

# Twenty-five Years of Research on Childhood Anxiety Disorders: Publication Trends Between 1982 and 2006 and a Selective Review of the Literature

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**Abstract** We examined trends in publications on childhood anxiety disorders over the past 25 years. A PsycINFO search was carried out to find relevant research articles published between 1982 and 2006. Results indicated a gradual and significant rise in the frequency of publications on childhood anxiety disorders during the past 25 years, and this increase was particularly strong for post-traumatic stress disorder, obsessive–compulsive disorder, social phobia, and multiple anxiety disorders. Most studies concerned the phenomenology of childhood anxiety disorders (i.e., >50%). Considerable less research has been conducted on the etiology, intervention, and assessment of these disorders in youths. Nevertheless, the conclusion seems warranted that the research on childhood anxiety disorders has made significant advancements during the past decades. This notion is supported by a selective review of the literature, which highlights important developments in this field of study.

**Keywords** Childhood anxiety disorders · Publication trends · Review

## Introduction

Anxiety disorders constitute a common psychiatric problem. For example, in their large-scale epidemiological study, Kessler et al. (2005b) noted that with a 12-months prevalence of 18.1% anxiety disorders were by far the most prevalent DSM-IV disorders in a representative sample of

American adults. Not surprisingly, anxiety disorders have attracted a considerably amount of research attention, which has led to clear advancements in our knowledge of the phenomenology, etiology, assessment, and treatment of this type of disorders (e.g., Barlow 2002).

Meanwhile, researchers have neglected to investigate childhood anxiety disorders for a long time. This was probably due to the fact that fear and anxiety are fairly common in youth, which has led many psychologists to the conclusion that these phenomena were of less interest from a clinical point-of-view (Cartwright-Hatton et al. 2006). During the last two decades, this opinion has gradually changed as it has been demonstrated that a substantial minority of children and adolescents do suffer from such high fear and anxiety levels that a diagnosis of an anxiety disorder is clearly warranted. In fact, community studies have indicated that anxiety disorders are among the most frequent forms of psychopathology among youths (Costello et al. 2003; Ford et al. 2003). Moreover, there is evidence indicating that a significant proportion of the childhood anxiety disorders have a chronic course, and even last into adulthood (Keller et al. 1992; Roza et al. 2003).

A recent analysis of publication trends in individual anxiety disorders (Boschen 2008) has demonstrated that research on this psychiatric disorder has steadily grown during the past 25 years. Obviously, publication trends are one method to determine the health of a research field (e.g., Pincus et al. 1993), and on the basis of Boschen's results it can be concluded that the anxiety research in adults has substantially increased over the past decades. However, it remains to be seen whether such a conclusion is also true for the research on childhood anxiety disorders. With this issue in mind, the present study was conducted. More precisely, it was examined whether the understanding that childhood anxiety disorders represent a serious psychiatric

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problem has led to an increase of activity in research. Furthermore, an attempt was made to typify the research and to provide a selective review of the literature, which highlights some of the major research advancements in the past 25 years as well as avenues for future studies on childhood anxiety disorders.

## Method

The method closely followed the procedure employed by Boschen (2008; see Mendlowicz et al. 2006) in his investigation of publication trends on anxiety disorders. The most popular database of psychological literature, PsycINFO, was used to search for articles on childhood anxiety disorders. For each year in the period 1982–2006, we looked for original research articles in peer-reviewed journals that focused on childhood anxiety disorders. Searches were conducted employing the following search terms in the title of the articles from the database, in combination with the term CHILD\* OR ADOL\*, which could appear anywhere: (1) PANIC OR AGORAPHOBI\* for panic disorder/agoraphobia, (2) SOCI\* PHOBI\* OR SOCI\* ANXI\* OR AVOID\* DISO\* for social phobia, (3) SPECIFIC PHOBI\* OR SIMPLE PHOBI\* OR PHOBIA for specific phobia, (4) OBSESSI\* OR COMPULSI\* OR OCD for obsessive–compulsive disorder, (5) SEPA\* ANXI\* for separation anxiety disorder, (6) POST-TRAUM\* OR POSTTRAUM\* OR PTSD for posttraumatic stress disorder, and (7) GENERALI\* ANXI\* OR GAD OR OVERANXI\* DISO\* for generalized anxiety disorder. Note that although we employ the current nosologic terms for anxiety disorders as listed in the more recent editions of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association 1994, 2000) throughout this article, our search terms also covered relevant diagnoses that were used in previous editions of this classification system (American Psychiatric Association 1980, 1987). To prevent that we would miss articles devoted to multiple childhood anxiety disorders, an additional search was carried out with ANXI\* DISO\* as search term in the title. These searches yielded 467 hits for panic disorder/agoraphobia, 454 for social phobia, 780 for specific phobia, 1240 for obsessive–compulsive disorder, 258 for separation anxiety disorder, 1522 for post-traumatic stress disorder, 106 for generalized anxiety disorder, and 517 for multiple anxiety disorders. The abstracts of all these hits were visually inspected in order to remove non-relevant articles. Commentaries, letters, review articles, dissertation abstracts, books, and book chapters were excluded, and we also encountered quite a large number of false positives (e.g., articles on childhood antecedents of adult anxiety disorders).

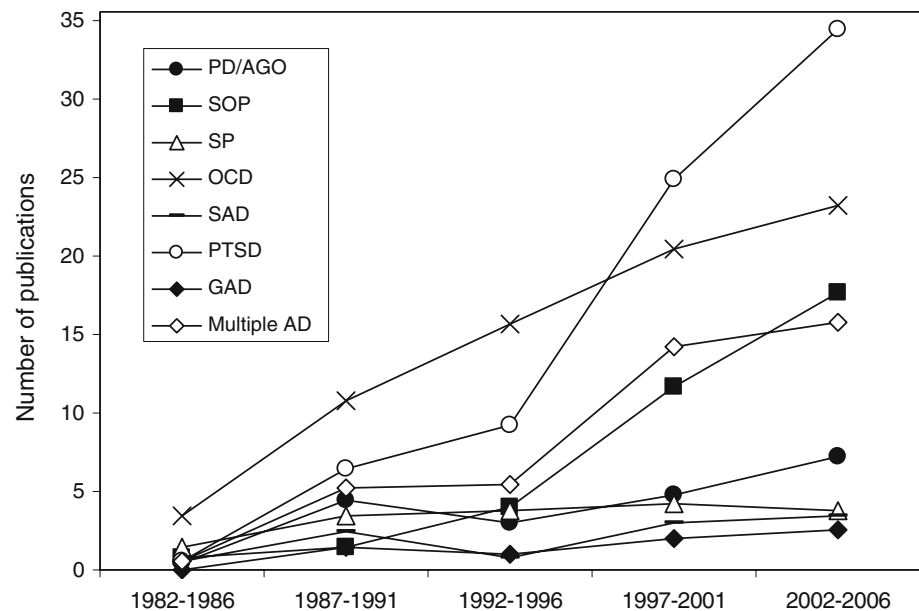
For relevant publications, a number of study characteristics were determined: (1) Did the study include clinically referred children? (2) Did the study investigate the pertinent anxiety disorder(s) in children (aged 0–12 years), adolescents (aged 13–18 years), or both age groups? (3) What was the main topic of research? The latter question had four response categories: (a) Phenomenology: the study is examining the anxiety disorder(s) on a descriptive level by investigating symptomatology, epidemiology, severity of the disorder, clinical correlates, and comorbidity with other psychiatric disorders, (b) Etiology: the study is investigating variables that play a role in the development and maintenance of the anxiety disorder(s), (c) Assessment: the study describes the development and/or psychometric evaluation of an instrument for measuring specific or more general aspects of anxiety disorders, and (d) Intervention: the study examines the effectiveness of a psychological or pharmacological intervention that aims to reduce or prevent anxiety disorders. As it is recognized that in particular the judgment of the study topic may be rather subjective, a reliability analysis was carried out. Two-hundred articles retrieved from the psychological literature were categorized into the four categories by two judges. The percentages of agreement were 89.1% for phenomenology, 76.9% for etiology, 89.7% for assessment, and 96.8% for intervention, yielding an overall kappa of 0.82.

## Results

Our analysis of the literature eventually yielded a total of 1394 relevant articles on childhood anxiety disorders: 99 of these were on panic disorder/agoraphobia, 177 on social phobia, 83 on specific phobia, 367 on obsessive–compulsive disorder, 51 on separation anxiety disorder, 377 on post-traumatic stress disorder, 34 on generalized anxiety disorder, and 206 on multiple anxiety disorders. From this, it can be concluded that the research on childhood anxiety disorders has been dominated by posttraumatic stress disorder and obsessive–compulsive disorder, followed by multiple anxiety disorders and social phobia, whereas studies on panic disorder/agoraphobia, specific phobia, separation anxiety disorder, and generalized anxiety disorder are clearly less frequent. Further, a comparison of these frequency figures with those of Boschen (2008) indicated that childhood anxiety disorders reflect only a small proportion of the total publications on anxiety disorders ( $N = 13614$ ), namely 10.2%.

Figure 1 displays the mean frequency of publications per year averaged for each 5-year period for various categories of childhood anxiety disorders. An 8 (anxiety disorders category)  $\times$  5 (time period) analysis of variance

**Fig. 1** Mean frequency of publications per year (averaged for each 5-year period) for individual childhood anxiety disorders. *PD/AGO* panic disorder and agoraphobia, *SOP* social phobia, *SP* specific phobia, *OCD* obsessive–compulsive disorder, *SAD* separation anxiety disorder, *PTSD* post-traumatic stress disorder, *GAD* generalized anxiety disorder, *AD* anxiety disorders



with the last factor being a repeated measure, yielded a significant main effect of anxiety disorders category [ $F(7,160) = 65.26$ ,  $p < .001$ ,  $\eta^2 = .74$ ], which indeed confirmed the observation that some childhood anxiety disorders were more frequently investigated than others. Bonferroni-corrected post hoc comparisons indicated that there were significantly more publications on post-traumatic stress disorder and obsessive–compulsive disorder than on multiple anxiety disorders and social phobia (all  $ps < .001$ ), which in turn were more often examined than the other anxiety disorders (all  $ps < .05$ ). Furthermore, the analysis yielded a significant main effect of time period [ $F(4,160) = 90.26$ ,  $p < .001$ ,  $\eta^2 = .69$ ]. As shown in Fig. 1, there was a significant increase in the number of publications on childhood anxiety disorders over the past 25 years. Post hoc analyses indicated that the increase of publications occurred gradually from one 5-year period to another (all  $ps < .01$ ); only between 1987–1991 and 1992–1996 no significant change in the number of publications was observed ( $p > .05$ ). Finally, the interaction of anxiety disorders category and time period was also significant [ $F(28,160) = 10.34$ ,  $p < .001$ ,  $\eta^2 = .64$ ], suggesting a differential course in the frequency of publications on various childhood anxiety disorders. To explore this finding, correlations were computed between year of publication and the number of publications per year for each anxiety disorder category (Table 1). For reasons of comparison, similar correlations as obtained by Boschen (2008) are also shown (for this reason, only the years 1982–2005 were used in the statistical analysis). For all anxiety disorders, correlations were positive and significant, indicating an increase of publications for all anxiety disorder categories during the past 25 years. However, tests

**Table 1** Correlations between year of publication (1982–2005) and number of publications per year for each anxiety disorder category

Anxiety disorder	$r$ Current study	$r$ Boschen (2008) study
PD/AGO	0.80 a	0.63
SOP	0.88 a	0.94
SP	0.33 b	–0.09
OCD	0.90 a	0.97
SAD	0.46 b	–
PTSD	0.91 a	0.97
GAD	0.55 a,b	0.94*
Total AD <sup>a</sup>	0.96	0.99

*Note:* *PD/AGO* panic disorder and agoraphobia, *SOP* social phobia, *SP* specific phobia, *OCD* obsessive–compulsive disorder, *SAD* separation anxiety disorder, *PTSD* post-traumatic stress disorder, *GAD* generalized anxiety disorder, *AD* anxiety disorders. Correlations within the same column that do share similar letters differ at  $p < 0.05$

\* Correlations between both studies differ at  $p < .05$

<sup>a</sup> Excluding separation anxiety disorder

for comparing correlation coefficients indicated that the increase for some anxiety disorders [i.e., post-traumatic stress disorder ( $r = 0.91$ ), obsessive–compulsive disorder ( $r = 0.90$ ), social phobia ( $r = 0.88$ ), and panic disorder/agoraphobia ( $r = 0.80$ )] was significantly stronger than for others [i.e., separation anxiety disorder ( $r = 0.46$ ) and specific phobia ( $r = 0.33$ ); all  $t(48)s \geq 2.99$ ,  $ps < .01$ ]. A statistical comparison between the correlations as found in the current study and those reported by Boschen (2008) indicated that the increase in number of publications in the childhood anxiety disorders literature was similar to that observed in the general anxiety literature. The only exception was generalized anxiety disorder, for which the

**Table 2** Characteristics (expressed in mean percentages of the total number of publications) of research performed between 1982 and 2006 on various childhood anxiety disorders

	PG/AGO	SOP	SP	OCD	SAD	PTSD	GAD	Multiple AD
Population								
Clinical patients	0.51 a,b	0.34 a	0.85 c	0.90 c	0.67 b,c	0.45 a,b	0.84 c	0.66 b,c
Children (0–12 years)	0.47 a	0.63 a,b	0.90 c,d	0.78 b,c,d	0.89 c,d	0.76 b,c	0.98 d	0.90 c,d
Adolescents (13–18 years)	0.87 a,b	0.75 a,b	0.61 b,c	0.86 a,b	0.47 c	0.73 a,b,c	0.75 a,b	0.78 a,b
Topic of study								
Phenomenology	0.53	0.48	0.37	0.50	0.61	0.62	0.57	0.42
Etiology	0.30	0.18	0.21	0.15	0.26	0.23	0.22	0.28
Assessment	0.05 a	0.28 b	0.06 a	0.08 a	0.12 a,b	0.07 a	0.10 a,b	0.13 a,b
Intervention	0.19 a	0.12 a	0.43 b	0.29 a,b	0.12 a	0.09 a	0.20 a,b	0.18 a

Note: PD/AGO panic disorder and agoraphobia, SOP social phobia, SP specific phobia, OCD obsessive–compulsive disorder, SAD separation anxiety disorder, PTSD post-traumatic stress disorder, GAD generalized anxiety disorder, AD anxiety disorders. Within-row percentages not sharing similar letters differ at  $p < .05$  (Bonferroni-corrected; only computed when ANOVA yielded significant main effect of anxiety disorder). For the ‘topic of study’ variable, percentages do not add up precisely to 100%, because some publications represented more than 1 topic

increase in publications was significantly smaller among children and adolescents [ $t(50) = 3.80, p < .001$ ].

The characteristics of the research on childhood anxiety disorders are shown in Table 2. Note that a substantial proportion of the studies (65.9%) included clinical patients, although the percentages differed across various disorders [ $F(7,162) = 15.96, p < .001$ ]. Research on obsessive–compulsive disorder, specific phobia, and generalized anxiety disorder most often included clinically referred youths, while studies on social phobia, post-traumatic stress disorder, and panic disorder/agoraphobia least frequently focused on youths in clinical settings. There were also significant differences between various anxiety disorders with regard to the inclusion of children [i.e., 0–12 years;  $F(7,162) = 13.43, p < .001$ ] and adolescents [i.e., 13–18 years;  $F(7,162) = 4.81, p < .001$ ]. Research on generalized anxiety disorder, specific phobia, multiple anxiety disorders, and separation anxiety disorder quite often investigated children, while studies on panic disorder/agoraphobia and obsessive–compulsive disorder most frequently relied on adolescent populations.

An inspection of the distribution of the research across various topics revealed that studies on the phenomenology of anxiety disorders were clearly most common (50.8%), followed by research on etiology (22.7%) and intervention (20.9%), whereas research on assessment was least prevalent (11.2%) [except for the comparison between etiology and intervention; all differences were significant with  $Zs \geq 4.06, ps < .001$ ]. ANOVAs indicated that only the frequency of publications on the etiology of childhood anxiety disorders has changed significantly over the past 25 years [ $F(4,165) = 3.69, p < .01$ ]: inspection of the mean percentages of publications per 5-year period revealed a gradual increase from 15.1% in 1982–1986 to 32.6% in 2002–2006 ( $p < .05$ ).

Further, there were no differences between various anxiety disorder categories regarding the frequencies of studies on phenomenology and etiology [both  $F(7,162)s \leq 1.66, p > .05$ ]. However, significant variation in research on assessment and intervention was found across various anxiety disorders [ $F(7,162)s$  being 3.39 and 4.84, respectively, both  $ps < .01$ ]. As can be seen in Table 2, studies on assessment instruments for social phobia were fairly prevalent, whereas few investigations addressed the measurement of panic disorder/agoraphobia, specific phobia, obsessive–compulsive disorder, and post-traumatic stress disorder. With regard to intervention, specific phobia was most commonly investigated, with relatively few studies on the treatment of post-traumatic stress disorder.

#### Selective Review of Research Advancements and Future Directions

Although the quantitative analysis of the literature on childhood anxiety disorders as presented above yields interesting information on publication trends in this research domain, it may also be worthwhile to perform a more qualitative review on the studies that have been published in order to highlight some of the advancements in this field of study. For this purpose, we will employ the four topics of research that were also used in the publication trends analysis (i.e., phenomenology, etiology, assessment, and intervention). For each topic, we will also indicate possible directions for future research.

#### Phenomenology

As mentioned earlier, epidemiological studies have indicated that childhood anxiety disorders are quite prevalent. For example, Costello et al. (2003) report a cumulative

prevalence rate of 9.9% for anxiety disorders by the age of 16 years, which means that 1 out of 10 youths in this study had suffered from an anxiety disorder at some point during their childhood. Specific phobia, social phobia, generalized anxiety disorder, and separation anxiety disorder are most common, with mean prevalence rates between 2.2 and 3.6%. Agoraphobia (1.5%) and post-traumatic stress disorder (1.5%) are less prevalent, whereas panic disorder and obsessive–compulsive disorder are relatively rare (i.e., <1%; Costello et al. 2004). Girls more frequently suffer from phobias and other anxiety disorders as compared to boys (i.e., the sex ratio is about 2:1), and there is clear evidence indicating that this difference in prevalence already emerges at a very early age (Lewinsohn et al. 1998). Findings concerning the course of childhood anxiety disorders indicate that anxiety disorders are transitory phenomena in most children and adolescents (Last et al. 1996). Yet, in a subgroup of youths, pathological manifestations of fear and anxiety become chronic, causing significant problems and interference with daily functioning for many years (e.g., Kessler et al. 2005a). Childhood anxiety disorders also show considerable comorbidity with other psychiatric problems, in particular depression. For example, Costello et al. (2004) noted that depression is more than 8 times as likely in youths with anxiety disorders than in youths without anxiety disorders.

Although current classification systems (e.g., American Psychiatric Association 2000) adopt highly similar criteria for defining anxiety disorders in youths and adults, child psychologists have questioned whether this is all correct (e.g., Weiss and Last 2001). There is emerging evidence indicating that the symptomatology of anxiety disorders may vary from one age group to another (Geller et al. 2001; Kendall and Pimentel 2003). Some authors have even proposed that developmental shifts may herald periods in which children are particularly prone to develop anxiety disorders (e.g., Westenberg et al. 1999). As such, it seems important to further examine the exact manifestations of specific anxiety disorders in youths of various ages and to explore the possible influence of developmental factors.

### *Etiology*

In the past decades, a range of variables have been identified that are thought to play a role in the etiology of childhood anxiety disorders (Muris 2007). First of all, behavioral-genetic research has shown that there is clear support for the genetic transmission of childhood anxiety disorders, with some studies showing that up to 50% of the variance in anxiety problems can be explained by heritability (Eley and Gregory 2004). It is assumed that the genetic influence on childhood anxiety is rooted in the biologically substrate of the temperament trait ‘neuroticism’, which already

manifests itself at a very early age as ‘behavioral inhibition’ (Craske 1997). Behavioral inhibition can be defined as the tendency of some children to interrupt ongoing behavior and to react with vocal restraint and withdrawal when confronted with unfamiliar people or settings (Kagan 1994). Evidence coming from cross-sectional and prospective studies has shown that children who clearly display the signs of this temperament characteristic are at increased risk for developing anxiety disorders (Fox, Henderson et al. 2005). Second, there are also environmental variables which may increase children’s vulnerability to develop anxiety disorders. Examples are overprotective parental rearing behaviors (Rapee 1997), an insecure attachment relationship (Warren et al. 1997), direct (i.e., conditioning) and indirect (i.e., modeling, negative information transmission) learning experiences (King et al. 1998), and negative life events (Tiet et al. 2001). Third, research has identified various types of cognitive biases that are thought to play a role in the development and maintenance of childhood anxiety disorders. More precisely, there is clear evidence showing that anxious children typically display hyperattention towards potentially threatening material (i.e., attentional bias) and more frequently interpret ambiguous stimuli and situations in a threatening way (i.e., interpretation bias; Vasey and MacLeod 2001).

While genetic-based vulnerability, environmental influences, and maintaining factors have been predominantly studied in isolation, it is clear that an “understanding of the pathways by which childhood anxiety disorders develop, persist and remit is likely to require consideration of a wide range of influences and, most importantly, their potential for complex, dynamic, transformational interactions (i.e., transactions) across development” (Vasey and Dadds 2001, p. 3). More longitudinal studies are urgently needed that include multiple vulnerability (as well as protective) factors to further expand our knowledge on the etiology of this highly prevalent type of psychopathology.

### *Assessment*

Although our publication trend analysis suggests that research on the assessment of childhood anxiety disorders is relatively sparse, it is positive to note that several questionnaires and interview instruments have become available in the past decade that classify and quantify symptoms of anxiety disorders in terms of the prevailing diagnostic system, i.e., the DSM (Silverman and Ollendick 2005). Good examples are the Spence Child Anxiety Scale (Spence 1998) and the Screen for Child Anxiety Related Emotional Disorders (Birmaher et al. 1999), which can be used to measure anxiety disorders symptoms from the child’s and parents’ point-of-view, and the Pediatric Anxiety Rating Scale (Research Units on Pediatric Psychopharmacology

Anxiety Study Group 2002), which is a clinician rating scale. As for interview instruments, the Anxiety Disorders Interview Schedule for DSM-IV: Child and Parent versions (Silverman and Albano 1996) is the gold standard. This semi-structured interview has been developed specifically to assess child and adolescent anxiety disorders as well as a number of frequent comorbid disorders (e.g., mood disorders, disruptive behaviour disorders).

Research has specifically addressed the development of instruments for measuring social phobia (see Table 1), including the Social Anxiety Scale for Children—Revised (LaGreca and Stone 1993) and the Social Phobia and Anxiety Inventory for Children (Beidel et al. 1995). This does not mean that specific instruments are lacking for other childhood anxiety disorders, but these simply need more psychometric evaluation.

### *Intervention*

Various methodologically sound treatment outcome studies have appeared in the literature, which have evaluated the effectiveness of psychological and biological interventions for youths with phobias and anxiety disorders (e.g., Barrett 1998; Birmaher et al. 2003; Kendall 1994; RUPP Anxiety Study Group 2001). This research has demonstrated that Cognitive Behavior Therapy (CBT) and pharmacotherapy are effective in reducing anxiety symptoms in children and adolescents of various ages. Given that the empirical evidence for CBT is more substantial than that for pharmacotherapy, cognitive-behavioral interventions should still be regarded as the treatment of choice for childhood anxiety disorders. However, pharmacotherapy (in particular Selective Serotonin Reuptake Inhibitors or SSRIs) can be employed during the acute phase of treatment (when symptoms are very severe) or when children or adolescents do not respond adequately to a CBT intervention (American Academy of Child and Adolescent Psychiatry 1997).

Although the field has made considerable progress in the treatment of youths with anxiety disorders, it is also true that there is a substantial proportion of the children and adolescents who do not respond to psychological and pharmacological interventions. By means of research on the mediators and moderators of treatment, we may learn more about how to use various interventions more effectively, which may improve our therapeutic approach of individual children and adolescents with anxiety disorders.

### **Discussion**

In this article, we present an analysis of publication trends on childhood anxiety disorders during the past 25 years as well as a selective review of the literature on this type of

psychopathology. With regard to the publication trend analysis, a number of remarks can be made. First of all, we observed a gradual and significant increase in publications during the past 25 years for all childhood anxiety disorders. This trend was highly similar to that observed in the adult literature (Boschen 2008), and particularly strong for post-traumatic stress disorder, obsessive–compulsive disorder, social phobia, and multiple anxiety disorders, for which, if this tendency continues, even a greater amount of research can be expected in the near future. Second, the results indicated that post-traumatic stress disorder and obsessive–compulsive disorder were most frequently examined (see also Boschen 2008), which of course is not in keeping with the fairly low prevalence rates of these anxiety disorders in youths. Meanwhile, it is quite surprising to note that separation anxiety disorder, which is quite prevalent and a disorder specifically diagnosed in particular among children, has received relatively little research attention (Silverman and Dick-Niederhauser 2004). Third, most studies have investigated the phenomenology of childhood anxiety disorders (i.e., >50%). Considerable less research has been devoted to the etiology, intervention, and assessment of childhood anxiety disorders. In spite of the observation that scientific advancements are not evenly distributed across various anxiety disorders and several research topics, we think that the conclusion is still justified that the research on childhood anxiety disorders has shown various important advancements as illustrated by our selective review of the literature.

Childhood anxiety disorders are best viewed from a developmental psychopathology perspective, which assumes that normal and abnormal manifestations of fear and anxiety are part of one and the same continuum (Vasey and Dadds 2001). This implies that it is equally relevant to study clinical as well as non-clinical populations of youths. Not surprisingly, then, although our literature search focused on childhood anxiety disorders, about one-third of the studies was found to rely on non-clinical children and adolescents and it is obvious that this proportion would have increased if we had employed more liberal search terms (e.g., FEAR OR ANX\* in combination with CHILD\* OR ADOL\*). In other words, it should be kept in mind that the publication trend analysis was not based on the definitive total of research output in the field of childhood anxiety (disorders), but rather focused on a representative sample of relevant studies.

As it is increasingly acknowledged that the foundation of many adult anxiety disorders is already laid during childhood (Craske 2003), it is good to note that researchers have picked up this notion and more and more investigate this type of problems in youths. In the past decades, the research domain of childhood anxiety disorders has made significant progress, as evidenced by an increasing amount

of empirical articles in scientific journals. We hope that this publication trend analysis and review may guide researchers in their future work in this rapidly expanding and intriguing research area.

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