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Social anxiety and narrowed attentional breadth toward faces

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Abstract

The amount of information that can be perceived and processed will be partly determined by attentional breadth (i.e., the scope of attention), which might be narrowed in social anxiety due to a negative attentional bias. The current study examined the effects of stimulus valence on socially anxious individuals' attentional breadth. Seventy-three undergraduate students completed a computerized dual-task experiment during which they were simultaneously presented with a facial picture at the center of the screen and a black circle (i.e., a target) at the periphery. Participants' task was to indicate the gender of the model in the picture and the location of the peripheral target. The peripheral target was presented either close to or far from the central picture. Higher levels of social anxiety were significantly associated with greater difficulties detecting the target presented far from the central facial pictures, suggesting that social anxiety is associated with narrowed attentional breadth around social cues. Narrowing of attentional breadth among socially anxious individuals might hamper their ability to process all available social cues, thereby perpetuating social anxiety.

Key words: social anxiety; attentional breadth; face

Social anxiety is associated with preferential attention to negative social-evaluative stimuli (e.g., Schultz & Heimberg, 2008). When socially anxious individuals' attention is captured by negative social cues, they might exhibit narrowed attentional breadth or the spatial scope of attentional focus. Once socially anxious individuals zoom in on these cues, their narrowed attentional breadth might limit the processing of more benign information, thereby maintaining their fear and anxiety.

Theories of attentional breadth suggest that mood states indeed influence an individual's ability to attend to multiple sources of information in the environment (Easterbrook, 1959). Easterbrook proposed that arousal and stress reduce the range of cues utilized so that attention to peripheral cues is limited in favor of processing central cues. The ensuing notion that negative emotion narrows attention whereas positive emotion broadens attention has garnered empirical support. For example, positive affect has been associated with broader attentional scope in behavioral (Rowe, Hirsh, & Anderson, 2007; Wadlinger & Isaacowitz, 2006) and event-related potential (ERP) studies (Moriya & Nittono, 2011). In contrast, high trait anxious individuals exhibited enhanced processing of local stimuli on a global-local task (e.g., a global H made of local Ts) compared to their less anxious counterparts (Derryberry & Reed, 1998). A narrower attentional breadth in anxious individuals might be due to difficulties expanding their attentional scope from a small area to a larger one (Najmi, Kuckertz, & Amir, 2012).

Previously reported narrowed attentional breadth associated with negative mood (e.g., Derryberry & Reed, 1998) might be especially prominent when the focal

stimulus is inherently threatening and relevant to an individual's concerns. If so, social anxiety may be associated with narrowed attentional breadth around threatening social stimuli. As a result, socially anxious individuals might miss other benign social cues in the environment, which, in turn, may perpetuate social anxiety. To our knowledge, however, no previous studies have examined attentional breadth in social anxiety while examining the effects of the valence of stimuli.

The current study was designed to better understand the association among valence of a stimulus, attentional breadth, and social anxiety. Disgusted faces are particularly salient to socially anxious individuals because they imply social rejection (Amir, Najmi, Bomyea, & Burns, 2010; Yoon & Zinbarg, 2007). Therefore, we compared attentional breadth for disgusted, happy, and neutral faces. We used a modified dual task paradigm (Ball, Beard, Roenker, Miller, & Griggs, 1988) that allows us to investigate different gradations of attentional breadth, without explicitly asking participants to attend to the emotional aspect of stimuli. In this computerized task, participants are presented with a facial picture in the middle of the screen. At the same time, a target (a black circle) is presented at a random location either close to or far away from the picture. Participants' task is to (a) identify the model in the central picture and (b) to localize the target. Participants' accuracy in target detection is used to infer participants' attentional breadth. This modified dual task paradigm has been successfully used to examine attentional narrowing. For example, less securely attached children exhibited narrower attentional breadth around a picture of their own mother than pictures of other women (Bosmans, Braet, Koster, & de Raedt, 2009).

By ensuring that participants' focus is on the center of the screen while varying the distance of the target from the central picture, we are able to examine attentional breadth. Greater difficulties in correctly identifying the location of the target that is presented far away from the central picture would suggest narrower attentional breadth. High levels of social anxiety were hypothesized to be associated with greater attentional narrowing, especially for disgusted faces. That is, levels of social anxiety would be inversely associated with accuracy in detecting "far" targets, especially when the central picture expresses disgust.

Method

Participants

Seventy-three undergraduate psychology students participated in the study in exchange for course credit. One participant was excluded from the analyses because this person's accuracy on the task was below 3 SD of the sample. Thus, the final sample consisted of 72 participants (28 female, 40 male, and 3 unknown; mean age = 18.25 years).

Social Phobia Scale (SPS; Mattick & Clarke, 1998)

Participants' social anxiety level was assessed using the Social Phobia Scale (Mattick & Clarke, 1998), which has high sensitivity and good specificity (Heimberg et al., 1992; Peters, 2000; Zinbarg & Barlow, 1996). Participants indicated the degree to which each statement described them on a 5-point Likert-type scale ranging from 0 (not at all characteristic or true of me) to 4 (extremely characteristic or true of me). In the current sample, Cronbach's α was .95, and the participants' mean SPS scores was 18.25 (SD=14.25).

Stimuli

Thirty-two models expressing disgust, happy, and neutral were selected from the NimStim Face Stimulus Set (Tottenham et al., 2009) to be used as the central stimulus in the attentional breadth task. The pictures were converted to black-and-white and resized to 3 cm wide by 4 cm high in size.

Attentional Breadth Task

We modified the dual task paradigm (Bosmans et al., 2009) to assess participants' attentional breadth (see Figure 1). Each trial started with a "Ready" message for 482 ms. Next, 16 gray dots with a diameter of 2 cm appeared 4.5 cm from the central picture ("close" locations; 10° visual angle) and at 11.2 cm from the central picture ("far" locations; 25° visual angle) for 482 ms. The gray dots were arranged in pairs of two (i.e., one close and one far) on one of eight imperceptible axes. Next, one facial picture appeared in the middle of the computer screen along with 16 gray dots that were already on the screen. Simultaneously with the central picture, the target, a black circle with a diameter of 1.3 cm, appeared in one of the gray dots. The central picture and the target along with 16 gray dots were presented for 62 ms. This short presentation time, which corresponded to the refresh rate of the CRT monitor, was used to prevent visual search (saccades). A similar presentation duration has been used in prior studies (Grol, Koster, Bruyneel, & de Raedt, 2014; Grol & de Raedt, 2014). Each trial ended with two questions: (1) gender of the model to ensure that participants were looking at the center of the screen when the stimuli were presented and (2) the location of the target. Accuracy on the second question served as the main dependent variable. There were six types

of trials, which were created by combining three types of picture valence (disgust, happy, and neutral) and two distances (close and far targets). The trials were randomly presented in two blocks of 96 trials each, resulting in a total of 192 trials.

Procedure

Upon arrival, participants were informed that the study was about visual information processing. Participants provided written informed consent after which they were introduced to the attentional breadth task. Participants were seated in front of a 19" CRT-computer monitor, at a distance of 27 cm from the screen. They were instructed to place their chin on a chin rest throughout the task to ensure accurate positioning. Participants first completed 16 practice trials during which the central picture and the target were presented for 250ms to help participants understand the task. Participants then completed 16 practice trials with a presentation time of 62 ms identical to the main trials. Facial pictures used in the practice trials were different from the pictures used for the main trials. After the task, participants completed the questionnaire. All procedures were approved by the Institutional Review Board at the University of Maine.

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Results

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Overall Performance

To ensure that participants attended to the central pictures, a 3 (Valence: disgust, happy, neutral) x 2 (Target Distance: close, far) x SPS (Social Phobia Scale) general linear model (GLM) on the accuracy of the identification of the central picture was conducted. Of note, a GLM allows the continuous nature of the social anxiety measure to be preserved, thereby increasing power. As expected, none of

the effects were significant, all $Fs<2.91$ and all $ps > .09$. Thus, there were no significant differences in participants' attention to the central pictures as a result of the picture type, the target distance, or social anxiety levels.

Attentional Breadth and Social Anxiety

To ensure that participants' attention was focused on the central pictures, we only used trials in which the central picture was correctly identified. Overall, 5.39 % (SD = 3.7 %) of the trials were discarded. The number of correctly identified central pictures varied among conditions and participants. To control these differences, proportion of trials on which the target location was correctly identified out of the trials with correctly identified central pictures served as the main dependent variable. A Valence x Target Distance x SPS GLM on the accuracy of target detection revealed an expected main effect for Target Distance, $F(1,70)=34.37$, $p<.001$, $\eta_p^2=.33$, which was qualified by a significant SPS x Target Distance interaction, $F(1,70)=4.33$, $p=.041$, $\eta_p^2=.06$. No other effects were significant. Figure 2 visually illustrates this interaction effect by creating extreme groups (+/- 1 SD).

The simple slope was significant for the far targets, $\beta =-.23$, $t=-2.02$, $p=.047$, whereas the simple slope for the close targets was not significant, $\beta =-.07$, $t=-.59$, ns. Importantly, an index of Attentional Narrowing (ANI = accuracy close target – accuracy far target; Bosmans et al., 2009) significantly correlated with the SPS scores, $r=.24$, $p=.04$. Although participants were generally less accurate in detecting far (vs. close) targets, the reduction in accuracy for the far targets was especially pronounced among more socially anxious individuals.

Discussion

The current study investigated the effects of social anxiety on the breadth of attentional focus around emotional faces. We demonstrated that higher levels of social anxiety are associated with narrower attentional focus on emotional faces, regardless of valence. These findings are consistent with previous research demonstrating narrower attentional breadth in anxiety (e.g., Derryberry & Reed, 1998).

Narrow, focused attention may facilitate visuospatial selective attention and a vigilant processing mode in social anxiety. We originally hypothesized that attentional narrowing among socially anxious individuals would be more pronounced for disgusted faces. Our hypothesis was based on cognitive theories of social anxiety (e.g., Rapee & Heimberg, 1997; Schultz & Heimberg, 2008) and previous findings that socially anxious individuals exhibit preferential attention to faces with negative facial expressions (e.g., Mogg, Philippot, & Bradley, 2004). However, some previous studies demonstrated that attentional biases in (social) anxiety is not specific to threat (e.g., Garner, Mogg, & Bradley, 2006; Schofield, Johnson, Inhoff, & Coles, 2012). Furthermore, any face might be potentially important to socially anxious individuals, and they "zoom in" on the details of an object that may signal whether or not the object is threatening (Derryberry & Reed, 1998). Along this line, previous research has demonstrated that social anxiety disorder (SAD) is associated with heightened amygdala activity to faces regardless of valence (Straube, Mentzel, & Miltner, 2005; Yoon, Fitzgerald, Angstadt, McCarron, & Phan, 2007).

The narrowing of attentional breadth among socially anxious individuals is in direct contrast to the broadening of attention associated with positive mood (e.g., Rowe et al., 2007). Social anxiety might enhance performance when a task or a situation calls for a narrow focused style of attention. On the other hand, high levels of social anxiety might hamper a more open and exploratory mode of attention. Along this line, the current findings might have implications for the proposition that difficulty to disengage from threat characterizes social anxiety (Amir, Elias, Klummp, & Przeworski, 2003; Heeren, Lievens, & Philippot, 2011; Schofield et al., 2012). Socially anxious individuals might not notice the presence of other stimuli due to their narrow attentional focus. In turn, there may be less demand for attentional disengagement, as they are unaware of the presence of other stimuli that compete for their attention. Delayed attentional disengagement could also contribute to attentional narrowing. However, given that the brief presentation time used in the current task prevents saccades, narrower attentional breadth in socially anxious individuals in the current study cannot be attributed to any attentional disengagement difficulty they might experience. Given the hypothesized relation between attentional breadth and attentional disengagement, training socially anxious individuals to broaden their attentional scope could facilitate or augment the effects of attention bias modification training, especially for training that targets attentional disengagement (e.g., Amir et al., 2003; Heeren et al., 2011). Future studies should investigate this proposition.

There are several limitations to this study. First, our findings are based on an analogue sample of undergraduate students and thus may not generalize to

individuals with a diagnosis of SAD. However, 30% of the current sample met or exceeded the diagnostic cut-off score of 24 or higher suggested in previous research (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992). Importantly, social anxiety lies on a continuum, and non-clinical individuals with high levels of social anxiety are similar to individuals diagnosed with SAD (Turner, Beidel, & Larkin, 1986). Nonetheless, it is possible that individuals diagnosed SAD may exhibit different patterns of attentional narrowing (e.g., show pronounced narrowing of attention for negative faces). Future studies with a clinical sample could improve our understanding of the nature and the role of the narrowing of attentional breadth in psychopathology.

The current study cannot eliminate several alternative explanations. First, we did not assess participants' affect at the time (e.g., state anxiety, mood) or their trait anxiety, which may affect the person's attentional breadth (e.g., Derryberry & Reed, 1998; Rowe, Hirsh, & Anderson, 2007). Thus, we cannot rule out the possibility that the current findings are due to participants' current mood and/or trait anxiety level, which tend to be highly correlated with social anxiety. We only employed social stimuli and, thus, cannot exclude the possibility that socially anxious individuals exhibit attentional narrowing to non-social stimuli. To clarify whether attentional narrowing in social anxiety is specific to social stimuli or not, future studies should include both social and non-social stimuli.

Lastly, this is the first study, to our best knowledge, to examine the effects of stimulus valence on the scope of attention in social anxiety using the dual task paradigm. Thus, the results should be interpreted with caution and require

replication. We acknowledge that our task instructions might have led to less processing of the emotional expressions, resulting in a lack of valence specific effects. Because we did not want to explicitly direct participants' attention to the emotional aspect of the stimuli, participants were asked to report the gender of each model. Future studies should replicate the current findings with valence as the response criterion.

Despite these limitations, our findings demonstrate that social anxiety is associated with narrower attentional breadth for faces. Such narrow and focused attention might influence the capacity for selective attention and facilitate a vigilant processing mode. This less explorative mode of attention in social anxiety might enhance filtering of unattended information, which is likely to be benign in nature. If so, socially anxious individuals will have less opportunity to encounter evidence challenging their beliefs (e.g., "Other people think I am stupid."), thereby perpetuating their dysfunctional beliefs and anxiety.

Acknowledgement

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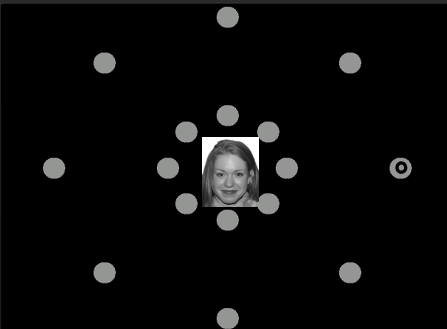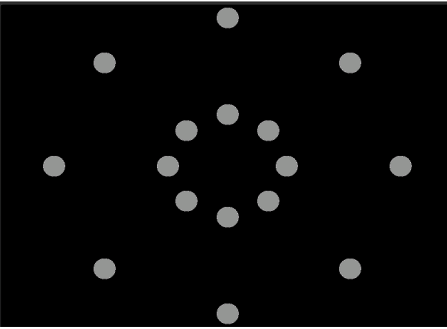   social phobia. *Behaviour Research and Therapy, 35*, 741-756.

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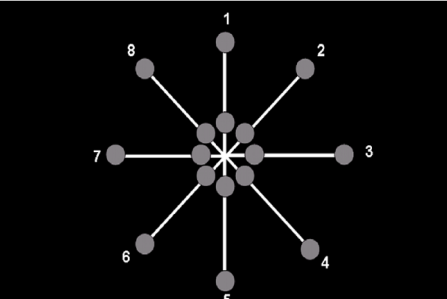
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On which axis did the black circle
appear? Press the correct number.

Figure 1. An example of a trial in which the target appears at a far location. On each trial,

participants were presented with a central picture along with 16 gray dots. On one of the

dots, a target (i.e., a black circle) appeared (on the axis 3 in this example). When the

facial picture and the target disappeared, participants were presented with the first

question asking about the central picture. Once participants made a response, participants

were asked to indicate the location of the target. Of note, this is a schematic figure and,

thus, the scale of the elements (e.g., the slide size, the dot size, distances between the

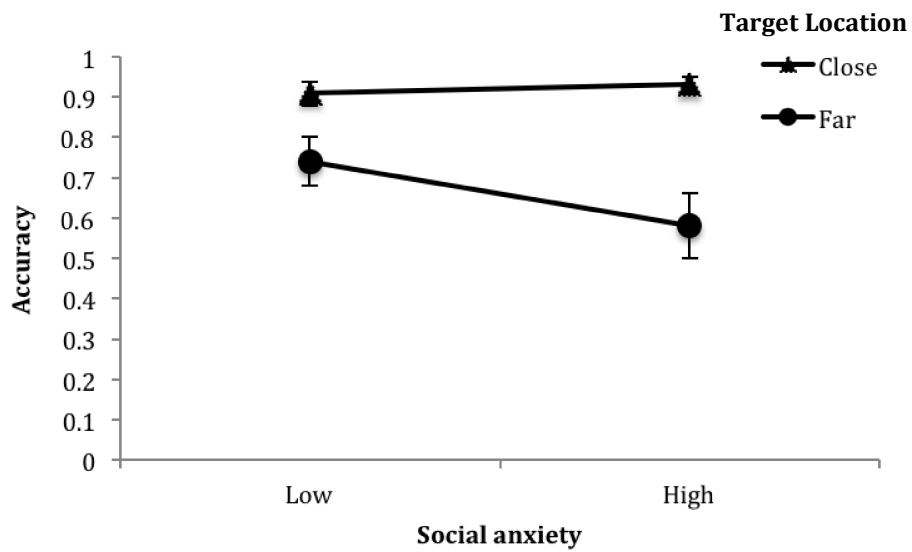dots, etc.) may not represent the actual scale.

Figure 2. Accuracy rates to correctly detect the location of the target as a function of

participants' level of social anxiety and the target's distance from the central picture.

Error bars represent one standard error.