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Israelashvili, J.; Dijk, C.; Fischer, A.H.

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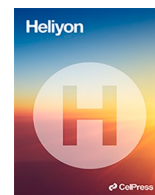
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Research article

Social anxiety is associated with personal distress and disrupted recognition of negative emotions

Jacob Israelashvili^{a,*}, Corine Dijk^b, Agneta H. Fischer^b^a Bar Ilan University, Israel^b The University of Amsterdam, Netherlands

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ABSTRACT

Past research investigating the relation between social anxiety (SA), empathy and emotion recognition is marked by conceptual and methodological issues. In the present study, we aim to overcome these limitations by examining whether individuals with high ($n = 40$) vs. low ($n = 43$) social anxiety differed across these two facets of empathy and whether this could be related to their recognition of emotions. We employed a naturalistic emotion recognition paradigm in which participants watched short videos of individuals (targets) sharing authentic emotional experiences. After each video, we measured self-reported empathic concern and distress, as well as their ability to recognize the emotions expressed by the targets in the videos. Our results show that individuals with high social anxiety recognized the targets' emotions less accurately. Furthermore, high socially anxious individuals reported more personal distress than low socially anxious individuals, whereas no significant difference was found for empathic concern. The findings suggest that reduced recognition of emotions among SA individuals can be better explained by the negative effects of social stress than by a general deficit in empathy.

1. Introduction

Many people only occasionally worry about their social interactions, but individuals with Social Anxiety Disorder (SAD) feel intense fear during social situations and therefore tend to avoid them. Hyperactivation of anxiety in social situations significantly affects social functioning. Socially anxious individuals thus find it hard to form and maintain close relationships; they are liked less and feel lonelier than people without SA ([1–4]). It has been suggested that the interpersonal difficulties that characterize socially anxious individuals are partly related to deficits in empathy ([5–7]).

Empathy is defined and measured in many ways and there is no consensus about the way it is conceptualized (see Refs. [8–10]). Distinct phenomena have been categorized as empathy, or empathy-related, such as perspective taking, sympathy, compassion, experience sharing, emotional contagion, and mentalization (see discussions by Refs. [8,11,12]). Following recent proposals, we define empathy broadly as an affective response that arises from perceiving and comprehending another's emotional state (e.g., Ref. [9]). This does not necessarily involve mirroring others' actual feelings, but may encompass various emotional reactions to others' feelings, such as feeling sympathetic or sad for a person who lost his father, or distressed because someone is seriously ill, even though the person herself is quite relaxed about it. Hence, we consider empathy as a broad, multidimensional construct.

Despite these varied definitions and measures, consensus exists within the literature regarding the pivotal role of empathy in

* Corresponding author.

E-mail addresses: jisraelashvili@gmail.com (J. Israelashvili), K.F.L.Dijk@uva.nl (C. Dijk), A.H.Fischer@uva.nl (A.H. Fischer).

effective social functioning, including the recognition of others' emotions ([13]), establishing positive relations ([14,15]), facilitating easier connections ([16]), and engaging in more effective communication with conversation partners ([17]). Nor surprisingly, the challenges faced by individuals with social anxiety in effective social functioning have been attributed to their impaired empathy and subsequent problems with emotion recognition. This could impede social interactions and reinforce individuals' fear of social situations, potentially leading to less socially appropriate behavior ([18]).

Empirical research testing the relation between social anxiety, empathy and emotion recognition, however, has led to mixed results. Existing research associates social anxiety (SA) with decreased empathy and impaired emotion recognition (e.g., Ref. [19]), but also with increased empathy and improved recognition of emotions (e.g., Refs. [20,21]). Recently, Pittelkow and colleagues ([18]) meta-analyzed available findings on the relation between SA and empathy. They included data from clinical and non-clinical levels of SA and various types of measures (self-report vs. performance-based) of SA and affective empathy. Most studies in the meta-analysis used the Basic Empathy Scale (BES; [22]) to measure empathy. Pittelkow and colleagues ([18]) classified this as unspecified affective empathy. Overall, the meta-analysis found a positive relation between self-reported measures of social anxiety and (unspecified) affective empathy ($r = 0.16$, $n = 3155$). This relation was similar for clinical and non-clinical samples of SA. In addition, the performance on emotion recognition tasks was negatively associated with SA among individuals with clinical SA ($r = -0.11$, $n = 1705$), but this relation was not significant for non-clinical levels of SA ($r = -0.02$, $n = 9310$; [18]), suggesting that emotion recognition only decreases in severe cases of SA. Importantly, Pittelkow and colleagues also found substantial heterogeneity across these relationships ($I^2 > 86$; for interpretation, see Ref. [23]), which limits the conclusions that can be drawn from the averaged estimations reported in the meta-analysis.

These inconsistent and heterogeneous findings can partly be explained by the use of different definitions and measures of empathy (see Ref. [10]). More specifically, we argue that it is crucial to distinguish between two different facets of empathy, which is not used by the most often used BES questionnaire, measuring unspecified empathy.

1.1. Different facets of empathy and their relation with SA

Empathy has at least two distinct facets, namely empathic concern and personal distress (see discussions by Refs. [24,25]) that may have a different prevalence in socially anxious individuals and may also have different effects on emotion recognition. Personal distress is marked by self-oriented feelings of anxiety and unease in reaction to another's stress, whereas empathic concern is focused on the other's feelings and involves the willingness to care for another person's welfare ([26,27]). For instance, imagine an individual with social anxiety attending a support group meeting where a fellow attendee shares a heart-wrenching story of losing their job. Empathic concern entails feeling compassion and sadness for the person facing unemployment. In contrast, personal distress implies that the individual's own anxiety about job security contributes to their emotional response. It suggests that their own sadness may partly stem from the fear of experiencing a similar situation.

We propose that this distinction could be crucial in understanding how social anxiety might shape emotional reactions to others' distress. Individuals with social anxiety may often experience personal distress in social situations, and thus their concern for others' struggles might intertwine with their own fears of unfavorable outcomes. Previous studies ([25,28]) have shown that empathic concern and personal distress are differently related to emotion recognition: especially personal distress is associated with worse emotion recognition, presumably because people are focused on their own rather than on others' feelings.

There are not many studies that have directly focused on personal distress in social anxiety disorder, but it is evident from previous research that socially anxious individuals typically experience negative emotions during social interactions (e.g., Refs. [29–34]). These negative feelings may also be elicited when observing others' stress. For example, one study found that socially anxious participants reported more intense negative feelings in response to negative facial displays of others ([35]). This suggests that socially anxious individuals may experience higher levels of personal distress in reaction to others' negative emotions, compared to non-anxious individuals. This more intense anxiety may in turn also relate to worse performance on emotion recognition tasks.

Studies on the relationship between social anxiety and empathic concern are scarce. Two studies found that social anxiety was related to more empathic concern for others ([21,26]), whereas another study did not find a relation with empathic concern in a socially anxious adult sample ([36]). In sum, most previous studies did not measure nor compare empathic concern versus personal distress in the same sample when examining the relationship between SA and affective empathy, whereas we think these two forms of empathy may play a different role in SA. This limits the conclusions that can be drawn from the available evidence.

1.2. The relation between SA and emotion recognition

The evidence regarding the question whether SA leads to poor emotion recognition is inconsistent. The meta-analysis of Pittelkow and colleagues ([18]) shows that this is only the case for severe cases of SA, but other studies suggest otherwise. The inconsistent results may be partly explained by the different ways in which emotion recognition has been measured (see e.g., Ref. [37]). Most studies measuring emotion recognition have used repetitive, posed expressions as stimuli. However, posed expressions are more prototypical and less ambiguous (e.g., Refs. [38,39]) than real life, spontaneous emotion expressions. This may be particularly relevant for studying emotion recognition in clinical samples and raises the possibility that the relation between SA and emotion recognition might be obscured when using highly recognizable stimuli (i.e., ceiling effect). Supporting this argument, in studies using posed, *unambiguous* stimuli, socially anxious individuals mostly do not differ in their accuracy ratings from individuals without social anxiety (e.g., Refs. [7,20,40–44]). On the contrary, when an emotional expression is *ambiguous* – as is often the case in everyday life – socially anxious individuals show reduced accuracy, mainly because they tend to identify others' expressions consistent with their fears, thus

more negative or self-threatening ([40,45–50]).

In sum, the available evidence suggests that socially anxious individuals are less accurate in the recognition of more ambiguous, everyday emotional stimuli, because they tend to interpret these emotional displays as negative or as social threats ([19,51]). Yet, this conclusion is premature, given that most available studies were primarily based on stimuli with posed expressions (i.e., low ecological validity). Importantly, SA individuals have difficulties with social relations in real life context (e.g., Ref. [2]). Thus, one reason why the meta-analysis of available findings ([18]) found nonsignificant relation between SA and emotion recognition could be that performance in emotion recognition was measured in contexts with low ecological validity. The current study examined the relation between SA and empathy in an interpersonal context to provide a more naturalistic test.

1.3. The current research

The current research has two overarching goals. Firstly, we seek to explore the relationship between social anxiety (SA) and two key empathic responses: personal distress and empathic concern. Specifically, we anticipate that individuals with higher levels of SA will report elevated personal distress, rather than increased empathic concern. Secondly, our aim is to test whether SA individuals also perform worse on an emotion recognition test that uses an ecologically valid set of emotional stimuli that resembles real-life social situations. We used a newly developed emotion recognition paradigm that included a series of short videos in which people spontaneously share an authentic story about an emotional event they experienced (for details, see Ref. [28]; for validation study, see Refs. [17,52]). Based on mass screening, we invited students with high and low socially anxiety levels to participate in the study. Participants were asked to indicate their levels of empathic concern and personal distress after watching each emotional video and next rated the emotions of the individuals (“targets”) in these videos. Accurate emotion recognition was defined as the match between the participant’s and the target’s emotional ratings.

Hypothesis 1. (H1). High-SA individuals report higher personal distress than Low-SA individuals. We did not make an a-priori prediction regarding differences between the High and Low-SA group with respect to their empathic concern, given the limited research available.

Hypothesis 2. (H2). High-SA individuals recognize others’ emotions worse than Low-SA individuals.

2. Method

2.1. Participants

Participants were first-year psychology students who were invited based on their scores on a previous mass screening on the Social Interaction Anxiety Scale (SIAS; [53]). Specifically, High Socially Anxious individuals (HSA) who scored in the top 25 % (SIAS score ≥ 33) and Low Socially Anxious individuals (LSA) who scored in the bottom 25 % (SIAS score ≤ 13) of the SIAS were invited to participate. In total, 232 individuals received an invitation. Eighty-three¹ participants ($n = 40$ HSA and $n = 43$ LSA) completed the study and received course credit for their participation (HAS: $M_{\text{age}} = 20$, $SD_{\text{age}} = 2.5$; 72 % female; LSA: $M_{\text{age}} = 20$, $SD_{\text{age}} = 2.5$; 72 % female). A sensitivity analysis conducted in G*Power ([54]; $\alpha = 0.05$), found that our sample size was sufficient to detect an effect size of $d = 0.3$ (for H1), and 0.54 (for H2) or higher with 80 % power.

2.2. Procedure and stimuli

Before commencing the study, participants were provided with a comprehensive overview of the tasks and were requested to provide informed consent for both their participation in the study and the linking of their study-data with the previous mass screening (2019-CP-9952). The study received approval from the university’s ethical committee (2019-COP-10327). All study procedures were conducted using computers within the university’s laboratory. Participants were presented with five videos featuring female individuals, each sharing a personal emotional experience from their own life. Each video had a duration of 2–3 min. The topics of the five videos were as follows: (1) Signs of a partner cheating, (2) experience of a parent being ill, (3) a divorced father in a new relationship, (4) emotional distance from family, and (5) problems with an internship. These video topics were adopted from Israelashvili et al. ([28]), and transcriptions can be found in the supplemental materials accompanying this paper. Immediately after sharing their respective emotional experiences, each target watched her own video and provided ratings of the emotions she felt during the video. These ratings were subsequently used to calculate accuracy, as explained in further detail below (see also the illustration in the supplemental materials). The videos were presented to participants in random order. After viewing each video, participants were asked to respond to a series of questions as outlined in the ‘Measure’ section below. These questions pertained to empathic concern, personal distress, as well as emotional accuracy. At the end of the study,² participants were debriefed about its objectives, and they were given the opportunity to seek clarification or pose any questions they may have had.

¹ There was another low anxious participant who completed the study but due to technical problem their data was not saved.

² As part of another study, participants were asked to report their current emotions before the empathy task, to complete the IIP (Horowitz et al., 1988), CESD (Radloff, 1977), the BCSS (Fowler et al., 2006) and the IRI (Davis, 1980), and conduct another task at the end of this study. These results will be reported elsewhere.

2.3. Measures

Social anxiety. To measure Social Anxiety, participants completed the Social Interaction Anxiety Scale (SIAS; [53]). The SIAS is a 20-item self-report scale that measures fear of social interaction situations. The items consist of 5-point Likert scales that ask participants to indicate the extent to which a statement is typical of them (0 = *not at all typical of me* to 4 = *very typical of me*). Good internal consistency, test-retest reliability, and validity have been reported for the SIAS ([55]). Cronbach's α in the current study is 0.96 ($M = 20.3$, $SD = 20$), and the correlation with the previous mass screening is 0.93.

Empathic concern and personal distress. Immediately after watching each video, participants were asked: "how do you feel in response to this story" and provided their responses by indicating the intensities of several emotions (sympathetic, warm, moved, compassionate, alarmed, grieved, upset, and distressed; 0 = not at all, 6 = very much). These indices were based on previous research that used similar emotion words to measure affective facets of affective empathy ([28,56]). An index of *Empathic concern* was calculated by averaging the ratings of feeling sympathetic, warm moved, and compassionate across all five videos ($M = 3.56$, $SD = 1.06$, Cronbach's $\alpha = 0.87$). An index of *Personal distress* was calculated by averaging the ratings of feeling alarmed, grieved, upset, and distressed across all five videos ($M = 1.42$, $SD = 1.02$, Cronbach's $\alpha = 0.88$).

Emotional accuracy was measured by asking participants to indicate the intensity with which they thought the person in the video felt each of the indicated emotions while telling the story (sad, disappointed, angry, rage, afraid, worried, confused, surprised, embarrassed, guilty; 0 = not at all, 6 = very much). Accuracy was calculated based on the absolute difference between participants' ratings and the target's own ratings across each one of the ten emotion rating scales (larger absolute differences indicate lower accuracy). We used the average accuracy score across all five targets as the unit of analysis, consistent with previous research on empathic accuracy and emotion recognition (e.g., Refs. [57,58]). Finally, to simplify the interpretation of this index, the average absolute difference was reversed ($-1 \times$ average absolute difference), such that a higher index reflects more accurate emotion recognition. For more detailed information on the video stimuli and their creation, please refer to Israelashvili et al., 2020 [28]. Recent research supports the effective use of this test to capture individual differences in emotion recognition. For instance, one study discovered that individuals who excel on the emotional accuracy test also perform better on other standardized tests of emotion recognition ([52]). Additionally, a recent study found that individuals who perform well on the emotional accuracy test also employ a more effective communication style that aligns with that of their conversation partner ([17]).

3. Results

3.1. Preliminary analyses

Social anxiety. The distinction between LSA vs. HAS groups has been created based on the results of the mass screening survey, which took place several weeks before the current study. Thus, on the study's day, we measured the participant's level of social anxiety again and found scores were consistent with those measured on the mass screening day, $r = 0.93$, $p < .001$. The level of anxiety (i.e., SIAS) reported by the LSA group ($M = 10.3$, $SD = 4.69$), on the day of the study was significantly different, $t(81) = 16.4$, $p < .001$, Cohen's $d = 3.6$, than the anxiety reported by the HSA group ($M = 45.1$, $SD = 12.60$). Note that according to the developer of this scale, a score of 43 or more indicates social anxiety (generalized irrational fears across numerous social situations with avoidance and impairment; [53]). Thus, the results of the preliminary analyses support an a-priori difference between the two groups (HSA, LSA) in the propensity to experience social interaction anxiety.

3.2. Main analyses

Empathic concern and personal distress. Descriptive statistics for levels of empathic concern and personal distress measured in each group is provided in Table 1. To test the difference between HSA and LSA groups on affective empathy (H1), we conducted a two-way analysis of variance (ANOVA) with repeated measures. We used the social anxiety level (HSA vs. LSA) as a between-subject factor and the intensity rating of concern and distress, as the dependent variables measured within-subject. Consistent with our expectation, results showed a significant interaction effect (SA-level*facets of affective empathy), $F(1, 81) = 16.0$, $p < .001$, $\eta_p^2 = 0.17$. Follow-up analyses with Tukey correction for multiple comparisons indicated that HSA vs. LSA participants differed in their level of personal distress, $t(81) = 3.85$, $p < .001$, but had similar levels of empathic concern, $t(81) = 0.11$, $p = 1$ (see illustration in Fig. 1). This analysis also created a composite measure of empathic concern and distress (i.e., a total score for affective empathy). It showed the difference between HAS vs. LSA levels is only marginally significant, $F(1, 81) = 3.86$, $p = .053$, $\eta_p^2 = 0.05$, when we do not take into account the differentiation between facets of affective empathy (concern vs. distress).

Emotional accuracy. Initial analyses indicated that emotional accuracy varied across participants (with average absolute difference scores ranging from 9 to 22), which allowed us to examine whether this variance was predicted by SA-level (H2). We conducted an independent T-test and found that performance on the emotional accuracy test was significantly different between the two groups, $t(81) = 2.12$, $p = .038$, Cohen's $d = 0.46$. High SA participants achieved accuracy scores ($M = -15.05$, $SD = 2.43$), worse than Low SA group ($M = -14.05$, $SD = 1.88$). This effect is also illustrated in Fig. 1.

3.3. Exploratory analysis

The mediating effect of personal distress on disrupted emotion recognition. So far, our analysis found evidence that individuals

Table 1
Descriptive statistics for empathy variables by groups.

Empathy outcome	High SA		Low SA	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Empathic concern	3.55	1.08	3.58	1.06
Personal distress	1.80	1.13	1.01	0.68
Emotional accuracy	-15.1	2.43	-14.0	1.89

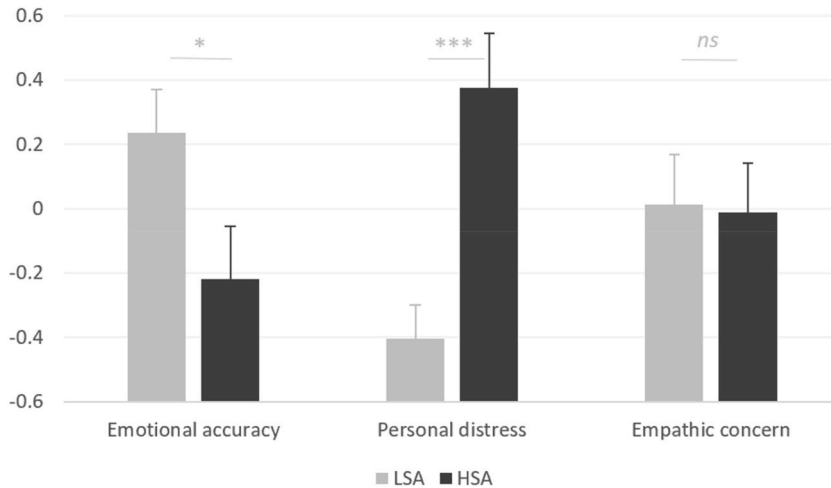


Fig. 1. Means (SEs) of emotional accuracy, feelings of empathic concern and personal distress (standardized) for High-vs. Low- Social Anxiety group. Social anxiety is linked with higher levels of distress and lower levels of emotional accuracy but has no effect on empathic concern. * $p < .05$; *** $p < .001$.

with high levels of SA experienced more personal distress and performed worse in recognizing emotions than individuals with low levels of SA. The exploratory nature of our analysis stems from the limitations due to the number of participants for this analysis, affecting statistical power, and the correlational design used. Given these constraints, we exploratory investigated the potential role of personal distress in shaping the diminished emotion recognition abilities observed in socially anxious individuals. Individuals with social anxiety may experience heightened stress when interpreting the emotional states of others, and this stress, characterized by personal distress, may contribute to their reduced performance in emotion recognition tasks. That is our last analysis tested whether the difference in SA levels (HSA vs. LSA) is associated with differential activation of personal distress, which, in turn, would explain differences in emotion recognition. We conducted a mediation analysis using the *jamm module* in Jamovi software (version 2.3.16) with 5000 bootstrapped samples to test the significance of each coefficient in the model. Our analysis found that Personal Distress fully mediated the effect of Social Anxiety level (HSA vs. LSA) on Emotional Accuracy (direct effect: $p = .530$; indirect effect $p = .015$). That is, High-SA group reported more personal distress ($\beta = 0.39$; $t(80) = 3.85$, $p < .001$), which was associated with their reduced accuracy ($\beta = 0.41$; $t(80) = -3.72$, $p < .001$), compared to Low-SA level. When controlling for the indirect effect of personal distress, the direct effect of SA level on reduced accuracy becomes insignificant ($\beta = -0.07$, $t(80) = -0.63$, $p = .530$). This suggests that personal distress fully explains the relation between SA level and reduced emotional accuracy (i.e., full mediation; see Fig. 2 for an illustration).

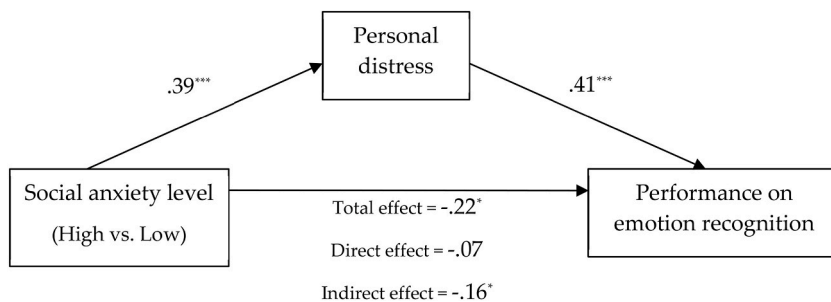


Fig. 2. Pathways for mediation analysis. Feelings of personal distress fully mediate the difference in emotion recognition across individuals with High vs. Low social anxiety. * $p < .05$; *** $p < .001$.

4. Discussion

The current research aimed to provide an explanation for the inconsistent findings in previous research on the relation between social anxiety, empathy and emotion recognition. We argued that a distinction should be made between personal distress and empathic concern, hypothesizing that high socially anxious individuals would report more personal distress and would be worse in recognizing others' emotions. We tested these hypotheses in a sample of individuals with high and low social anxiety. The results showed that individuals reporting high social anxiety reported more personal distress, but did not differ in empathic concern, compared to individuals with low social anxiety. Additionally, high socially anxious individuals also showed poorer emotional accuracy, implying that their recognition of targets' emotions deviated more from the self-reported emotions by the targets in the emotional stories. An exploratory mediation test further showed that personal distress fully mediated the relation between social anxiety and poor emotion recognition.

Our results replicate prior findings that social anxiety is associated with the biased interpretation of emotional information ([18,19,51,59]). However, our findings extend existing research in three ways. First, we offer an explanation for the inconsistent findings in previous studies (see Ref. [18]) by examining different specific facets of empathy. The results confirm that this distinction is relevant, because highly socially anxious individuals only differ in their reports of personal distress, not empathic concern (cf. [21]). In combination with our mediation analysis, we suggest that only negative stress and not a deficit in empathic concern may explain the problems of socially anxious individuals with social functioning. Our findings thus highlight the need to use specific rather than general measures of empathy (see Ref. [10]).

The second way in which this study extends existing findings is related to our stimuli. We used a new, validated emotion recognition test, in which the emotional stimuli consisted of authentic, real life emotional events, rather than standardized posed facial expressions (see Refs. [25,28]). These videos much more resemble actual social situations and thus the types of events that socially anxious people are afraid of and tend to avoid, compared to the standardized, posed emotional expressions that have often been used in previous research. In addition, the videos showed unfolding emotional expressions, which likely represent the social sharing of emotions better than most previous research that uses repetitive, posed, and prototypical expressions as stimuli. By including real-life emotional experiences as stimuli, we were better able to capture the complexities and nuances of everyday emotional expressions, which we believe to be important to predict socially anxious people's interactions.

Third, we operationalized performance in emotion recognition as the agreement between perceivers' ratings of targets' emotions with targets' self-reported emotion ratings (see also [7,60]). More specifically, participants could report several emotions of varying intensity, which likely resembles emotion perception in real-life situations more closely than selecting a single response option from an array. The resulting complex patterns of multiple (or no) emotions were matched with targets' reported emotions, resulting in an emotion accuracy measure based on agreement. We argue that this agreement, or shared identification, may be particularly important to study the interpersonal problems of socially anxious persons.

While the cross-sectional nature of our study precludes establishing causal relationships, it allows us to explore potential mechanisms underlying the link between social anxiety and poor emotion recognition. Previous research unrelated to SA has linked heightened personal distress to a general reduction in cognitive resources ([61]), difficulties in processing subtle emotional nuances ([62]), and diminished accuracy in recognizing emotions ([25], [28]; [63]). Especially the sharing of negative emotions by others is likely considered a social threat (see [64]) and thus could elicit a state of hypervigilance and heightened emotional reactivity in socially anxious people. This is confirmed by the higher distress reported by high socially anxious individuals in our study. There may be different processes that could explain this link. Because personal distress is characterized by a self-focussed rather than other-focussed orientation, socially anxious people may be oriented at regulating their own emotions rather than paying attention to others' emotions (e.g., [65]). This would imply that it is mainly an attentional problem. Another potential mechanism may be that the negative emotions that socially anxious people experience lead to a negativity bias in interpreting others' emotions, especially if they are ambiguous or complex (e.g. Ref. [35]).

5. Limitations and future directions

We acknowledge three limitations of the current research. First, we used a cross-sectional design to establish a relation between social anxiety and reduced emotion recognition. Experimental and longitudinal designs are needed to determine whether social anxiety leads to poor emotion recognition, if poor recognition level leads to interpersonal distress, or if they mutually enforce each other. A second limitation is that our participants were all students. It seems important for future studies to replicate these results with a more heterogeneous (e.g., in age, gender and education) sample of socially anxious individuals to test the generalizability of the patterns we observed. Third, while there are clear advantages of our emotion recognition task, in terms of highly ecologically valid videos and an agreement-based emotion accuracy score, the representativeness of gender differences, the video topics, and the number of video stimuli were limited. Future research should aim to diversify the stimuli and include a larger set of video scenarios to provide a robustness check for the current findings.

We suggest several paths for future studies. First, experimental and longitudinal designs are needed to determine the causal and directional relations between social anxiety, personal distress and emotion recognition. Second, future studies could delve deeper into the underlying mechanisms, such as the intricate interplay between cognitive resources, emotional regulation strategies, attention focus, and the experience of personal distress in socially anxious individuals. Such investigations could uncover the precise nature of these relationships and their implications for therapeutic interventions.

6. Conclusion

The present study aimed to find an explanation for the inconsistencies in previous research on the relation between social anxiety, empathy and emotion recognition. In contrast with many previous studies, we did not use a general empathy measure, but distinguished two facets of empathy: personal distress and empathic concern. We further used an emotion recognition test that better reflects the complexities and nuances of emotion perception in everyday life. We found that compared to low socially anxious individuals, high socially anxious individuals are less accurate in emotion recognition, and report more personal distress, but they do not differ in empathic concern. In addition, the worse emotion recognition is fully mediated by personal distress. We conclude that individuals with social anxiety often find themselves wrestling with personal distress, which seems to be a crucial factor in the interpersonal challenges that they are facing.

Data availability statement

Data will be made available on request.

CRedit authorship contribution statement

Jacob Israelashvili: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Corine Dijk:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Agneta Fischer:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used OpenAI (<https://chat.openai.com>) in order to improve language and readability of sporadic paragraphs. After using this tool, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no conflict of interest. All authors have approved the final article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e24587>.

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