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Cognitive Bias in Adolescents With Social Anxiety Disorder

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Judgmental biases for threat-relevant stimuli are thought to be important mechanisms underlying the etiology and maintenance of anxiety disorders. Previous research has shown that adults with social anxiety disorder rate negative social events as more likely (probability) to occur as well as more distressing (cost) than do nonanxious controls. However, no empirical research has examined whether this is also the case in adolescents with social anxiety disorder. Elucidation of the cognitive processes of social anxiety disorder in the adolescent population may aid in a better understanding of the etiology and maintenance of the disorder, and may suggest directions for treatment and prevention efforts. This study investigated probability and cost estimations of negative social and nonsocial events among adolescents with social anxiety disorder relative to nonanxious controls. Results indicated that socially anxious adolescents overestimated the cost and probability of negative social events compared to nonanxious adolescents, even after controlling for depressive symptoms. Implications and limitations of these findings are discussed.

KEY WORDS: social anxiety disorder; cognitive bias; information processing; adolescents.

INTRODUCTION

Social anxiety disorder (SAD), also known as social phobia, refers to persistent fear and/or avoidance of social situations related to the possibility of scrutiny by others and fears of acting in such a way that is embarrassing or humiliating (*DSM-IV*; American Psychiatric Association, 1994). SAD has been found to be more common than previously thought (Kessler et al., 1994; Stein & Kean, 2000), and frequently associated with various forms of comorbid psychopathology (Kessler, Stang, Wittchen,

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Stein, & Walters, 1999; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). Although relatively little is known about the etiology of SAD, considerable progress has been made in assessment and treatment of the disorder in the adult population and more recently in child and adolescent populations.

Theoretical Models of SAD

Several theoretical models have been proposed to explain the mechanisms that underlie SAD, some of which emphasize cognitive processes (e.g., Beck, Emery, & Greenberg, 1985; Clark & Wells, 1995; Foa & Kozak, 1986). Foa and Kozak (1985, 1986) proposed a theory of anxiety disorders that focuses on specific dysfunctional cognitive assumptions. According to Foa and Kozak, social fears are characterized by unusually high negative valence (cost) for social scrutiny and criticism as well as overestimation of their likelihood (probability). Persons with SAD often believe this high probability stems from their own perceived deficits in social performance that are exacerbated by their anxiety. Their fears include associations about social situations and anxiety symptoms, evaluation of social encounters as threatening, and evaluation of anxiety responses evoking criticism from others as dangerous.

In an attempt to study core elements of this model empirically, Foa, Franklin, Perry, and Herbert (1996) examined both probability and cost estimates of negative socially relevant and socially irrelevant events in adults with SAD relative to nonanxious controls. They also studied the effects of a cognitive behavioral treatment, which has been found successful in ameliorating social anxiety, on these biases. They found that persons with SAD rated negative social events, but not nonsocial events, as more probable relative to nonanxious controls. Results also indicated that those with SAD rated negative social events but not nonsocial events as more costly relative to nonanxious controls. Both cost and probability estimates of the SAD participants for social events decreased following treatment; however, these estimates remained higher than those of the control participants. Notably, whereas a decrease in both estimated cost and probability of social events was associated with the level of social anxiety severity following treatment, this relationship remained strong for estimated cost after controlling for change in estimated probabilities, but not vice versa. Thus, change in cost estimates of social events accounted for the greater percentage of variance in improvement of social anxiety.

Gilboa-Schechtman, Franklin, and Foa (2000) further explored probability and cost estimates by comparing individuals with SAD, individuals with obsessive compulsive disorder, and nonanxious controls on probability and emotional reaction ratings for both negative and positive social events. Their results supported the previous findings that socially anxious individuals rated the probability and impact of negative social events higher relative to those with obsessive compulsive disorder as well as nonanxious controls. They also found that socially anxious individuals estimated positive events as less likely to occur as well as more likely to have a greater impact with more intense negative reactions than did the other two groups.

The above two studies and other information processing research in SAD have focused solely on adult populations. Although research has shown that the onset of SAD is typically during adolescence (Schneier et al., 1992), very little research has

been conducted investigating the etiology and treatment of SAD in adolescents (for recent reviews, see Kashdan & Herbert, 2001; Velting & Albano, 2001).

SAD in Children and Adolescents

It is common for children and adolescents to report many types of fears and worries (Essau, Conradt, & Petermann, 1999; Muris, Merckelbach, Gadet, & Moulaert, 2000). However, these fears are usually transitory and are not impairing for most youths. SAD is characterized by social fears that are persistent and cause significant impairment in functioning. Furthermore, the severity of social anxiety in children and adolescents has been closely correlated with severity of school refusal (Last & Strauss, 1990) and selective mutism (Black & Uhde, 1992; Dummit, Klein, Tancer, & Asche, 1997). SAD in adolescents is related to increased comorbidity with depressive disorders, somatoform disorders, and substance use disorders (Essau et al.,1999). In addition, adolescents with SAD have few friends, poor school performance, difficulties with intimate relationships, and increased alcohol use (Albano, Marten, Hold, Heimberg, & Barlow, 1995; Wittchen, Stein, & Kessler, 1999). These findings indicate that SAD during childhood and adolescence is associated with significant problems in functioning.

Some literature suggests that the clinical syndrome of SAD in children and adolescents is very similar to the presentation in adults. For example, both populations report the presence of identical somatic symptoms such as heart palpitations, trembling and shaking, blushing, and sweating (Beidel, Christ, & Long, 1991; Essau et al., 1999; Turner, Beidel, & Larkin, 1986). In addition, both populations describe similar types of feared social situations with public speaking and going to parties representing the most commonly feared situations (Beidel, 1998; Beidel, Turner, & Morris, 1999; Essau et al., 1999).

Limited research has described the clinical features of SAD during childhood and adolescence in comparison with same-aged peers without psychopathology. Beidel et al. (1999) examined the clinical syndrome of SAD in 50 preadolescent children with SAD and compared aspects of their functioning with a sample of 22 normal peers. She found that children with SAD had a higher level of general emotional overresponsiveness, social fear and inhibition, dysphoria, loneliness, and general fearfulness. In addition, 60% suffered from another concurrent disorder. The socially anxious children were more likely to have poorer social skills and reported socially distressing events to occur quite frequently. They also exhibited significant maladaptive coping behaviors to deal with distressing events. Specific areas of reported fear and avoidance included speaking in front of the class, performances, joining in conversations, starting conversations, and speaking to adults. Even when criteria for generalized anxiety disorder were not met, children with SAD had symptoms of generalized anxiety and specific fears, indicating that these children may also suffer distress in nonsocial situations. Spence, Donovan, and Brechman-Toussaint (1999) also compared differences between children (ages 7–14) with SAD and their same aged peers on several social outcomes. They found that children with SAD had a higher level of negative cognitions, exhibited considerable deficits in social skills, and were less likely to receive positive outcomes from their peers during their social interactions in comparison to their nonanxious peers. These studies illuminate

the clinical presentation of childhood SAD. No studies to date have focused on the clinical picture of adolescent SAD.

No research has yet explored cognitive models of SAD within the adolescent population. It remains uncertain whether the same mechanisms of development and maintenance of SAD theorized for adults hold true for adolescents. That is, do socially anxious adolescents differ in their cognitive bias compared to nonanxious adolescents, just as adults with social anxiety disorder exhibit specific cognitive biases in relation to nonanxious adults? Or, are there different mechanisms that underlie SAD in adolescents, such as cognitive developmental differences or other differences in the course of the disorder? For example, it could be that the development of SAD during adolescence is primarily the result of direct conditioning experiences, with no awareness of negative cognitive appraisals to the feared stimuli, and as the disorder progresses into adulthood, interpretation biases develop which further sustain the disorder.

Because empirical data on the development and course of SAD in adolescence have been very limited and also because SAD usually begins during adolescence, follows a chronic course, and is quite debilitating, a better understanding of the etiology and maintenance of SAD during adolescence is needed. In addition, a better understanding of the etiology and maintenance of SAD may also aid in the development of improved treatment and prevention efforts.

Goals of the Present Study

The present study was designed to evaluate the potential role of cognitive biases in adolescent SAD. This study examined the probability and cost estimation of negatively socially relevant and socially irrelevant events in adolescents with SAD relative to nonanxious controls. Depressive symptoms have been associated with negative attributional styles (Sweeney, Anderson, & Bailet, 1986), and therefore may also be related to negative interpretations of social situations in individuals with depressive symptomotology. Given the high comorbidity of depression and SAD (Kessler et al., 1999; Schneier et al., 1992), depressive symptoms were examined in order to elucidate their role in the relationship between SAD and information processing. In addition, gender differences may exist among individuals with SAD (Turk et al., 1998); therefore, potential effects of gender were explored in the analyses. It was hypothesized that (a) adolescents with SAD would rate negative social events as more probable than nonanxious controls; (b) adolescents with SAD would rate negative social events as more costly than nonanxious controls; and (c) there would be no difference between adolescents with SAD and nonanxious controls on probability and cost ratings of nonsocial situations.

METHOD

Participants

Social Anxiety Disorder Group

Thirty-seven socially anxious participants meeting DSM-IV criteria (American Psychiatric Association, 1994) for the generalized subtype of SAD participated in

the study. DSM-IV defines generalized SAD by the presence of intense fear and avoidance of most social situations. Participants were recruited through community media announcements as well as through a network of local school personnel and social service agencies for a cognitive-behavior treatment program for adolescent SAD offered under the auspices of an anxiety clinic in an urban health sciences university. Parents of potential participants were contacted by phone for a 20-min telephone screening in an attempt to ascertain if the applicant was likely to meet the study inclusion criteria. Those who reported symptoms of social anxiety were invited for an extensive evaluation with a trained diagnostician using the Anxiety Disorders Interview Schedule for DSM-IV: Child Version, a semistructured interview based on DSM-IV criteria (ADIS-DSM-IV:C; Albano & Silverman, 1996). Given time and resource constraints, the interview was only conducted with the adolescent.
Inclusion criteria included

(a) age between 12 and 17;
(b) literacy in English;
(c) DSM-IV diagnosis of primary SAD (generalized subtype). To meet criteria for the generalized subtype of SAD, the participant must have reported intense fear and avoidance of at least three distinct types of social situations, causing significant impairment in functioning.

The exclusion criteria included

(a) history of mental retardation, pervasive developmental disorder, organic mental disorder, bipolar disorder, a psychotic disorder, or borderline or schizotypal personality disorders. Other Axis I disorders (e.g., overanxious disorder, major depression, dysthymia) were acceptable as long as SAD was judged to be clearly primary to and of greater severity than the secondary diagnosis. Primacy was defined as the disorder with the earliest onset, and severity was defined in terms of the level of symptomatology associated with the condition as well as the degree of impairment attributed to it. The diagnostician made these judgments.
(b) presence of significant suicidal risk (as assessed by the diagnostician using the ADIS-DSM-IV:C and the Beck Depression Inventory);
(c) substance abuse or dependence within the past year;
(d) unstable or untreated medical condition (e.g., asthma, endocrine disease, vascular disease) that might confuse the diagnosis of an anxiety disorder.

Because of epidemiological data indicating that there is a high comorbidity of other Axis I disorders with SAD, we allowed patients with secondary comorbid Axis I disorders to enter this study in order to enhance the external validity of the results.

The SAD sample consisted largely of Caucasian and African American urban high school students with a mean age of 15 years from middle class families. Table I provides means and frequencies of demographic variables including gender, race, grade level, living situation, and Hollingshead Index of Family Social Status. Hollingshead Index of Family Social Status scores (Hollingshead, 1975) were calculated to measure social status of the participants' families. Computed scores range from a high of 66 to a low of 8, with higher scores representing higher social status

Table I. Means, Frequencies, and Significance Tests for Demographic Characteristics

	SAD[a]	NAC[b]	χ^2
Age (Mean ± SD)	15.2 ± 1.4	15.1 ± 1.4	*ns*
Gender			
Male	16 (43%)	8 (36%)	*ns*
Female	21 (57%)	14 (64%)	
Race			
Caucasian	18 (49%)	11 (50%)	*ns*
African American	15 (41%)	9 (41%)	
Other	4 (8%)	2 (9%)	
Grade Level			
7th & 8th grade	8 (22%)	4 (18%)	
9th & 10th grade	16 (43%)	8 (36%)	*ns*
11th & 12th grade	11 (30%)	10 (45%)	
Graduated from HS	2 (5%)	—	
Living situation			
With one parent	10 (27%)	8 (36%)	*ns*
With both parents	26 (70%)	13 (59%)	
Other	1 (3%)	1 (5%)	
Hollingshead Index			
Level I	8 (22%)	5 (23%)	*ns*
Level II	9 (24%)	8 (36%)	
Level III	9 (24%)	4 (18%)	
Level IV	2 (5%)	4 (18%)	
Missing data	9 (24%)	1 (5%)	

Note. SAD = Social Anxiety Disorder Group. NAC = Nonanxious Control Group.
[a] $n = 37$ for SAD group.
[b] $n = 22$ for NAC group.
[c] t test.

levels. Level I represents the status structure of major business and professionals, Level II represents medium business, minor professional, and technical social strata, Level III represents skilled craftsman, clerical, and sales workers strata, and Level IV represents machine operators and semiskilled workers strata.

In addition, of the 37 participants, 19 had no other Axis I diagnosis (51%), 11 had a comorbid generalized anxiety disorder (30%), 7 had comorbid dysthymic disorder (19%), 2 had comorbid major depression (5%), and 9 had some other Axis I diagnosis (24%), including attention deficit hyperactivity disorder, specific phobia, obsessive compulsive disorder, separation anxiety disorder, and bulimia nervosa.

Nonanxious Control Group

Twenty-nine nonanxious control participants (NAC) were recruited through a network of local school personnel and social service agencies. These participants were also between the ages of 12 and 17 and were literate in English. The NAC participants were paid 5 dollars for their participation in this study. These participants underwent a semistructured interview based on screening questions from the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1997). Participants who endorsed any evidence of a mood

disorder, anxiety disorder, or a psychotic disorder were excluded. In addition, participants completed the Social Phobia Anxiety Inventory for Children and Adolescents (SPAI-C: Beidel, Turner, & Morris, 1995) and the Beck Depression Inventory (BDI: Beck, Rush, Shaw, & Emery, 1979). Control participants were required to fall within the nonclinical range on both of these instruments, defined as less than 15 on the SPAI-C and less than 13 on the BDI (SPAI-C: Beidel et al., 1995; BDI: Beck et al., 1979). The combination of the brief diagnostic interview as well as the self-report measures ruled out psychopathology among the NAC participants. Seven potential participants were excluded from the study for endorsing screening questions and/or scoring higher than a 15 on the SPAI-C or scoring higher than a 13 on the BDI. The following description of participants is, therefore, on the remaining 22 NAC participants.

The NAC sample, like the SAD sample, consisted of Caucasian and African American urban high school students with a mean age of 15 years from middle class families (see Table I for demographic characteristics).

Procedure

The SAD group was initially screened by telephone and then brought into the clinic to complete the ADIS-DSM-IV:C interview. The NAC group was screened by completing the SCID screening interview. After each group completed the screening/interview process, both the SAD and NAC groups completed the SPAI-C, BDI, and Probability/Cost Questionnaires for Children (PCQ-C); these questionnaires are described below. Both groups were asked to complete all four measures again approximately 2 weeks later to assess test–retest reliability. The SAD group was administered these measures for both time points before beginning treatment.

Measures

Anxiety Disorders Interview Schedule for DSM-IV: Child Version (ADIS-DSM-IV:C; Albano & Silverman, 1996)

The ADIS-DSM-IV:C is a structured interview designed for the assessment of anxiety disorders and other Axis I disorders for children and adolescents. High interrater reliability has been reported with a sample of participants with SAD (Silverman & Nelles, 1988; Silverman & Rabian, 1995). The social anxiety disorder subsection of the ADIS-DSM-IV:C contains separate ratings made by the child or adolescent during the interview of the severity of the anxiety and avoidance across various social situations.

Social Phobia Anxiety Inventory for Children (SPAI-C; Beidel et al., 1995)

The SPAI-C consists of 26 items rated on a 3-point Likert scale (*never or hardly ever, sometimes, most of the time or always*). The items assess a range of potentially anxiety-producing situations and assess physical and cognitive characteristics of SAD as well as avoidance behaviors. Nine of the 26 items have subitems allowing the child

to rate his or her distress based on specific characteristics of the interpersonal partner. The SPAI-C was adapted from the adult version of the instrument, the Social Phobia Anxiety Inventory (Beidel, Turner, Stanley, & Dancu, 1989). The SPAI-C has been found to have high internal consistency, $r = .95$, high 2-week test–retest reliability, $r = .86$, and adequate reliability at 10 months, $r = .63$ (Beidel et al., 1995). The SPAI-C was also shown to have good discriminative validity, convergent validity, and external validity (Beidel, Turner, & Fink, 1996; Beidel, Turner, Hamlin, & Morris, 2000).

Beck Depression Inventory (BDI; Beck et al., 1979)

This measure consists of 21 items, each of which is rated as to how it described the participant's feelings over the past week. The BDI is the most widely used self-report measure of depression in adults and is supported by an extensive psychometric literature (Beck & Steer, 1988; Richter, Werner, Heerlein, Kraus, & Sauer, 1998). Psychometric properties of the BDI with adolescent populations have been found to be similar to findings with adult populations (Ambrosini, Metz, Bianchi, Rabinovich, & Undie, 1991; Barrera & Garrison-Jones, 1988; Bennett et al., 1997; Kashani, Sherman, Parker, & Reid, 1990; Kutcher & Marton, 1989; Roberts, Lewinsohn, & Seeley, 1991; Strober, Green, & Carlson, 1981; Teri, 1982).

Probability/Cost Questionnaire for Children (PCQ-C)

This questionnaire was derived from the measure developed by Foa, Franklin, Perry, & Herbert (1996). It consists of 40 items, 20 negative nonsocial events (e.g., *you will lose your backpack*) and 20 negative social events (e.g., *you will be ignored by someone you know*). The PCQ-C is modified from the original version to be more applicable and comprehendible for children and adolescents (18 items were altered to apply to common social and nonsocial events a typical adolescent may experience, and some language was changed to be understandable for a younger population). For example, "*You will walk into a meeting late*" was changed to "*You will walk into class late*" and "*You will feel inferior to others*" was changed to "*you will feel not as important as others*." The questionnaire yields four subscales: social probability, nonsocial probability, social cost, and nonsocial cost. These subscales were originally theoretically derived. The questionnaire was counterbalanced so that half of the participants first rated the probability that these hypothetical events would occur and then rated the cost associated with each event, whereas the other half first rated the cost of the event and then the probability. All ratings are made on a 9-point Likert scale ranging from 0 (*not at all likely/bad*) to 8 (*extremely likely/bad*). The subscales of the original PCQ has been shown to have adequate internal consistency (Cronbach's $\alpha = .85–.97$) as well as satisfactory test–retest reliability (Foa et al., 1996). Given that this measure was revised to facilitate its appropriateness for children and adolescents, its psychometrics are unknown. As described below, preliminary psychometric properties were examined with study participants to evaluate the reliability of the PCQ-C.

RESULTS

This study utilized a quasi-experimental design comparing questionnaires completed by a group of participants with SAD to a group of nonanxious control participants. All participants were asked to complete three questionnaires (PCQ-C, SPAI-C, and BDI) at two time points.

Preliminary Analyses

No significant differences were found in demographic characteristics between the two participant groups for gender, $\chi^2(1, N = 59) = 0.27$, *ns*, grade level, $\chi^2(6, N = 59) = 3.2$, *ns*, race $\chi^2(3, N = 59) = 0.61$, *ns*, living condition, $\chi^2(2, N = 59) = 0.79$, *ns*, or age, $t(57) = -.067$, *ns*. Likewise, no significant differences were found between groups for the Hollingshead Index of Social Status categories, $\chi^2(4, N = 59) = 6.3$, *ns*. Means and frequencies for demographic characteristics are presented in Table I.

Independent sample *t* tests were computed to detect differences in SPAI-C and BDI scores between the two groups (see Table II). As expected, SPAI-C scores for the SAD group were significantly higher than SPAI-C scores for the NAC group ($t = -7.51$, $p < .001$). In addition, the SAD group reported more depressive symptoms than did the NAC group ($t = -3.58$, $p < .001$). The two groups did overlap somewhat on SPAI-C and BDI scores, suggesting that the NAC group did not result from a selection bias resulting in a "supernormal" control group.

Psychometric Properties of the PCQ

Internal Consistency and Retest Reliability

The internal consistency of the four PCQ-C subscales was examined using Cronbach's alpha for the entire sample. All four subscales demonstrated high internal consistency (Cronbach's $\alpha = .81$–$.96$). When alphas were calculated separately for

Table II. Means and Standard Deviations for SPAI-C, BDI, and PCQ-C Subscales

	SAD			NAC			
	M	*SD*	*n*	*M*	*SD*	*n*	*t* tests
SPAI-C	18.45	9.64	37	2.36	3.55	22	−7.51*
BDI	9.88	9.30	34	2.45	3.49	22	−3.58*
PCQ-C cost							
Social	87.30	32.47	37	30.00	27.43	22	−6.93*
Nonsocial	71.32	32.58	37	43.73	32.84	22	−3.14*
PCQ-C probability							
Social	67.19	30.15	37	25.73	22.79	22	−5.57*
Nonsocial	25.46	16.37	37	27.77	21.58	22	*ns*

Note. SPAI-C = Social Phobia Anxiety Inventory for Children. BDI = Beck Depression Inventory. PCQ-C = Probability Cost Questionnaire for Children.
*$p < .005$.

both groups, internal consistency of the four PCQ-C subscales remained high for both the NAC group (Cronbach's $\alpha = .87–.93$) and for the SAD group (Cronbach's $\alpha = .76–.92$).

Both groups were tested twice within a 2-week interval to assess changes on the social and nonsocial scales of both the probability and cost questionnaires. Pearson correlations revealed good 2-week test–retest reliability for each of the four subscales of the PCQ-C. The social probability subscale was $r = .86$, $p < .001$; the nonsocial probability subscale was $r = .84$, $p < .001$; the social cost subscale was $r = .93$, $p < .001$; and the nonsocial cost subscale was $r = .71$, $P < .001$. No significant differences were found between means of the two test points for the entire sample on any of the PCQ-C subscales.

Probability and Cost Judgments

A multivariate analysis of covariance (MANCOVA) was computed on the PCQ-C measure to address the principal hypotheses. To evaluate the possibility of gender differences in responses on the cognitive bias measure, gender was included as an independent variable. As noted above, the SAD group reported more depressive symptoms as indicated by the BDI. Scores on the BDI were therefore included as a covariate in order to control for the possible impact of depressive symptoms on the PCQ-C. The MANCOVA examined the four PCQ-C subscales (social cost, nonsocial cost, social probability, and nonsocial probability) by group (SAD vs. NAC) and by gender (male vs. female) covarying BDI scores. After covarying BDI scores, the group effect was still significant, Hotelling's $T^2 = .683$, $F(4, 54) = 8.20$, $p < .001$. The main effect for gender was not significant, nor was the group by gender interaction.

According to follow-up one-way ANCOVAs, the BDI accounted for some variance on all four PCQ-C subscales. The between participants effects for depression were significant for social cost, $F(1, 54) = 7.84$, $p < .01$; social probability, $F(1, 54) = 12.68$, $p < .001$; nonsocial cost, $F(1, 54) = 5.29$, $p < .05$; and nonsocial probability, $F(1, 54) = 5.71$, $p < .05$. After controlling for depressive symptoms, the SAD group still overestimated the cost and probability of negative social events and the cost of negative nonsocial events. Between participants effects for group were significant for social cost, $F(1, 54) = 26.55$, $p < .001$; social probability, $F(1, 54) = 13.37$, $p < .001$; and nonsocial cost, $F(1, 54) = 4.81$, $p < .05$. These results support the first two hypotheses that adolescents with SAD would exhibit judgment biases for both the cost and probability of negative social events. The third hypothesis was partially supported. As expected, there were no differences between groups in estimates of the probability of negative nonsocial events. However, adolescents with SAD reported higher cost estimates of negative nonsocial situations than did their nonanxious peers.

Secondary Analyses

The above analyses provided information about cognitive biases between a diagnosed group of adolescents with social anxiety relative to adolescents who do not have such a diagnosis. Secondary analyses examining judgment biases related

Table III. Intercorrelations Among PCQ-C Subscales, BDI, and SPAI-C ($n = 59$)

Measure	1	2	3	4	5
1. PCQ-C social cost	—	—	—	—	—
2. PCQ-C nonsocial cost	.68**	—	—	—	—
3. PCQ-C social probability	.84**	.48**	—	—	—
4. PCQ-C nonsocial probability	.24	.41**	.36*	—	—
5. SPAI-C total score[a]	.60**	.47**	.48**	−.07	—
6. BDI	.52**	.40**	.60**	.26	.62**

Note. SPAI-C = Social Phobia Anxiety Inventory for Children. BDI = Beck Depression Inventory. PCQ-C = Probability Cost Questionnaire for Children.
** $p < .005$, * $p < .01$.
[c]Partial correlations between PCQ-C and SPAI-C covarying BDI.

to continuous measures of anxiety and depression across all participants combined compliment the primary analyses. Pearson correlations between the four PCQ-C subscales (social probability, nonsocial probability, social cost, and nonsocial cost) and scores on the SPAI-C and the BDI were calculated for the entire sample. Given that depressive symptoms were correlated with PCQ-C subscales, partial correlations between the PCQ subscales and the SPAI-C are presented covarying out the BDI.

As seen in Table III, correlations between each of the four PCQ-C subscales were significant except for the correlation between the nonsocial probability subscale and the social cost subscale (which approached significance at $r = .24$, $p < .075$). These results indicate generally a significant relationship between probability and cost estimates of both social and nonsocial events. The BDI was correlated with the social cost subscale, nonsocial cost subscale, and social probability subscale, but not with the probability estimate for nonsocial events. The SPAI-C was highly correlated with the cost of social and nonsocial events, as well as with the probability of social events, even after covarying out negative affect (the BDI). The SPAI-C was not correlated with the probability estimate for nonsocial events. These findings parallel the results of the MANCOVA, and support the hypothesis that adolescents who report significant social anxiety are more likely to exhibit judgment biases than those who deny social anxiety symptoms.

DISCUSSION

Our results support the proposed hypotheses that adolescents with SAD, like adults with the disorder, would exhibit judgment biases for negative social events; adolescents with SAD rated negative social events as more probable and more costly than did nonanxious controls, even after controlling for depressive symptoms. The third hypothesis that there would be no differences between groups on probability and cost ratings of nonsocial situations, was partially confirmed. There were no differences between the SAD group and the NAC group on probability scores for negative nonsocial situations, after controlling for depressive symptoms. However, the SAD group's scores on the cost subscale for nonsocial events were higher than the NAC's group scores. Gender was not a significant factor in accounting for cognitive biases.

Moreover, the NAC group found negative nonsocial events more costly than negative social situations, indicating that the social events on PCQ-Q were not interpreted as particularly dangerous to the NAC group. The SAD group exhibited the reverse; they viewed the negative social situations as more harmful than the negative nonsocial events.

Theoretical Implications

These results on cost and probability estimates support various models proposed to account for the mechanisms that underlie SAD. The core feature of social anxiety according to these theories is the inaccurate interpretation of social stimuli as dangerous, which, interacting with behavior and somatic symptoms, creates a cyclical pattern that maintains fear and avoidance (Beck et al, 1985; Clark & Wells, 1995; Foa & Kozak, 1986). These interpretation biases include the overestimation of severity of danger as well as the overestimation of probability of danger occurring. Prior to this study, it was unclear whether the models derived for adults with SAD were appropriate for adolescents. Findings from this age downward extension study on a socially anxious adolescent sample support these theories' postulations that exaggerated probabilities and negative valence of threatening social events are one of the primary cognitive distortions in SAD, perhaps playing an important role in the maintenance of this disorder. If these biases were not found in adolescents with SAD, the findings would have questioned current cognitive theories that emphasize the putative role of cognitive bias in the etiology and maintenance of SAD. These positive findings, therefore, strengthen the centrality of cognitive biases in the development and maintenance of SAD. Adolescents with SAD appear to overestimate the severity and likelihood that negative social situations will occur, which may trigger physiological symptoms of anxiety as well as behavior patterns that impact social interactions and further increase the likelihood of avoidance in the future. Because of possible increased avoidance, this distorted thinking pattern is not challenged, allowing social anxiety to persist into adulthood. These results suggest that judgment biases do not appear to accrue over time, following a long history of fear and avoidance, but instead are already evident in adolescent SAD.

Furthermore, these results are congruent with other information processing literature on childhood anxiety. Although no previous studies have directly examined cost and probability biases for negative social situations in adolescents with SAD, several investigations indicate that anxiety-disordered children exhibit interpretation biases of ambiguous situations (i.e., they interpreted ambiguous situations as more threatening than did normal controls; Barrett, Rapee, Dadds, & Ryan, 1996). Similarly, trait anxiety was also related to interpretation bias of ambiguous situations (Chorpita, Albano, & Barlow, 1996). Evidence further suggests that test-anxious children report biases of probability and cost judgments compared to nonanxious peers (Leitenberg, Yost, & Carroll-Wilson, 1986).

How these exaggerated estimates of probabilities and impact of negative social events originally developed is uncertain. It may be that these biases were formed as the result of negative personal history such as prior rejection. Socially anxious adolescents may have experienced significant humiliation, excessive criticism during

childhood, or both which led to the formation of such expectations for future negative encounters. In fact, these adolescents' probability estimates may not be biases at all, but accurate ratings of how often negative social events occur in their lives. Factors such as skills deficits may cause socially anxious adolescents to be rejected more by their peers. Therefore, they may actually experience negative social events more often than nonanxious adolescents, which may reinforce expectations for future encounters. However, it may also be the case that these adolescents experienced a relatively balanced social history of positive and negative special events compared to their peers, but that socially anxious adolescents may have attended to their past negative social experiences more, and therefore perceived future negative social events as more likely to happen and more upsetting. Gilboa-Schechtman et al. (2000) suggested that socially anxious individuals' probability estimates of symptom-related events such as "you will blush when you walk into a room full of strangers" are likely to be motivated by actual experiences. Furthermore, they posit that judgment of nonsymptom-related negative events such as "someone will turn you down for a date" is driven by increased attention to these experiences rather than their actual occurrence. In addition, data suggest that socially anxious individuals exhibit interpretation bias of ambiguous situations (Williams, Watts, McLeod, & Mathews, 1988). Therefore, even situations that may not necessarily be negative may be interpreted in a negative manner.

Interestingly, the socially anxious adolescents also rated negative nonsocial events as more costly than did their nonanxious peers, a finding that did not support the third hypothesis of this study. It may be the case that adolescents with SAD interpret all negative situations with greater impact. Beidel et al. (1999) found that adolescents with SAD also reported significant generalized anxiety even when criteria for generalized anxiety disorder were not met. It may therefore be the case that the adolescents in the SAD group may have been experiencing other anxiety symptomatology that may have accounted for the increased report of cost estimates for nonsocial situations.

Clinical Implications

Not only does this study help to elucidate our current understanding of SAD during adolescence, it also raises possible treatment implications for adolescents. Research has just begun in the treatment of adolescent SAD; therefore, little is known as to what may be effective in treating this disorder for this population. Some initial treatment outcome studies with socially anxious adolescents, as well as numerous studies with adults, suggest the effectiveness of cognitive behavior therapy (Kashdan & Herbert, 2001). These treatments may work by directly or indirectly decreasing cost and probability estimates of negative social events. Foa et al. (1996) found that probability and cost estimates of negative social events decreased after 12 weeks of cognitive behavior treatment for adults. In addition, Foa et al. (1996) noted that the efficacy of cognitive behavior therapy in ameliorating pathological anxiety was mediated by the reduction in exaggerated cost associated with the feared consequence. Given that adolescents with SAD also report elevated cost and probability estimates for social events, it might also be true that cognitive behavior therapy may be

effective in ameliorating anxiety by reducing overestimations of the severity of negative social situations in adolescents.

Because the reduction of exaggerated cost of negative social situations may mediate the efficacy of cognitive behavior therapy, directly focusing on these cognitive distortions during treatment may better reduce pathological anxiety to the extent that it corrects judgment biases associated with the specific fears of the patient. Furthermore, preventative measures have not yet been developed or investigated for the development of social anxiety. Knowing that cognitive biases may play a role in the etiology, maintenance of adolescent SAD, or both focusing on these biases may prove to be an effective means for preventative interventions.

Limitations and Future Directions

Future research is needed to investigate whether cognitive behavior therapy would reduce cost and probability estimates of negative social events in the adolescent population. If this is indeed the case, additional research would evaluate whether the efficacy of cognitive behavior therapy in reducing anxiety is mediated by the decrease in exaggerated cost and/or probability judgments of negative social situations. In addition, studies are warranted on investigating other cognitive biases in adolescents with SAD. For example, do adolescents exhibit other types of interpretation biases such as negative interpretation of ambiguous social situations or a failure to positively interpret mildly positive interactions? In addition, future research is warranted to determine whether cognitive biases are present in shy children before the development of SAD to ascertain the relationship between distorted cognitions and the manifestation of psychopathology. Little information is known about specific cognitive differences in younger versus older nonanxious adolescents related to interpretation of social events, therefore a better understanding of developmental issues related to information processing would aid future investigations of developmental differences in cognitive bias of children and adolescents with SAD.

Although this study offers new information regarding cognitive processing of adolescent SAD, several limitations warrant caution in interpreting the results. The cross-sectional design does not permit determination of causality of the relationship between cognitive bias and SAD. Judgment biases and phobic anxiety may be coeffects with anxiety leading to distorted thinking, or vice versa. Furthermore, a third unidentified variable may be operating. For example, socially anxious adolescents actually may be experiencing negative social events more often than nonanxious adolescents, elevating their social probability estimates. Different diagnostic tools were used to assess psychopathology for each group. The SCID-I/P screening module was conducted with the NAC group, whereas the ADIS-DSM-IV:C was utilized to determine diagnoses for the SAD group. Using different interview measures somewhat limits comparability between groups. This study offers some insight into cognitive processes of SAD in adolescents, but it is a preliminary investigation. Further research is necessary to appreciate fully the various mechanisms of the etiology and maintenance of SAD in the adolescent population. Moreover, greater knowledge is needed about normal cognitive processing development in childhood and adolescence to understand fully possible pathological cognitive processes.

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