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Threat Perception Bias in Nonreferred, Socially Anxious Children

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Investigated whether socially anxious children display a threat perception bias. A sample of 252 primary school children ages 8 to 13 years were exposed to ambiguous stories of social situations and instructed to find out as quickly as possible whether a story was scary. Furthermore, children were invited to tell how each story would end and to judge how they would feel when actually confronted with that situation. The main results can be summarized as follows. First, socially anxious children displayed lower thresholds for threat perception than control children. In other words, compared with control children, socially anxious children needed to hear fewer sentences of a story before deciding it was scary. Furthermore, socially anxious children more frequently perceived threat while listening to the stories than did control children. Finally, socially anxious children more often interpreted the stories as threatening and displayed higher levels of negative feelings and cognitions in relation to these stories compared with control children. These findings fit nicely in current information-processing theories of childhood anxiety. An additional aim of this study was to investigate the convergent validity of the social phobia scales of 2 recently developed self-report questionnaires for measuring anxiety disorder symptoms in children: the Spence Children's Anxiety Scale (Spence, 1998) and the Screen for Child Anxiety Related Emotional Disorders (Birmaher et al., 1997). Results indicated that the social phobia scale of the Spence Children's Anxiety Scale and the extended social phobia scale of the Screen for Child Anxiety Related Emotional Disorders correlated substantially with a specific measure of social anxiety, the Social Anxiety Scale for Children—Revised.

Although fears of social situations are a common feature of children's normal development, there is a considerable minority of children who exhibit fears of social interactions to such an extent that it interferes with daily functioning and hinders social-emotional development (King, Murphy, & Heyne, 1997). Children who experience such problems may qualify for the diagnosis of social phobia (Beidel & Morris, 1995). According to the latest edition of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [DSM-IV]; American Psychiatric Association [APA],

1994), the essential feature of social phobia is "a marked and persistent fear of social or performance situations in which embarrassment may occur" (p. 411). Current estimates of the prevalence rate of social phobia suggest that 3% to 4% of children may be affected by this disorder (Beidel, Turner, & Morris, 1999). Although it is generally assumed that social phobias have their onset in the midteens (APA, 1994), this disorder also occurs in younger children (e.g., Beidel, 1991). Moreover, a recent study by Spence (1997) examining the prevalence of anxiety disorders symptoms in a community sample suggested that social phobia is the most common anxiety disorder category among 8- to 12-year-old children.

As to the phenomenology of social fears and phobias, research indicates that children with these symptoms report distress and anxiety in a broad range of social encounters: public speaking, eating in front of others, going to parties, writing in front of others, using public restrooms, and speaking to authority figures (see

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Beidel & Morris, 1995). Strauss and Last (1993) reported a similar range of stressful situations plus a category of "school," referring to social fears in the school setting.

It is generally assumed that cognitive factors play an important role in maintaining (childhood) anxiety disorders such as social phobia. Empirical studies on information-processing abnormalities in anxious children are just beginning to emerge (for a review, see Daleiden & Vasey, 1997). According to Kendall's (1985) theory of childhood anxiety, pathological fear and anxiety result from the chronic overactivity of schemas organized around themes of threat and danger. So far, there is evidence for the existence of two types of cognitive abnormalities in anxious children: *attentional bias*, which refers to the tendency to selectively attend to signals of threat, and *interpretation bias*, which reflects anxious children's tendency to more readily interpret ambiguous situations as threatening.

A number of studies show that the attentional bias phenomenon occurs in anxious children. In a Stroop experiment, Martin, Horder, and Jones (1992) found that children afraid of spiders exhibit retarded color naming times when confronted with spider-related words (e.g., *hairy*) but not when confronted with control words (e.g., *fly*). In a recent study by Dubner and Motta (1999), sexually abused children with and without posttraumatic stress disorder (PTSD) carried out a modified Stroop task that included trauma-related and control stimuli. Results showed that sexually abused children with PTSD had significantly longer color naming times to trauma-related stimuli than did sexually abused children without PTSD (for similar findings, see Moradi, Taghavi, Neshat-Doost, Yule, & Dalgleish, 1999). Likewise, using the dot-probe paradigm, several studies (Taghavi, Neshat-Doost, Moradi, Yule, & Dalgleish, 1999; Vasey, Daleiden, Williams, & Brown, 1995; Vasey, El-Hag, & Daleiden, 1996) have demonstrated that clinically anxious children and children high in test anxiety are faster to react to a probe if it is preceded by a threatening rather than a neutral word. This differential reaction reflects selective attention to threatening stimuli in anxious children that was not evident for control children.

Support for the existence of an interpretation bias in anxious children comes from a study by Barrett, Rapee, Dadds, and Ryan (1996), who examined interpretations of ambiguous situations in anxiety-disordered children, children with oppositional defiant disorder, and normal controls. Children were presented with 12 vignettes of ambiguous situations and asked about what was happening during each situation. Then children were given two possible neutral outcomes and two possible threatening outcomes and were asked which outcome was most likely to occur. Results showed that both anxious and oppositional children interpreted am-

biguous situations as more threatening than did normal controls. Interestingly, anxious children more frequently chose avoidant outcomes, whereas oppositional children more often selected aggressive outcomes. Collectively, these findings suggest that anxious children disproportionately interpret ambiguous situations as threatening and that they may become anxious and engage in avoidance behaviors as a result (for similar findings, see Chorpita, Albano, & Barlow, 1996; Bögels & Zigterman, in press). Employing a different approach, Hadwin, Frost, French, and Richards (1997) examined whether children's levels of trait anxiety would be related to the interpretation of ambiguous stimuli. Children listened to homophones (i.e., words that sound the same but have two distinct meanings, such as *dye* versus *die*) and were asked to indicate the interpretation of a word by pointing to an appropriate picture. Results showed that levels of trait anxiety significantly predicted children's interpretation of homophones. More specifically, increases in levels of anxiety were positively associated with threatening interpretation of homophones.

In their intriguing review article, Daleiden and Vasey (1997) proposed that apart from attentional bias and interpretation bias, anxious children may display other information-processing abnormalities. One of these abnormalities is concerned with the "intensity of attention." In this context, Daleiden and Vasey referred to a study by Dodge and Newman (1981), who measured the attentional intensity of aggressive boys by examining the number of social cues these children used in making interpretations. The boys were asked to play a detective game during which they could listen to audiotaped testimonies. Children were allowed to listen to as many of the testimonies as necessary to be confident in their decision about whether the suspect had committed the crime in question. Results showed that, compared with nonaggressive children, aggressive children sought less information before making their decisions. Daleiden and Vasey hypothesized that a similar way of information processing may occur in anxious children:

Anxious children may adopt a similar approach to processing threat-relevant information, such that even very minor threat cues may readily trigger subsequent processing and consequently anxious responding. In essence, they may be acutely vigilant for signals of potential threat but, once they have encoded such a signal, they may quickly move through the interpretation stage and conclude the situation is dangerous even though a search for further information would show it is not. For example, upon seeing a dog, dog-phobic children may quickly jump to the conclusion that they are in danger and, because they have ceased encoding further information, they may fail to notice that the dog is on a leash or that a dog is behaving in a friendly manner. (pp. 411-412)

Most studies that examined whether anxious children display an interpretation bias have relied on a vignette paradigm. That is, children are presented with the full description of an ambiguous situation and then are asked to choose the outcome that is most likely to occur (e.g., Barrett et al., 1996). This paradigm may also be useful for studying the intensity of attention in anxious children. Instead of confronting children with the full description of an ambiguous situation, one could provide the information in a piecemeal fashion to find out when children begin to perceive a scenario as threatening. Such an approach would make it possible to investigate whether anxious children tend to settle earlier on a threatening interpretation.

This study was an attempt to examine whether socially anxious children display a "threat perception bias" (i.e., a biased "attentional intensity"). A group of 252 primary school children were exposed to stories in which social situations were described. Children were told that some of the stories were scary (i.e., these stories would have a bad ending), whereas other stories were not scary (i.e., these stories would have a happy ending). Children were instructed to indicate as quickly as possible whether the pertinent story was scary or not scary. Stories were read aloud sentence by sentence, and after each sentence, children were asked whether they thought that the story would be scary or not scary. In this way, thresholds for threat perception were measured. We anticipated that children with high levels of social anxiety would listen to fewer sentences before deciding the story was scary (i.e., display lower thresholds for threat perception) compared with children with low levels of social anxiety. Children were also invited to tell how each story would end and to judge how they would feel when actually confronted with that situation. This was done to test whether children with high levels of social anxiety interpreted and evaluated the stories as more threatening than did children with low levels of social anxiety.

An additional purpose of this study was to further investigate the convergent validity of the social phobia scales of two recently developed self-report questionnaires for measuring anxiety disorders symptoms in children, namely the Spence Children's Anxiety Scale (SCAS; Spence, 1998) and the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997). More specifically, we examined the connections between the SCARED and SCAS social phobia scales and a specific measure of social anxiety, the Social Anxiety Scale for Children-Revised (SASC-R; La Greca & Stone, 1993). Although previous studies have shown that the SCAS social phobia scale is a valid measure of social anxiety (Spence, 1998), the SCARED social phobia scale has been criticized because it seems to measure only one particular aspect of social anxiety, that is, fear of meeting unfamiliar people. Recently, Birmaher et al. (1999) revised the scale

by adding three new items, but it remains to be established whether this revision is indeed an improvement.

Method

Children

The sample consisted of 252 children (123 boys and 129 girls) who were recruited from two primary schools in Eindhoven, The Netherlands. Informed consent was obtained from parents and children before participation in the study; 92% of those invited to participate eventually did so. Mean age of the children was 10.1 years ($SD = 1.3$; range = 8–13 years). The vast majority of the children (90%) were Caucasian. Percentages of children with low, middle, or upper socioeconomic background were 15%, 55%, and 30%, respectively (these figures were anonymously provided by the staffs of both schools and based on the occupational levels of both parents). About 10% of the children came from single-parent families.

Assessment

Questionnaires. The SASC-R (La Greca & Stone, 1993) is an 18-item self-report measure that has been developed to assess social evaluative anxiety and social avoidance. The scale consists of 18 items that have to be scored on a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*all the time*). Factor analysis has revealed three subscales (e.g., La Greca & Stone, 1993): Fear of Negative Evaluation From Peers (FNE; eight items, e.g., "I worry about what other kids say about me"), Social Avoidance and Distress Specific to New Situations (SAD-New; six items, e.g., "I get nervous when I talk to new kids"), and Generalized Social Avoidance and Distress (SAD-General; four items, e.g., "I feel shy even with kids I know very well"). SASC-R total and subscale scores are obtained by summing relevant items. The psychometric properties of the SASC-R with primary school children are satisfactory: Internal consistency (with Cronbach's alphas between .60 and .90) and test-retest reliability (with a test-retest correlation of .67 for the total score) were sufficient to good (La Greca, Dandes, Wick, Shaw, & Stone, 1988; La Greca & Stone, 1993). Furthermore, support has been found for the discriminant validity of the scale: In a sample of anxiety-disordered children, scores on the SASC-R differentiated children with and without a social-based anxiety disorder (Ginsburg, La Greca, & Silverman, 1998).

The SCAS (Spence, 1998) and the SCARED (Birmaher et al., 1999, Birmaher et al., 1997) are recently developed questionnaires that assess symptoms of DSM-IV-defined anxiety disorders in children. Because this study was concerned with social anxiety,

only the social phobia subscales of both questionnaires were used. The SCAS social phobia scale consists of six items (e.g., "I feel afraid that I will make a fool of myself in front of people") that have to be answered on a 4-point scale ranging from 0 (*never*), 1 (*sometimes*), 2 (*often*), to 3 (*always*), describing the frequency with which children experience each symptom. The SCARED social phobia scale contains four items that have to be rated on a 3-point scale ranging from 0 (*almost never*), 1 (*sometimes*), to 2 (*often*). All four items of the original SCARED social phobia scale are concerned with children's fear of meeting unfamiliar people (e.g., "I don't like to be with people I don't know well"). In an attempt to cover the symptoms of social phobia more fully, Birmaher et al. (1999) recently revised the scale by adding three new items ("I am shy," "I feel nervous when I am with other children or adults and I have to do something while they watch me," and "I feel nervous about going to parties, dances, or any place where there will be people that I don't know well"). The SCAS and SCARED social phobia scales (including the revised scale of the SCARED) are generally found to have good internal consistency with Cronbach's alphas approximately .75 (e.g., Birmaher et al., 1999; Muris, Merckelbach, Van Brakel, & Mayer, 1999; Muris, Schmidt, & Merckelbach, 2000).

Stories. Seven hypothetical stories were used (see the Appendix). The stories described a wide range of social situations that children may encounter: asking other children to come to your birthday party, meeting unfamiliar adults, going to a sporting club for the first time, being teased by another child, encountering a group of unfamiliar children, talking to the teacher who asks you to give an oral report in front of the class, and meeting a child of new neighbors. Six of the seven stories were ambiguous; one threatening story (Story 4) was included.¹ This was done to enhance the credibility of the instruction, that is, to give children the idea that some of the stories were indeed threatening (see subsequent discussion). Children received the following general instruction:

In a moment, I am going to read you a number of brief stories. Some stories are scary: This means that these stories will have a bad end. Some stories are not scary: This means that the stories will have a good end. You have to try to guess as quickly as possible whether the story that I read is a scary story, which will have a bad end, or a

nonscary story, which will have a good end. I will read you each story sentence by sentence, and after each sentence I will ask you whether you think that the story is scary or nonscary. Once you have told me that you think the story will be scary, you still may change your opinion after the next sentence.

Each story consisted of five sentences. After reading each sentence, the child was asked, "What do you think? Is this going to be a scary or a nonscary story?" Two scores were derived from children's answers to this question. First, for each story, the *threshold of threat perception* was established. This threshold score was defined as the moment at which the child first began to perceive the story as scary. When a child indicated that the story was scary after reading the first sentence, the threshold score was 1, when a child indicated that the story was scary after the second sentence, the threshold score was 2, etc. When a child still indicated that the story was nonscary after the fifth sentence, the threshold was scored as 6. Thus, the lower the threshold score, the less information a child needed to perceive threat. Second, for each story, the number of sentences after which children indicated the story to be scary was summed to yield the *frequency of threat perception*. This variable provided additional information because children were allowed to change their opinion after hearing a new sentence of the story.

After each sentence of the story, threat ratings were obtained. Each time the child indicated the story to be scary, he or she was asked to predict how threatening the story was going to be on a 10-point Likert-type scale ranging from 1 (*almost not*) to 10 (*very much*). This threat rating was scored as 0 when children indicated the story was nonscary after hearing a sentence. For each story, a mean threat rating score was calculated.

To measure interpretation bias, the story was then read out to the children for a second time without any interruptions. Children were asked, "What do you think will happen in this situation?" Children's answers were written down word-by-word and then rated by a blind rater who judged whether children had interpreted the pertinent story as either threatening or nonthreatening. A second blind rater judged the answers of the 32 children. Raters agreed on 92.9% of the answers, resulting in a kappa of 0.85.

Finally, children were asked, "How would you feel if you were in this situation?" and rated the following feelings and cognitions scales: (a) I am scared, (b) I am shy, (c) I don't know what to do, (d) I am worried that this will end badly. Each scale had to be scored on a 5-point scale ranging from 1 (*not at all*), 2 (*a little*), 3 (*somewhat*), 4 (*pretty much*), to 5 (*very much*).

Diagnostic Interview. The child version of Diagnostic Interview Schedule for Children (DISC, Ver-

¹Three ambiguous stories were taken from Bögels and Zigterman (in press). The other three ambiguous stories and the threatening story (Story 4) were created for the purpose of this study. Results of a pilot study ($N = 124$) showed that Story 4 was interpreted as threatening by 93.5% of the children. For the other six stories, this percentage was on average 28.2%, $\chi^2(1, N = 124) = 111.1, p < .001$.

sion 2.3; National Institute of Mental Health, 1992) is a highly structured, lay-administered interview instrument designed to assess the more common *DSM-IV* diagnoses found in children and adolescents. Previous research has shown that the instrument possesses adequate test-retest stability (Schwab-Stone et al., 1993), sufficient interrater reliability (Shaffer et al., 1993), and acceptable validity (Piacentini et al., 1993). The DISC was used to identify children with high levels of social anxiety. This was done by administering the Social Phobia section. This section covers the following *DSM-IV* criteria of social phobia: (a) a marked and persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others; (b) exposure to the feared social situation almost invariably provokes anxiety; (c) the person recognizes that the fear is excessive or unreasonable; (d) the feared social or performance situations are avoided or endured with intense anxiety or distress; (e) the avoidance, anxious anticipation, or distress in the feared social or performance situations interferes significantly with the person's normal functioning. In this study, these criteria were employed to identify socially anxious and control children. When children met the key criterion for social phobia (i.e., Criterion A) and at least three of the other four criteria, they were defined as socially anxious. Children who did not fulfill these stringent criteria were considered to be control children.

Procedure

Children first completed the self-report questionnaires (SASC-R and the social phobia scales of the SCARED and SCAS). This was done in their classrooms in the presence of the teacher and a research assistant, who answered questions if necessary. In the 2 weeks after the completion of questionnaires, children were interviewed individually by a trained research assistant. This assistant was blind to children's questionnaire scores. She read the stories in a neutral way to the children, asked questions, and documented children's answers online. To minimize carryover effects, half of the children heard the stories in an order from Story 1 to Story 7, whereas the other half received the stories in reversed order. When the story interview was finished, children were interviewed by means of the Social Phobia section of the DISC.

Statistical Analyses

Statistical analyses were carried out by means of the Statistical Package for the Social Sciences (SPSS). Chi-square and *t* tests were employed to compare socially anxious and control children with regard to de-

mographic characteristics and questionnaire scores. Multivariate analyses of covariance (MANCOVAs) with age, sex, and order of story administration as covariates were carried out to compare socially anxious and control children in the case of continuous dependent variables. Significant MANCOVAs were followed by univariate analyses of covariance (ANCOVAs). Logistic regression analyses were employed when the dependent variable was dichotomous (i.e., interpretation of stories). To control for age, sex, and order of story administration, these variables were forced into the regression equation on Step 1. Finally, we computed correlations (while controlling for age, sex, and order effects) to examine the relations among social anxiety questionnaires and between social anxiety scales and indexes of threat perception.

Results

Comparisons Between the Social Anxiety and Control Groups

Table 1 shows demographic characteristics (age and sex) and scores on the social anxiety measures for the social anxiety group and the control group. As can be seen, children in the social anxiety group were somewhat younger than children in the control group. No significant difference between groups emerged with respect to sex. Furthermore, as expected, children in the social anxiety group scored significantly higher on all social anxiety questionnaires than children in the control group. This result suggests that the DISC interview successfully discriminated children with high levels of social anxiety from children with low levels of social anxiety. Finally, SASC-R scores of the social anxiety group were comparable with those reported by Ginsburg et al. (1998) for their sample of clinically referred socially anxious children.

Correlations Among Social Anxiety Questionnaires

Correlations (while controlling for sex and age) among social anxiety questionnaires are presented in Table 2. As can be seen, positive correlations were found among most scales. Most importantly, the social phobia scales of the SCARED (in particular the extended scale) and SCAS correlated substantially with SASC-R indexes.

Thresholds of Threat Perception

Mean thresholds of threat perception are shown in Table 3. A multivariate analysis of variance with age,

Table 1. Demographic Characteristics and Scores on the Social Anxiety Measures for the Social Anxiety Group and the Control Group

	Social Anxiety ^a		Control ^b		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age	9.6	1.4	10.2	1.2	2.6	<.01
Sex (Boys:Girls)	12:16		111:113		0.4	<i>ns</i>
SASC-R						
Total Score	53.6	11.7	32.1	11.1	9.6	<.001
FNE	26.2	7.5	15.3	6.5	8.3	<.001
SAD-New	18.2	4.3	10.8	4.1	8.9	<.001
SAD-General	9.1	3.2	6.0	2.2	5.0	<.001
SCARED Social Phobia	5.3	1.8	2.8	2.0	6.1	<.001
SCARED Social Phobia ^c	9.4	2.7	4.6	3.2	7.6	<.001
SCAS Social Phobia	6.8	4.2	2.8	2.5	5.0	<.001

Note: SASC-R = Social Anxiety Scale for Children-Revised; FNE = Fear of Negative Evaluation from Peers; SAD-New = Social Avoidance and Distress Specific to New Situations; SAD-General = Generalized Social Avoidance and Distress; SCARED = Screen for Child Anxiety Related Emotional Disorders; SCAS = Spence Children's Anxiety Scale.

^a*n* = 28. ^b*n* = 224. ^cScale extended by three new items.

Table 2. Correlations (Controlling for Sex and Age) among Social Anxiety Questionnaires

	1	2	3	4	5	6
1. SASC-R Total Score						
2. SASC-R FNE	.93					
3. SASC-R SAD-New	.86	.63				
4. SASC-R SAD-General	.80	.63	.66			
5. SCARED Social Phobia	.62	.49	.65	.52		
6. SCARED Social Phobia ^a	.70	.55	.74	.59	.94	
7. SCAS Social Phobia	.73	.68	.63	.59	.45	.56

Note: *N* = 252. All correlations significant at *p* < .001. SASC-R = Social Anxiety Scale for Children-Revised; FNE = Fear of Negative Evaluation from Peers; SAD-New = Social Avoidance and Distress Specific to New Situations; SAD-General = Generalized Social Avoidance and Distress; SCARED = Screen for Child Anxiety Related Emotional Disorders; SCAS = Spence Children's Anxiety Scale.

^aScale extended by three new items.

sex, and order of stories as covariates performed on these data revealed a significant main effect of group, Hotelling's $F(7, 241) = 5.1, p < .001$. As can be seen, socially anxious children generally displayed lower threat thresholds (except for Stories 4 and 7) than control children. In other words, anxious children needed fewer sentences to decide the story to be threatening than control children did.

Overall thresholds were 3.3 ($SD = 1.2$) for children in the social anxiety group versus 4.5 ($SD = 1.1$) for children in the control group, a difference that was highly significant, $F(1, 247) = 17.9, p < .001$.

Frequency of Threat Perception and Threat Ratings

The mean frequencies of threat perception (i.e., the number of sentences after which children indicated the story to be scary) for both groups are shown in Table 4. A MANCOVA yielded a significant main effect of group, Hotelling's $F(7, 241) = 5.7, p < .001$: Socially anxious children more frequently indicated that the

Table 3. Mean Thresholds and Standard Deviations for Threat Perception in the Social Anxiety Group and the Control Group

	Social Anxiety ^a		Control ^b		<i>F</i> ^c	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Story 1	4.9	1.4	5.7	0.9	15.8	<.001
Story 2	2.5	2.0	3.7	2.2	5.3	<.050
Story 3	2.7	1.7	4.1	1.8	15.2	<.001
Story 4	3.4	1.3	4.1	1.4	3.7	<i>ns</i>
Story 5	2.9	1.6	4.5	1.5	22.8	<.001
Story 6	3.0	2.0	4.4	2.0	8.1	<.005
Story 7	4.0	1.5	4.8	1.5	1.9	<i>ns</i>
Overall	3.3	1.2	4.5	1.1	17.9	<.001

^a*n* = 28. ^b*n* = 224. ^c*F* values obtained by means of univariate ANCOVAs.

story would be scary after hearing a new sentence than did control children. Univariate follow-up ANCOVAs showed that this effect was found for all stories, except for Story 7 (see Table 4).

A MANCOVA performed on the threat ratings also yielded a significant main effect of group, Hotelling's

Table 4. Mean Frequencies and Standard Deviations of Threat Perception of Children in the Social Anxiety Group and the Control Group

	Social Anxiety ^a		Control ^b		<i>F</i> ^c	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Story 1	0.7	1.0	0.2	0.6	11.9	<.001
Story 2	2.5	1.6	1.4	1.4	11.5	<.001
Story 3	2.8	1.6	1.5	1.4	17.4	<.001
Story 4	2.3	1.2	1.6	1.3	4.5	<.050
Story 5	2.9	1.5	1.3	1.3	28.1	<.001
Story 6	2.4	1.7	1.0	1.4	14.7	<.001
Story 7	1.5	1.2	0.9	1.3	2.6	<i>ns</i>
Overall	2.1	1.1	1.1	0.9	21.6	<.001

^a*n* = 28. ^b*n* = 224. ^c*F* values obtained by means of univariate ANCOVAs.

Table 5. Mean Threat Ratings and Standard Deviations of Children in the Social Anxiety Group and the Control Group After Hearing a New Sentence of the Story

	Social Anxiety ^a		Control ^b		<i>F</i> ^c	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Story 1	0.6	1.1	0.1	0.5	10.2	<.005
Story 2	2.5	2.2	1.1	1.4	20.0	<.001
Story 3	2.7	2.0	1.1	1.5	26.6	<.001
Story 4	2.5	1.9	1.3	1.4	11.7	<.005
Story 5	3.0	2.0	1.0	1.3	40.3	<.001
Story 6	2.3	1.9	0.8	1.5	15.2	<.001
Story 7	1.5	1.6	0.7	1.2	5.0	<.050
Overall	2.1	1.4	0.9	0.9	32.0	<.001

^a*n* = 28. ^b*n* = 224. ^c*F* values obtained by means of univariate ANCOVAs.

Table 6. Percentages of Children in the Social Anxiety Group and the Control Group Who Interpreted the Story as Threatening

	Social Anxiety ^a	Control ^b	Wald χ^2 or <i>F</i>	<i>p</i>
Story 1	14.3	3.1	3.9	<.050
Story 2	28.6	11.6	4.6	<.050
Story 3	28.6	15.2	—	—
Story 4	100.0	92.9	—	—
Story 5	53.6	31.3	4.4	<.050
Story 6	35.7	13.4	4.2	<.050
Story 7	35.7	11.6	8.6	<.005
<i>M</i> ^c	3.0	1.8	18.5	<.001
<i>SD</i>	1.6	1.1		

Note: In cases where no statistical values are shown, the variable group (0 = control, 1 = social anxious) did not enter in the regression equation.

^a*n* = 28. ^b*n* = 224. ^cMean number of stories that were interpreted as threatening.

$F(7, 241) = 7.6, p < .001$: Children in the social anxiety group predicted the story to be more threatening than did children in the control group. As can be seen in Table 5, univariate follow-up ANCOVAs revealed that this was the case for all stories.

ANCOVAs comparing the overall threat perception scores and threat ratings of both groups confirmed the previously described results. Overall threat perception scores were 2.1 ($SD = 1.1$) for socially anxious children versus 1.1 ($SD = 0.9$) for control children, $F(1, 247) = 21.6, p < 0.001$. For threat ratings, these figures were 2.1 ($SD = 1.4$) versus 0.9 ($SD = 0.9$), respectively, $F(1, 247) = 32.0, p < .001$ (see Tables 4 and 5).

Interpretation of Stories

The percentages of children who interpreted the stories as threatening are presented in Table 6. Results showed that socially anxious children more frequently interpreted the stories as threatening than did control children, means being 3.0 ($SD = 1.6$) and 1.8 ($SD = 1.1$), respectively, $F(1, 247) = 18.5, p < .001$. A series of logistic regression analyses were performed with age, sex, and order of story administration (all forced into the equation on Step 1) and DISC status (a dummy variable with 0 = control, 1 = socially anxious) as the predictors, and the interpretation of separate stories being

the dependent variable. Results showed that in five of the seven regression equations, group status entered in the regression equations, accounting for a significant proportion of the variance. In other words, socially anxious children more frequently interpreted these stories as threatening than did control children. Story 4 (i.e., the threatening story) was more frequently interpreted as threatening than the other stories and that this was the case in both groups.

Feelings and Cognitions

Mean scores on feelings and cognitions scales for both groups are shown in Table 7. A series of MANCOVAs revealed significant group effects for all

stories and for overall scores: Hotelling's $F(4, 244)$ values were 7.2 for Story 1, 12.6 for Story 2, 7.4 for Story 3, 9.3 for Story 4, 16.9 for Story 5, 11.8 for Story 6, 5.7 for Story 7, and 17.6 for overall scores, all $ps < .001$. As evidenced by post hoc ANCOVAs, socially anxious children consistently displayed higher scores on the scales measuring negative feelings and cognitions than did control children (see Table 7). Thus, socially anxious children evaluated the stories as more threatening than did control children.

Correlational Analysis

To examine the relations between social anxiety and threat perception from another perspective, we com-

Table 7. Mean Scores and Standard Deviations of the Social Anxiety Group and the Control Group on Feelings and Cognitions Scales

	Social Anxiety ^a		Control ^b		<i>F</i> ^c	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Story 1						
I am scared	1.6	0.8	1.1	0.4	22.8	<.001
I am shy	1.8	0.8	1.4	0.5	10.1	<.005
I don't know what to do	1.5	0.7	1.2	0.4	10.8	<.005
I am worried that this will end badly	1.6	0.9	1.3	0.5	7.5	<.010
Story 2						
I am scared	2.5	1.1	1.5	0.7	29.7	<.001
I am shy	2.8	1.2	2.1	0.8	11.7	<.005
I don't know what to do	2.7	1.0	1.9	0.8	23.5	<.001
I am worried that this will end badly	2.1	1.0	1.2	0.5	40.0	<.001
Story 3						
I am scared	2.3	1.0	1.6	0.7	20.2	<.001
I am shy	2.8	1.1	2.3	0.8	10.4	<.005
I don't know what to do	2.6	1.1	1.9	0.8	19.4	<.001
I am worried that this will end badly	2.2	1.0	1.5	0.7	18.5	<.001
Story 4						
I am scared	2.9	1.1	1.9	0.8	22.2	<.001
I am shy	1.9	1.1	1.3	0.7	12.8	<.001
I don't know what to do	2.7	1.3	1.7	0.9	21.7	<.001
I am worried that this will end badly	2.9	1.1	1.7	0.9	32.1	<.001
Story 5						
I am scared	3.1	1.1	1.8	0.8	50.0	<.001
I am shy	2.8	1.1	1.9	0.8	26.1	<.001
I don't know what to do	2.8	1.1	1.9	0.8	22.6	<.001
I am worried that this will end badly	3.0	1.4	1.6	0.9	50.3	<.001
Story 6						
I am scared	2.0	0.7	1.3	0.6	23.2	<.001
I am shy	2.4	1.5	1.5	0.8	19.8	<.001
I don't know what to do	2.4	1.1	1.4	0.7	32.9	<.001
I am worried that this will end badly	2.8	1.3	1.6	0.9	31.5	<.001
Story 7						
I am scared	2.1	1.1	1.4	0.6	13.8	<.001
I am shy	2.8	1.1	2.0	0.8	17.0	<.001
I don't know what to do	2.4	1.0	1.8	0.8	7.1	<.010
I am worried that this will end badly	1.8	0.9	1.3	0.7	5.1	<.050
Overall						
I am scared	2.3	0.7	1.5	0.4	60.5	<.001
I am shy	2.5	1.1	1.8	0.8	37.2	<.001
I don't know what to do	2.4	0.7	1.7	0.5	43.4	<.001
I am worried that this will end badly	2.3	0.6	1.5	0.5	58.5	<.001

^a $n = 28$. ^b $n = 224$. ^c F values obtained by means of univariate ANCOVAs.

puted partial correlations (while controlling for age, sex, and order effects) between social anxiety questionnaires, on the one hand, and frequency of threat perception, threat ratings, threat thresholds, threat interpretation, and threat evaluation (as measured by the feelings and cognitions scales) on the other hand. The results of these analyses are shown in Table 8. As can be seen, all social anxiety scales were significantly, and in the expected direction, associated with threat perception indexes. That is, positive correlations were found between social anxiety and frequency of threat perception, threat ratings, threat interpretation, and threat evaluation, whereas negative associations emerged between social anxiety and threat thresholds.

Discussion

In this study, we investigated the relation between social anxiety and the perception of threat in a group of primary school children. Children were exposed to stories of social situations and instructed to find out as quickly as possible whether a story was scary. The main results can be catalogued as follows. First, socially anxious children displayed lower thresholds for threat perception than control children. In other words, compared with control children, socially anxious children needed to hear fewer sentences before deciding a story to be scary. Second, socially anxious children more frequently perceived threat while listening to the stories than did control children. Third, socially anxious children more often interpreted the stories as threatening and displayed higher levels of negative feelings and cognitions in relation to these stories compared with control children.

These results are well in line with Daleiden and Vasey's (1997) hypothesis that anxious children need less information to judge a situation as threatening, and they support Kendall's (1985) theory of childhood anxiety, which proposes that pathological fear and anxiety result from an overactivity of threat-and-danger schemas. These findings suggest that such schemas are

more easily triggered in anxious than in nonanxious children. It is likely that threat perception bias and, in its wake, interpretation bias are important cognitive factors maintaining anxiety symptoms in children (for a discussion, see Craske, 1997).

Previous studies with clinical samples have shown that anxious children tend to disproportionately interpret ambiguous situations as threatening (Barrett et al., 1996; Bögels & Zigterman, in press; Chorpita et al., 1996). To our knowledge, this study is the first to document this interpretation bias effect in a sample of nonreferred but socially anxious children.

Threat perception bias and interpretation bias seem to be relevant for the treatment of anxiety disorders in children. Over the past years, a series of studies have indicated that cognitive-behavioral treatment is an effective intervention for anxiety-disordered children (for a review, see Ollendick & King, 1998). It is generally assumed that cognitive restructuring is an essential component of cognitive-behavioral treatment (see Kendall et al., 1992). That is, anxious children have to be encouraged to recognize and restructure anxiety-promoting cognitions (i.e., threatening interpretations). In light of the threat perception bias, it also seems important to teach children to search for additional information in case they suspect a situation to be threatening.

An additional aim of this study was to investigate the concurrent validity of the social phobia scales of two recently developed self-report questionnaires for measuring anxiety disorders symptoms in children (SCARED and SCAS). Results showed that the social phobia scale of the SCAS and the extended social phobia scale of the SCARED correlated substantially with SASC-R scores. Correlations between the original SCARED social phobia scale and SASC-R scores were considerably lower. Thus, with the addition of three new items (Birmaher et al., 1999), the SCARED social phobia scale is improved and now seems to be an acceptable index of social anxiety in children.

Several limitations of this study should be acknowledged. First, children were explicitly told that some of

Table 8. Correlations Between Self-Report Questionnaires of Social Anxiety and Indexes of Threat Perception

	Threat Frequency	Threat Ratings	Threat Thresholds	Threat Interpretation	Threat Evaluation
SASC-R					
Total score	0.55	0.52	-0.53	0.40	0.70
FNE	0.50	0.45	-0.49	0.37	0.62
SAD-New	0.48	0.46	-0.47	0.34	0.62
SAD-General	0.44	0.46	-0.41	0.33	0.61
SCARED Social Phobia	0.39	0.34	-0.38	0.24	0.49
SCARED Social Phobia ^a	0.43	0.37	-0.42	0.28	0.54
SCAS Social Phobia	0.45	0.43	-0.46	0.35	0.57

Note: $N = 252$. All correlations significant at $p < .001$. SASC-R = Social Anxiety Scale for Children-Revised; FNE = Fear of Negative Evaluation From Peers; SAD-New = Social Avoidance and Distress Specific to New Situations; SAD-General = Generalized Social Avoidance and Distress; SCARED = Screen for Child Anxiety Related Emotional Disorders; SCAS = Spence Children's Anxiety Scale.

^aScale extended by three new items.

the stories would be scary and so, presumably, they felt some demand to judge some stories to be threatening. This might explain why control children perceived threat in response to some ambiguous stories, even though these children were not scared. Critics could even argue that the differences found between anxious and control children simply reflected anxious children's greater susceptibility to the demands implicit in the task. However, this argument is not very plausible because anxious children displayed threat perception abnormalities to all stories even though the instruction had clearly told them that some of the stories would not be scary. Second, as mentioned before, the study was carried out in a sample of schoolchildren and certainly needs replication in a sample of children referred for anxiety disorders. Third, one research assistant administered both the stories and the DISC interview. One could argue that this may have introduced an experimenter bias, that is, that DISC status was influenced by the answers that children gave on the questions about the stories. However, the DISC interview is highly structured, leaving no room for interpretation on the side of the interviewer. Moreover, correlations between social anxiety questionnaire scores (which had been obtained several weeks before the interview and to which the assistant was blind) and threat perception indexes revealed a highly similar pattern of results. Fourth, the study was only concerned with social anxiety. It remains to be seen whether threat perception bias occurs with other types of childhood anxiety (e.g., separation anxiety or generalized anxiety).

In the past decade, research on cognitive aspects of adult anxiety disorders has enhanced our understanding of anxiety-related information processing. An increasing number of researchers are investigating childhood anxiety from a cognitive perspective (see Daleiden & Vasey, 1997). This research has indicated that cognitive phenomena such as attentional bias and interpretation bias are certainly relevant for understanding childhood anxiety (e.g., Craske, 1997). This study adds to this knowledge and shows that anxious children also display a threat perception bias, a cognitive abnormality that may contribute to the maintenance of anxiety disorders in children.

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Appendix: Stories Used in This Study

Story 1

1. Next week is your birthday and you want to organize a birthday party.
2. You have made a list of children you want to invite.
3. You plan to ask the children during the break.

4. The break starts.
5. You walk toward the children that you want to invite.

Story 2

1. You come home from school and in the hall you hear voices of people you don't know.
2. Your mother calls you in.
3. An unknown man and woman are sitting in the living room.
4. Your mother introduces you to these people.
5. Mother fetches coffee in the kitchen and you stay in the room with this unknown man and woman.

Story 3

1. You have decided to join a sporting club.
2. You are for the first time in the changing room of the sporting club.
3. There you see a group of children waiting in a row.
4. You don't know any of them.
5. They all look at you.

Story 4

1. There is a new boy in your class.
2. You know him from nursery school and you don't like him.
3. In the past, he has bullied you once or twice.
4. In class, he whispers: "You just wait! I will get you later!"
5. After school, he comes to you and pushes you.

Story 5

1. You are going on holiday. Your parents have told you that you are going to a campsite where there will be a lot of other children.
2. You have just arrived and you walk around the campsite to see where everything is.
3. You see a group of children.
4. They are a few years older than you are.
5. They walk toward you.

Story 6

1. When school is over, the teacher asks you to stay.
2. While he is talking in the hall, you are waiting in the classroom.
3. He comes in and takes a seat in front of you.
4. He says that he wants to talk with you.
5. Then he asks you whether you are willing to give a small presentation next week.

THREAT PERCEPTION

Story 7

1. You have new neighbors with a boy/girl (opposite sex) of your age.
2. You are playing in the street and you see that the door of the new neighbors opens.
3. That boy/girl comes out of the house.
4. He/she walks toward you.
5. He/she asks whether you can come to play inside.