angry, or fearful) on the answer sheet provided. The instructions were also printed on the answer sheet. Both the DANVA2-AF and the DANVA2-AAAF were constructed and validated according to a social norming approach (Nowicki & Duke, 1994). The DANVA2-AF has been widely used and has demonstrated internal consistency, reliability, and validity in college samples (McIntire, Danforth, & Schneider, 1999). The DANVA2-AAAF has also demonstrated test-retest reliability and internal consistency in college students (Nowicki et al., 1998).

2.3. Procedure

Participants completed the study in a large classroom in groups of approximately 20–30 participants. After receiving written informed consent, a Caucasian research assistant provided participants with a self-report packet and asked them to enter demographic information (including age and sex). They were told they were participating in a study of "social anxiety and group membership" and that the first part would require them to comfortably view the projection screen in the front of the room. Participants then completed both the DANVA2-AF and the DANVA-AAAF. Participants viewed the target faces one at a time for 2 s, on a large projector screen at the front of the classroom. This time frame is consistent with data from the information processing literature that suggest social anxiety is associated with early detection and interpretation of potentially threatening cues (Battaglia et al., 2004; Gilboa-Schechtman et al., 2005; Simonian et al., 2001). The order of the presentation of stimuli was randomly assigned for each group of participants. After the two DANVA measures, participants completed the battery of self-report measures.

3. Results

3.1. Sample characteristics

Participants were classified in groups of either high (n = 24) or low (n = 121) social anxiety based on the SPS clinical cutoff. In the low social anxiety group, the mean SPS score was 9.72 (S.D. = 6.22) which is consistent with means reported by participants from the community (Heimberg et al., 1992; Mattick & Clarke, 1998). In the high social anxiety group, the mean was 32.29 (S.D. = 7.97) which is consistent with means found among individuals diagnosed with SAD (Heimberg et al., 1992; Mattick & Clarke, 1998). The high social anxiety group demonstrated significantly higher SPS total scores than the low group, $F(1, 145) = 239.09$, $p < 0.001$.[2]

We next examined whether the high and low social anxiety groups differed on demographics variables and levels of depression and trait anxiety. The high social anxiety group was more likely to be female (χ^2 =10.55, p = 0.001) although the groups did not differ in age, $F(1, 143) = 0.84$, $p = 0.36$. As expected, the high social anxiety group reported higher depression scores (M = 13.33, S.D. = 7.56) than the low social anxiety group (M = 7.92, S.D. = 6.27), $F(1, 142) = 13.90$, $p < 0.001$. The high social anxiety group also exhibited higher levels of trait anxiety (M = 53.58, S.D. = 7.58) than the low social anxiety group (M = 43.70, S.D. = 9.06), $F(1, 142) = 24.03$, $p < 0.001$. Gender, depression, and trait anxiety were therefore included as covariates in all analyses to ensure observed effects were not better attributable to these variables (Cohen & Cohen, 1983).

3.2. Main effects of social anxiety

To test the hypothesis that high social anxiety would be associated with greater overall accuracy on the DANVA, a one-way analysis of covariance (ANCOVA) was conducted in which social anxiety group (low vs. high) served as the independent variable and gender, BDI total score, and STAI-T total score served as covariates. The dependent variable was total percentage of correct scores on both versions of the DANVA. As predicted, the high social anxiety group correctly classified a significantly greater percentage of faces (M = 68.98, S.D. = 4.62) relative to the low social anxiety group (M = 64.04, S.D. = 7.76), $F(1, 99) = 13.24$, $p < 0.001$.

We next examined whether social anxiety was related to DANVA accuracy for each specific emotional expression (regardless of the race of the target face). Separate one-way ANCOVAs were conducted for each facial expression. Relative to the low social anxiety group, the high social anxiety group was more accurate identifying the following faces: happy ($F(1, 129) = 7.13$, $p < 0.01$), sad ($F(1, 139) = 11.10$, $p = 0.001$), and fearful ($F(1, 114) = 6.44$, $p = 0.01$). There was a non-significant trend in this same direction in regard to angry faces, $F(1, 128) = 2.02$, $p = 0.16$.

3.3. Social anxiety and accuracy of overall Caucasian and African American expressions

To examine whether the social anxiety groups differed on their accuracy for Caucasian or African American facial expressions (regardless of valence of facial expression), percentage of accurate responses was examined using a 2 (high vs. low social anxiety) × 2 (race of target stimuli: Caucasian vs. African American) ANCOVA, with gender and BDI and STAI-T total scores included as covariates. This interaction approached significance, $F(1, 99) = 3.43$, $p = 0.067$. Examination of the simple effects revealed that in regard to Caucasian faces, the high social anxiety group (M = 88.85, S.E. = 3.06) was more accurate than the low social group (M = 77.86, S.E. = 1.26), $F(1, 99) = 10.46$, $p = 0.002$. Similarly, the high social anxiety group (M = 53.79, S.E. = 1.72) was more accurate than the low group (M = 49.25, S.E. = 0.71) for African American faces, $F(1, 99) = 5.66$, $p = 0.019$ (Fig. 1).

3.4. Social anxiety, emotional expression, and accuracy by race

To examine whether the social anxiety groups differed on their accuracy for Caucasian or African American facial expressions as a function of the valence of the facial expression, percentage of accurate responses was examined with a 2 (social anxiety: high vs. low) × 2 (race of target stimuli: Caucasian vs. African American) × 4 (valence: happy, angry, sad, fear) mixed-model ANCOVA, with BDI and STAI-T total scores and gender included as covariates. Social anxiety group served as the between-subjects factor and race and valence were within-subjects factors. This model was not significant, $F(3, 297) = 0.52$, $p = 0.67$. Given a priori hypotheses

[2]The high and low social anxiety groups also significantly differed on two other measures of social anxiety, the Social Anxiety Interaction Scale (Mattick & Clarke, 1998), $F(1, 144) = 50.95$, $p < 0.001$, and the Liebowitz Social Anxiety Scale (Liebowitz, 1987), $F(1, 137) = 28.49$, $p < 0.001$.

regarding between group differences on specific facial expressions, we conducted a series of 2 (social anxiety) × 2 (race of target stimuli) ANCOVAs for each facial expression. As shown in Table 1, there was a significant two-way interaction between social anxiety and race only for fearful facial expressions (Fig. 2). Follow-up analyses of the significant two-way interaction revealed that the high social anxiety group was significantly more accurate in their ratings of fearful Caucasian faces relative to the low social anxiety group, $F(1, 110) = 9.72$, $p = 0.002$. However, the high social anxiety group was not significantly more accurate in their ratings of fearful African American relative to the low social anxiety group, $F(1, 110) = 0.18$, $p = 0.67$.

4. Discussion

The present study sought to clarify the relationships between social anxiety, facial expression identification, race, and emotional valence. Overall, individuals with high social anxiety more accurately identified facial expressions (regardless of valence or race) than individuals with low social anxiety. This finding is consistent with the notion that individuals with social anxiety vigilantly scan social cues in order to rapidly identify whether a social cue (in this case facial expression) is threatening. In addition, our data add to a growing body of empirical evidence suggesting that, contrary to some theories of social anxiety (Rapee & Spence, 2004; Schlenker & Leary, 1982), inaccuracy in the interpretation of facial expressions does not appear to serve as a marker of social anxiety. Instead, the present findings are consistent with theories that posit that social anxiety is associated with selective attention toward social anxiety cues (Beck, Emery, & Greenberg, 1990; Rapee & Heimberg, 1997) and suggest that selective attention to facial expressions as a social feedback cue may result in greater accuracy scores for individuals with high versus low social anxiety.

At the level of specific emotions, individuals with high social anxiety were more accurate than those with low social anxiety at identifying happy, sad, and fearful faces. Contrary to the indications of prior work (e.g., Gilboa-Schechtman et al., 1999; Horley et al., 2004; Joormann & Gotlib, 2006), there was no difference for angry faces (though the data in this report were trending in this direction). This finding is somewhat unexpected given that angry faces represent the greatest threat and therefore individuals with high social anxiety may be more accurate than individuals with low social anxiety identifying angry faces in particular. However, it has been suggested that anger may not be the most salient negative facial expression in social anxiety (Amir et al., 2005). It may be that facial expressions that signal negative evaluation (a core feature of social anxiety) are more salient. For instance, it may be that the happy faces in the present study were interpreted as mocking by those high levels of social anxiety. Future work investigating the interpretation of these social cues is warranted to understand the mechanisms underlying greater accuracy of these particular facial expressions among those with higher levels of social anxiety. In addition, there are some methodological differences between this study and previous investigations that could help to explain these disparate findings. For example, some studies reported individuals with high social anxiety more quickly identified angry faces (Gilboa-Schechtman et al., 1999; Joormann & Gotlib, 2006) as opposed to being more accurate, which is potentially a different phenomenon.

Consistent with prior work (Elfenbein & Ambady, 2002), our Caucasian participants more accurately identified facial expressions on other Caucasian faces than on African American faces. The present findings build upon prior work by providing novel data that aid in the understanding of race and facial expression identification in social anxiety. Specifically, we found an interaction between social anxiety and race of the target face such that individuals with high social anxiety were more accurate identifying fearful facial expressions on Caucasian target faces compared to participants with lower social anxiety. This suggests that, in addition to valence, characteristics of the target face influence accuracy. In particular, individuals with

higher social anxiety appear more accurate at identifying some facial expressions among other in-group members, but not out-group ones.

Interestingly, our data are contrary to the hypothesis that individuals with high social anxiety would exhibit less attenuation of accuracy for angry African American faces compared to those with low social anxiety. However, given that social anxiety was not strongly related to angry expressions, it may be that anger is not the most salient facial expression for out-group members. In addition, our findings suggests that although out-groups are perceived as threatening (McArthur & Baron, 1983), the threat advantage for individuals with high social anxiety reported in the information processing literature may not translate to an advantage with identifying threat in out-group members. Instead, our findings are more consistent with models suggesting a greater effect for decreased accuracy as a result of a lack of familiarity with facial expressions of emotion displayed by out-group individuals (Elfenbein et al., 2007).

The present study should be considered in light of limitations that suggest additional work in this area. First, each stimulus presentation consisted of a single face. Future work may benefit from the use of multiple faces or “face in the crowd” paradigms that may change the demands of the tasks. It has been argued that multi-facial displays are more externally valid as they contain mixed messages and require integration of information (Gilboa-Schechtman et al., 2005). Second, the sample included only Caucasian participants and future work is necessary to examine the relations between social anxiety and facial expression identification for people of other races and ethnicities. Third, the sample was comprised of non-treatment seeking participants. Although participants in our high social anxiety group exhibited a mean SPS score consistent with that found in clinical samples (Heimberg et al., 1992; Mattick & Clarke, 1998), replication with clinical samples could strengthen confidence in the present findings. Fourth, preliminary analyses of sample characteristics identified significant differences between the high social anxiety group and the low social anxiety group in depression and trait anxiety. Similarly, the high social anxiety group had a disproportionately high number of female participants. As a result, depression, trait anxiety, and gender were included as covariates in the analyses. It is possible that these variables adversely affected accuracy rates at the level of specific emotions and may have contributed to some of the unexpected findings. Although analysis of covariance is commonly employed in an attempt to statistically control for the variance attributable to identified confounds, it has been argued that the procedure does not successfully attenuate the effects of variables that are so closely related conceptually (Miller and Chpaman, 2001). Future investigations should attempt to delineate the independent effects of depression, trait anxiety, and gender. This will likely include attempts to control differences across groups by matching participants on these variables.

In sum, our findings indicate that higher social anxiety is associated with greater accuracy in facial expression identification, particularly for in-group faces. Future studies should identify mechanisms underlying these processes. In addition, the present study suggests that characteristics of social cues (e.g., race of the target face) may moderate the ability to interpret facial expressions among those with social anxiety. Future studies should attempt to merge theory and data concerning the nature of cross-cultural interactions from a clinical perspective. This work is important because the accumulation of knowledge about the cognitive processes that maintain social anxiety has implications not only for research attempting to describe information processing in social anxiety, but also for the development and application of successful interventions.

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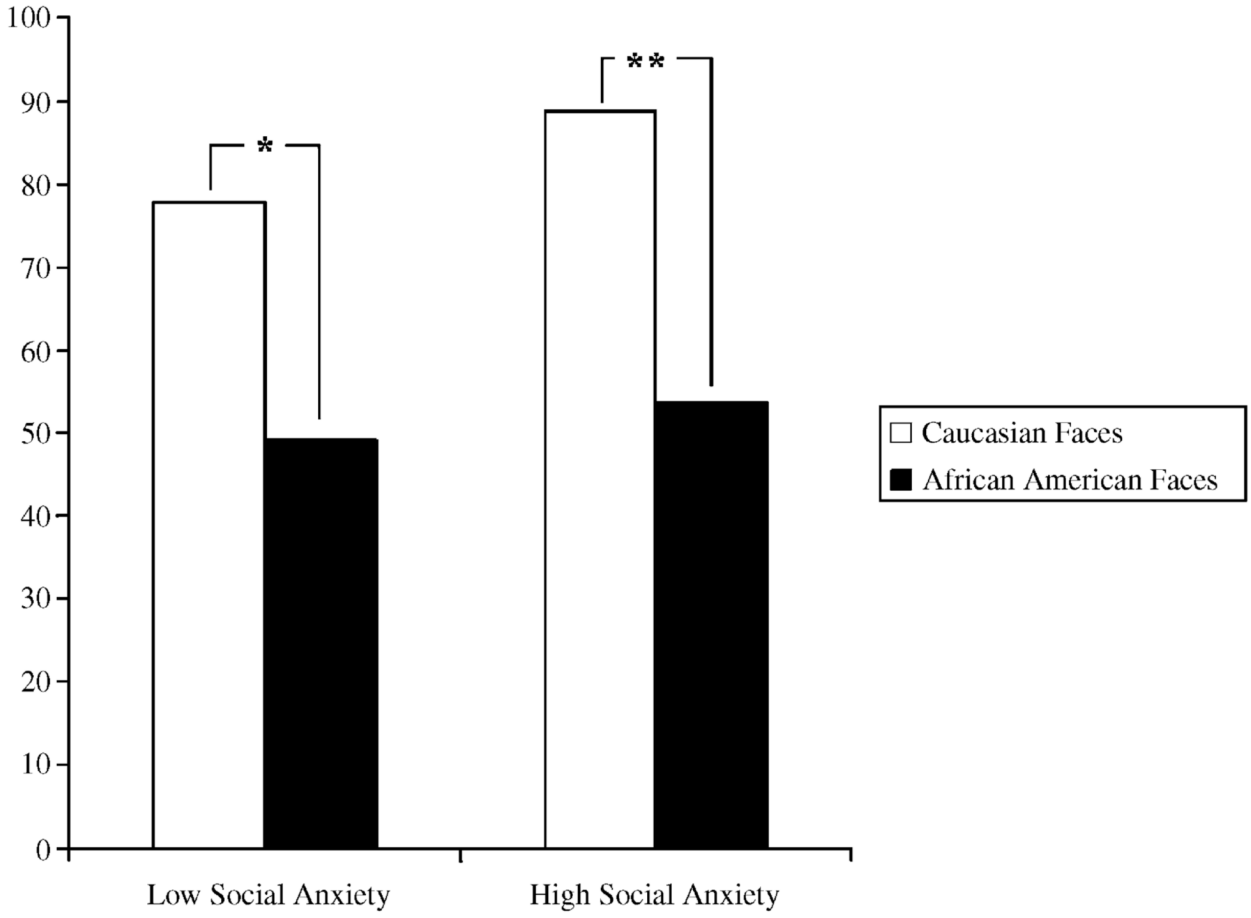

Fig. 1.

Accuracy for overall facial expression identification by social anxiety group as a function of race of target face. *Note*. Low social anxiety accuracy for Caucasian faces > Low social anxiety accuracy for African American faces *p < 0.02. High social anxiety accuracy for Caucasian faces > High social anxiety accuracy for African American faces **p < 0.002.

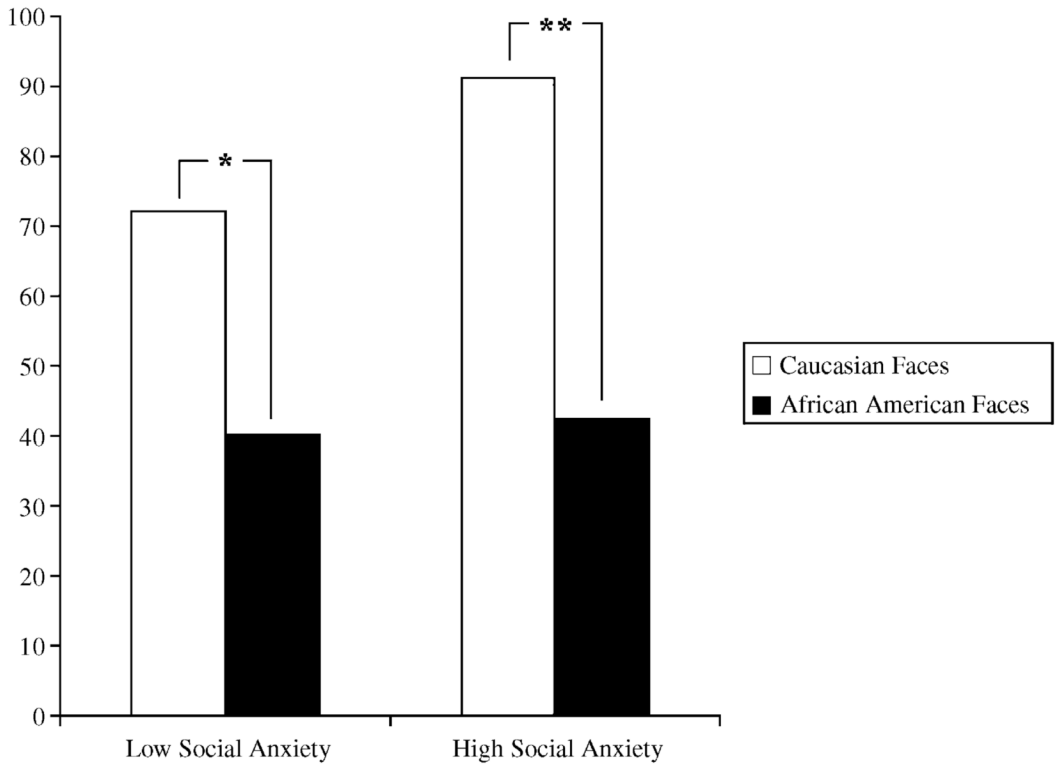

Fig. 2.

Accuracy for fearful faces by social anxiety group as a function of race. *Note*. Low social anxiety accuracy for fearful Caucasian faces > High social anxiety accuracy for fearful African American faces **$p < 0.002$.

Table 1

Percentage accuracy by race of target face and social anxiety group.

	Low social anxiety (*n* = 121)		**High social anxiety (*n* = 24)**		**Race of target face × social anxiety group**		
	M	**S.E.**	***M***	**S.E.**	***F***	***d.f.***	***p***
Fearful					4.51	1, 110	0.039
Caucasian	72.18	2.20	91.14	5.51			
African American	40.13	1.95	42.41	4.88			
Happy					0.08	1,125	0.77
Caucasian	88.63	1.39	96.77	3.31			
African American	54.65	1.41	61.36	3.36			
Angry					1.16	1, 124	0.28
Caucasian	71.11	2.32	80.32	5.60			
African American	34.19	1.56	35.57	3.78			
Sad					0.75	1, 135	0.39
Caucasian	70.14	2.17	84.42	5.28			
African American	64.49	1.24	73.06	3.03			

Note: Social anxiety was measured using the Social Phobia Scale (Mattick & Clarke, 1998). Covariates were included in the model: depression was measured with the Beck Depression Inventory (BDI-II; Beck et al., 1996), trait anxiety with the State-Trait Anxiety Inventory (STAI-T; Spielberger et al., 1983) and gender (0 = male, 1 = female). Covariates were evaluated at the following values: BDI = 8.68, STAIT = 45.07, and gender = 0.