

# The Relation Between Cognitive Development and Anxiety Phenomena in Children

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**Abstract** We examined the relation between cognitive development and fear, anxiety, and behavioral inhibition in a non-clinical sample of 226 Dutch children aged 4–9 years. To assess cognitive development, children were tested with Piagetian conservation tasks and a Theory-of-Mind (TOM) test. Fears were measured by means of a self-report scale completed by the children, while anxiety symptoms and behavioral inhibition were indexed by rating scales that were filled out by parents. Significant age trends were observed for some anxiety phenomena. For example, younger children displayed higher fear scores, whereas older children exhibited higher levels of generalized anxiety. Most importantly, results of regression analyses (in which we controlled for age) indicated that cognitive development, and in particular TOM ability, made a unique and significant contribution to various domains of behavioral inhibition. In all cases, higher levels of TOM were associated with lower levels of behavioral inhibition. In general, percentages of explained variance were rather small (i.e., <6%), indicating that the role of cognitive development in various anxiety phenomena is limited.

**Keywords** Anxiety · Fear · Behavioral inhibition · Developmental patterns · Cognitive development · Children

## Introduction

Anxiety phenomena are highly prevalent during the development of children (e.g., Craske 1997). That is, non-clinical youths generally report a surprisingly high frequency of fears (Ollendick et al. 1989), with a substantial minority of them displaying symptoms of anxiety disorders (Bell-Dolan et al. 1990), or exhibiting clear signs of behavioral inhibition (e.g., Kagan et al. 1984), a temperamental characteristic referring to the tendency to be shy and to respond with fearfulness and withdrawal in new and unfamiliar situations (Hirshfeld-Becker et al. 2004). Although such phenomena are in essence considered benign, developmental psychopathology theories increasingly view normal fear, anxiety, and inhibited behaviors as the starting point for anxiety pathology in youths (Craske 2003; Muris 2007). As such, the study of normative fear, anxiety, and behavioral inhibition is certainly of relevance to the research field of clinical psychology.

Normal fear and anxiety in youths show a clear developmental pattern. Marks (1987) has described this pattern as the “ontogenetic parade”, which refers to the rise and disappearance of certain fears in a predictable sequence during children’s development. That is, in their preschool years, children are afraid of imaginary creatures (e.g., ghosts, witches), animals, and the natural environment (e.g., the dark, thunderstorms). In middle childhood, fears of physical danger, bodily injury, and school performance become more prominent, whereas, during adolescence, youths more often report fear about social affairs, death, and illness (Bauer 1976; Muris et al. 2000). The developmental course of behavioral inhibition has not been studied yet. However, it seems plausible that specific stimuli and situations elicit inhibited behaviors at various ages (e.g., Kagan 1989; Rubin et al. 1997). For example, the

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confrontation with an unfamiliar peer will evoke a social withdrawal response in behaviorally inhibited preschool children, but in older children a more challenging situation is needed to elicit such a reaction (e.g., the confrontation with a group of peers or an unfamiliar adult; Kagan 1989). In a similar vein, a climbing frame may be a challenging stimulus for a toddler and hence elicit an inhibited behavioral response, but in older youths such a reaction is likely to be absent as most children have learned to deal adequately with such play equipment (van Brakel 2007).

It is often assumed that developmental patterns in anxiety phenomena are mediated by children's cognitive development (Vasey 1993). This is hardly surprising given the fact that fear and anxiety originate from threat and threat has to be conceptualized. Conceptualization critically depends on cognitive abilities (Flavell et al. 2002). Bauer (1980), for instance, assumed that there should be a relationship between the changes in the content of children's fears and the cognitive shift from concrete to more abstract representations. This author also postulated that the development of children's understanding of space, time, and causality should be connected to the development of fears of themes such as separation and death.

The empirical evidence for the link between cognitive development and anxiety phenomena is relatively sparse. Nevertheless, there are a few studies that made an attempt to investigate this issue. To begin with, researchers have compared the fears of mentally retarded children with those of children with normal intelligence (e.g., Gullone et al. 1996; King et al. 1994; Muris et al. 2002a; Ramirez and Kratochwill 1997). The results have generally indicated that children with intellectual disabilities report a higher intensity and a greater variety of fears than children with a normal intellectual capacity. Further, the content of the fears of children with an intellectual disability more clearly resembled the fears of younger normal children (e.g., fears of animals and supernatural phenomena) than those of their normal similar-aged peers. Further, there are also a few investigations that have directly measured children's cognitive development to study its relationship with anxiety phenomena. In general this research has revealed that with increasing levels of cognitive skills, children are more capable of developing worrisome thoughts (Muris et al. 2002b) and more frequently interpret physical symptoms as a sign of anxiety (Muris et al. 2007), while adolescents more often display socially evaluative fears (Westenberg et al. 2004).

Taken together, there are indications that cognitive maturation indeed plays a role in the developmental patterns as observed for anxiety phenomena. However, so far only a few studies have examined this issue by actually measuring children's level of cognitive development. In addition, studies on the developmental pattern of

behavioral inhibition have not been conducted yet. With these issues in mind, we made a further attempt to investigate the relation between cognitive maturation and anxiety phenomena in children aged 4–9 years. Two measures were used to assess the level of cognitive development in the children, namely a series of Piagetian conservation tasks and a Theory-of-Mind (TOM) test. Conservation tasks were employed to obtain a rough impression of children's cognitive development, but can also be criticized because they consider development as a discontinuous, global change in cognition (Flavell et al. 2002). Therefore, we also included the TOM-test, which considers the cognitive development as a continuous process. Finally, it is important to note that information about the anxiety phenomena was gathered via multiple informants. That is, fears were assessed by means of a self-report scale completed by the children, while anxiety symptoms and behavioral inhibition were indexed by rating scales that were filled out by the parents.

Thus, in the current study we examined developmental patterns in fear, anxiety, and behavioral inhibition in a sample of preschool and latency-aged non-clinical children. Further, we investigated to what extent cognitive development was associated with these phenomena. It was hypothesized that symptoms of separation anxiety, "infantile" fears such as fears of ghosts, witches, and the dark, and non-social behavioral inhibition were most prevalent in younger children, whereas symptoms of generalized anxiety disorder and social behavioral inhibition were expected to be more common in older children. In a similar vein, we predicted that symptoms of separation anxiety, infantile fears, and signs of non-social behavioral inhibition would decline, whereas symptoms of generalized anxiety and social behavioral inhibition would become more prominent with increasing cognitive maturation.

## Method

### Participants

Two-hundred-and-twenty-six children (104 boys and 122 girls) aged between 4 and 9 years and their parents (211 mothers and 15 fathers) participated in this study, which was approved by the Ethical Committee Psychology of Erasmus University Rotterdam. Children and parents were recruited from three primary schools in Rotterdam and Nieuwerkerk aan den IJssel, The Netherlands. Before the study started parents were asked to fill in an informed consent form; approximately 25% of the invited parents did so and agreed to participate. The average age of the children was 6.09 years ( $SD = 1.54$ ). To study developmental patterns in fear, anxiety, and behavioral inhibition, children

were divided in three age groups: (1) 4- and 5-year-olds ( $n = 92$ ; 46 boys and 46 girls), (2) 6- and 7-year-olds ( $n = 80$ ; 35 boys and 45 girls), and (3) 8- and 9-year-olds ( $n = 54$ ; 23 boys and 31 girls). The majority of the children were Dutch, that is, more than 80% of them had a father and mother who were born in the Netherlands. No other information about the socioeconomic background of the children was available.

## Assessment

### Parents

**Preschool Anxiety Scale—Revised** The Preschool Anxiety Scale—Revised (PAS-R; Edwards 2007), which is a modification of the Preschool Anxiety Scale (PAS; Spence et al. 2001), is a parent-based questionnaire for measuring symptoms of DSM-defined anxiety disorders in young children. The PAS-R includes 30 items representing symptoms of social phobia, generalized anxiety, separation anxiety, specific fears, and obsessive-compulsive disorder. Parents were asked to score the anxiety symptoms of their child on a 5-point scale, ranging from 1 (*not at all true*) to 5 (*very often true*). PAS scores can be calculated by summing the scores on relevant items, with higher scores being indicative for higher levels of anxiety. In the present study, we only focused on the scales measuring separation anxiety and generalized anxiety, as there were specific hypotheses regarding these anxiety symptoms. Psychometric evaluations of the original PAS and PAS-R have shown that these questionnaires display good reliability and validity (Broeren and Muris 2008; Edwards 2007; Spence et al. 2001).

**Behavioral Inhibition Questionnaire** The Behavioral Inhibition Questionnaire (BIQ; Bishop et al. 2003) is a 30-item parent-rated questionnaire that assesses behavioral inhibition in three domains (i.e., social novelty, situational novelty, and physical challenges). Social novelty is covered by 14 items that refer to inhibited behaviors during performance situations and interactions with peers and adults. Situational novelty and physical challenges, which in the present study were combined to measure behavioral inhibition in response to non-social novelty, are represented by 16 items that refer to separation and other new situations. After recoding reversed items, a total score and social and non-social novelty scores were computed, with higher scores being indicative for higher levels of behavioral inhibition. The psychometric properties of the BIQ are adequate. More precisely, the scale has satisfactory reliability and validity (Bishop et al. 2003; Edwards 2007).

### Children

**Theory-of-Mind Test** The shortened version of the Theory-of-Mind (TOM) test (Muris et al. 1999) is an interview-based measure consisting of nine stories, drawings and vignettes about which children have to answer 38 questions. These questions refer to various aspects of social-cognitive ability: recognition of basic emotions, first-order beliefs, second-order beliefs, pretense, understanding false belief, and understanding humor and sarcasm. Each question is scored as either passed (1) or failed (0). In the present study, a TOM total score was obtained by summing all passed items, with higher scores reflecting more developed social-cognitive abilities (i.e., theory-of-mind). The TOM-test is a reliable and valid measure of theory-of-mind. Muris et al. (1999) showed that the test has sufficient to good internal consistency, test-retest stability, and interrater-reliability. Moreover, the test discriminates between normal children and children with a pervasive development disorder, which are known to display clear deficits in this cognitive domain.

**Piagetian Conservation Tasks** Five Piagetian conservation tasks were administered to measure children's concrete operational skills: conservation of liquid quantity, number, length, mass, and area (see for a more extensive description: Muris et al. 2007). Children's responses on these five tasks were scored as failed (0) or passed (1). A total developmental score was calculated by summing the scores on the five tasks (range 0–5), with higher scores reflecting higher levels of cognitive development. Muris et al. (2002a, b) examined the interrater reliability of the conservation tasks and found a 100% agreement between observers. Furthermore, several authors posit that from age 7, children show a marked progression in these cognitive skills. Piaget (1970), for example, states that children around this age make the transition from the preoperational stage to the stage of concrete operations, during which most children learn to successfully solve conservation tasks. Muris et al. (2007) indeed demonstrated such a developmental transition in children's conservation task performance. These researchers also observed a significant positive correlation between performance on conservation tasks and scores on the TOM-test, which further supports its validity as an index of cognitive development.

**Koala Fear Questionnaire** The Koala Fear Questionnaire (KFQ; Muris et al. 2003) is an interview-based, self-report scale for assessing fears and fearfulness in 4- to 12-year-old children. The scale consists of 31 potentially fear-provoking stimuli and situations that are all illustrated with pictures. For each item children rate their level of anxiety using a visual scale depicting Koala bears that express

various degrees of fear (1 = *No fear*, 2 = *Some fear*, 3 = *A lot of fear*). A total KFQ score can be obtained by summing the item scores (range 31–93). Factor analysis yielded five meaningful factors, with one of them nicely covering the more infantile fears that were of particular interest to the present study. This factor is labeled as “fear of the unknown” and contains items such as “witches”, “ghosts”, “the dark”, “scary dreams”, and “scary movies”. Psychometric properties of the KFQ have proven to be adequate: that is, the internal consistency and test-retest reliability appear satisfactory, and scores on this test correlate positively with concurrent measures of fear and anxiety (Muris et al. 2003).

**Procedure**

Parents received an informed consent letter and a set of questionnaires via their child’s teacher. When they agreed to participate by signing the consent form, they also completed the PAS-R and the BIQ. All questionnaires were in Dutch. The PAS-R and BIQ were translated into the Dutch language by a translation service, which employed a back-and-forward translation procedure to ensure that translated items correctly reflected their original content. Subsequently, all children were individually tested in a separate room at school. Children were administered the TOM-test, Piagetian conservation tasks, and the KFQ in one testing session, that lasted approximately 15–20 min. These tests were administered in two sequences: (1) TOM-test-KFQ-conservation tasks, and (2) conservation tasks-KFQ-TOM-test. Children were randomly assigned to one of the two sequences. In two of the schools, children received a small present in return for their participation in the study (e.g., colored pencils, crayons, a booklet). Children in the third school were rewarded with playing materials for the entire classroom (e.g., footballs, tennis balls).

**Results**

**General Findings**

Before discussing the main results of the present study, a number of general findings will be addressed. First, independent *t*-tests revealed that girls displayed higher KFQ total and “fear of the unknown” scores than boys (*M*s being 57.45, *SD* = 10.94 and 9.63, *SD* = 2.94 versus 50.83, *SD* = 12.15 and 8.39, *SD* = 2.94, respectively; both *t*(222)’s  $\geq 3.15, p < .01$ ). No other gender differences were observed for indexes of cognitive development, behavioral inhibition, and anxiety, and therefore it was decided not to include gender as a covariate in further analyses.

Second, reliability analyses were carried out on various PAS-R, BIQ, and KFQ scales, and indexes of cognitive development (i.e., conservation tasks, TOM-test). Table 1 shows the internal consistency coefficients (Cronbach’s alphas) and item-total correlations for these measures. The internal consistency of most scales was good (with Cronbach’s alphas between .75 and .95) and this was generally also true for the item-total correlations (*r*’s between .12 and .84).

Third, significant and substantial correlations were observed between the BIQ and PAS-R scales: a correlation of .70 ( $p < .01$ ) was found between the total scores of both questionnaires, whereas correlations among various (sub) scales varied between .38 (BIQ social novelty and PAS-R separation anxiety) and .74 (BIQ non-social novelty and PAS-R total scale).

Fourth and finally, a positive association was found between performance on the TOM-test and the score on the conservation tasks ( $r = .55, p < .001$ ). Age also correlated positively with scores on the TOM-test ( $r = .69, p < .001$ ) and the conservation tasks ( $r = .62, p < .001$ ). Additional analyses revealed that TOM-test scores of 4- and 5-year-old children ( $M = 26.13, SD = 6.71$ ) were significantly lower than those of 6- and 7- ( $M = 34.18, SD = 2.85; p < .001$ ) and 8- and 9-year-old children [ $M = 35.48, SD = 2.46; p < .001; F(2,221) = 88.87, p < .001$ ]. On the conservation tasks, 4- and 5-year-old children ( $M = 0.78, SD = 1.45$ ) scored significantly lower than 6- and 7-year-old children ( $M = 2.97, SD = 1.98; p < .001$ ), who in their turn scored significantly lower than 8- and 9-year-old children [ $M = 3.80, SD = 1.52; p < .05; F(2,221) = 65.58, p < .001$ ].

**Table 1** Mean scores (standard deviations), Cronbach’s alphas, and item-total correlations for instruments measuring children’s anxiety symptoms, behavioral inhibition, fears, and cognitive development

Scale	<i>M</i> ( <i>SD</i> )	Cronbach’s $\alpha$	Item-total <i>r</i>
PAS-R total score	59.85 (16.73)	.92	.21–.71
PAS-R separation anxiety	8.33 (3.19)	.76	.44–.64
PAS-R generalized anxiety	14.83 (5.38)	.87	.43–.75
BIQ total score	86.09 (25.04)	.95	.33–.81
BIQ social novelty	43.30 (13.45)	.92	.47–.75
BIQ non-social novelty	42.88 (13.18)	.93	.39–.82
KFQ total score	54.41 (11.95)	.91	.12–.64
KFQ fear of the unknown	9.06 (3.00)	.79	.44–.64
TOM-test	31.22 (6.37)	.91	.13–.68
Conservation tasks	2.28 (2.10)	.91	.63–.84

*Note:* *N* = 226; *PAS-R* = Preschool Anxiety Scale—Revised; *BIQ* = Behavioral Inhibition Questionnaire; *KFQ* = Koala Fear Questionnaire; *TOM-test* = Theory-of-Mind Test

## Age Differences in Anxiety Phenomena

Table 2 shows the mean scores and standard deviations for the total scale and relevant subscales of the PAS-R, BIQ, and KFQ for the three age groups separately. Analyses of variance (ANOVAs) yielded a significant effect of age for the PAS-R generalized anxiety scale [ $F(2,223) = 5.73$ ,  $p < .01$ ]. Four- and 5-year-old children ( $M = 13.40$ ,  $SD = 4.88$ ) displayed lower scores on this scale than children in the two older age groups ( $M$ s being 15.75,  $SD = 5.29$  and 15.90,  $SD = 5.84$ , respectively; both  $p$ 's  $< .05$ ). KFQ scores also differed among the age groups, and this was true for the KFQ total scale [ $F(2,221) = 5.94$ ,  $p < .01$ ] as well as for the “fear of the unknown” scale [ $F(2,221) = 22.86$ ,  $p < .001$ ]. Post-hoc comparisons revealed that 4- and 5-year-olds ( $M = 57.65$ ,  $SD = 12.72$ ) exhibited significantly higher total fear scores than the 6- and 7- ( $M = 52.44$ ,  $SD = 11.73$ ;  $p < .05$ ) and 8- and 9-year-olds ( $M = 51.81$ ,  $SD = 9.65$ ;  $p < .05$ ). A similar pattern was observed for the scores on the KFQ “fear of unknown” subscale: again children of the youngest age group ( $M = 10.53$ ,  $SD = 3.08$ ) scored significantly higher than children of the older two age groups ( $M$ s being 8.30,  $SD = 2.75$  and 7.69,  $SD = 2.00$ ; both  $p$ 's  $< .001$ ).

The most frequently endorsed items of the PAS-R in the 4- and 5-year-olds were mainly related to social anxiety and specific fears (e.g., unfamiliar people, dogs, and the dark), whereas the most prevalent items in 6- and 7- and 8- and 9-year-olds predominantly consisted of items from the social anxiety and generalized anxiety scales (e.g., new people, looking stupid, doing the right thing, and new unusual situations). Inspection of the most frequently endorsed BIQ items revealed that there were few systematic differences in the type of inhibited behaviors across the three age groups. Performing in front of others, approaching unfamiliar children, and being the center of attention were most common among children of all ages. Inspection of the most prevalent KFQ items revealed that

more infantile fears (e.g., witches, crocodiles, and lions) ranked somewhat higher in the hierarchy of younger children, whereas more abstract fears (e.g., war and your parents getting divorced) listed higher in the ranking of older children.

## Relation Between Cognitive Development and Anxiety Phenomena

To study the effects of cognitive development on anxiety phenomena scores, correlations were computed between TOM-test and conservation tasks, on the one hand, and PAS-R, BIQ, and KFQ scores, on the other hand. Further, a series of linear regression analyses was carried out to examine unique contributions of cognitive development indexes (besides age) to various anxiety phenomena. In these analyses, scores on cognitive measures and age were entered as the predictors, whereas scores on the PAS-R, BIQ and KFQ total scales and subscales were the dependent variables.

The correlational analysis revealed that only the BIQ and the KFQ total scales were linked to the cognitive measures. That is, small but significant negative correlations were found between the BIQ total score and the TOM-test ( $r = -.15$ ,  $p < .05$ ). Further, the KFQ total score correlated negatively with scores on the TOM-test and the conservation tasks ( $r$ 's being  $-.19$  and  $-.20$ ,  $p$ 's  $< .01$ ).

The results of the regression analyses revealed unique and significant contributions of TOM to various BIQ scales (Table 3). More precisely, TOM was a significant and independent predictor of total BIQ, BIQ social novelty, and BIQ non-social novelty scores. All standardized betas were negative, indicating that higher levels of TOM were associated with lower behavioral inhibition scores. Age emerged as an independent and significant predictor of the PAS-R total score, separation anxiety and generalized anxiety. In all cases, standardized betas were positive,

**Table 2** Mean scores (and standard deviations) on PAS-R, BIQ, and KFQ for the three age groups

Scale	4- and 5-year-olds ( $n = 92$ )	6- and 7-year-olds ( $n = 80$ )	8- and 9-year-olds ( $n = 54$ )
PAS-R total score	58.27 (15.56)	60.89 (16.34)	61.02 (19.12)
PAS-R separation anxiety	8.05 (3.10)	8.43 (2.98)	8.65 (3.65)
PAS-R generalized anxiety	13.40 (4.88) <sup>a</sup>	15.75 (5.29) <sup>b</sup>	15.90 (5.84) <sup>b</sup>
BIQ total score	85.73 (25.98)	87.86 (23.20)	84.09 (26.31)
BIQ social novelty	43.32 (14.32)	44.15 (12.76)	41.98 (13.05)
BIQ non-social novelty	42.41 (13.01)	43.71 (12.19)	42.88 (14.99)
KFQ total score	57.65 (12.72) <sup>a</sup>	52.44 (11.73) <sup>b</sup>	51.81 (9.65) <sup>b</sup>
KFQ fear of the unknown	10.53 (3.08) <sup>a</sup>	8.30 (2.75) <sup>b</sup>	7.69 (2.00) <sup>b</sup>

Note:  $N = 226$ ; PAS-R = Preschool Anxiety Scale—Revised; BIQ = Behavioral Inhibition Questionnaire; KFQ = Koala Fear Questionnaire. Means with different subscripts differ at  $p < .01$

**Table 3** Effect of cognitive development and age on fear, anxiety and behavioral inhibition

	$\beta$			$R^2$
	Age	TOM-test	Conservation tasks	
PAS-R total score	.19*	-.09	-.08	.02
PAS-R separation anxiety	.23*	.02	-.24**	.04
PAS-R generalized anxiety	.24**	-.01	-.01	.05
BIQ total score	.11	-.24**	.03	.03
BIQ social novelty	.06	-.26**	.08	.04
BIQ non-social novelty	.15	-.19*	-.02	.02
KFQ total score	-.12	-.06	-.10	.06
KFQ fear of the unknown	-.25**	-.13	-.13	.19

Note: PAS-R = Preschool Anxiety Scale—Revised; BIQ = Behavioral Inhibition Questionnaire; KFQ = Koala Fear Questionnaire. \*  $p < .05$ , \*\*  $p < .01$

indicating that a higher age was associated with higher levels of anxiety symptoms. Additionally, age was also a significant predictor of KFQ “fear of the unknown”: here the negative beta signified that higher age was related to lower levels of these infantile fears. Finally, conservation tasks also emerged as an independent and significant predictor of PAS-R separation anxiety; the standardized beta was negative, indicating that higher scores on the conservation tasks were associated with lower levels of separation anxiety.

Admittedly, the percentages of explained variance accounted for by age and cognitive development were generally low (between 2 and 6%). Only in the case of KFQ “fear of the unknown”, variables accounted for a relatively large percentage of the explained variance (i.e., 19%).

**Discussion**

The current study revealed significant age trends for general fearfulness, “fear of the unknown”, and generalized anxiety. More specifically, younger (i.e., 4- and 5-year-old) children displayed higher fear scores, whereas older (i.e., 6- and 7-year-old and 8- and 9-year-old) children exhibited higher generalized anxiety scores. These age trends were in keeping with those reported in previous studies. For example, Muris et al. (2000) also noted that specific fears, and especially infantile fears, decline as children become older, whereas symptoms of generalized anxiety (i.e., worry) tend to increase with age.

No evidence was obtained for the idea that types of behavioral inhibition varied as a function of age. More

precisely, we expected that at a younger age this temperamental trait would be particularly elicited by non-social events, whereas in older children social cues would become more potent triggers of inhibited behaviors. It may well be that the restricted age range (i.e., 4–9 years) in the present sample may have accounted for this negative finding, and that the expected developmental changes in behavioral inhibition would have emerged if we had included older children and even adolescents in our own study.

In a similar vein, the predicted decline in symptoms of separation anxiety did not emerge. In fact, the regression analysis yielded a quite complex pattern of results. The positive beta with age indicated that separation anxiety symptoms slightly increased as children were older, while the negative beta with conservation task performance signified that these symptoms declined with increasing cognitive maturation. Two remarks can be made with regard to these on first sight rather contradictory findings. First, it may well be that the expected decline in separation anxiety symptoms did neither emerge because of the limited age range of the present sample. When studying the full age span of youth, there is quite convincing evidence indicating that these anxiety problems clearly display a significant decrease over time (e.g., Weems and Costa 2005; Westenberg et al. 1999). Second, the fact that symptoms of separation anxiety were positively related to age but at the same time negatively associated with cognitive development, seems to point out that this anxiety problem is characterized by diverging symptoms (e.g., Silverman and Dick-Niederhauser 2004) which may exhibit a differential developmental pattern. On the one hand, separation anxiety reflects a rather childish desire not to be separated from the parent, which is likely to decrease in the course of development. On the other hand, this type of anxiety is also marked by worrisome thoughts about bad things that might happen to parents (American Psychiatric Association 2000), which presumably increase as children become older. Obviously, this is an issue that warrants further research.

In general, it can be concluded that the impact of developmental factors on various anxiety phenomena was fairly limited. Age accounted for a substantial proportion of the infantile fears (i.e., 18.9%), suggesting that this type of fears are clearly a function of maturation. However, for the other anxiety phenomena (i.e., general fearfulness, anxiety, and behavioral inhibition), a much smaller percentage of the variance was explained by age and cognitive development (i.e. <6%). This finding seems to point out that there are other factors which might play a more important role in the origins of anxiety phenomena. A model that may be relevant to discuss in this context is the developmental psychopathology account of childhood phobias and anxiety disorders as described by Muris (2007). Briefly, the model

suggests that there is a continuum with normal fear and anxiety on one side, and pathological manifestations such as phobias and anxiety disorders on the other side. At each point in time, children's level of fear and anxiety is determined by the current constellation of vulnerability factors (e.g., neuroticism and negative parental rearing behaviors) and protective factors (e.g., effortful control and effective coping strategies). Within this model, children's developmental level is only conceived as a moderating variable that may partly determine the content of fear and anxiety at various ages, as well as the cognitive processes underlying the anxiety phenomena (e.g., cognitive biases). When considering the fact that our study was more focused on measuring the intensity and frequency of various anxiety phenomena, the small percentage of explained variance by cognitive maturation might not be that surprising. It is possible that cognitive development is more relevant when studying the underlying cognitive processes of fear and anxiety in children.

It should be admitted that the present study was subject to several limitations. One shortcoming was already mentioned and pertains to the restricted age range of the children included in this study. Another limitation has to do with the cross-sectional nature of the study. Obviously, a longitudinal investigation in which children are followed for several years would provide a more detailed picture of the developmental course of various anxiety phenomena and the role of cognitive development. Further, fear and anxiety were only measured by means of self- and parent-rated questionnaires that quantified the frequency/intensity of the anxiety phenomena. The measures were predominantly content-based, and hence are silent of the cognitive processes that may underlie fear, anxiety, and behavioral inhibition. It is likely that process-based measures have a more clear-cut link to children's level of cognitive development.

In conclusion, the role of cognitive development in developmental patterns in anxiety phenomena has been put forward by several researchers (e.g., Muris 2007; Vasey 1993). The present study was a preliminary attempt to further investigate this issue, and the results demonstrate that cognitive development plays a role in infantile fears, but for the further part only seems to explain a fairly small proportion of the variance in childhood fear, anxiety, and behavioral inhibition.

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