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Priming panic interpretations in children of patients with panic disorder

Silvia Schneider[a,*], Suzan Unnewehr[b], Irmela Florin[c], Jürgen Margraf[d]

[a]*Universität Basel, Switzerland*
[b]*Humboldt-Universität, Berlin, Germany*
[c]*Philipps-Universität, Marburg, Germany*
[d]*Universität Basel, Switzerland*

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Abstract

Cognitive and psycho-physiological models of panic disorder stress the role of interpretation bias in the maintenance of the disorder. Several studies have reported results consistent with this hypothesis, but it is still unclear whether this bias precedes panic disorder or is a consequence of it. In the present study, we compared the interpretations of ambiguous scenarios of children of individuals with panic disorder, children of individuals with animal phobia, and children of healthy controls. Children were presented with three types of scenarios each including one of the following descriptions: panic-relevant physical sensations, animal-relevant stimuli, and panic-irrelevant physical sensations (i.e., cold symptoms). To test, if children's interpretation bias is affected by priming, we compared their responses to the scenarios before and after watching a panic, a spider phobic, and a cold model. The results revealed that (a) children of panic disordered parents but not of parents with animal phobia and of healthy controls showed a significant increase in anxious interpretations after priming; and (b) this significant increase emerged only after priming through presentation of a panic-relevant model and not after priming through presentation of a phobia-relevant or cold-relevant model. Because the children of panic disordered parents did not have panics themselves, their increase in panic interpretations can be

* Corresponding author. Present address: Psychiatrische Universitätsklinik, Klinische Psychologie und Psychotherapie, Wilhelm Klein-Strasse 27, CH-4025 Basel, Switzerland.
Tel.: +41-61-325-51-17; fax: +41-61-325-50-87.
E-mail address: silvia.schneider@unibas.ch (S. Schneider).

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viewed as a vulnerability factor. Longitudinal studies should clarify the role of interpretation style in the etiology of panic disorder.

Subject-index terms: Children of panic disordered patients; Children of phobia disordered patients; Interpretation bias; Priming

Keywords: Panic disorder; Panic-relevant model; Panic interpretations

1. Introduction

Over the past two decades many clinical researchers have been interested in elucidating the cognitive processes underlying anxiety (cf.,Williams, Watts, MacLeod, & Mathews, 1997). Indeed, influential psychological models of anxiety disorders have postulated that cognitive processes are crucial for the maintenance of these disorders (e.g., Beck, Emery, & Greenberg, 1985; Foa & Kozak, 1986) and several studies have supported this premise. In particular, three kinds of cognitive biases, which were found to differentiate anxiety disordered individuals from nonanxious controls, have been hypothesized to mediate the maintenance of anxiety disorders: attentional bias (e.g., Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993; Hope, Rapee, Heimberg, & Dombeck, 1990), memory bias (e.g., Becker, Roth, Andrich, & Margraf, 1999; McNally, Litz, & Prassas, 1994), and interpretation bias (e.g., Butler & Mathews, 1983; McNally & Foa, 1987).

Cognitive and psycho-physiological models of panic disorder have emphasized the role of interpretation bias in the maintenance of this disorder (Beck et al., 1985; Clark, 1986; Ehlers & Margraf, 1989; Margraf & Ehlers, 1989). Specifically, these models postulate that individuals with panic disorder interpret body sensations associated with panic as threatening, and that this interpretation, in turn, gives rise to panic attacks, thus maintaining the disorder. Other authors conceptualized this feature as ''fear of fear'' (Goldstein & Chambless, 1978) or ''anxiety sensitivity'' (Reiss & McNally, 1985). Several studies examined the presence of an interpretation bias in panic disordered patients. McNally and Foa (1987) adopted a questionnaire originally developed by Butler and Mathews (1983), which consisted of ambiguous scenarios half of which included panic-relevant stimuli and the other half, panic-irrelevant potentially threatening stimuli. Untreated individuals with agoraphobia showed more catastrophic interpretations of panic-relevant stimuli than healthy controls and patients whose agoraphobia was successfully treated. Using McNally and Foa's (1987) questionnaire, Harvey, Richards, Dziadosz, and Swindell (1993) compared interpretations of individuals with panic disorder to individuals with social phobia and to healthy controls. The results were consistent with those of McNally and Foa. Panic disordered individuals, with and without agoraphobia, exhibited a bias towards catastrophic interpretation of panic-relevant stimuli more than individuals

with social phobia and healthy controls. However, both anxiety disordered groups also showed negative interpretation bias for panic-irrelevant scenarios compared to healthy controls. Taken together, these results suggest that anxiety disorders may be associated with a general tendency for negative interpretation, but that panic disorder is associated with a specific interpretation bias for panic-relevant stimuli.

To further examine specificity of the interpretation bias in panic disordered individuals, Clark et al. (1997) modified McNally and Foa's (1987) questionnaire by adding scenarios relevant to social anxiety and scenarios that included panic-irrelevant body symptoms. The study consisted of three groups: panic disorder, other anxiety disorders, and nonanxious controls. Results were consistent with the hypothesis that the interpretation bias in panic disorder is specific to panic-relevant stimuli. Panic disordered individuals more frequently perceived panic-relevant sensations as dangerous than did either the nonpanic anxious individuals or healthy controls. However, panic disordered individuals did not differ from individuals with other anxiety disorders in their interpretations of ambiguous social stimuli or other ambiguous stimuli. Here both groups had higher scores than healthy controls. With respect to panic-irrelevant body sensations, there were no group differences at all.

Results summarized above support the supposition that panic disorder is associated with negative interpretation bias of panic-relevant body sensations. But the design of these studies does not ascertain whether this bias precedes the disorder, and thereby contributes to its etiology or whether it is a consequence of the disorder and mainly contributes to its maintenance. One way to examine this issue is to study people who are at risk for panic disorder. One study examined memory bias in individuals who exhibit panics but do not meet criteria for panic disorder, i.e., ''nonclinical panickers,'' who are considered to be a risk group for the disorder (e.g., Ehlers, 1995). In this study, memory for anxiety, hostility, and neutral words of nonclinical panickers was compared to memory of nonpanickers (Norton, Schaefer, Cox, Dorward, & Wozney, 1988). To prime the threat material, Norton et al. (1988) had participants read a paragraph describing a panic attack, anger, or hunger. Immediately thereafter, participants were presented with words related to the three categories followed by a free recall test. Nonclinical panickers, who were primed by the panic attack paragraph, displayed a recall bias towards anxiety words. The authors suggested that the panic paragraph primed a danger schema in nonclinical panickers, thus enhancing retrieval of anxiety-relevant information. Interestingly, studies with panic disorder individuals reported memory bias without priming (Becker, Rinck, & Margraf, 1994; Cloitre, Cancienne, Heimberg, Holt, & Liebowietz, 1995; McNally, Foa, & Donnell, 1989). Possibly, priming may be necessary for nonclinical, but not for clinical, panickers because the former are constantly primed for danger stimuli. The concept of priming assumes that there are already existing structures within the memory that represent familiar items such as words. After presentation of relevant material these information structures become more readily accessible for retrieval (Baddeley, 1990).

Several family studies have established that panic disorder runs in families (Maier, Buller, & Hallmayer, 1988; Noyes et al., 1986; Weissman et al., 1993); thus, offspring of panic disordered patients are another group at risk of developing the disorder. While existence of panic disorder is well established in adults, controversy exists as to whether this phenomenon occurs in children and adolescents. With respect to adolescents, there are several community studies showing that panic attacks and panic disorder are common in this age group (Hayward, Killen, & Taylor, 1989; King, Gullone, Tonge, & Ollendick, 1993; Reed & Wittchen, 1998). In children prior to adolescence this phenomenon is quite seldom, but nevertheless exists (Last & Strauss, 1989; Ollendick, Mattis, & King, 1994). Citing the cognitive model of panic (Clark, 1986), Nelles and Barlow (1988) hypothesized that children are not capable of ''catastrophic misinterpretation'' of panic-relevant somatic symptoms up until adolescence and that their cognitive reactions are dominated by notions of external causation. However, a study by Mattis and Ollendick (1997) found that, while the tendency to make internal, catastrophic attributions in response to panic imagery may not be a common childhood phenomenon, certain individual factors (i.e., internal attributional style in response to negative outcomes and anxiety sensitivity) may predispose children to experience internal, catastrophic attributions in response to panic-relevant symptoms, thus facilitating the likelihood of having a panic attack.

There are only a few studies examining cognitive biases in children; however, recent studies demonstrated that children with anxiety disorders and highly anxious children appear to show the same attentional bias (e.g., Martin, Horder, & Jones, 1992; Vasey, Daleiden, Williams, & Brown, 1996; Vasey, El-Hag, & Daleiden, 1996) and interpretation bias (Barrett, Rappee, Dadds, & Ryan, 1996; Chorpita, Albano, & Barlow, 1996) as their adult counterparts. Furthermore, it seems that interpretation bias may be sensitive to influence from parents as demonstrated by Barrett et al. (1996) and Chorpita et al. (1996). Barrett et al. (1996) asked children with anxiety disorders, children with oppositional defiant disorder, children without mental disorder, and the parents of these children to complete a questionnaire similar to the ambiguous-situations task outlined by Butler and Mathews (1983). The questionnaire consisted of 12 ambiguous situations referring half to physical and half to social threat. The situations described were relevant for children with anxiety disorders. The children were asked to interpret and how to handle the described situations. The parents were asked to answer what their child might think and do in these situations. Children with anxiety disorders and their parents showed higher threat interpretation scores than normal controls. However, children with oppositional defiant disorder showed the highest threat interpretation score. Furthermore, children with anxiety disorders and their parents reported more often avoidance solutions for the ambiguous scenarios than both other groups. After a family discussion concerning a mutual solution, only children with anxiety disorders showed an increase in avoidance solutions.

Chorpita et al. (1996) showed with a similar methodology as used in the Barrett et al. (1996) study, that higher trait-anxious children have a heightened tendency to interpret ambiguous material as threatening, to express avoidance plans when faced with ambiguity, and to assign higher probability to the occurrence of threatening events.

In the proposed study, we examined presence of panic interpretations in children of parents with panic disorders who do not themselves exhibit the disorder. Because children of panic patients are often exposed to panic attacks of their panic parent, it seems reasonable that these children do have panic-relevant schema, but these are not readily accessible. The children may show increased threat activation on interpretive task, when previously primed by anxious ideas from their anxious parent. To investigate possible panic interpretations for panic-relevant stimuli in children of panic disordered individuals, we developed an ''Anxiety Interpretation Questionnaire for Children (AIQ-C)'' modeled on those of McNally and Foa (1987) and Clark et al. (1997). We hypothesized that like nonclinical panickers, these children would show such panic interpretations but only when presented with priming information. To test for specificity in interpretation we compared three classes of scenarios: panic-relevant, spider phobic-relevant, and cold-relevant symptoms (panic-irrelevant symptoms). We primed children using three video models describing: (a) a severe panic attack, (b) a frightening encounter with a spider, or (c) a cold. We predicted that: (a) children of individuals with panic disorder would show a significant increase in panic interpretations of panic-relevant stimuli after watching the panic model, but not after watching the other two models; (b) after watching the panic model, children of panic disordered individuals would show a significant increase in panic interpretations of panic-relevant stimuli whereas children of individuals with animal phobias and children of healthy controls would not show a significant increase.

2. Method

2.1. Participants

Over a period of 1 year, all panic disordered patients in an Anxiety Disorders Outpatient Clinic, with children between 8 and 15 years, were asked to participate in the study. Children of animal phobics and of parents without a history of psychiatric disorders were recruited by newspaper advertisement. The sample consisted of 29 children of parents with panic disorder and agoraphobia (CPAN), 21 children of parents with animal phobias (CPHOB), and 30 children of parents without any psychiatric disorder (CCON). All children and parents were informed that the aim of the study was to investigate the development of mental health. The children of the two clinical groups were aware of their parents' anxiety diagnoses. All parents provided informed consent and had obtained the consent of their

children to participate. The animal phobic disordered parents and the healthy control parents, who responded to the advertisements, were paid DM 50 (about US$30) and were given information about treatment possibilities. The children received a small gift for their participation.

2.2. Parents

In the CPAN and CPHOB groups, at least one parent had to have the target diagnosis, while in the CCON group neither parent had any history of psychiatric disorder. Furthermore, in the CPAN group children of panic disordered parents with a history of animal phobia were excluded from the study. Similarly, in the CPHOB group children of parents with a history of panic disorder were excluded. The parents in the CPHOB were a mixed group of individuals with animal phobia: 50% spider phobia, 31% dog phobia, 13% mouse phobia, 6% bird phobia. Parents were diagnosed using a structured interview (DIPS, Margraf, Schneider, Ehlers, DiNardo, & Barlow, 1989, German version of the Anxiety Disorders Interview Schedule-Revised version, ADIS-R, DiNardo & Barlow, 1988) for the assessment of mental disorders according to DSM-III-R (American Psychiatric Association, 1987). Characteristics of the participating parents are presented in Table 1. Since we included several children of one parent, the number of parents is less than the number of children.

In more than 80% of the cases, the mother was the target parent. The three groups did not differ significantly in this factor (female: CPAN 90%, CPHOB 94%, CCON 83%). Parent groups were comparable with respect to age ($F(2, 77) = .10$, ns) and sex ($\chi^2(2) = 2.31$, ns). The two clinical groups (CPAN and CPHOB) differed significantly on severity and duration of target diagnosis (severity: $t(25.98) = 3.94$, $P < .002$, duration: $t(25) = -4.48$, $P < .001$). Because most animal phobias have their onset in childhood or adolescence, the duration of the disorder was significantly longer in the parents with animal phobia than in the panic disordered parents. Moreover, the disorder was rated as significantly less severe in the former than in the latter. Since we used two different recruitment procedures, we checked whether the three parent samples were comparable. No

Table 1
Means (standard deviations) or percentage for characteristics of parents

	Group			*P*
	CPAN ($N = 19$)	CPHOB ($N = 16$)	CCON ($N = 24$)	
Age	38.3 (4.25)	36.7 (4.98)	35.4 (8.97)	ns
Female	55%	67%	47%	ns
Severity of target diagnosis (scale 0–8)	5.47 (1.71)	3.75 (.78)	–	<.002
Duration of target diagnosis (years)	8.29 (7.06)	24.10 (11.37)	–	<.001

differences were found in marital status, education or current employment in the three groups.

2.3. Children

Children were between 8 and 15 years. Because we wanted to examine the children before they had any panic attacks, we only included children younger than 16 years old. Data indicate that panic attacks are very rare before adolescence (Ollendick et al., 1994). Since the children had to complete self-report questionnaires, we excluded children younger than 8 years old. A total of 29 children of 19 parents with panic disorder, 21 children of 16 parents with animal phobia, and 30 children of 23 healthy control parents participated in the study. The groups were matched by age and comparable with respect to sex ($\chi^2(2) = 2.31, P = .32$).

Children completed the trait and state forms of the State Trait Anxiety Inventory for Children (STAIC, Spielberger, Gorsuch, & Lushene, 1970, German translation by Unnewehr, Schneider, & Margraf, 1990); a Panic Symptom List for Children including a measure of frequency of panic symptoms, a modified version of the Panic Symptom List for Adults developed by Margraf (1989); and Likert-scales of state anxiety (SA) and state excitement (SE). We measured excitement because it was possibly thought that the children in the three groups might differ in the way they labeled arousal. All ratings were based on self-report. Demographic and clinical characteristics of the participants are reported in Table 2.

To establish whether children met current or past criteria for DSM-III-R, mental disorders we conducted separate structured interviews of children and their parents. We used the Kinder-DIPS (Kinder-DIPS, DSM-III-R version; Unnewehr, Schneider, & Margraf, 1995), which assesses all anxiety disorders of childhood or adolescence, panic disorder (with and without agoraphobia), agoraphobia without history of panic disorder, simple phobia, major depression, dysthymia, attention-deficit hyperactivity disorder, oppositional defiant disorder, enuresis, and encopresis. The Kinder-DIPS is a reliable and valid structured interview. Test-retest reliability for the specific disorders reaches kappa coefficients between .50 and .89 (child version) and between .49 and 1.0 (parent version) (Schneider, Unnewehr,

Table 2
Means (standard deviations) for characteristics of participants

	Group			*P*
	CPAN ($N = 29$)	CPHOB ($N = 21$)	CCON ($N = 30$)	
Age	10.97 (1.84)	10.95 (2.01)	10.76 (1.76)	ns
STAIC-T (scale 20–60)	35.00 (7.70)	35.48 (5.56)	31.90 (5.71)	ns
STAIC-S (scale 20–60)	31.97 (6.23)	33.14 (4.11)	30.31 (4.06)	ns
Panic Symptom List (scale 0–57)	4.35 (5.70)	4.91 (3.16)	3.03 (3.07)	ns

& Margraf, 1995). Interrater reliability for the diagnoses observed in this study were between 98 and 100% (child version) and between 96 and 100% (parent version).

Children of both parents with animal phobias and panic disorder had more anxiety disorders than control group children (CPAN: 31%, CPHOB: 43%, CCON: 17%). While the CPHOB group more frequently had animal phobia, the CPAN group more frequently had anxiety disorders other than specific phobias (e.g., Separation Anxiety Disorder, Overanxious Disorder, Avoidant Disorder). Further results are reported in details in Unnewehr, Schneider, Florin, and Margraf (1998).

2.4. Materials

2.4.1. Anxiety Interpretation Questionnaire for Children (AIQ-C)

Our AIQ-C consists of nine items, modeled on questionnaires of McNally and Foa (1987) and Clark et al. (1997). Children were asked to interpret the ambiguous scenarios, all of which could have been construed as threatening. Three types of ambiguous scenarios were included: scenarios with panic-relevant stimuli, animal phobia-relevant stimuli, and cold-relevant stimuli. Panic-relevant stimuli were body sensations such as heart pounding, dizziness, and shortness of breath; the phobia-relevant stimulus was a spider. Symptoms such as a hot forehead, head pain, and feeling bad constituted cold-relevant stimuli. These stimuli were construed as panic-irrelevant physical sensations. After each scenario, we presented three alternative explanations for the symptoms: an anxious, a neutral, and a positive alternative. These were balanced across scenarios and children. Because we wanted to study children of individuals with panic disorder who did not have panic attacks themselves, we decided to relate the scenarios to other people and not to the subject. However, studies with individuals with panic disorder typically relate the object of the scenario to the subject themselves. The children were asked to choose the most plausible explanation. Below are examples of stories from each of the three categories (there were three stories in each category.) In five of the scenarios, the main character was a girl and in the remaining scenarios the main character was a boy.

Example of a panic scenario:

Lena is lying on her bed. Suddenly she notices that her heart is pounding and she is dizzy and short of breath. What has happened?

anxious:	Lena is afraid. She thinks that she is seriously sick and needs a doctor.
neutral:	Lena has just arrived from school. She has run the whole way home and she is tired.
positive:	Lena is very excited. It's her birthday and her classmates will be coming to her birthday party right away.

Example of a phobia scenario:

John and Anna go for a walk in the woods with their parents. John runs through the bushes and suddenly discovers a huge spider that he wants to show Anna and his parents. Anna doesn't approach him. What has happened?

anxious:	Anna is terribly afraid of spiders.
neutral:	Anna isn't interested in spiders. She would rather continue the walk.
positive:	Anna had just found a little rabbit in the meadow.

Example of a cold scenario:

John is sitting at his desk and doing his homework. He has a hot forehead, a headache, and he feels bad. What has happened?

anxious:	John is seriously ill. He has to go to the doctor right away.
neutral:	John played very hard with his friend after eating lunch and he is tired.
positive:	John has just a very minor cold.

Explanations that construed the situation as dangerous were taken to reflecting *anxiety*; probable explanations such as exhaustion or no interest were construed as *neutral*; and emotionally positive explanations were construed as *positive*. In the case of cold scenarios, the positive interpretation was the cold interpretation. This interpretation was positive in the sense that it was a nonthreatening plausible interpretation of the cold symptoms.

Because we wanted to administer the AIQ-C before and after a video presentation, we developed two parallel versions of the AIQ-C. For each scenario there was a parallel scenario that used the same symptoms. The AIQ-C for each scenario was scored as follows: $+1$ = anxious interpretation, 0 = neutral interpretation, and -1 = positive interpretation. Mean scores for panic, phobia, and cold scenarios were derived by computing the averages for the three scenarios within each category. A mean value >0 denotes that on average the child gave an anxious interpretation, a mean value <0 denotes that on an average the child gave positive interpretations.

Content validity was determined by asking seven clinical psychologists, experienced with panic disorder, to independently categorize each scenario as panic, phobia, or cold relevant. The agreement among raters was 98%. Internal consistency (Cronbach's Alpha) for the present sample on the different scenarios scales was .65 for the panic scenarios, .76 for the phobia scenarios and .55 for the cold scenarios.

2.4.2. Video models

Priming materials were three video clips each showing a woman about the age of the children's mothers. The panic video portrayed a panic disordered woman

describing a severe panic attack, the phobia video portrayed a woman describing a frightening encounter with a spider; the cold video portrayed a woman describing her cold symptoms. The cold model was included in order to investigate the specificity of potential priming effects. The descriptions in the two fear videos were presented by real patients who met DSM-III-R symptom criteria for panic disorder and simple phobia, respectively, each describing her own symptoms. Each video lasted about 2 min.

2.5. Procedure

After completing questionnaires and the structured diagnostic interview, the children were asked to complete the AIQ-C with its set of three scenarios and to give SA and SE ratings. The children were presented with the video clips. After each video we presented the child with a second version of scenarios that were relevant to the video and the SA and SE. The sequence of the type of video clip was varied according to a Latin square design.

2.6. Statistical analyses

To control for alpha inflation, we used a hierarchical approach to statistical analysis. Post hoc univariate analyses of variance were only interpreted when global tests proved significant. An alpha level of .05 was used for all statistical tests. Effect sizes are presented for the last level of the statistical analysis in the form of Cohen's "*d*."

2.6.1. AIQ-C

A three-way repeated measures ANOVA was performed with one between-subject factor (group: CPAN, CPHOB, CCON), and two repeated-measures factors (time: before, after; and content: panic, phobia, cold video). Significant main effects and interactions were followed by separate one-way analyses of variance and by post hoc Student–Newman–Keuls tests (SNK) or paired comparisons based on variance *t*-tests.

2.6.2. SA and SE

A two-way repeated measures MANOVA with the factors "group" (CPAN, CPHOB, CCON) and "time" (baseline, panic-, phobia-, control-video) was performed on the subjective measures SA and SE. Subsequently, paired comparisons based on separate variance *t*-tests (baseline-panic, baseline-phobia, baseline-control) were computed for SA and SE separately.

Subject observations were not completely independent in that more than one child from the same family was tested (two children per family: CPAN = 6, CPHOB = 3, CCON = 6; three children per family: CPAN = 2, CPHOB = 1, CCON = 0). An additional analysis controlled for this factor: only one child per family was randomly selected, and all analyses were repeated with the smaller

sample (CPAN = 19, CPHOB = 16, CCON = 24 children). No differences between the two samples were observed. Therefore, only results for the total sample will be reported.

3. Results

3.1. Effects of the models on the interpretations of the scenarios

Results of the priming procedure are shown in Fig. 1. Means and standard errors of the AIQ-C before and after model presentation are presented separately for each group and for each condition.As hypothesized, a $3 \times 2 \times 3$ ANOVA performed on AIQ-C revealed a significant *group* × *time* × *content* interaction, indicating that the groups showed differential reactions to the model tasks. Further 3×2 ANOVAs with the factor ''group'' (CPAN, CPHOB, CCON) and ''time'' (before, after) were computed for each content. Consistent with our hypothesis there was a significant *group* × *time* interaction for the panic video. Paired comparisons based on variance *t*-test revealed that only CPAN showed a significant increase in panic interpretations after the panic model (Cohen's $d = .54$). A significant time effect for the cold video indicated that all children showed an increase in cold interpretations of cold symptoms. Contrary to expectation, there was no significant interaction of group × time after the animal phobia video. Details of the statistical analyses are reported in Table 3.

Further analysis showed that after the panic video 73% of CPAN showed more panic interpretations compared to only 24% of CPHOB and 20% of CCON ($\chi^2(2) = 21.64$, $P < .001$). No effects of age, sex, and severity of parents target diagnosis on interpretations of the scenarios were detected.

3.2. Effects of the models on the anxiety and excitement rating

Means, standard deviations, and detailed results of the statistical analyses on these variables are reported in Table 4. A 4×2 MANOVA performed on AR and ER revealed a significant time effect. Subsequent paired *t*-tests indicated an increase in AR after baseline in all groups. But after using the Bonferroni-corrected alpha level (.008) there were only significant increases after the panic and after the phobia video. No significant changes in ER were found after the panic and phobia video, but after the cold video there was an significant decrease in ER.

3.3. Exploratory analyses

To investigate whether our negative priming effect with the spider phobia model was caused through our mixed animal phobia group, we conducted a separate *t*-test with the 10 children of parents with spider phobia for the means of

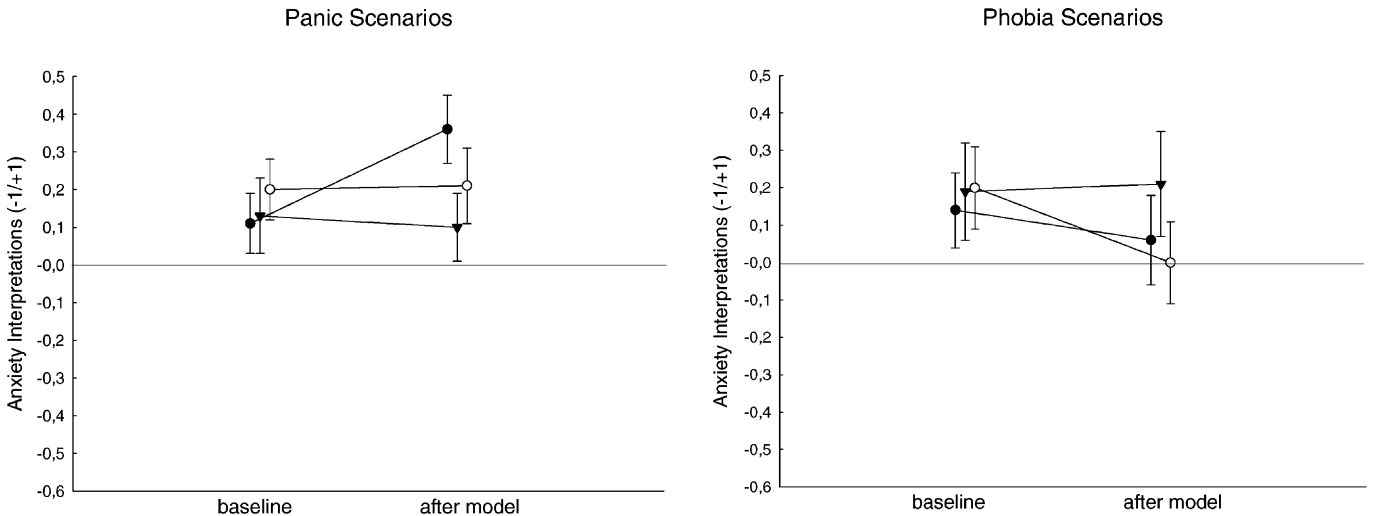

Fig. 1. Anxiety interpretations at baseline and after priming with a panic, phobia, and cold model. Symbols represent the mean in the Anxiety Interpretations Questionnaire for Children; vertical lines depict standard errors of the means. A mean value >0 denotes that on an average the child gave anxious interpretation, a mean value <0 denotes that on an average the child gave a nonanxious interpretation.

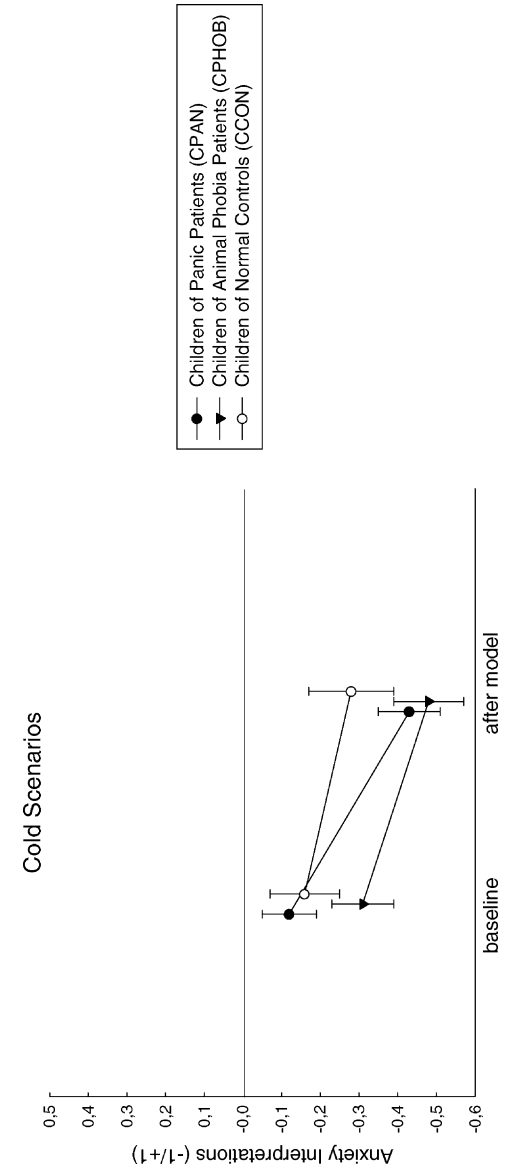

Fig. 1. (*Continued*).

Table 3
Reactions in AIQ-C to modeling procedure: statistical analyses

Effect/interaction	*F*	*df*	*P*
Three-way repeated measures ANOVA			
Group	.29		.75
Time	4.86	1,77	.03
Content	29.73	2,154	.01[a]
G × T	.33	2,77	.73
G × C	.85	4,154	.50
T × C	6.55	2,154	.01
G × T × C	2.48	4,154	.05
Post hoc ANOVA: panic content			
Group	.56	2,77	.58
Time	2.30	1,77	.13
G × T	3.13	2,77	.05
Post hoc ANOVA: phobia content			
Group	.27	2,77	.76
Time	2.15	1,77	.15
G × T	1.05	2,77	.35
Post hoc ANOVA: control content			
Group	1.35	2,77	.27
Time	14.57	1,77	.01[a]
G × T	1.37	2,77	.26
t-test baseline versus after panic model			
CPAN	−2.89	28	.01
CPHOB	36	20	ns
CCON	−.14	29	ns

[a] *P*-level < .01.

phobia-relevant interpretations before and after priming. The *t*-test revealed no significant difference.

To examine whether reactions to the experimental task were influenced by the diagnostic status of the children, additional analyses were performed comparing two groups: children with a primary diagnosis of anxiety disorder ($N = 35$) and children without history of any psychiatric diagnosis ($N = 42$). Since there were only three children with a primary diagnosis other than anxiety disorders, we excluded these children from analysis. A $2 \times 2 \times 3$ ANOVA with factors group, time, and content performed on AIQ-C revealed a significant Group × Time × Content interaction ($F(2, 150) = 3.26$, $P < .05$). Further 3×2 ANOVAs with factor group and time for each content were computed. There were no significant effects or interactions for the panic and phobia scenarios, but there was a main effect for the cold scenario. Time had a significant effect ($F(1, 75) = 18.04$, $P < .001$) in that all groups showed an decrease of anxious interpretations of cold symptoms after the model.

Table 4
Reactions in AR and ER to modeling procedure: means (standard deviations) and statistical analyses

	Baseline		Panic		Phobia		Control	
	AR	ER	AR	ER	AR	ER	AR	ER
CPAN	.14 (.35)	.55 (.78)	.79 (.94)	.52 (.79)	.76 (.83)	.45 (.57)	.38 (.78)	.21 (.49)
CPHOB	.24 (.44)	.52 (.75)	.48 (.68)	.57 (.81)	.95 (1.12)	.52 (.81)	.38 (.67)	.24 (.44)
CCON	.10 (.31)	.43 (.57)	.47 (.86)	.60 (.77)	.40 (.62)	.43 (.63)	.17 (.53)	.33 (.61)

Factor/interaction	*F*/*t*	*df*	*P*
MANOVA on anxiety and excitement rating			
Group	.89	4,154	ns
Time	10.01	6,72	.001
G × T	1.17	12,146	ns
t-test on anxiety rating			
Baseline versus panic	−5.04	79	.001
Phobia	−5.39	79	.001
Cold	−2.33	79	.05
t-test on excitement rating			
Baseline versus panic	−.70	79	ns
Phobia	.50	79	ns
Cold	3.04	79	.01

4. Discussion

Our results confirmed the hypothesis that children of panic disordered individuals would show significant increase in panic interpretations of panic-relevant stimuli after watching the panic model, but not after watching the other two models. No group differences emerged before the presentation of the panic model. This finding is consistent with the results of Norton et al. (1988) that nonclinical panickers displayed a higher recall for anxiety words on a free recall memory task after priming for panic-relevant word compared to priming for anger or hunger. However, the effect of priming cannot be ascertained from Norton's study because the memory bias was not examined before the priming material was introduced.

It should be noted that Norton et al.'s (1988) subjects had already experienced some panic attacks, albeit not frequently, whereas the children of the panic disordered parents in our study had not had any panic attack. Why then did these children exhibit negative interpretations to panic symptoms? We suggest that exposure to the panic attacks of their parents, including the catastrophic cognition associated with these attacks, formed a "panic schema" in these children's memories. Because the children did not experience panic symptoms themselves, their "panic schema" do not reside in working memory as is the case with their disordered parents who constantly dread the next panic attack. However, when panic-relevant material is presented the schema is primed and panic interpretations emerges. Indeed, the concept of priming supposes the presence of information

structures in memory that become more readily accessible for retrieval after the presentation of relevant material (Baddeley, 1990).

Results of the present study also confirmed our hypothesis that after watching the panic model, only children of panic disordered parents would show significant increase in panic interpretations of panic-relevant stimuli whereas children of individuals with animal phobias and children of healthy controls would not show this significant increase. Children of panic disordered patients showed a significantly higher increase in panic interpretations after the panic model compared to children of parents with animal phobia and of healthy controls. These results suggest that panic schemas could only be activated in children of panic disordered parents. Our results are similar to the findings of Harvey et al. (1993) and Clark et al. (1997), who demonstrated that individuals with panic disorder are more likely to misinterpret panic-relevant body sensations as dangerous than healthy controls and individuals with other anxiety disorders.

The proposition that the observed interpretation bias reflects the priming of already existing schemas is supported by the finding that prior to priming most children interpreted the symptoms in the cold scenarios as resulting from playing very hard with a friend and being tired. Indeed, such an interpretation is closely related to schemas that represent information about their everyday experiences and therefore was readily accessible. After viewing the cold model, they interpreted these symptoms as referring to having a cold. It is conceivable that all children had experienced cold symptoms or observed their parents having such symptoms, thus possessing a ''cold schema''. Priming of this schema by the cold model thus should have favored the cold interpretation.

Our results indicated no priming effect of the spider phobia model on the children of parents with animal phobias. This finding may be due to the fact that only 50% of the children in this group had parents who feared spiders. The other children had parents with fears of other animals such as dogs, rats, or birds. However, an exploratory analysis did not find a significant increase in phobia interpretations after priming in children of parents with spider phobia. This result may be due to the small sample size.

Interestingly, no significant group differences emerged in state and trait anxiety at baseline, although the means of children of anxious parents was somewhat higher than that of the controls. After the presentation of the panic model, all three groups showed an increase in SA, yet, as discussed above, a significant impact on interpretations of panic-relevant stimuli was found only in the group of children of panic disordered parents. Taken together, these results suggest that the model equally affected all children, but only those with a panic schema changed their interpretations. Thus, the results indicate that the priming effect on interpretations is not a consequence of higher state or trait anxiety.

Because 31% of children of panic disordered parents had a diagnosis of some anxiety disorder, it is possible that the panic interpretations observed in these children are an expression of their diagnostic status. However, a comparison between children with and without a primary diagnosis of anxiety disorder did not

support such an explanation. This finding is in contrast to the results of the Barrett et al. (1996) study, in which children with anxiety disorders showed higher threat interpretation scores and more avoidance solutions for ambiguous scenarios than normal controls. This contradictory finding may be explained by the fact that in the Barrett et al. (1996) study children with anxiety disorders were asked about their interpretations of ambiguous situations which were relevant to themselves. Whereas in our study, children were asked to interpret ambiguous situations that were relevant for their ill parent. Thus, increase in panic interpretations found in children of panic disordered parents seems to be related to the parents' diagnosis rather than to their own diagnostic status. While the parent's diagnostic status predicted the presence of panic interpretations, the severity of the parents' symptoms did not. It follows that the formation of a panic cognitive structure in one's offspring does not require extremely severe symptoms.

Taken together the results of the present study suggest presence of specific panic interpretations towards panic-relevant symptoms in children of panic disordered individuals, but this interpretation style is observed only after priming with a panic model. Thus, children of panic disordered patients, who are at a high risk for panic disorder, showed similar cognitive characteristics to that found in their parents. Furthermore, these children showed these features in the absence of panic attacks. In another study, we found that children of panic disordered parents more often terminated a hyperventilation task prematurely compared to children of parents with animal phobia and healthy control parents (Unnewehr, Schneider, Margraf, Jenkins, & Florin, 1996). This finding suggests a tendency towards avoidance of panic-relevant symptoms in this children, a feature that parallels that of their parents. Indeed, a number of studies showed that hyperventilation produced higher subjective anxiety or more panic attacks in panic disordered individuals than in individuals with other types of anxiety disorder and healthy controls (for a review see Margraf, 1993). Thus, in both studies we have demonstrated that children of panic disordered parents manifest characteristics of the disorder.

While the results of the present study suggest a specific negative interpretation bias for panic-relevant symptoms in offspring of panic disordered individuals, the exact role of such an interpretation bias in the etiology of the disorder is unclear. Indeed, not all children of individuals with panic disorder develop the disorder. A longitudinal investigation would shed light on the relevance of factors such as cognitive biases to the development of panic disorder. We are now conducting such a longitudinal study. If this study implicates cognitive biases as markers for the disorder, it will not only further our understanding of its etiology but will also have implication for the prevention of the disorder. The investigation of methods for modifying cognitive biases has already begun and these methods could be adopted for individuals with panic-related cognitive biases who have not yet developed the disorder.

Since this is the first study that experimentally studied panic interpretation in children of parents with panic disorder, no methods with established reliability and validity could be used. In the ''Anxiety Interpretation Questionnaire'' that we

developed for this study, the positive interpretations for the cold scenarios are not comparable with the positive interpretations in the other types of scenarios. However, we needed to include a cold interpretation because we wanted to test the priming effect of a cold model. We replaced the positive and not the neutral interpretation with a cold interpretation because we thought that an interpretation of symptoms like "hot forehead" and "head pain" as symptoms of positive excitement would be not plausible. Also, the given anxious interpretations in the AIQ-C could be strongly formulated as threat interpretations, such as has been done in adult studies. In the current version of the AIQ-C, the panic respectively anxiety interpretations of the scenarios are a mixture of emotional and cognitive interpretations.

A further limitation of the present study is the composition of the animal phobia group that included a variety of animals. A strong test of the effect of the spider model on interpretations in children of individuals with animal phobia, would have needed to have a group of parents all of whom suffer from spider phobia. Finally, our results need to be replicated, using the same method (i.e., interpretation of scenarios, as well as other paradigms such as contextual priming).

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