

## Psychopathology in Children of Patients with Panic Disorder or Animal Phobia

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### Abstract

Several studies reveal a heightened risk for anxiety and other mental disorders in the offspring of patients with panic disorder and other anxiety disorders. Data on the specific type of transmitted disorders, however, are inconsistent. We investigated the specificity of the relationship between parents' and children's psychopathology. We assessed current and past mental disorders in 5- to 15-year-old children of patients with panic disorder (CPAN, n = 34), children of parents with no diagnosis of a mental disorder (CCON, n = 30) and children of animal phobics (CPHOB, n = 23) using a structured diagnostic interview according to DSM-III-R criteria. Diagnoses are based on parent as well as child information. CPAN and CPHOB had significantly more often at least one current mental disorder than children of the healthy control parents. Compared to CPHOB and CCON, children of panic patients had significantly more severe diagnoses and more often multiple diagnoses. Furthermore, a higher rate of internalizing anxiety disorders, particularly separation anxiety disorder, was found in CPAN. In contrast, children of animal phobics showed a higher rate of externalizing anxiety disorders. Our results suggest a specific transmission of such disorders that share common features of parental symptomatology.

### Objective

#### *Studies on Adult Relatives of Patients with Panic Disorder and Specific Phobia*

Family studies on panic disorder that focussed on adult relatives of patients with panic disorder found an elevated risk of anxiety disorders and particularly of panic disorder in, especially female, relatives of panic patients [1–7]. In addition, there is

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evidence that disorders frequently cooccurring with panic disorder (depressive disorders, substance abuse disorders) have a higher prevalence in relatives of panic patients [3, 4]. However, an elevated rate of anxiety disorders in general as well as panic disorder in particular does not appear to be specific for relatives of panic patients: This finding also applies to relatives of patients suffering from other anxiety disorders [4, 8, 9]. In a family study on specific phobia, a significantly higher risk of specific phobias was found in relatives of patients with specific phobia (according to DSM-III-R) compared to relatives of normal controls [10].

#### *Studies on Children of Parents with Panic Disorder*

Table 1 provides an overview of the 'top-down' studies on panic disorder (with or without agoraphobia). These studies examined whether the children (up to the age of 18) of patients with panic disorder have a higher frequency of mental disorders, particularly anxiety disorders. In all of the reported studies, diagnoses of parents and children were based on DSM-III or DSM-III-R criteria. Since most of the patients with agoraphobia according to DSM-III had panic attacks, they too will be referred to as panic patients. The results of these studies can be summarized as follows:

(1) Children of panic patients are at a higher risk of having anxiety disorders and other mental disorders than children of normal control parents [11–13]. This risk seems to be specifically increased in children of panic patients who also show behavioral inhibition [14, 15].

(2) Children of patients with other anxiety disorders (generalized anxiety disorder, obsessive-compulsive disorder) as well as children of patients with (comorbid primary or secondary) affective disorders (major depression, dysthymic disorder) or other mental disorders are also at a higher risk of having anxiety disorders and other psychopathology when compared to children of control subjects without psychopathology [11–13]. Two studies compared children of patients with panic disorder (with or without agoraphobia) and comorbid major depressive disorder to children of patients with either major depressive disorder or panic disorder (with or without agoraphobia) as the only diagnosis [11, 16]. In these studies, children of patients with panic disorder (with or without agoraphobia) and comorbid major depressive disorder had the highest rate of anxiety disorders, whereas children of patients with only major depressive disorder had the lowest rate of anxiety disorders. In contrast, Sylvester et al. [12] and Turner et al. [13] found much higher rates of anxiety disorders in children of patients with major depressive disorder or dysthymic disorder.

(3) In general, the findings cited in table 1 do not support the hypothesis of a specific transmission of separation anxiety disorder. Klein [17, 18] proposed that the occurrence of separation anxiety during childhood represents a specific predisposition for panic disorder – at least in women. Furthermore, he stated that particularly female patients with panic disorder who had had separation anxiety as a child would transmit separation anxiety to their children [19].

Table 2 gives an overview of the anxiety disorders found in the top-down studies on children of panic patients. In the study by Turner et al. [13], separation anxiety disorder was the most frequent disorder in children of patients with anxiety disorders. This rate was significantly higher than in children of normal controls. The authors do not mention, however, how many panic patients were included in their anxiety disorders sample consisting of patients with agoraphobia or obsessive-compulsive disorder.

**Table. 1** Mental disorders in children of patients with panic disorder

Study	Ref.	Parent sample (diagnosis, n, gender)	Child sample (n, age, gender)	Method of investigation	Frequency (%) of anxiety disorders	Frequency (%) of other mental disorders	Comments
Weissman, et al., 1984	11	MDD <sup>a</sup> : n = 23 MDD + AG: n = 10 MDD + PAN: n = 11 MDD + GAD: n = 16 CON: n = 40 57% women	CMDD: n = 38 CMDD+AG: n = 18 CMDD+PAN: n = 19 CMDD+GAD: n = 32 CCON: n = 87 6–17 years; ca. 50% boys; groups comparable regarding age and gender	Interview of index parent and (in 64% of cases) of the other parent using a modified version of the DICA-P [44]	CMDD: 0 CMDD+AG: 39 CMDD+PAN: 58 CMDD+GAD: 6.3 CCON: 2.4	Frequency of MDD: CMDD: 10.5 CMDD+AG: 22.2 CMDD+PAN: 26.3 CMDD+GAD: 3.1 CCON: 0 Frequency of attention deficit disorder and/or conduct disorder: CMDD: 23.7 CMDD+AG: 22.2 CMDD+PAN: 5.3 CMDD+GAD: 12.5 CCON: 2.4	E, G
Sylvester et al., 1987	12	PAN: n = 24 MDD: n = 10 CON: n = 19	CPAN: n = 42 CMDD: n = 17 CCON: n = 32 7–17 years; no information on gender of children	Interview of index parent and child using the DICA/DICA-P [44]	Results from interviews with the parents: CPAN: 43 CMDD: 59 CCON: 9 Results from interviews with the children: CPAN: 40 CMDD: 29 CCON: 3 For parent and child interviews: no significant difference between children of the two clinical groups was obtained; significant differences emerged between children of each of the clinical groups and CCON	For parent and child interviews: Children of both clinical groups had significantly higher rates of other mental disorders (major depressive disorder, attention deficit disorder, oppositional and conduct disorder) than CCON	C, D, G

(continued)

**Table 1** (continued)

Study	Ref.	Parent sample (diagnosis, n, gender)	Child sample (n, age, gender)	Method of investigation	Frequency (%) of anxiety disorders	Frequency (%) of other mental disorders	Comments
Turner et al., 1987	13	AG/OCD: n = 13 DD: n = 11 CON: n = 10	CAG/OCD: n = 16 CDD: n = 14 CCON: n = 13 7–12 years; 38 boys, 24 girls; groups comparable regarding age and gender	Interview of child using the CAS [45]	CAG/OCD: 37.5 CDD: 21.4 CCON: 7.7 No significant difference between children of the two clinical groups was obtained; significant differences emerged between children of each of the clinical groups and CCON	One child of parent with AG/OCD had DD	C, F, G
Silverman et al., 1988	20	AG with panic attacks: n = 14 PAN: n = 5 GAD: n = 5 'mixed phobias' (simple phobia, social phobia and/or OCD): n = 4 25 females, 3 males	CAG: n = 21 CPAN: n = 6 CGAD: n = 7 mixed phobias: n = 8 6–16 years 24 boys, 18 girls	Interview of index parent and child using the ADISC/ADISP [46], Parents also completed the Child Behavior Checklist [47]	81% of the CAG, 0 of the CPAN, 75% of the children of the mixed-phobia parent group, 29% of the CGAD had an anxiety disorder and/or questionnaire scores of clinical relevance	?	A, B, D
Biederman et al., 1990	14	PAN + AG	CPAN+AG with BI: n = 18 CPAN+AG without BI: n = 12 4–7 years mean age of CPAN+AG with BI: 5.4 years, CPAN+AG without BI: 4.7 years, ( $p \leq 0.05$ ); ca. 50% boys	Interview of mother using the DICA-P [44]	CPAN+AG with BI: 33 at least 1 anxiety disorder 22.2 $\geq$ 2 anxiety disorders CPAN+AG without BI: 1 child had 1 anxiety disorder, no child had $\geq$ 2 anxiety disorders	CPAN+AG with BI had a higher frequency of disruptive behavior disorders and depressive disorders than CPAN+AG without BI	B, C, E, G

Biederman et al., 1991	16	PAN+AG PAN+AG+MDD MDD other mental disorders	CPAN+AG: n = 14 CPAN+AG+MDD: n = 25 CMDD: n = 12 Cother: n = 23 4–22 years CPAN+AG sign. younger than children of other groups	Interview of mother using the DICA-P [44]	CPAN+AG: 21.4 at least 1 anxiety disorder 14.3 $\geq$ 2 anxiety disorders CPAN+AG+MDD: 48 at least 1 anxiety disorder 16 $\geq$ 2 anxiety disorders CMDD: 8.3 at least 1 anxiety disorder 0 $\geq$ 2 anxiety disorders Cother: 21.7 at least 1 anxiety disorder 4.4 $\geq$ 2 anxiety disorders	Frequency of MDD: CPAN+AG: 35.7 CPAN+AG+MDD: 20 CMDD: 16.7 Cother: 17.4 Overall, CPAN+AG and Cother had more disruptive behavior disorders than the other groups of children	B, C, E, G
Biederman et al., 1993 3-Year follow-up of Biederman et al., 1990	15 14	PAN+AG	CPAN+AG with BI: n = 26 mean age 6.7 years 18 boys CPAN+AG without BI: n = 17 mean age 5.9 years 10 boys	Interview of mothers using the DICA-P and modules of the Kiddie-SADS [48]	CPAN+AG with BI: 58 at least 1 anxiety disorder 39 $\geq$ 2 anxiety disorders CPAN+AG without BI: 41 at least 1 anxiety disorder 6 $\geq$ 2 anxiety disorders	CPAN+AG with BI had more disruptive behavior disorders and depression than CPAN+AG without BI	B, C, E

AG: Agoraphobia; BI: behavioral inhibition; CON: control subjects without mental disorder; DD: dysthymic disorder; GAD: generalized anxiety disorder; MDD: major depressive disorder; OCD: obsessive-compulsive disorders; PAN: panic disorder; PAN+AG: panic disorder with agoraphobia.

CAG: children of parents with agoraphobia; CCON: Children of control subjects without mental disorders; CDD: children of parents with dysthymic disorder; CGAD: children of parents with generalized anxiety disorder; CMDD: children of parents with major depressive disorder; COCD: children of parents with obsessive-compulsive disorder; Cother: children of parents with other mental disorders; CPAN: children of parents with panic disorder; CPAN+AG: children of parents with panic disorder and agoraphobia.

A: Interview/diagnostician not blind with regard to parent diagnosis or not reported in detail; B: no control group of parents without mental disorder and their children; C: no information on important characteristics of the parent sample; D: no information on important characteristics of the child sample; E: parents as only source of information about the symptoms of their children; F: children as only source of information about their symptoms; G: limited range of assessed anxiety disorders; ?: no information.

<sup>a</sup> Many patients with MDD met criteria for more than one additional anxiety disorder. In these cases, the following hierarchy was used: AG over PAN over GAD; e.g., a patient with MDD+PAN+GAD would be classified as MDD+PAN.

**Table 2.** Frequency (%) of anxiety disorders in children of patients with panic disorder

	Weissman et al. [11] CMDD+PAN children (n = 19) CCON (n = 87)	Turner et al. [13] CAG/OCD (n = 16) CCON (n = 13)	Sylvester et al. [12] <sup>a</sup> CPAN (n = 42) CCON (= 32)	Silverman et al. [20] <sup>c</sup> CPAN+AG (n = 27)	Biederman et al. [14] CPAN+AG (n = 30) with and without BI	Biederman et al. [16] CPAN+AG (n = 14)	Biederman et al. [15] CPAN+AG (n = 43) with and without BI
Separation anxiety disorder	36.8/0*	25/0*	43/9 <sup>b</sup> .*	3.7	13.3	14.3	20.9
Overanxious disorder	NA	12.5/10		18.5	16.7	14.3	9.3
Avoidant disorder	NA	0/0	NA	3.7	10	14.3	18.6
Simple phobia	5.3/0	0/0	NA	44.4	6.7 <sup>d</sup>	7.1 <sup>d</sup>	62.8 <sup>e</sup>
Social phobia	5.3/1.2	0/0	NA	14.8	NA	NA	16.3
Panic disorder	5.3/0	NA	NA	3.7	NA	NA	4.7
Agoraphobia	5.3/0	NA	NA	0	NA	NA	4.7

BI: Behavioral inhibition; CAG/OCD: children of patients with agoraphobia or obsessive-compulsive disorder; CCON: children of control subjects without mental disorder; CMDD+PAN: children with major depressive disorder and panic disorder; NA = not assessed.

\*  $p < 0.05$  compared to the control group.

<sup>a</sup> 50% of the children of panic patients and 16% of the children of normal controls also had a combined diagnosis of an anxiety disorder and depression.

<sup>b</sup> The majority of children in this category had overanxious disorder.

<sup>c</sup> Children of patients with agoraphobia or panic disorder were combined in this instance. Note that none of the CPAN (n = 6) had a DSM-III diagnosis.

<sup>d</sup> Children with 'phobic disorders'.

<sup>e</sup> Children with 'phobic disorders' and/or simple phobia.

In case that there were more patients with obsessive-compulsive disorder, the results would be more likely to contradict the hypothesis of a specifically increased risk of separation anxiety in panic patients. Weissman et al. [11] found that separation anxiety disorder was the most frequent disorder in children of depressed patients with a secondary diagnosis of panic disorder. Due to this comorbidity, however, no clear conclusion about a specific association between separation anxiety disorder and panic disorder can be drawn from these results. Evidence against the separation anxiety hypothesis is provided by Sylvester et al. [12], Silverman et al. [20] and Biederman et al. [14–16]. Here, children of patients with panic disorder had the same or even a higher rate of anxiety disorders other than separation anxiety disorder.

The overall interpretation of the results of the top-down studies is complicated by a number of methodological issues listed in table 1. Taking these issues into account, it was our aim to further examine whether the children of patients with panic disorder or specific phobia are at a higher risk of having mental disorders and whether any specific relationships can be found.

## Methods

### *Subjects*

Parents with panic disorder, animal phobia and no mental disorder who had children of ages 5–15 were asked to participate in a study on familial transmission of anxiety disorders. Parents with panic disorder and some of the parents with animal phobia were recruited from research centers for clinical psychology and outpatient clinics where they had applied for treatment. Additional parents with animal phobia and the healthy control parents were recruited through advertisements in local newspapers. All parents provided informed consent and had obtained the consent of their children to participate in the study. The phobic patients and the healthy control parents who had responded to the advertisements were paid an amount of DM 50. The phobic patients were also informed about therapeutic possibilities and were referred to behavior therapy when required. The children received a small present for their participation.

To be included in the study, patients were required to have panic disorder (with or without agoraphobia) or animal phobia according to the DSM-III-R criteria, respectively, as their primary mental disorder. Due to the high comorbidity of anxiety disorders, subjects from both clinical groups were not excluded if they had additional diagnoses of a mental disorder (except for psychotic disorders). These additional disorders had to be of markedly lower severity. In the clinical samples, only the parent having the disorder was examined. For the normal control group, however, it was ensured that none of the parents had a history of current or past mental disorders or panic attacks. When patients had more than one child within the indicated age range, all of these children were included. Overall, 22 parents with panic disorder, 18 with animal phobia and 24 control parents participated in the study together with their children ( $n = 34$  for the panic disorder group,  $n = 23$  for the animal phobia group and  $n = 30$  for the normal control group).

### *Procedure*

All of the parents were diagnosed using a structured interview (DIPS [21], German version of the ADIS-R [22]) for the assessment of mental disorders according to the DSM-III-R [23]. In the clinical groups only the parent who carried the anxiety disorder was interviewed. From the control parents, diagnostic information from both parents was obtained in order to make sure that none of the parents of this group had a history of a mental disorder.

After this, a structured interview assessing DSM-III-R disorders in children and adolescents (DSM-III-R version of the Kinder-DIPS [24], a German interview with established reliability and validity) was conducted with both the child and the participating parent.

Diagnostic assessment of parents and children was carried out by clinical psychologists having received a special interview training. The duration of each of the interviews was approximately 60 min. For organizational reasons, it was not possible to achieve blindness of interviewers with regard to the parental diagnosis in all cases. To compensate for this shortcoming, all 174 child diagnostic interviews were audiotaped and for 95 randomly selected interviews diagnoses were also given on the basis of these recordings by a rater blind to the parental diagnosis. Diagnostic agreement was higher than 90% for the respective diagnoses. When raters differed, cases were discussed until consensual diagnoses were reached.

### *Measures*

The Kinder-DIPS, DSM-III-R version, provides information about the anxiety disorders of childhood and adolescence (i.e. separation anxiety disorder, overanxious disorder, avoidant disorder), panic disorder, specific phobia, major depressive and dysthymic disorder as well as disruptive behavior disorders (attention deficit and hyperactivity disorder, oppositional disorder) and functional enuresis and encopresis. Test-retest reliability (kappa coefficients [25] or, if base rates were lower than 10%, Yule coefficients [26]) were: 0.50 (child version), 0.49 (parent version) for the anxiety disorders of childhood and adolescence, 0.71 (child version), 0.66 (parent version) for the other anxiety disorders, 0.56 (child version), 0.87 (parent version) for disruptive behavior disorders, 0.89 (child version) 1.0 (parent version) for elimination disorders and 0.81 (child version), 1.0 (parent version) for depressive disorders [24].

We assessed current as well as past disorders. Current diagnoses were subdivided into primary diagnoses and secondary diagnoses. Severity of disorders was rated by the interviewers on a 9-point rating scale ranging from 1 (low impairment) to 9 (very strong impairment).

All of the results to be reported are based on the combined diagnoses from the parent and child versions of the structured interview. In case of diverging diagnoses from the parent and child interview the combined diagnosis was derived according to the following rules [27]: (1) As to the temporal order of symptoms and to past symptomatology, more weight was assigned to information obtained from the parent. (2) Concerning internalizing disorders (i.e. anxiety disorders, depression), more weight was assigned to the information obtained from the child or adolescent. (3) Concerning externalizing disorders (e.g. attention deficit and hyperactivity disorder, oppositional disorder), more weight was assigned to the information given by the parent.

The anxiety disorders were subdivided into two subcategories, namely those implying fears primarily relating to internal states (e.g. fears concerning physical well-being, fears of being alone or of self-competence) and those implying fears of external situations or objects. These subcategories will be referred to as internalizing versus externalizing (phobic) anxiety disorders. The category of internalizing anxiety disorders comprises separation anxiety disorder, overanxious disorder, avoidant disorder and panic disorder (with or without agoraphobia). The category of externalizing anxiety disorders comprises agoraphobia without a history of panic attacks, specific phobia or school phobia. Other diagnostic categories are the disruptive behavior disorders including attention deficit and hyperactivity disorder and oppositional disorder, depressive disorders including major depression and dysthymic disorder and elimination disorders including functional enuresis and encopresis. In addition, because of its specific theoretical relevance, separation anxiety disorder was also investigated as a separate entity.

#### *Statistical Analysis*

For between-group comparisons of type and frequency of disorders  $\chi^2$  tests or, in case of expected values smaller than 5, Fisher's exact tests were computed. If expected values were lower than 2, the results are presented descriptively.

The independence of observations is restricted by the fact that siblings were participating in the study. An additional analysis controlled for this factor: only one child per family was randomly selected and all analyses were performed once more with this reduced sample. No results differing from the main analysis were obtained. Therefore, results for the whole group are presented.

In order to compare sociodemographic and clinical data of the three groups, univariate analyses of variance with subsequent post-hoc comparisons (Student-Newman-Keuls tests) or t tests were performed.

All statistical tests are two-tailed with an alpha level of 0.05.

## **Results**

### *Demographic and Clinical Characteristics of the Sample*

Table 3 presents the demographic and clinical data of the parent sample. In more than 80% of the cases per group, the mother was the participating parent. The typical parent was married and was working as a white-collar employee. The three groups did not differ significantly in any of these variables. Parents with panic disorder, however, differed significantly from parents with specific phobia with respect to severity (rated by the diagnostician on a 9-point rating scale) and duration of the disorder. The disorder was rated as significantly less severe in animal phobics than in panic patients. Due to the fact that most animal phobias have their onset in childhood or adolescence, duration of the disorder was significantly longer in the phobic patients than in the panic patients. These differences can be seen as inherent to the nature of the two disorders. Any attempt to select different cases (e.g. panic disorder with onset at age 5 and low severity) would have resulted in atypical samples for the disorder to be studied. With regard to

**Table 3.** Demographic and clinical characteristics of the parents

	Panic parents (n = 22)	Phobia parents (n = 18)	Control parents (n = 24)	p
Age, years	38.1 ± 4.4	36.5 ± 4.7	37.0 ± 5.2	NS
Female	90.9 (20)	94.4 (17)	83.2 (20)	NS
Male	9.1 (2)	5.6 (19)	16.7 (4)	
Married	86.4 (19)	66.7 (12)	75.0 (18)	NS
<i>Primary diagnosis</i>				
Panic disorder	100 (22)	–	–	
Agoraphobia	95.5 (21)	–	–	
Simple phobia <sup>a</sup>	–	100 ± 18	–	
Severity (0–8)	5.4 ± 1.6 (n = 16)	3.8 ± 0.9 (n = 11)		<0.001
Duration, years	8.3 ± 7.1 (n = 17)	23.8 ± 10.8 (n = 17)		<0.001
<i>Secondary diagnoses<sup>b</sup></i>				
Agoraphobia	–	11.1 (2)	–	
Simple phobia	13.6 (3)	–	–	
Social phobia	9.1 (2)	5.6 (1)	–	
Generalized anxiety disorder	9.1 (2)	5.6 (1)	–	
MDD	4.5 (1)	–	–	
<i>Past diagnoses<sup>b</sup></i>				
MDD or DD	18.2 (4)	22.2 (4)	–	
Alcoholism	4.5 (1)	5.6 (1)	–	
PTSD	4.5 (1)	–	–	
Anorexia nervosa	4.5 (1)	–	–	
Bulimia nervosa	–	5.6 (1)	–	

Up to 3 diagnoses per person possible. MDD: Major depressive disorder; DD: Dysthymic disorder; PTSD: Posttraumatic stress disorder.

The table shows percent (number of cases) or means ( $\pm$  SD when applicable)

<sup>a</sup> 12 patients (66.6%) had a spider phobia, 4 persons (22.2%) had a dog phobia, 1 person (5.5%) had a cat phobia and 1 person (5.5%) had a bird phobia.

<sup>b</sup> Up to 3 diagnoses per person possible.

comorbidity both clinical parent groups were comparable. It should be noted that 3 panic patients had a secondary diagnosis of specific phobia and that 2 animal phobics also had agoraphobia as a secondary comorbid diagnosis.

#### *Frequency of Mental Disorders*

Table 4 shows the frequency of current and mental disorders in the three groups (children of parents with panic disorder, CPAN; children of animal phobics, CPHOB, and children of parents with no diagnosis of a mental disorder, CCON), regardless of their type. The groups differed significantly in the frequency of disorders ( $\chi^2 = 13.96$ ; d.f. = 2;  $p < 0.01$ ). Further  $\chi^2$  tests revealed that children of panic patients and children of phobia patients had significantly more often at least one current disorder than children of control parents (CPAN, CPHOB > CCON, all  $p < 0.05$ ). Moreover, the children

**Table 4.** Frequency of mental disorders

	CPAN	CPHOB	CCON
≥ 1 current disorder	24 (70.6)	15 (65.2)	8 (26.7)
≥ 2 current disorders	14 (41.2)	2 (8.7)	0
≥ 1 past disorder	6 (12.6)	6 (26.1)	5 (16.7)

Values are numbers of patients with percentages in parentheses.

**Table 5.** Frequency of specific mental disorders

	CPAN	CPHOB	CCON
Internalizing anxiety disorders	22 (64.7)	4 (17.4)	2 (6.7)
Externalizing anxiety disorders	11 (32.3)	11 (47.8)	4 (13.3)
Disruptive disorders	8 (23.5)	0	1 (3.3)
Elimination disorders	0	2 (8.7)	1 (3.3)
Depressive disorders	3 (8.8)	0	0

Values are numbers of patients with percentages in parentheses.

of panic patients had significantly more often at least two current disorders than the children in the other parent groups (CPAN > CPHOB, CCON, all  $p < 0.05$ ). There were no statistically significant differences with regard to the frequency of past diagnoses ( $\chi^2 = 0.86$ ; d.f. = 2;  $p = 0.650$ ). It should be noted that the severity of the parental anxiety disorder had no significant influence on the number of mental disorders in the children. Those children ( $n = 13$ ) whose parent had an anxiety disorder of low severity (severity degree between 1 and 3) had a mean number of 0.85 (SD = 0.80) current mental disorders. Those children ( $n = 34$ ) whose parent had a higher severity of his disorder (severity degree between 4 and 9) had a mean number of 1.09 (SD = 1.11) current mental disorders ( $t(45) = -0.72$ ;  $p = 0.478$ ).

#### *Severity of Disorders*

Mean severity ratings of the primary diagnoses (regardless of type of disorder) were 4.6 (SD = 2.9) for the CPAN, 3.6 (SD = 1.7) for the CPHOB and 2.7 (SD = 1.4) for the CCON. Significant group differences emerged ( $F = 3.64$ ; d.f. = 2, 44;  $p < 0.05$ ): the disorders of the children of panic patients were rated as more severe than those of children of phobic and control parents (post-hoc SNK tests,  $p < 0.05$ ).

#### *Frequency of Specific Disorders*

Table 5 presents frequencies of the specific current diagnoses in the three groups. It should be noted that a child could have up to two primary and up to three secondary diagnoses. However, if a child fulfilled criteria for two disorders of the same diagnostic category, it was mentioned only once in this category. There were significant differ-

ences between the three groups regarding internalizing anxiety disorders ( $\chi^2 = 27.73$ ; d.f. = 2;  $p < 0.01$ ): Children of panic patients had significantly more often internalizing anxiety disorders than phobia and control children (CPAN > CPHOB, CCON,  $p < 0.05$ ). There were also significant between-group differences regarding externalizing anxiety disorders ( $\chi^2 = 7.55$ ; d.f. = 2;  $p < 0.05$ ): Children of phobia patients had significantly more often externalizing, i.e. phobic, anxiety disorders than control children (CPHOB > CCON,  $p < 0.05$ ). 12 (66.7%) children of the 18 phobics also had a diagnosis of specific phobia (in most cases disorders were primary diagnoses). In 8 out of the 12 cases (again 66.7%) the object of the phobia was identical in the parent and child. With respect to externalizing anxiety disorders, CPAN did not differ significantly from the CPHOB. There was a trend towards a significantly higher rate of externalizing anxiety disorders of CPAN when compared to CCON ( $p < 0.10$ ). Children of panic patients also had a significantly higher rate of disruptive behavior disorders compared to both other groups ( $\chi^2 = 10.62$ ; d.f. = 2;  $p < 0.01$ ); CPAN > CPHOB, CCON,  $p < 0.05$ ). Depressive disorders were also more frequent in children of panic patients than in children of both comparison groups where in contrast, the rate of enuresis and encopresis was higher. As for these disorders expected values were lower than 2, no statistical analyses of these group differences were performed.

#### *Frequency of Separation Anxiety Disorder*

Analysis of this question was based on lifetime frequencies (i.e., past and current diagnoses) of separation anxiety disorder, because of otherwise very low base rates. Groups differed significantly ( $\chi^2 = 14.91$ ; d.f. = 2;  $p < 0.01$ ): 38.2% ( $n = 13$ ) of the panic children, 17.4% ( $n = 4$ ) of the phobia children and none of the children of the normal control parents had a lifetime diagnosis of separation anxiety disorder. Children of panic patients had significantly more often a diagnosis of separation anxiety disorder than children of both other groups (CPAN > CPHOB, CCON,  $p < 0.05$ ).

## **Conclusions**

#### *Heightened Risk of Mental Disorders in Children of Patients with Panic Disorder or Animal Phobia*

The results of the present study confirm the hypothesis of an increased risk of mental disorders in children of panic patients and patients with specific phobia. This is in line with earlier top down studies. However, it further appeared that only children of panic patients had a significantly increased risk of multiple diagnoses. In a similar vein, the severity of primary diagnoses was significantly higher in children of panic patients than in children of both other groups. The results thus show that a parental anxiety disorder increases the risk of the occurrence of psychopathology in the child. In addition, a parental diagnosis of panic disorder seems to place children at greater risk regarding the extent and severity of symptomatology in the child. These observed differences are not attributable to the greater severity of parental panic disorder.

#### *Specific Transmission of Mental Disorders*

Internalizing anxiety disorders, particularly separation anxiety disorder were the most frequent diagnoses in children of panic patients as opposed to externalizing anxiety disorders in children of both animal phobics and normal controls. Externalizing (i.e.

phobic) anxiety disorders were significantly more frequent in children of phobic patients compared to children of control probands. A trend towards a higher frequency of phobic anxiety disorders was also apparent in children of panic patients when compared to control children. The results thus show an increased susceptibility to specific anxiety disorders in children of panic patients and of specific phobics, respectively.

The children of panic patients in this study had a significantly higher frequency of separation anxiety disorder than the children of both other parent groups. In view of the fact that more than 90% of the parents with panic disorder were mothers, this supports the validity of the hypothesis formulated by Gittelman and Klein [19] that separation anxiety disorder is specifically common in children of female patients with panic disorder. Our findings further agree with the above-mentioned results from the studies by Weissman et al. [11] and Turner et al. [13]. In comparison to these two studies, an advantage of the present study is that all panic patients had panic disorder as their primary diagnosis and that diagnoses of the children were based on both parent and child data. In contrast, Sylvester et al. [12] found a higher rate of overanxious disorder in children of panic patients compared to children of healthy controls. Overanxious disorder was also quite a frequent diagnosis in the studies of Turner et al. [13], Silverman et al. [20] and Biederman et al. [14, 16]. A possible explanation for the differing results is the comorbidity of separation anxiety disorder and overanxious disorder which was found in several studies [28, 29]. In addition, it appears that both disorders quite frequently alternate within one child [30]. This was one reason, why we grouped both disorders together with avoidant disorder and panic disorder (with or without agoraphobia) into the subcategory of internalizing anxiety disorders. According to our results, the classification into internalizing and externalizing anxiety disorders appears to be an adequate and useful differentiation. On the basis of our findings, the statement that children of panic patients have a higher risk of separation anxiety disorder should be extended to the statement that they show a higher risk for internalizing anxiety disorders than children of patients with other anxiety disorders or children of normal controls.

At first glance contrary to our findings, Silverman et al. [20] reported more phobic disorders in children of patients with agoraphobia with panic attacks. In their sample, children of panic patients without agoraphobia showed no psychiatric disorders at all. These diverging results are probably due to differences in parent symptomatology. The dominant symptom in the agoraphobic parents studied by Silverman and colleagues was their agoraphobic avoidance behavior. Hence, it may be due to this fact that children mainly developed phobic symptoms. This would in turn correspond with the tendency toward a specific transmission of disorders similar to the parental disorder as observed in the present study. Also contrary to our findings are the results of Biederman et al. [15], who also found phobic disorders as the most frequent diagnostic category in children of panic patients. However, a problem of that study is that the diagnostic description of the category 'phobic disorders' remains unclear.

Next to specific anxiety disorders, the children of panic patients in this study also had the highest rate of other mental disorders compared to children of both animal phobics and control subjects. This difference proved significant with regard to disruptive behavior disorders while base rates of the remaining disorders were too low for statistical analyses. This finding once again reveals the generally elevated susceptibility to mental disturbances in children of panic patients that was also apparent in the studies by Weissman et al. [11] and Sylvester et al. [12]. Further noteworthy within this context

is the study by Anderson et al. [31] showing that children primarily suffering from attention deficit and hyperactive disorder had a significantly higher rate of additional anxiety disorders than had control children. This result suggests a comorbidity between these disorders in spite of their apparent differences in symptomatology.

#### *Similarities in the Symptomatology of Parents and Their Children*

In 67% of the cases, phobic children and phobic parents had identical phobic objects. Similarities in symptomatology were also found between panic patients and their children having internalizing anxiety disorders. Two cases of panic disorder were diagnosed in the children, another child had agoraphobia without panic attacks. The most frequent disorders in this groups were separation anxiety disorder (29.4%), followed by overanxious disorder (20.6%) and avoidance disorder (14.7%). These disorders contain a number of symptoms that parallel features of adult panic patients: For instance, unrealistic fears that something may happen to closely related persons, leaving oneself alone and helpless; or a persistent fear of being alone or of the occurrence of physical symptoms in moments of separation. Viewed in this context, a finding from Last [32] should be noted. She observed that children with panic disorder, separation anxiety disorder or overanxious disorder more frequently reported suffering from physical symptoms than children with other anxiety disorders. This may suggest a selective attention to bodily processes and their anxious evaluation as associated features of these disorders. According to psycho(physio)logical models of panic disorder [e.g. 33, 34], these processes play a central role for the triggering and maintenance of panic attacks and hence may be cognitive risk factors for panic disorder. The relatively high frequency of avoidant disorder corresponds with the finding that the temperamental characteristic of behavioral inhibition seems to be more frequent in children of panic patients [35].

#### *Possible Mechanisms of Transmission*

At this point, the question of the transmission mechanisms arises. One possibility is that genetic factors determine a general vulnerability with regard to anxiety disorders, while environmental influences have more weight in determining the type of disorder [36, 37]. Only a few studies have undertaken a closer examination of the nature of these environmental influences. On the basis of animal models (primates), Mineka et al. [38, 39] could clearly demonstrate effects of vicarious learning in the development of animal phobias. These results do not, however, contradict the existence of a genetic component. For instance, one might assume vicarious learning only to take place on the basis of a corresponding genetic disposition. Indirect evidence for the importance of modeling factors in humans is provided by investigations studying the effectiveness of vicarious learning in the reduction of anxiety [e.g., 40]. Windheuser [40] was able to show that children with specific phobia had a better outcome when the children could observe the therapy sessions of their anxious mothers. Some of the phobic parents of our study reported that their child began to react fearful to an animal after having repeatedly observed his parent's anxious reactions to the same animal. The fact that the object of a phobia was identical in parents and children in the majority of cases also suggests effects of vicarious learning without directly corroborating these.

Less evidence is presented in the literature with regard to panic disorder and the nature of possible environmental influences on its transmission to the child. According to Klein's assumptions, separation anxiety in children of panic patients is mainly genet-

ically determined. However, alternative explanations exist: In the present study a number of children reported that their anxiety had emerged after they had experienced their mother having a panic attack. Since then they feared that something terrible might happen to their mother. Similarly, in several cases mothers with panic disorder reported that they sometimes asked their children to stay at home and not to go to school in order to provide help in case of a panic attack. This form of interaction was also reported by Silverman [41]. In this way, conditions were created that increase the likelihood of the occurrence of anxiety, particularly separation anxiety. At the same time, the likelihood of the child learning to interpret physical symptoms as dangerous increases. In an experimental study, Schneider et al. [42] found evidence for modeling effects of these anxious interpretations in children. Compared to children of animal phobics and normal controls, children of panic patients significantly more often showed anxious or catastrophizing interpretations of bodily symptoms after they had seen a video where a woman spoke of bodily symptoms and her anxious and catastrophizing reactions to them. Moreover, children whose parents are not able to do things such as going out shopping, driving a car or going on a trip will probably be exposed less frequently to these situations than other children. They have thus fewer opportunities to gain competence in dealing with such situations [43].

In conclusion, there is evidence that children of parents with anxiety disorders have a greater risk especially for anxiety disorders themselves. Furthermore, in comparison to children of parents with animal phobia, children of panic patients seem to be more affected with regard to the extent and the severity of their disorders. Our results also reveal that the type of transmitted disorders is related to the specific symptomatology of the parents. It should be considered that no group of children of parents with mental disorders other than anxiety disorders (e.g. depression) was examined. Therefore, this study allows no conclusion whether results are specific for children of parents with panic disorder or animal phobia. Results of the above cited studies indicate that children of parents with depressive disorders are also at higher risk for anxiety disorders.

The specific mechanisms of transmission need further study. It would also be desirable for future investigations that in all groups both parents undergo diagnostic assessment. This would make it possible to examine whether the child's risk increases if both parents have mental disorders. In addition, it would be possible to investigate whether certain behaviors of the healthy parent have a modulating influence on the child's risk. More generally, the study of possible protective factors should be added to the investigation of risk factors.

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