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Enhanced avoidance behavior in social anxiety: Evidence from a probabilistic learning task

Stephan Stevens [a,b,*,1], Andreas Peters [b], Anna Abraham [b], Christiane Hermann [b,**,1]

[a] Department of Clinical Psychology, University of Cologne, Germany
[b] Department of Clinical Psychology, University of Giessen, Germany

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ABSTRACT

Background and objectives: Social phobia is characterized by avoidance of feared social situations. Although avoidance is a central feature of social anxiety, few studies have examined avoidance learning.
Methods: We used a probabilistic instrumental learning paradigm where participants had to learn by trial and error which response led to the disappearance of a neutral or angry face. 20 high socially anxious and 20 non-socially anxious individuals with an average level of social anxiety learned to avoid an angry or a neutral face by choosing one of two cues. Each of the cues led to the disappearance of the face either with high or low reinforcement probability.
Results: Groups learned to choose the more effective cue across trials and did not differ with regard to self-report valence, arousal for the faces or the a posteriori estimated reinforcement probability for both cues. High socially anxious individuals as compared to the controls chose the high probability cue significantly more often and were slower particularly when the neutral face could be avoided. Notably, HSA engaged in more avoidance responding to the neutral as compared to the angry face early on during the experiment.
Limitations: Due to the experimental design, the observed avoidance behavior most likely reflects the motivation for avoidance rather than contingency learning per se.
Conclusions: In social anxiety, neutral faces might be processed as ambiguous social cues and strongly motivate avoidance behavior.

1. Introduction

Avoidance behavior is a core feature of anxiety disorders. Accordingly, avoidance is listed among the primary diagnostic criteria of anxiety disorders in the Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV; American Psychiatric Association, 1994). Social phobia (SP) is characterized by avoidance of feared social situations. In addition to passive avoidance behavior, cognitive models of SP posit that socially anxious individuals also rely on subtle in-situation safety behaviors (e.g., avoiding eye contact; Clark & Wells, 1995) which function as active avoidance behavior and are maintained through operant conditioning. The pivotal role of avoidance learning for the maintenance of pathological anxiety has been proposed by one of the earliest learning accounts of pathological anxiety. Mowrer's (1951, 1956) two process theory posits that conditioned threat cues serve as discriminative stimuli for avoidance behavior. Building upon this model, Lovibond and colleagues (Lovibond, Saunders, Weidemann, & Mitchell, 2008) proposed that avoidance reduces the expectancy of an aversive consequence as acquired by classical conditioning. Consistent with these assumptions, an instrumental response that allows to avoid a conditioned fear stimulus during extinction prevents the conditioned response from being extinguished (Lovibond, Mitchell, Minard, Brady, & Menzies, 2009).

Surprisingly little research has focused on the acquisition and performance of avoidance behaviors in SP. Ly and Roelofs (2009) investigated whether individuals high and low in social anxiety, as defined by a median split on a social anxiety measure, differ in the acquisition of an avoidance response, and how this affects the extinction of conditioned fear. Subsequent to an initial classical

* Corresponding author. Department of Clinical Psychology and Psychotherapy, University of Cologne, Pohligstraße 1, 50969 Cologne, Germany. Tel.: +49 221 4704723.
** Corresponding author. Department of Clinical Psychology and Psychotherapy, Justus-Liebig-University Giessen, Otto-Behaghel-Str. 10 F, 35394 Giessen, Germany. Tel.: +49 641 9926081; fax: +49 641 9926099.
E-mail addresses: stephan.stevens@uni-koeln.de (S. Stevens), christiane.hermann@psychol.uni-giessen.de (C. Hermann).
[1] Both authors contributed equally to this paper.

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conditioning phase, participants were explicitly instructed that during CS presentation, one or more of four buttons would light up and that they had to press one of these. Only one of the buttons would prevent the US to occur, but this would be always the same throughout the experiment. The instrumental phase entailed avoidable trials, in which a correct button press led to the nonoccurrence of the US, and unavoidable trials, in which the correct response button was not available. Individuals high in social anxiety as compared to low socially anxious participants had higher US expectancies on the very first trial of the instrumental task. This expectancy bias is consistent with previous findings that individuals with social anxiety overestimate negative consequences of neutral or ambiguous social situations as revealed by illusionary correlation paradigms, conditioning experiments or studies on interpretational biases (Hermann, Ofer, & Flor, 2004; Hermann, Ziegler, Birbaumer, & Flor, 2002; Stopa & Clark, 2000). However, Ly and Roelofs (2009) did not observe group differences in the acquisition of the avoidance response. This may be accounted by the experimental design not being sufficiently sensitive to detect differences in avoidance learning. Specifically, there was only one correct button response, which prevented the US with a probability of 100 percent. Interestingly, based on their previous learning experience, the high socially anxious individuals were rather accurate in estimating the US probability once the correct response button was unavailable. By contrast, the low socially anxious individuals underestimated the actual US probability in the nonavoidable trials. In addition, in the Ly and Roelofs (2009) study the US consisted of electrical stimulation combined verbal social rejection. Hence, even low anxious individuals might have been highly motivated to avoid the US possibly contributing to a ceiling effect.

The aim of the present study was to investigate whether high socially anxious (HSA) as compared to individuals with an average level of social anxiety (non-socially anxious controls, NSAC) differ in their avoidance behavior in response to social cues of different threat value. Participants underwent a probabilistic avoidance learning task. We adapted a reward learning paradigm (Murray et al., 2008), since there is evidence that reward learning and avoidance learning are associated with similar activation of those brain regions which are involved in the processing of reward (e.g., Delgado, Jou, Ledoux, & Phelps, 2009). Specifically, experienced relief following successful avoidance of an aversive stimulus may be experienced similar to receiving a reward (Seymour et al., 2005). Unlike in previous studies and to target avoidance instead of reward processes (Lovibond et al., 2009; Ly & Roelofs, 2009), participants had to learn by trial and error which behavioral response was most successful in avoiding the potentially threatening social cue, allowing to investigate differences in learning rate and performance of the learned behavior depending on the level of social fear. In order to determine the role of the motivational value of the stimulus to be avoided, faces with an angry and neutral expression were used. Participants chose one of two cues either of which led to the disappearance of the face with a different, stochastically independent probability. HSA were expected to show a higher level of avoidance behavior, i.e. a higher number of choices of the high probability cue. Angry faces function as biologically evolved threat cues (Mineka & Ohman, 2002), HSA show biased processing of angry faces in attentional and memory tasks (Coles & Heimberg, 2005; Staugaard, 2010) compared to non-socially anxious controls. Thus we expected HSA as compared to NSAC to show a heightened avoidance response to angry faces. Furthermore, we also hypothesized heightened avoidance responding in HSA to neutral facial expressions. The latter assumption was based on previous observations that biased processing of social information in individuals with social phobia as compared to healthy controls is also apparent with regard to neutral social cues (e.g., Stevens, Gerlach, & Rist, 2008), which might be perceived as potentially threatening due to their ambiguous nature. In HSA, neutral faces may trigger a fear response and enhanced processing (Amaral, 2002; Birbaumer et al., 1998; Schneider et al, 1999), which may result in a facilitated acquisition and heightened level of avoidance behavior.

2. Method

2.1. Participants

Participants were screened with the Fear of Negative Evaluation Scale (Watson & Friend, 1969; German: Vormbrock & Neuser, 1983). The scale measures fears of negative evaluation in social situations with 20 items (e.g., "I get nervous when I am observed") using a four point Likert rating scale from "1 = does never apply" to 4 "always applies". Those who scored 1 SD above the group mean were considered as HSA, while those scoring within ±1 SD above and below the mean were considered as NSAC, avoiding possible disadvantages of extreme group comparisons as used in previous studies (e.g., Ly & Roelofs, 2009). Extreme group approaches artificially restrict the statistical variance of the sample to the highest and lowest end of the distribution. Hence, conclusions based on significant statistical differences are of limited validity because these differences are likely to result not only from true variance of the group with high, but also from the group at the low end. A more conservative and more valid procedure is to compare a sample from the mid-range of the population to a high scoring group. Although such an approach might decrease statistical power, significant results reliably indicate a true difference between the high scoring group as compared to the average range (for a more detailed discussion of sampling issues and extreme group comparisons see Preacher, Rucker, MacCallum, & Nicewander, 2005). The screening questionnaire was administered as part of an online survey administered to 1500 first year students (all study programs) at the University of Giessen. From each subgroup, i.e. HSA and NSAC according to the FNE criteria, 20 participants were randomly selected and matched according to sex, age and years of education (Table 1). All individuals were interviewed by telephone and participants were excluded if they were currently in treatment for a psychological disorder or taking psychopharmacological medication. Scores on social anxiety measures differed in the expected direction between groups (see Table 1). The obtained FNE scores are in the range that can be expected when sampling high socially anxious participants (Stevens, Gerlach, et al., 2011; Stevens, Rist, & Gerlach, 2011). SPS and SIAS scores reflect clinically relevant social anxiety

Table 1
Sociodemographic and questionnaire data depending on social anxiety status of the participants.

	High socially anxious individuals (HSA) $n = 20$ *M* (SD)	Non socially anxious controls (NSAC) $n = 20$ *M* (SD)	F/χ^2
Age	23.2 (2.3)	23.1 (2.7)	.01
Sex	Male: 10 Female: 10	Male: 10 Female: 10	.01
Years of education	13.0 (2.5)	12.5 (2.1)	1.0
Fear of Negative Evaluation Scale	54.8 (9.6)	38.5 (7.3)	13.73**
Social Phobia Scale	18.5 (12.9)	7.7 (5.48)	11.86**
Social Interaction Anxiety Scale	27.30 (12.18)	15.5 (8.52)	12.70**

Note: $^{*}p < .05$.