NIH Public Access
Author Manuscript

Negative Interpretation Bias Mediates the Effect of Social Anxiety on State Anxiety

Courtney Beard[1,2] and **Nader Amir**[1,3]

[1] Department of Psychology University of Georgia Athens, GA 30602

Abstract

Cognitive models of social anxiety predict that interpretation bias mediates the relationship between level of social anxiety and state anxiety in response to social-evaluative threat. We tested this prediction in 67 socially anxious undergraduates. Participants completed self-report measures of social anxiety and interpretation bias, and two days later they completed an impromptu speech. Mediational analyses supported the hypothesis that interpretation bias mediates the effect of social anxiety on state anxiety in response to the speech. This relationship was specific to negative interpretation of ambiguous social scenarios. The current findings support cognitive models of social phobia and add to the empirical base supporting the role of interpretation bias in social anxiety.

Keywords

Social phobia; social anxiety; interpretation; cognitive model

---

Cognitive models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997) designate biased interpretation of ambiguous social cues as one of the processes that maintains social anxiety. For example, during a social interaction a socially anxious individual may interpret a conversation partner's yawn as indicative of boredom (negative interpretation), rather than exhaustion (benign interpretation). An individual who interprets the yawn negatively will likely experience more state anxiety during the situation compared to an individual who interprets the yawn as benign.

Consistent with these models, a number of correlational studies have revealed an association between social anxiety and interpretation bias. For example, to examine interpretation bias in social anxiety, many researchers have developed questionnaires comprising ambiguous scenarios (e.g., Amir, Foa, & Coles, 1998; Constans, Penn, Ihen, & Hope, 1999; Roth, Antony, & Swinson, 2001; Stopa & Clark, 2000). These questionnaires require participants to read ambiguous scenarios (e.g., "You see a group of friends having lunch, they stop talking when you approach") along with various interpretations of each scenario (i.e., positive: "They are about to ask you to join," negative: "They were saying negative things about you," and neutral: "They just ended their conversation"). Participants usually rank order the interpretations according to how likely they would be to come to mind if they were in a similar situation. Questionnaire studies have varied in materials used and participant characteristics, yet they all concluded that socially anxious individuals interpret ambiguous social information more

[2]Corresponding Author Permanent Address: Department of Psychiatry and Human Behavior Alpert Medical School of Brown University Box G-BH, Duncan Building Providence, RI 02912 Phone: (401) 444-1964 Fax: (401) 455-0516 Courtney_Beard@brown.edu.
[3]Permanent Address: Department of Psychology SDSU/UCSD Joint Doctoral Program in Clinical Psychology San Diego, CA 92120 namir@mail.sdsu.edu

negatively (or less positively) than non-anxious controls. Studies that have used other measures of interpretation, such as videos (Amir, Beard, & Bower, 2005), facial expressions (Yoon & Zinbarg, 2007), and reaction time indices (Hirsch & Mathews, 1997; 2000), have also revealed biased interpretation in social anxiety.

Although these data are consistent with the hypothesis that there is an association between interpretation bias and social anxiety, little research has examined the cognitive models" prediction that interpretation bias maintains social anxiety. One source of evidence comes from recent studies that directly manipulated interpretation. Computer programs that facilitated a benign interpretation bias in socially anxious individuals led to decreased anticipatory anxiety for a hypothetical social interaction (Murphy, Hirsch, Mathews, Smith, & Clark, 2007) and decreased social anxiety symptoms (Beard & Amir, 2008). Another useful method to test this prediction would be to test whether interpretation bias mediates the relationship between an individual's social anxiety level and state anxiety in response to a social-evaluative threat.

The few studies that have examined cognitive processes as potential mediators have supported the cognitive models. For example, Rapee and Abbott (2007) tested whether various processes outlined in cognitive models of social anxiety mediate response to social stress in individuals with Social Phobia. In that study, participants completed self-report measures of cognitive processes, and an impromptu speech served as a social-evaluative threat situation. Path analysis supported mediational pathways for several cognitive processes predicted by the models, including attentional focus and probability/cost estimates of negative evaluation.

Similarly, Schulz, Alpers, and Hofmann (2008) tested the mediating role of negative self-focused cognitions (e.g., "What I say will sound stupid") in a sample of individuals with varying levels of social anxiety. They found that inducing negative self-focused cognitions led to increased anxiety during a public speaking task compared to a relaxation induction. Moreover, negative self-focused cognitions fully mediated the relationship between social anxiety and state anxiety during the speech. Together, these two studies provide support for several of the cognitive biases outlined in cognitive models. However, neither study included a measure of interpretation bias. Given the robust findings supporting the role of interpretation bias in social anxiety, examining this specific bias as a potential mediator is warranted.

In the current study, we sought to extend research testing cognitive models" predictions by examining whether interpretation bias mediates the relationship between social anxiety and state anxiety in response to social-evaluative threat. To this end, we utilized a previously established measure of interpretation of ambiguous social scenarios (Amir, Foa, & Coles, 1998) and a commonly used social-evaluative threat situation (i.e., impromptu speech). As cognitive models' predictions are specific to the maintenance of social phobia, we tested mediation in a group of socially anxious individuals.

Methods

Participants

We recruited socially anxious undergraduates with an advertisement soliciting individuals with "difficulty giving speeches." Participants who responded to the advertisement and who scored 30 or above on the Liebowitz Social Anxiety Scale–self-report version (Mennin, et al., 2002) were eligible for the study. A total of 67 participants (64% female) were eligible and completed all the study procedures.[1] Participants received research credit as compensation. Demographic information is presented in Table 1. *Measures*

[1]The participants in the current paper are a subsample of participants included in the first author's dissertation.

Social Anxiety Level—Participants completed the self-report version of the *Liebowitz Social Anxiety Scale* (LSAS; Liebowitz, 1987) as a measure of social anxiety. The LSAS consists of 24 social situations (e.g., giving a speech) that are commonly feared by socially anxious individuals. For each situation, participants rate their fear (0–3) and avoidance (0–3). The self-report version of the LSAS correlates highly with the clinician administered version and has demonstrated good convergent and discriminant validity (Fresco, Coles, & Heimberg, 2001).

State Anxiety Level—Participants completed the state form from the *State Trait Anxiety Inventory* (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1970), which consists of 20 items assessing state symptoms of general anxiety and has adequate psychometric properties (r ranges from .73 to .86) (Spielberger et al., 1970).

Interpretation Bias—The *Interpretation Questionnaire* (IQ; Amir, Foa, & Coles, 1998) was developed to assess individuals' interpretation of ambiguous social scenarios. This questionnaire comprises 22 ambiguous scenarios (e.g., "You see a group of friends having lunch, they stop talking when you approach") and three interpretations of each scenario (i.e., positive: "They are about to ask you to join," negative: "They were saying negative things about you," and neutral: "They just ended their conversation"). Participants are asked to rank order how likely each interpretation would be to come to mind if they were in a similar situation. To conserve time, participants completed a short version of the IQ comprising 10 scenarios (5 social and 5 non-social), which demonstrated adequate internal consistency ($\alpha = 0.70$) in our sample. We used participants' rankings of the negative interpretations of the social scenarios as the measure of interpretation bias.

Additional Measures—To further characterize the participants, they completed the trait form from the *State Trait Anxiety Inventory* (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1970), which consists of 20 items assessing trait symptoms of general anxiety, and the *Beck Depression Inventory, 2nd ed* (BDI-II; Beck, Steer, & Brown, 1996), which consists of 21 items that assess various symptoms of depression.

Procedure

Participants completed two experimental sessions. In the first session, they completed the self-report measures (LSAS, IQ, STAI-trait, BDI-II). Participants returned two days later for the second experimental session.[2] In that session, participants were asked to make an impromptu speech. They were told that their speech would be video recorded so that a graduate student could later rate its quality. They were then presented with a list of five topics (abortion, corporal punishment, seatbelt laws, nuclear power, and the American Health System; Hofmann, Newman, Ehlers, & Roth, 1995). They chose one of the five topics and spent two minutes thinking and writing notes in preparation for the speech. However, they were told they could not use these notes during the speech. At the end of the two-minute preparation period, the experimenter collected the notes, and participants stood in a designated area in front of a video camera (Logitech web camera on top of computer monitor). Participants briefly saw their image on the computer screen before the experimenter pressed "Record." After the camera began recording, the experimenter then minimized the camera window so that participants could not see themselves during the speech. The experimenter either stopped participants after five minutes, or participants could stop at any time by holding up a STOP card. Participants then completed the STAI-state.

---

[2]After arriving at both experimental sessions, the participants completed several, additional measures that are not the focus of this paper.

Results

Mediational Analyses

Means and standard deviations for each measure are presented in Table 1. To test the hypothesis that interpretation bias mediates the relationship between social anxiety and state anxiety in response to social-evaluative threat, we conducted mediation analysis following the procedure described by MacKinnon and colleagues (MacKinnon, Fairchild, & Fritz, 2007;MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In brief, this procedure tests the product of the coefficients for the effects of (1) the independent variable on the proposed mediators (α), and (2) the mediator on the dependent variable when the independent variable is taken into account (β). This procedure is a variation on the Sobel (1982) test that accounts for the non-normal distribution of the $\alpha\beta$ path through the construction of asymmetric confidence intervals (MacKinnon, Fritz, Williams, & Lockwood, 2007). Results revealed that the 95% confidence interval of $\alpha\beta$ did not overlap with zero (lower limit = 0.02999, upper limit = 0.26150), which provides support for the indirect effect of social anxiety level on state anxiety response through interpretation bias.

Correlational Analyses

All of the measures (LSAS, IQ-social, IQ-non-social, STAI-trait, BDI) correlated with state anxiety in response to the speech (see Table 2). However, only social anxiety (LSAS) correlated with interpretation bias of social scenarios ($r = .36$). Consistent with the mediational analyses, the correlation between social anxiety and state anxiety in response to the speech became non-significant after controlling for social interpretation bias ($p > .2$).

Discussion

The current study tested the cognitive models' prediction that interpretation bias mediates the effect of social anxiety on state anxiety response to social-evaluative threat. Mediational analyses supported this hypothesis, as rankings of negative interpretations of social scenarios mediated the relationship between social anxiety level and state anxiety in response to the impromptu speech. This finding extends previous studies testing other cognitive mediators (Rapee & Abbott, 2007; Schulz, Alpers, & Hofmann, 2008) and suggests that interpretation bias is also involved in the maintenance of social anxiety. In the current study, trait anxiety and depression also significantly correlated with state anxiety in response to the speech, but they did not correlate with interpretation bias. Additionally, the rankings of negative interpretations on the non-social items of the interpretation questionnaire correlated with state anxiety, but not with social anxiety. In sum, the current study supports a specific pathway from social anxiety to state anxiety through interpretation of social situations. Future studies are needed to delineate additional indirect pathways between measures of psychopathology (e.g., trait anxiety, depression) and state anxiety in response to social threat.

The current results converge with several lines of research supporting the role of interpretation bias in the maintenance of social anxiety. For example, recent studies show that correcting interpretation bias positively affects social anxiety symptoms (e.g., Beard & Amir, 2008). In that study, a computerized interpretation modification program effectively changed interpretation bias in socially anxious individuals compared to a control condition. Moreover, changes in interpretation bias mediated the effect of group on change in social anxiety symptoms. The current results also converge with findings that interpretation bias ameliorates with effective treatment of social phobia (Franklin, Huppert, Langner, Leiberg, & Foa, 2005). These findings support numerous studies that found an association between interpretation bias and social anxiety (e.g., Amir, Foa, & Coles, 1998). Moreover, these findings suggest that

interpretation bias is not simply a consequence of social anxiety, but rather a mechanism involved in the maintenance of social anxiety.

Our measure of interpretation included items about social situations, but it did not include any items specifically about public speaking. Thus, it appears that a negative interpretation bias in social situations in general is related to state anxiety in response to a specific social situation (i.e., impromptu speech). Future studies might extend this study by providing participants with ambiguous feedback specific to the social situation used (e.g., facial expressions of audience members during a speech) and then measure participants" interpretation of that feedback. One might expect that interpretation of ambiguous cues during a specific social threat may be a stronger mediator of the effect of social anxiety on state anxiety compared to the more global measure of interpretation used in the current study.

Future research could improve upon the current study in several ways. First, these findings need replication in a clinical sample of individuals with Social Phobia. Similarly, it is unclear if the current findings from a homogeneous, undergraduate sample will generalize to a heterogeneous, older sample of individuals with social anxiety. Second, we did not include a control group because cognitive models do not make predictions about interpretation bias in non-anxious individuals. However, future studies may also want to include a non-anxious control group to determine whether this mediational this pathway is specific to socially anxious individuals. We only used one social situation as our social-evaluative situation. We chose a public speaking task because previous studies testing cognitive models have used this task and because most socially anxious individuals fear public speaking. However, it would be interesting to test whether interpretation bias also mediates in different social situations (e.g., interaction task). We also only used one measure of interpretation bias. Future research is needed to determine if other measures of interpretation (e.g., "on-line" reaction time tasks) also reveal mediation between social anxiety and state anxiety in response to social threat. Finally, future studies might also test a more complex mediational model that includes measures of imagery, as studies have found that interpretation bias and imagery likely interact to maintain social anxiety (e.g., Hirsch, Mathews, & Clark, 2007).

Acknowledgments

References

Amir N, Foa EB, Coles ME. Negative interpretation bias in social phobia. Behaviour Research and Therapy 1998;36:945–958. [PubMed: 9714945]

Amir N, Beard C, Bower E. Interpretation and Social Anxiety. Cognitive Therapy and Research 2005;29:433–443.

Beard C, Amir N. A Multi-session Interpretation Modification Program: Change in Interpretation and Social Anxiety. Behaviour Research and Therapy 2008;46:1135–1141. [PubMed: 18675400]

Beck, AT.; Steer, RA.; Brown, GK. Manual. 2. San Antonio, TX: Psychological Corporation; 1996. Beck Depression Inventory.

Clark, D.; Wells, A. A cognitive model of social phobia. In: Heimberg, R.; Liebowitz, M.; Hope, D.; Schneider, R., editors. Social Phobia: Diagnosis, Assessment, and Treatment. New York: Guilford Press; 1995. p. 69-93.

Constans J, Penn D, Ihen G, Hope D. Interpretive biases for ambiguous stimuli in social anxiety. Behaviour Research and Therapy 1999;37:643–651. [PubMed: 10402689]

Franklin ME, Huppert J, Langner R, Leiberg S, Foa EB. Interpretation Bias: A Comparison of Treated Social Phobics, Untreated Social Phobics, and Controls. Cognitive Therapy and Research 2005;29:289–300.

Fresco DM, Coles ME, Heimberg RG, Leibowitz MR, Hami S, Stein MB, Goetz D. The Liebowitz Social Anxiety Scale: A comparison of the psychometric properties of self-report and clinician-administered formats. Psychological Medicine 2001;31:1025–1035. [PubMed: 11513370]

Hirsch C, Mathews A. Interpretive Inferences When Reading About Emotional Events. Behavior Research and Therapy 1997;35:1123–1132.

Hirsch C, Mathews A. Impaired Positive Inferential Bias in Social Phobia. Journal of Abnormal Psychology 2000;109:705–712. [PubMed: 11195994]

Hirsch CR, Mathews A, Clark DM. Inducing an interpretation bias changes self-imagery: A preliminary investigation. Behaviour Research and Therapy 2007;45:2173–2181. [PubMed: 17178103]

Hofmann SG, Newman MG, Ehlers A, Roth WT. Psychophysiological differences between subgroups of social phobia. Journal of Abnormal Psychology 1995;104:224–231. [PubMed: 7897046]

Liebowitz MR. Social Phobia. Modern Problems in Phamacopsychiatry 1987;22:141–173.

MacKinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. Annual Review of Psychology 2007;58:593–614.

MacKinnon DP, Fritz MS, Williams J, Lockwood CM. Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. Behavior Research Methods 2007;39:384–389. [PubMed: 17958149]

MacKinnon DP, Lockwood CM, Hoffmann JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychological Methods 2002;7:83–104. [PubMed: 11928892]

Mennin DS, Fresco DM, Heimberg RG, Schneier FR, Davies SO, Liebowitz MR. Screening for social anxiety disorder in the clinical setting: using the Liebowitz Social Anxiety Scale. Journal of Anxiety Disorders 2002;16:661–673. [PubMed: 12405524]

Murphy R, Hirsch CR, Mathews A, Smith K, Clark DM. Facilitating a benign interpretation bias in a high socially anxious population. Behaviour Research and Therapy 2007;45:1517–1529. [PubMed: 17349970]

Rapee R, Abbott MJ. Modelling relationships between cognitive variables during and following public speaking in participants with social phobia. Behaviour Research and Therapy 2007;45:2977–2989. [PubMed: 17850761]

Rapee R, Heimberg R. A cognitive-behavioral model of anxiety in social phobia. Behaviour Research and Therapy 1997;35:741–756. [PubMed: 9256517]

Roth D, Antony M, Swinson R. Interpretations for anxiety symptoms in social phobia. Behaviour Research and Therapy 2001;39:129–138. [PubMed: 11153968]

Sobel, ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: Leinhart, S., editor. Sociological methodology. Washington, DC: American Sociological Association; 1982. p. 290-312.

Schulz SM, Alpers GW, Hofmann SG. Negative self-focused cognitions mediate the effect of trait social anxiety on state anxiety. Behaviour Research and Therapy 2008;46:438–449. [PubMed: 18321469]

Spielberger, CD.; Gorsuch, RL.; Lushene, R. Manual for the State-Trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologist Press; 1970.

Stopa L, Clark D. Social Phobia and interpretation of social events. Behaviour Research and Therapy 2000;38:273–283. [PubMed: 10665160]

Yoon L, Zinbarg R. Threat is in the eye of the beholder: Social anxiety and the interpretation of ambiguous facial expressions. Behaviour Research and Therapy 2007;45:839–847. [PubMed: 16797485]

Table 1

Demographic Information and Self-report Measures (N = 67)

Variable	N	(%)
Ethnicity		
Caucasian	51	(76)
African American	6	(9)
Asian American	8	(12)
Other	2	(3)
	M	(*SD*)
Age	19	(1.2)
Education (in years)	14	(1.0)
LSAS-total	53.7	(15.60)
IQ-social	1.9	(0.56)
IQ-non-social	2.5	(0.45)
STAI-state	47.7	(11.71)
STAI-trait	41.5	(11.56)
BDI-II	10.0	(7.38)
Speech duration (in seconds)	127	(88.1)

Note. LSAS-total = Liebowitz Social Anxiety Scale-self report, IQ = Interpretation Questionnaire ranking of negative interpretations as 1st, 2nd, or 3rd likely to come to mind, STAI = Spielberger State-Trait Anxiety Inventory, BDI-II= Beck Depression Inventory, 2nd Edition.

Table 2

Correlation among measures (N = 67)

trait	LSAS	IQ-social	IQ-non-social	STAI-state	STAI-trait
IQ-social	−.36 (*p* = .003)	-----	-----	-----	-----
IQ-non-social	−.08 (*p* = .573)	.48 (*p* = .000)	-----	-----	-----
STAI-state	.27 * (*p* = .027)	−.41 (*p* = .001)	−.35 (*p* = .004)	-----	-----
STAI-trait	.39 (*p* = .001)	−.23 (*p* = .064)	−.11 (*p* = .396)	.62 (*p* = .000)	-----
BDI	.24 (*p* = .049)	−.13 (*p* = .305)	−.17 (*p* = .167)	.43 (*p* = .000)	.77 (*p* = .000)

Note. LSAS-total = Liebowitz Social Anxiety Scale-self report, IQ = Interpretation Questionnaire ranking of negative interpretations as 1st, 2nd, or 3rd likely to come to mind, STAI = Spielberger State-Trait Anxiety Inventory, BDI-II= Beck Depression Inventory, 2nd Edition. We did not present correlations with speech duration because it did not correlate with any measures (*ps* > .1).

*
Partial correlation after controlling for IQ-social, *r* = .15, *p* = .244.