Anxiety in Non-Clinical Children

Developmental course and vulnerability factors

Suzanne M.L. Broeren

Anxiety in Non-Clinical Children: Developmental Course and Vulnerability Factors

Suzanne M. L. Broeren

ISBN: 978-90-9025652-8

Cover design by Ingrid Broeren & Jan van Kampenhout (www.janvankampenhout.com)
Cover photo by Lloyd
Lay out by Suzanne Broeren
Printed by Ipskamp Drukkers B.V.

Anxiety in Non-Clinical Children:
Developmental Course and Vulnerability Factors

Angst bij niet-klinische kinderen:
Ontwikkelingsverloop en kwetsbaarheidsfactoren

Proefschrift

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus

Prof.dr. H.G. Schmidt

en volgens besluit van het College voor Promoties**.**

De openbare verdediging zal plaatsvinden op
vrijdag 14 januari 2011 om 11.30 uur

door

Suzanne Maria Liduina Broeren

geboren te Rotterdam

Promotiecommissie

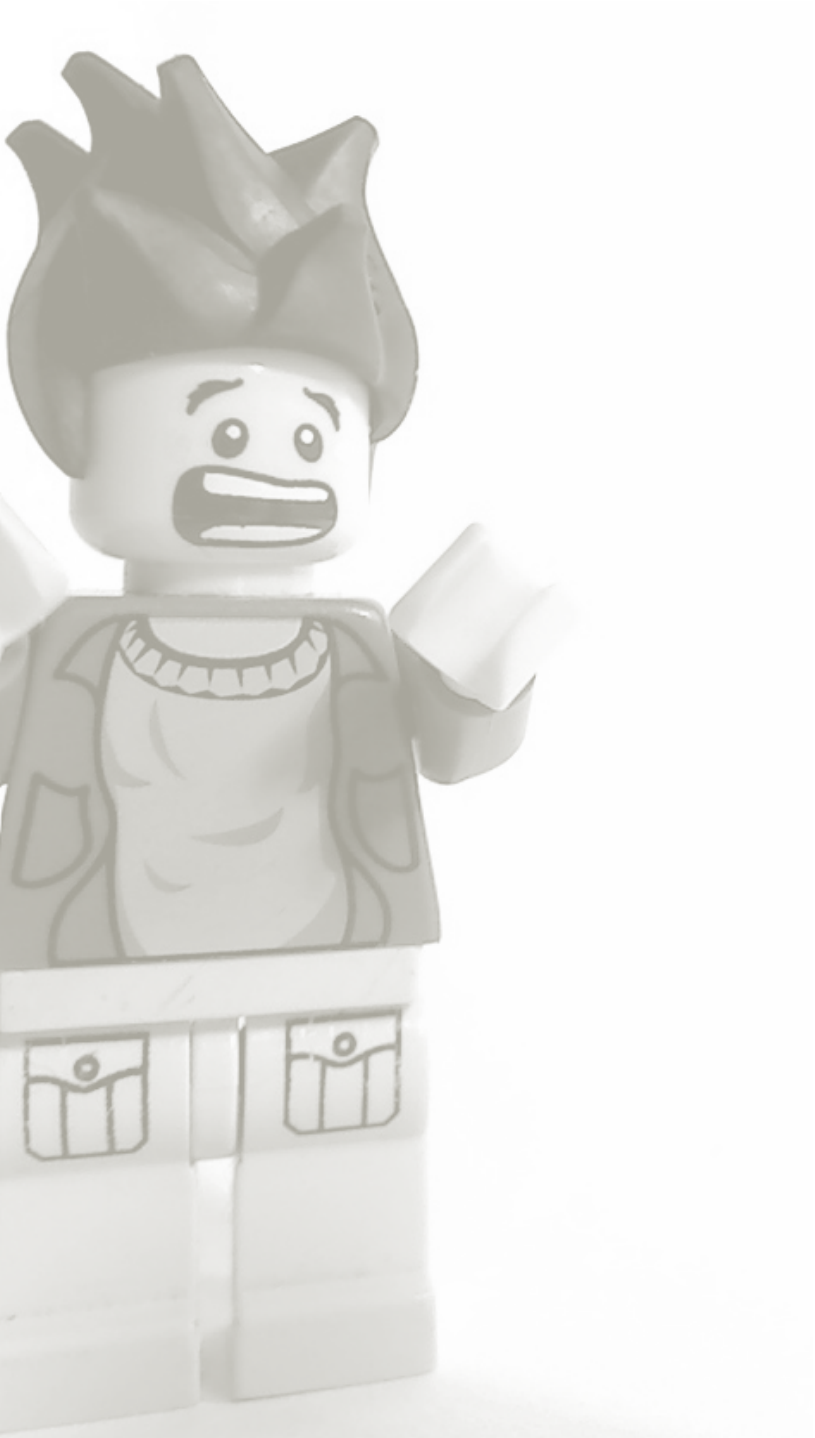
Promotor: Prof.dr. P.E.H.M. Muris

Overige leden: Prof.dr. F.C. Verhulst
Prof.dr. E. de Haan
Dr. A.A.C.M. Smeets

Content

Chapter 1

General introduction



Some children are afraid of the dark, spiders, ghosts, or imaginary creatures, others are apprehensive of something bad happening to their parents or themselves, or worry about doing something stupid in front of others. Nevertheless, fear and anxiety are a normal part of childhood development and can be seen as an adaptive response to stimuli and situations that are potentially threatening or dangerous (Marks, 1987). Normal fear and anxiety in youths shows a clear developmental pattern (Gullone, 2000). 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's fears are focused on imaginary creatures (e.g., ghosts, witches), animals, strangers, and their 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 fears about social evaluations and interactions, death, and illness (Bauer, 1976; Muris, Merckelbach, Gadet, & Moulaert, 2000). Fear and anxiety are thought to come up and disappear following this predictive pattern because they are linked to different developmental stages and the specific dangers that children encounter during these stages (Marks, 1987). For example, fear of strangers and separation anxiety become manifest around the time that infants have learned to differentiate between familiar and unfamiliar faces, whereas fear of heights usually develops around the time infants start crawling. When children have acquired these cognitive and/or physical skills, they encounter potential dangers (e.g., strangers, heights) for which they do not already have developed sufficient cognitive capacity to understand. Therefore, children develop fears to protect them from these potential dangers by triggering the appropriate safety responses (e.g., avoiding strangers or avoiding heights). When children acquire the cognitive abilities to understand the potential dangers of these situations and learn how to deal with them, their fear or anxiety for these stimuli or situations usually abates. Thus, it seems that children's fears and anxiety are closely linked to their cognitive and physical development.

Despite fear and anxiety being a normative part of childhood development, differences can be observed in intensity, frequency, and duration of these phenomena between children (Gullone, 2000). Moreover, while in the majority of youths fear and anxiety are normal, transitory phenomena, in a minority of children they become severe and chronic, and start to interfere with their daily lives. These differences in intensity, frequency, and duration of fears are conceptualized as being on a continuum (e.g., MacLeod, 1991; Rapee, 2001; Rapee & Spence, 2004) with no or only low levels of fears on the lower end of the continuum and the more intense, pathological levels of fear and anxiety on the upper end.

From a clinical point of view, the pathological levels of fear and anxiety, also known as phobias and anxiety disorders, are among the most common psychiatric problems in children and adolescents, affecting between 10 and 20% of youths (Cartwright-Hatton, McNicol, & Doubleday, 2006; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). Typically, these disorders are characterized by subjective apprehension and distress, worrisome thoughts, avoidance behavior, and physiological arousal in relation to specific stimuli or

situations (American Psychiatric Association, 2000). Anxiety disorders have the earliest median age of onset of all psychiatric disorders (Kessler et al., 2005; Kim-Cohen et al., 2003), and anxiety problems tend to be relatively stable over time (Costello et al., 2003) and, if left untreated, may even persist into adolescence and adulthood (Keller et al., 1992; Last, Perrin, Hersen, & Kazdin, 1996). Furthermore, these problems can cause significant impairment in social, emotional, and school functioning (Strauss, Frame, & Forehand, 1987; Woodward & Fergusson, 2001), and pose a risk for the development of (other) internalizing and externalizing disorders in childhood (Last et al., 1996), adolescence (Bittner et al., 2007), and even adulthood (Pine, Cohen, Gurley, Brook, & Ma, 1998). This profound impact of anxiety disorders on the lives of children highlights the need to understand the factors involved in the etiology and maintenance of this type of psychopathology.

A large variety of factors has been proposed to play a role in the development of phobias and childhood anxiety disorders among which genetics, (early) life experiences, temperament/personality, parental rearing, learning experiences, and cognitive factors (e.g., Muris, 2007; Rapee, Schniering, & Hudson, 2009). However, it is also assumed that these factors are not likely to act in isolation, but tend to interact with each other in the development of childhood fear, anxiety, and their disorders (e.g., Vasey & Dadds, 2001). With this in mind, Muris (2007) has recently proposed a dynamic multifactorial model of childhood phobias and anxiety disorders in which a large variety of vulnerability and maintaining factors as well as protective factors are incorporated within a developmental psychopathology perspective. In this model, fear and anxiety are also depicted as a continuum with normal fear and anxiety on one end, and their pathological manifestations on the other end. On each point in their development, children's levels of fear and anxiety are determined by their current constellation of protective and vulnerability factors. That is, protective factors such as effective coping mechanisms or (high) effortful control reduce fear and anxiety, while vulnerability factors such as behavioral inhibition and information-processing abnormalities, increase or maintain fear and anxiety. It should be noted that protective and vulnerability factors in this model operate in a dynamic way, allowing all factors to be interrelated, influence, reinforce, or interact with each other. Thus, when low protection is combined with high vulnerability, the probability rises that a child will display pathological levels of fear and anxiety and when this happens frequently within a (short) period of time, the child may qualify for an anxiety disorder.

Finally, another important aspect of the model is that it assumes that the developmental level of the child plays a role in the origin, manifestation, and continuation of childhood anxiety problems. In sum, Muris' model hypothesizes that fear and anxiety can become pathological if in a complex, dynamic interplay vulnerability factors outweigh protective factors. For every child, protective and vulnerability factors may differ, and the equilibrium between these factors, even within an individual child, changes continuously as a result of experiences and level of (cognitive) development.

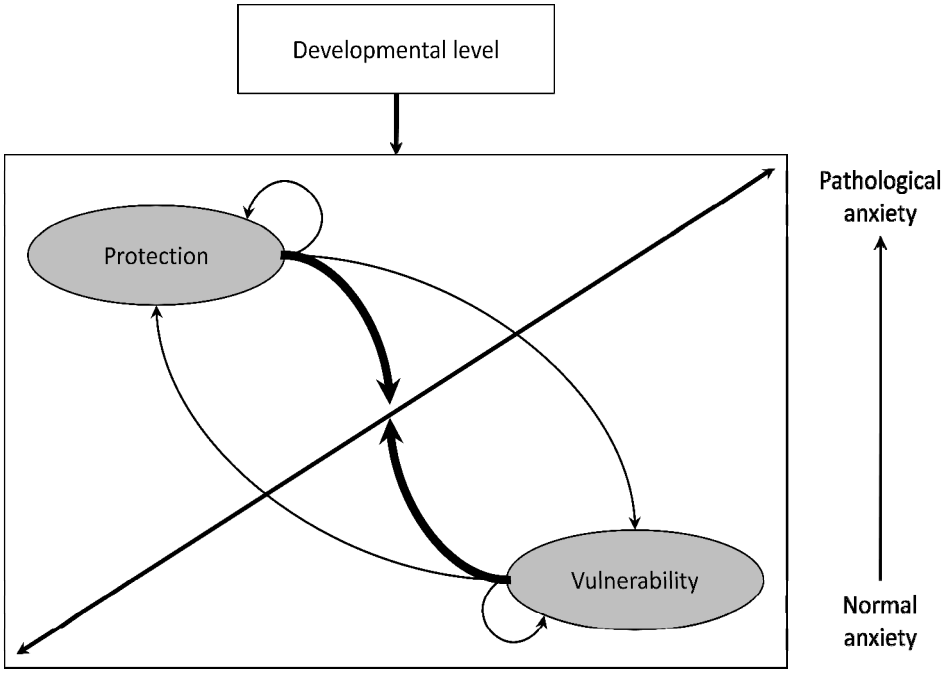


Figure 1. A dynamic multifactorial model of childhood anxiety disorders (Muris, 2007)

In the meantime, although this multifactorial model makes an attempt to outline the dynamic nature of the development of childhood anxiety, the precise role of various protective and vulnerability factors, as well as developmental level, and, maybe even more importantly, the interactions among these variables remain largely unclear. Recently, studies have begun to address interactions between temperamental vulnerability (e.g., behavioral inhibition, neuroticism) and negative environmental influences (e.g., stressful experiences, negative maternal modeling, insecure attachment), or between temperamental vulnerability and protective temperamental traits (e.g., effortful control; e.g., Brozina & Abela, 2006; De Rosnay, Cooper, Tsigaras, & Murray, 2006; Lonigan, Vasey, Phillips, & Hazen, 2004; Shamir-Essakow, Ungerer, & Rapee, 2005). However, much is still unknown about the development of anxiety disorder symptoms over time, the vulnerability factors playing a role in this development and their interactions, as well as the influence of (social-)cognitive development.

The present studies

The purpose of this dissertation is threefold. The first goal is to gain more insight in the development of childhood anxiety disorder symptoms in typically developing children. The second objective is to study a number of vulnerability factors that are hypothesized to play a role in the etiology and maintenance of anxiety problems, and to clarify their role in the development of anxiety pathology. Finally, for the investigation of anxiety and related vulnerability factors, reliable and valid measures are essential. That is, psychometrically sound screening instruments for childhood anxiety symptoms and relevant vulnerability factors such as behavioral inhibition are urgently needed, and this seems particularly true for young children. The identification of vulnerable children at a young age not only facilitates research on the development of anxiety symptoms and the role of vulnerability factors, but also makes it possible to implement early prevention and

intervention programs (e.g., Dadds et al., 1999; Rapee, 2002). Therefore, the third aim of this research project was to examine the psychometric properties of a number of questionnaires measuring anxiety and related vulnerability factors in young children.

The current dissertation presents a series of seven studies (Chapter 2 to 8) which can roughly be divided into three parts in accordance with the three above described aims. First, Chapters 2 and 3 describe psychometric studies on parent-based questionnaires that can be used to study anxiety and related internalizing problems, and vulnerability factors in young children. Second, Chapter 4 and 5 aim to get a better understanding of the course of childhood anxiety disorder symptoms and their association with child-related vulnerability factors and (social-)cognitive development. Third, Chapter 6, 7, and 8 address various specific vulnerability factors that are hypothesized to be involved in the development of anxiety problems, namely repetitive negative thoughts, information-processing biases, and peer modeling. The specific research purpose(s) of each chapter will be described below.

First, in **Chapter 2** the psychometric properties and acceptability of two parent-based scales, the Preschool Anxiety Scale (Spence, Rapee, McDonald, & Ingram, 2001) and the Children's Moods Fears and Worries Questionnaire (Bayer, Sanson, & Hemphill, 2006) are examined in a Dutch community sample of preschool children. These questionnaires can be used to study anxiety and related internalizing problems in very young children.

Chapter 3 reports the psychometric evaluation of a parent-rated and self-report version of the Behavioral Inhibition Questionnaire (Bishop, Spence, & McDonald, 2003) in a community sample of children and adolescents. This questionnaire assesses children's levels of behavioral inhibition, which can defined as a temperament characteristic referring to the tendency to be unusually shy and to respond with fearfulness and withdrawal in new and unfamiliar social and non-social situations (Hirshfeld-Becker, Biederman, & Rosenbaum, 2004), which is thought to be associated with a higher risk of developing anxiety problems (Biederman et al., 1993).

Chapter 4 describes a cross-sectional examination of developmental patterns in fear, anxiety, and behavioral inhibition in a sample of preschool- and latency-aged children and investigates to what extent (social-)cognitive development is associated with these phenomena.

In **Chapter 5** a prospective, multi-cohort study is described that examines developmental trajectories of various types of anxiety disorder symptoms in school-aged, typically-developing children and explores to what extent the child-related variables of behavioral inhibition, social-cognitive development, and psycho-social adjustment, measured at study onset, are predictive of these trajectories.

Subsequently, **Chapter 6** describes a study in which not only symptoms of anxiety, but emotional problems in general (i.e., including symptoms of depression and sleep problems) are investigated. This study explores the role of repetitive negative thoughts (i.e., worry and rumination) as a vulnerability factor for emotional problems in latency-aged non-clinical children. More specifically, a mediation model is examined in which worry and rumination statistically mediate the link between the personality trait of neuroticism and symptoms of anxiety, depression, and sleep problems. Furthermore, it also examines

whether behavioral inhibition accounted for unique variance in the prediction of repetitive thought and symptoms of psychopathology, and anxiety problems in particular.

Chapter 7 explores the vulnerability factor of information-processing biases. This chapter describes a study examining processing biases for emotional facial stimuli in a large sample of pre-school and school-aged non-clinical children. Furthermore, it explores developmental patterns in these biases, and whether in children of various ages this bias is related to social anxiety or the temperamental trait of behavioral inhibition. Additionally, it is examined whether this type of processing bias is present in all children, or mainly a characteristic of those who are already socially anxious or who display the vulnerability to develop such anxiety problems.

The experimental study presented in **Chapter 8** considers the effect of (filmed) peer modeling on fear-beliefs and approach-avoidance behaviors towards an unknown animal in 8- to 10-year-old typically developing children.

Finally, **Chapter 9** presents an overview and integration of the main findings of Chapter 2 to 7, and describes the implications of these finding and directions for future research.

Chapter 2

Psychometric evaluation of two new parent-rating scales for measuring anxiety symptoms in young Dutch children

This chapter has been published as: Broeren, S. & Muris, P. (2008). Psychometric evaluation of two new parent-rating scales for measuring anxiety symptoms in young Dutch children. Journal of Anxiety Disorders, 22, 949-958.

Abstract

The current study examined the reliability and validity of the Preschool Anxiety Scale (PAS) and the Children's Moods Fears and Worries Questionnaire (CMFWQ) in a Dutch community sample of 275 preschool children aged 2 to 6 years. The acceptability of PAS and CMFWQ items was good. Preliminary exploratory factor analyses yielded a meaningful five-factor model for the PAS and a three-factor model for the CMFWQ. PAS scales had moderate to high reliability coefficients (alphas between .59 and .86), whereas CMFWQ scales displayed good internal consistency (alphas between .88 and .95). The validity of both measures was supported by a number of findings. First, PAS and CMFWQ scores were substantially correlated. Particularly high correlations were found between the PAS total scale and CMFWQ fear and anxiety problems. Second, PAS and CMFWQ scores were also correlated with CBCL emotionally reactive, anxious/depressed and withdrawn subscales. Third, girls displayed significantly higher scores on the PAS scales than boys, which is in agreement with previous research. Also some age differences were found on the PAS, with older children scoring higher on the social phobia and generalized anxiety disorder subscales than younger children. Finally, CMFWQ and PAS scores discriminated reasonably between children scoring in the normal, subclinical, and clinical range of the CBCL subscales. The utility of the PAS and the CMFWQ as a screening instrument for anxiety problems in preschoolers is briefly discussed.

Introduction

Anxiety disorders are among the most prevalent psychiatric disorders during childhood (Bernstein, Borchardt, & Perwien, 1996). Approximately five percent of all children meet the diagnostic criteria of an anxiety disorder at some time in their youth, whereas almost 20 percent of all children have had a clinically significant anxiety problem by the age of 16 (Costello et al., 2003). Anxiety disorders have the earliest median age of onset of all psychiatric disorders (Kessler et al., 2005; Kim-Cohen et al., 2003), and although it is certainly true that some fears and anxieties are part of the normal development of children (Muris, 2007), there are also anxiety problems that are relatively stable over time (Costello et al., 2003) and that may persist into adolescence and even adulthood if left untreated (Keller et al., 1992; Last et al., 1996).

Most research on childhood anxiety has been carried out with older children and adolescents, but there are clear indications that anxiety problems reveal themselves at a very young age (e.g., Egger & Angold, 2006). Distinct markers of anxiety pathology can already be observed in preschool children. A good example is behavioral inhibition, which can be defined as a biologically based temperament characteristic referring to the tendency to be unusually shy and to respond with fearfulness and withdrawal in new and unfamiliar situations (Hirshfeld-Becker et al., 2004). Meanwhile, there is also evidence that anxiety problems in young children mirror those found in older children. Spence and colleagues (2001) showed that anxiety symptoms among preschoolers cluster in constructs that closely correspond with the anxiety disorders as described in the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2000).

These clear-cut signs of anxiety in the preschool years have made several authors to stress the importance of identifying anxious children as early as possible (e.g., Hirshfeld-Becker & Biederman, 2002). Early identification would not only be important for children who already meet the diagnostic criteria of an anxiety disorder, but also for children with subclinical levels of anxiety, as it would become possible to implement early prevention and intervention programs (e.g., Dadds et al., 1999; Rapee, 2002). To achieve this goal, psychometrically sound instruments for screening anxiety symptoms in very young children are urgently needed. Currently, parent rating scales such as the Child Behavior Checklist (CBCL; Achenbach, 1991) and the Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001) are often used for this purpose. However, various studies have shown that even in older children these measures are not very sensitive for detecting anxiety problems (e.g., Aschenbrand, Angelosante, & Kendall, 2005; Kasius, Ferdinand, Van den Berg, & Verhulst, 1997). Although these scales provide valuable information on psychopathological symptoms in general, they do not include specific anxiety scales. Instead they measure broader categories of internalizing or emotional problems, which also include symptoms of depressed mood and peer problems (Spence et al., 2001). Thus, there seems to be a need for symptom-specific and age-appropriate scales for measuring anxiety problems in young children.

Recently two new scales have been developed that seem useful for this purpose. The first is the Preschool Anxiety Scale (PAS; Spence et al., 2001), which is a parent-rating questionnaire based on the anxiety disorders as listed in the DSM-IV. In short, the PAS

consists of 28 items that assess symptoms of separation anxiety disorder, generalized anxiety disorder, social phobia, physical injury fears (representing specific phobia), and obsessive-compulsive disorder, and is considered to be suitable for children aged 2 to 5 years. The second scale is the Children's Moods, Fears, and Worries Questionnaire (CMFWQ; Bayer et al., 2006). The CMFWQ is also completed by young children's parents, and although this scale measures a broad range of internalizing difficulties, the scale includes quite a number of items referring to symptoms of anxiety, worry, and behavioral inhibition.

So far, psychometric evaluations of the PAS and CMFWQ have generally yielded positive results. As for the PAS, data have demonstrated that, with exception of the obsessive-compulsive disorder scale, all scales displayed moderate to good internal consistency (with Cronbach's alphas > .70), cross-informant reliability (correlations between mother and father > .60), and test-retest stability (r > .60 over a 12-month interval; Edwards, 2007). First evidence has also been obtained for the validity of the PAS. That is, factor analysis indicated that symptoms cluster into components that are in keeping with the anxiety disorders as described in the DSM (Edwards, 2007; Spence et al., 2001). Further, all PAS (sub)scales are substantially and positively correlated with the internalizing problems scale of the CBCL (all rs > .42), whereas fairly low correlations (rs between -.08 and .21) are observed with the externalizing problems scale (Spence et al., 2001).

Similar positive psychometric features have been reported for the CMFWQ (Bayer et al., 2006). That is, the total scale has good internal consistency (Cronbach's alpha >.80), and the test-retest reliability was found to be adequate over a 2-year-period (r > .50). Factor analysis has revealed two clear-cut components that have been replicated in younger (2-year-old) and older (4-year-old) preschool children, namely internalizing difficulties (which was a mixture of anxiety and depression symptoms) and solitary play with peers. So far, little is known about the validity of the CMFWQ, but data have demonstrated that the internalizing difficulties factor correlates positively (r = .42) with inhibition as measured by the Short Temperament Scale for Toddlers (STST; Prior, Sanson, & Oberklaid, 1989).

Given the fact that fear and anxiety symptoms may manifest themselves at a very early age, there seems to be a need for reliable and valid assessment instruments that specifically measure this type of internalizing problems in young children. The PAS and the CMFWQ seem to be suitable scales for this purpose and although the first psychometric evaluations of the PAS and CMFWQ have been promising, it is clear that more research on these measures is required. With this in mind, the current study examined the psychometric properties of the PAS and the CMFWQ in a Dutch community sample of preschool children. For this purpose, the parents of 275 children aged 2 to 6 years completed the two scales together with relevant subscales of the CBCL 1½-5 (Achenbach, 1992). Parents were explicitly asked if they understood the items of the PAS and CMFWQ, which enabled us to explore the acceptability of these scales. Further, we investigated the reliability (internal consistency), factor structure, and construct validity of the PAS and the CMFWQ. This latter issue was not only studied by examining the correlations among the new scales and the CBCL 1½-5, but also by comparing PAS and CMFWQ scores of children showing

normal, subclinical, and clinical problems on the CBCL. It was hypothesized that the PAS and CMFWQ would be positively correlated with CBCL subscales, in particular the anxious/depressed subscale. The CMFWQ was expected to correlate more positively with the CBCL subscales because the CBCL and CMFWQ have more in common as they both seem to assess general levels of internalizing difficulties, whereas the PAS is more specifically focused on fear and anxiety problems. It was also predicted that children in the clinical range of the CBCL would display higher scores on the PAS and CMFWQ than children scoring in the subclinical range, which in turn would score higher than children in the normal range of the CBCL. Finally, age and gender effects in the prevalence of anxiety symptoms as indexed by both scales were examined.

Method

Participants

Participants were 275 children aged 2 to 6 years (*M* = 4.42 years, *SD* = 1.07; 114 boys and 157 girls) and their primary caregivers (252 mothers, 17 fathers, and 2 adult sisters). Originally, the parents of preschool children from 4 primary schools (525 parents) and 7 playgroups (200 parents) in the metropolitan area of Rotterdam, The Netherlands, were invited to participate in this study. Approximately 38 percent of the parents (*N* = 275) agreed to participate. These parents completed the informed consent form, filled out the questionnaires, and returned them to their child's teacher or via mail to the researchers at the university. Parents reported information about the cultural background of the family. The majority of the parents was Dutch (*n* = 250; 90.9%). Other parents were from Moroccan (*n* = 6; 2.2%), Turkish (*n* = 4; 1.5%), English (*n* = 2; 0.7%), German (*n* = 2; 0.7%), Polish (*n* = 2; 0.7%), Surinam, Lithuanian, Rumanian, Indonesian, Iraqi, French and Serbian descent (all *n* = 1; 0.4%). Six parents had a double nationality (3 Moroccan-Dutch, 2 Turkish-Dutch, and 1 Serbian-Dutch). Two parents did not report their nationality. Other demographic variables were not obtained.

Procedure

All parents received an informed consent letter and a set of questionnaires from their child's teacher. When parents decided to participate, they completed the PAS, CMFWQ, and parts of the CBCL, namely the emotionally reactive and anxious/depressed subscales and a number of relevant items taken from the withdrawn subscale. For the PAS and the CMFWQ, parents were also explicitly asked whether they understood each item of these questionnaires (i.e., "Do you understand the item?"; yes/no). Children received a small present (i.e., a booklet or a toy) in return for the participation of their parents.

Questionnaires

***PAS*.** As mentioned earlier, the PAS is a parent-based questionnaire for measuring DSM-defined anxiety disorder symptoms in young children aged 2 to 5. More precisely, the PAS includes 28 items representing symptoms of generalized anxiety disorder (5 items; e.g., "Has difficulty stopping him/herself from worrying"), social phobia (6 items; e.g., "Is afraid to go up to a group of children to join their activities"), obsessive-compulsive disorder (5 items; e.g., "Has bad or silly thoughts or images that keep coming back over and over"), physical injury fears (i.e., specific phobia; 7 items; e.g., "Is frigh-

tened of dogs"), and separation anxiety disorder (5 items; e.g., "Is reluctant to go to sleep without you or to sleep away from home"). Parents are asked to score each item on a 5-point scale, rated from 0 (*not at all true*) to 4 (*very often true*). PAS total score and subscale scores can be calculated by summing across relevant items.

***CMFWQ*.** The CMFWQ is a parent-rating scale of internalizing difficulties in preschoolers. The full-length version contains 60 items referring to fear and anxiety (e.g., "Fears strangers"), mood problems (e.g., "Looks sad, miserable, unhappy"), and withdrawal and inhibition (e.g., "Prefers to play alone rather than with other young children"). Parents have to rate each item on a 5-point scale (1 = *almost never*, 2 = *rarely*, 3 = *sometimes*, 4 = *often*, 5 = *almost always*). The 60 items can be summed to yield a total score.

The authors translated English versions of the PAS and CMFWQ into the Dutch language. These translations were back-translated by a native (American) speaker who was also fluent in Dutch. In this way, it was carefully checked whether the translated items correctly represented their original content.

***CBCL for Ages 1½-5*.** The CBCL for Ages 1½-5 is a well-known parent-rating instrument for assessing different kinds of problems in young children. This study only employed the emotionally reactive subscale (9 items; e.g., "Disturbed by change"), the anxious/depressed subscale (8 items; e.g., "Too dependent"), and a number of items from the withdrawn subscale of the CBCL that were considered to be relevant in the context of fear and anxiety (4 items; e.g., "Withdrawn"). The response format is 0 = *not true*, 1 = *somewhat or sometimes true*, 2 = *very true or often true*. Subscale scores are derived by summing the responses on relevant items. For each subscale, clear cut-off scores are available that can be employed to identify children scoring in the subclinical and clinical range. Psychometric evaluations of the CBCL 1½-5 have generally yielded positive results (Achenbach & Rescorla, 2000). All scales displayed good test-retest reliability (over a 12-month interval: *r*s > .52; mean *r* = .61) and cross-informant reliability (*r*s between mother and father > .48; mean *r* = .61). There is also evidence for the validity of the CBCL 1½-5. Criterion validity was supported by the fact that the scale discriminated well between non-referred and referred children (Achenbach & Rescorla, 2000). Finally, CBCL 1½-5 scales correlated positively with other problem measures such as the Richman Behavior Checklist (Richman, Stevenson, & Graham, 1982) and the Toddler Behavior Screening Inventory (Mouton-Simien, McCain, & Kelley, 1997).

Results

Acceptability analysis

The acceptability of the items of the both questionnaires was explored in two ways. That is, missing values were inspected as well as parents' responses to the explicit question of whether they understood various items or not. A threshold of 5% missing values and "not understood" responses was employed to detect unsatisfactory items. More precisely, when an item had more than 5% missing values or when more than 5% of the parents indicated that they did not understand its content, the item was considered as "unacceptable" and no longer included in further analyses. As for the PAS, none of the items had more than 5% missing values. The item "Is nervous of going swimming" was

most frequently missing (3%). The reason for this could be the fact that children in the Netherlands usually start to swim in school at age 7. Seven parents (2.5%) indicated that they did not understand the item "Washes his/her hands over and over many times each day". A number of these parents indicated that they asked their children to wash their hands regularly, because of hygiene, and apparently did not see the intended compulsive content of this item.

An examination of the items of the CMFWQ yielded 4 items with fairly high numbers of missing values, namely "Whines" (10 missing values; 3.6%), "Sulks" (9; 3.3%), "Doesn't respond to affection of others" (8; 2.9%), and "Is self-conscious" (20; 7.3%). Parent's problems with these items can be explained by the rather abstract content of these items and the employment of words that are not frequently used in the Dutch language (anymore). Parents generally indicated that they understood the items of the CMFWQ. An exception was the item "Is self-conscious": 14% of the parents (*n* = 39) indicated that they did not comprehend its content. Because of the high percentage of missing values (7.3%) and the poor understanding of this item, this item was no longer included in further analyses. Given the small number of missing values and the fact that parents generally indicated that they understood the items, the conclusion seems warranted that the acceptability of the PAS and CMFWQ is good.

Preliminary factor analysis

An exploratory factor analysis (principal component analysis with oblimin rotation) of the PAS yielded five factors with eigenvalues > 1.0 (i.e., 6.87, 2.31, 1.85, 1.41 and 1.25), which together accounted for 48.91% of the total variance in scores. Inspection of this five-factor structure showed that the data fitted reasonably with the hypothesized model (Spence et al., 2001). That is, clear indications were found for the presence of the generalized anxiety disorder, social phobia, and obsessive-compulsive disorder factors. The two other factors appeared to consist of physical injury fear items, whereas items referring to separation anxiety disorder loaded on various components. To enhance comparability with previous research, it was decided to employ the original subscale scores (Spence et al., 2001) rather than the present study's factor scores in further analyses.

A factor analysis performed on the 60 items of the CMFWQ revealed a three-factor model that seemed to be theoretically more meaningful than the two-factor model as reported by the original authors (Bayer et al., 2006). The three components together accounted for 39.63% of the variance. The first factor had an eigenvalue of 16.81 and consisted of 30 items that mainly covered fear and anxiety problems. The second component had an eigenvalue of 3.63, and contained 17 items that seemed to represent behavioral inhibition and solitary play with peers. The third and final component had an eigenvalue of 2.54, and included 11 items which referred to a range of mood problems[1].

[1] Two items were discarded from the factor analyses of the CMFWQ: the item "Significant changes in appetite for food" because it did not load on any of the factors and the item "Is self-conscious" because its acceptability was too low.

Internal consistency

Table 1 shows the internal consistencies (Cronbach's alphas) and the item-total correlations for the total scale and subscales/components of the two questionnaires. The Cronbach's alpha values of the total PAS score and the social phobia and generalized anxiety disorder subscales were good (.86, .81 and .78, respectively). The obsessive-compulsive disorder, physical injury fears, and separation anxiety disorder subscales had moderate internal consistency (Cronbach's alphas were respectively .66, .60, and .59). Item-total correlations were generally satisfactory, although there were a few items that had fairly low item-total correlations (i.e., between .15 and .64 for the total scale and between .20 and .64 for the subscales).

The CMFWQ showed somewhat higher internal consistency coefficients than the PAS, probably due to the larger number of items included in the various scales. The total scale had a Cronbach's alpha of .95, whereas internal consistency coefficients of the three components ranged between .88 and .92. Item-total correlations were also satisfactory and ranged between .34 and .62 for the total scale and between .31 and .74 for the separate components.

In this study, the subscales of the CBCL also displayed good internal consistency. Cronbach's alphas were .74 for the emotionally reactive subscale, .73 for the anxious/depressed subscale, and .60 for the 4 items of the withdrawn subscale.

Table 1. Cronbach's alphas and item-total correlations for various PAS and CMFWQ scales

Scale	Cronbach's α	Item-total *r*
PAS		
Total score	.86	.15 - .64
Separation anxiety disorder	.59	.23 - .45
Generalized anxiety disorder	.78	.50 - .64
Social phobia	.81	.54 - .63
Physical injury fears	.60	.20 - .40
Obsessive-compulsive disorder	.66	.23 - .51
CMFWQ		
Total score	.95	.34 - .62
Fear and anxiety problems	.92	.31 - .69
Inhibition/solitary play	.91	.40 - .74
Mood problems	.88	.47 - .68

Note. PAS = Preschool Anxiety Scale; CMFWQ = Children's Moods, Fears, and Worries Questionnaire.

Frequently endorsed anxiety symptoms

By computing mean item scores for the total sample, the most frequently endorsed anxiety symptoms were identified. As shown in Table 2, the most prevalent symptoms as measured by the PAS related to physical injury fears, social phobia, and generalized

anxiety disorder. The most commonly endorsed items of the CMFWQ (see Table 3) represented a broad range of internalizing, mood, and behavioral inhibition symptoms, but remarkably, did not include any specific fear or anxiety symptoms.

Table 2. Top 10 of most commonly endorsed PAS items

PAS item (subscale)	*M* (*SD*)
1. Is afraid of insects and/or spiders (Physical injury fears)	1.38 (1.15)
2. Is afraid of the dark (Physical injury fears)	1.31 (1.19)
3. Is frightened of dogs (Physical injury fears)	1.29 (1.31)
4. Is afraid of meeting or talking to unfamiliar people (Social phobia)	1.20 (1.01)
5. Worries that he/she will do something embarrassing in front of other people (Social phobia)	1.19 (1.01)
6. Is nervous of thunderstorms (Physical injury fears)	1.18 (1.19)
7. Has difficulty stopping him/herself from worrying (Generalized anxiety disorder)	0.97 (0.92)
8. Is afraid of talking in front of the class/preschool group, for example show and tell (Social phobia)	0.89 (1.03)
9. Asks for reassurance when it doesn't seen necessary (Generalized anxiety disorder)	0.86 (0.98)
10. Is scared to ask an adult for help, for example a preschool or school teacher (Social phobia)	0.76 (0.91)

Note. N = 275; PAS = Preschool Anxiety Scale.

Table 3. Top 10 of most commonly endorsed CMFWQ items

CMFWQ item (component)	*M* (*SD*)
1. Is sensitive to criticism (Inhibition/solitary play)	1.92 (0.95)
2. Gives up easily (Inhibition/solitary play)	1.63 (0.90)
3. Is easily disappointed (Mood problems)	1.42 (0.79)
4. Worries about making mistakes (Inhibition/solitary play)	1.38 (0.96)
5. Doesn't speak to people outside home (Fear and anxiety problems)	1.37 (1.09)
6. Whines (Mood problems)	1.33 (0.82)
7. Asks for help with simple tasks (Inhibition/solitary play)	1.27 (0.74)
8. Has irritable or cranky moods (Mood problems)	1.26 (0.83)
9. Cries easily (Mood problems)	1.25 (0.86)
10. Prefers to play alone than with other young children (Fear and anxiety problems)	1.23 (0.88)

Note. N = 275; CMFWQ = Children's Moods, Fears, and Worries Questionnaire.

Table 4. Mean scores (and standard deviations) on various PAS and CMFWQ scales for the total sample, and for boys, girls, younger, and older children

Scale	Total sample (*N* = 275)	Boys (*n* = 114)	Girls (*n* = 157)	2- to 4-year-olds (*n* = 137)	5- to 6-year-olds (*n* = 135)
PAS					
Total score	18.84 (11.57)	16.68 (11.27)	20.62 (11.57)**	18.04 (11.91)	19.49 (11.15)
Separation anxiety disorder	2.34 (2.41)	1.97 (2.31)	2.65 (2.45)*	2.32 (2.42)	2.34 (2.40)
Generalized anxiety disorder	2.95 (2.91)	2.77 (2.77)	3.12 (3.03)	2.54 (2.77)	3.33 (3.02)†
Social phobia	5.43 (4.22)	4.73 (4.03)	5.99 (4.32)*	4.67 (4.22)	6.11 (4.07)††
Physical injury fears	6.69 (4.11)	5.91 (3.84)	7.32 (4.21)**	6.87 (4.48)	6.50 (3.69)
Obsessive-compulsive disorder	1.43 (2.19)	1.29 (2.24)	1.55 (2.18)	1.64 (2.30)	1.21 (2.07)
CMFWQ					
Total score	54.67 (24.99)	51.46 (24.84)	57.42 (24.93)	53.62 (26.13)	55.49 (23.83)
Fear and anxiety problems	24.84 (12.88)	23.50 (12.71)	26.03 (12.95)	23.37 (13.05)	26.28 (12.63)
Inhibition/solitary play	14.76 (9.30)	13.58 (9.66)	15.76 (8.99)	15.39 (9.68)	13.84 (8.44)
Mood problems	11.44 (5.86)	10.74 (5.59)	11.96 (5.98)	11.22 (6.02)	11.71 (5.75)

Note. PAS = Preschool Anxiety Scale; CMFWQ = Children's Moods, Fears, and Worries Questionnaire.

Gender differences: *$p < .05$, ** $p < .01$, Age group differences: $^{\dagger}p < .05$, $^{\dagger\dagger}p < .01$.

Age and gender effects

Table 4 shows the mean scores on various PAS and CMFWQ scales for the total sample and for boys and girls, and younger and older children separately. Independent *t*-tests only revealed significant age and gender effects for the PAS. More precisely, girls (*M* = 20.62, *SD* = 11.57) displayed significantly higher total scores on the PAS than boys (*M* = 16.68, *SD* = 11.27; *t*[271] = 2.80, *p* < 0.01). The same pattern was found for some PAS subscales: that is, girls scored significantly higher on separation anxiety disorder (*M*s being 2.65, *SD* = 2.45 vs. 1.97, *SD* = 2.31; *t*[271] = 2.30, *p* < .05), social phobia (*M*s being 5.55, *SD* = 4.32 vs. 4.73, *SD* = 4.03; *t*[271] = 2.44, *p* < .05), and physical injury fears (*M*s being 7.32, *SD* = 4.21 vs. 5.91, *SD* = 3.84; *t*[271] = 2.82, *p* < .01) than boys. Significant differences between younger (2- to 4-year-old) and older (5- to 6-year-old) children were observed for the generalized anxiety disorder (*M*s being 3.33, *SD* = 3.02 vs. 2.54, *SD* = 2.77; *t*[272] = 2.26, *p* < .05) and social phobia subscales (*M*s being 6.11, *SD* = 4.07 vs. 4.67, *SD* = 4.22; *t*[272] = 2.87, *p* < .01), with older children scoring significantly higher on both subscales.

Construct validity of the PAS and CMFWQ

To explore the construct validity of the new measures, correlations between the PAS and CMFWQ scores were computed (see Table 5). Participants with too many missing values on the CBCL were deleted, and so the data of 253 parents were employed for this correlation analysis. All PAS and CMFWQ scales correlated positively (*r*s between .24 and .77). Particularly high correlations were found between the PAS total score and CMFWQ total score (*r* = .77, *p* < .001) and the PAS total score and CMFWQ fear and anxiety problems (*r* = .75, *p* < .001). Fairly low correlations emerged between PAS obsessive-compulsive disorder scores and CMFWQ inhibition/solitary play (*r* = .24, *p* < .001) and CMFWQ mood problems (*r* = .25, *p* < .001). Tests for comparing correlated correlation coefficients indicated that the PAS scales were most substantially correlated with the CMFWQ fear and anxiety problems component (see Table 5). Further, PAS social phobia correlated more convincingly with inhibition/solitary play than with the two other CMFWQ factors.

Scores on the PAS and CMFWQ were also correlated with the scores on the emotionally reactive, anxious/depressed, and the withdrawn subscales of the CBCL. The PAS and CMFWQ total scores both correlated significantly with all three CBCL subscales (*r*s between .39 and .70). The same was true for the PAS and CMFWQ subscales/components (*r*s between 0.15 and 0.69), except for obsessive-compulsive disorder which did not correlate significantly with the CBCL Withdrawn subscale (*r* = .11, *p* = .09).

Table 5. Correlations between CMFWQ and PAS scales while controlling for age and gender effects

	CMFWQ			
	Total score	Fear and anxiety problems	Inhibition/solitary play	Mood problems
PAS				
Total score	.77	$.75_a$	$.66_b$	$.56_c$
Separation anxiety	.57	$.57_a$	$.46_b$	$.44_b$
Generalized anxiety	.62	$.64_a$	$.45_b$	$.51_b$
Social phobia	.68	$.57_a$	$.76_b$	$.46_c$
Physical injury fears	.49	$.52_a$	$.34_b$	$.36_b$
Obsessive-compulsive	.35	$.40_a$	$.24_b$	$.25_b$

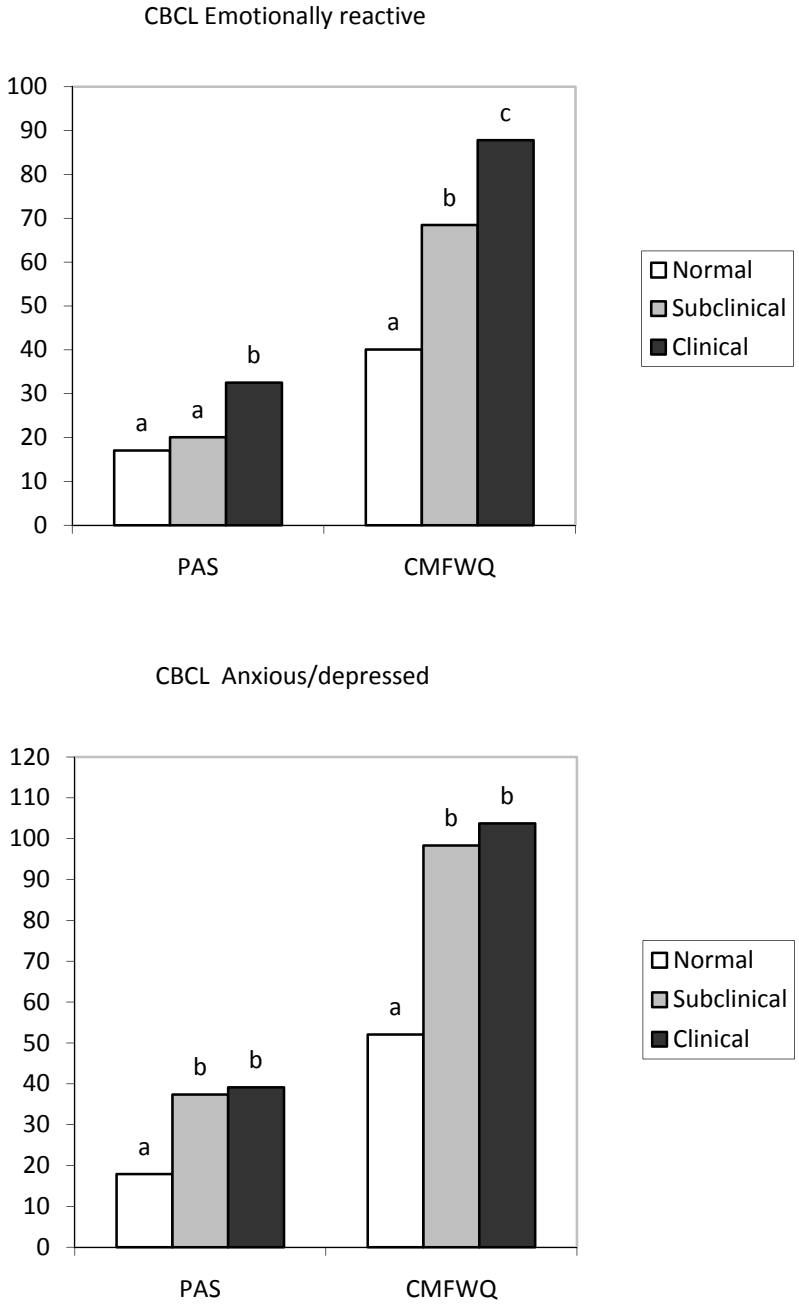
Note. N = 253; PAS = Preschool Anxiety Scale; CMFWQ = Children's Moods, Fears, and Worries Questionnaire. All correlations were significant at $p < .001$. Correlations with different subscripts differed at $p < .05$.

Additionally, analyses of variance (with age and gender as covariates; ANCOVAs) were conducted in order to explore whether the PAS and CMFWQ could differentiate between children that were classified as normal, subclinical, or clinical based on their scores on the emotionally reactive and anxious/depressed subscales of the CBCL. Figure 1 displays the main results of these analyses. Results indicated that PAS scores differentiated between normal, subclinical, and clinical children as classified by the CBCL emotionally reactive scale (F[2,256] = 28.12, $p < .001$; partial $\eta^2 = .18$). Post-hoc comparisons revealed that this effect was primarily due to the fact that children in the clinical range (M = 33.07, SD = 14.38) of the emotionally reactive subscale displayed significantly higher PAS total scores than those in the subclinical (M = 19.81, SD = 9.35) and normal range (M = 16.98, SD = 9.99; both ps < .001). PAS scores also differentiated among groups defined by the anxious/depressed subscale of the CBCL (F[2,256] = 23.19, $p < .001$; partial $\eta^2 = .16$). Post-hoc comparisons indicated that the PAS scores this time differentiated between children with scores in the normal (M = 17.83, SD = 10.59) and subclinical range of the CBCL anxious/depressed (M = 37.43, SD = 8.30; $p < .001$), whereas no significant differences were found between children scoring in the subclinical and clinical range (M = 41.00, SD = 15.34; $p = .63$).

For the CMFWQ, the ANCOVAs also yielded main effects of group as defined by the CBCL emotionally reactive (F[2,256] = 43.70, $p < .001$; partial $\eta^2 = .26$) and CBCL anxious/depressed (F[2,256] = 28.95, $p < .001$; partial $\eta^2 = .19$) scales. Post-hoc comparisons revealed differences in CMFWQ scores among the three groups as defined by the CBCL emotionally reactive subscale. That is, children scoring in the clinical range of this subscale (M = 88.64, SD = 23.96) displayed significantly higher scores than children in the subclinical range (M = 68.13, SD = 13.68; $p < .001$), who in turn displayed higher CMFWQ scores than the children in the normal range (M = 49.00, SD = 21.85; $p = .001$). When employing the CBCL anxious/depressed subscale to define groups, CMFWQ scores only differentiated between children with scores in the normal range (M = 51.97, SD = 22.56) on the one hand, and children in the subclinical and clinical range on the other hand (M =

98.43, *SD* = 24.23; *p* < .001 and *M* = 106.50, *SD* = 24.87; *p* = .30, respectively; see Figure 1).

Figure 1. Mean PAS and CMFWQ total scores for children scoring in the normal, subclinical, and clinical range of the CBCL emotionally reactive and anxious/depressed scales



Note. Bars with different subscripts differ at *p* < .05.

Discussion

The current study was a first attempt to examine the psychometric properties of the PAS and the CMFWQ in a Dutch sample of young children aged 2 to 6 years. The main results can be summarized as follows. First, the acceptability of both questionnaires was good: Parents generally indicated that they understood the items and the missing value rate was fairly low. Second, the reliability (internal consistency) of various PAS and CMFWQ scales appeared to be satisfactory. Third, factor analysis yielded multifactorial structures for both scales that were largely in keeping with hypothesized models. Fourth, evidence was obtained for the construct validity of the PAS and CMFWQ. That is, PAS and CMFWQ scales correlated substantially with each other, and most PAS and CMFWQ scales correlated positively with relevant subscales of the CBCL. Further, PAS and CMFWQ scores discriminated reasonably between children scoring in the normal, subclinical, and clinical range of the CBCL emotionally reactive and CBCL anxious/depressed subscales. Fifth and finally, age and gender differences were only found for the PAS but not for the CMFWQ.

On first sight, results of this study seem to suggest that the CMFWQ has somewhat better psychometric properties than the PAS. To begin with, the internal consistency of the CMFWQ appeared to be slightly better than that of the PAS. That is, the internal consistency coefficients of the CMFWQ were all well above .88, whereas the coefficients of the PAS ranged between .59 and .86. This is well in line with previous research which also found moderate to good internal consistency for the PAS (Edwards, 2007) and good internal consistency for the CMFWQ (Bayer et al., 2006). However, the finding that reliability coefficients of the CMFWQ are somewhat higher than those for the PAS is not that surprising given the fact that the CMFWQ scales consist of much more items than the PAS scales. Further, the CMFWQ was also found to discriminate somewhat better between children scoring in the normal, subclinical, and clinical range of the CBCL than the PAS. This is probably due the fact that the CMFWQ is more similar to the CBCL than the PAS. That is, both the CMFWQ and the CBCL are indices of internalizing difficulties in general, whereas the PAS is more specifically focused on fear and anxiety problems. This can also be clearly observed in the top 10 rank orders of most frequently endorsed items for both scales. That is, while the top 10 of the PAS mainly consisted of fear and anxiety items, the top 10 of the CMFWQ included a variety of other internalizing problems. Thus, although the present data suggest that the CMFWQ has slightly better psychometric properties, it is also clear that the PAS seems to be a more specific index for measuring anxiety problems in young children. Obviously, further research is needed to confirm this notion. In such studies, the PAS and the CMFWQ should be compared to a diagnostic interview of anxiety disorders in order to investigate to what extent both scales discriminate between children with and without an anxiety disorder diagnosis.

Although the sample size of this study was fairly small (*N* = 275), exploratory factor analyses yielded interpretable factor structures for both measures. For the PAS, a five-factor solution provided the best fit for the data. That is, items clustered in factors representing generalized anxiety disorder, social phobia, obsessive-compulsive disorder, and physical injury fears (two separate factors). A separation anxiety disorder factor did

not emerge: the items of this anxiety problem loaded on various components, but especially on the generalized anxiety disorder factor. Spence and colleagues (2001) also noted that the separation anxiety disorder and generalized anxiety disorder scales of the PAS show considerable overlap, although in their study these anxiety problems did emerge as separate factors. For the CMFWQ, a meaningful three-factor model was found with separate components for fear and anxiety problems, inhibition/solitary play, and mood problems. This result somewhat deviates from Bayer and colleagues (2006) who obtained a two-factor model for this questionnaire with internalizing difficulties loading on one factor and solitary play with peers loading on the other component. Thus, in the current study, Bayer et al.'s internalizing difficulties factor was split into one factor referring fear and anxiety problems and another factor representing mood problems. Note that some evidence was obtained to support the validity of this splitting: that is, substantial correlations were found between CMFWQ fear and anxiety problems and PAS scales, which were all significantly larger than those observed between CMFWQ mood problems and PAS scales.

Findings concerning gender and age differences in anxiety symptoms were only found for the PAS, and were consistent with those previously reported in the anxiety literature (Gullone, 2000). More specifically, girls displayed higher scores on the total PAS and the separation anxiety disorder, social phobia, and physical injury fears subscales than boys. Age differences were also only found on the PAS. That is, older children (5- to 6-year-olds) scored higher on generalized anxiety disorder and social phobia than younger children (2- to 4-year-olds). This is also consistent with earlier research which has indicated that these types of anxiety problems increase as a function of cognitive development (e.g., Muris, Merckelbach, Meesters, & van den Brand, 2002; Westenberg, Drewes, Goedhart, Siebelink, & Treffers, 2004).

It should be acknowledged that the present study suffers from a number of limitations. A first limitation of this study is the limited participation rate (38%). Inspection of the total population of the playgrounds and schools revealed that in particular children from ethnic minorities were underrepresented. As such, it remains to be seen to what extent the current findings can be generalized to other samples. Further research in a more representative population is needed to replicate the current findings and to establish valid norms for the PAS and CMFWQ. A second limitation was already mentioned and is concerned with the fairly small sample size. This was especially an issue for the analysis of the factor structure of the CMFWQ (which contained 60 items) and the comparison of normal, subclinical, and clinical groups as defined by the CBCL. It is clear that some psychometric properties of the questionnaires, in particular their factor structure and utility as a screening tool for identifying anxiety problems need to be tested in a larger sample of preschool children. Third, only non-clinical children were studied and hence the clinical utility of the PAS and CMFWQ still has to be established. Finally, a number of psychometric properties of both scales remain to be tested. The current study only examined one aspect of the reliability (i.e., internal consistency) and some validity aspects of the two measures. Future studies need to further investigate other psychometric properties of the PAS and CMFWQ such as the test-retest reliability and the predictive,

divergent and discriminant validity. In spite of these limitations, this first evaluation of the PAS and CMFWQ in a community sample of Dutch preschool children yielded encouraging results. Both scales seem to be reliable and valid instruments for measuring emotional difficulties in young children. The PAS seems to be particularly useful for measuring a variety of fear and anxiety symptoms, whereas the CMFWQ seems to be a suitable index of a broader range of internalizing problems.

Chapter 3

A psychometric evaluation of the Behavioral Inhibition Questionnaire in a non-clinical sample of Dutch children and adolescents

This chapter has been published as: Broeren, S., & Muris, P. (2010). A psychometric evaluation of the Behavioral Inhibition Questionnaire in a non-clinical sample of Dutch children and adolescents. Child Psychiatry and Human Development, 41, 214-229.

Abstract

The Behavioral Inhibition Questionnaire (BIQ) is a parent-rating scale for measuring temperamental characteristics referring to shyness, fearfulness, and withdrawal in young, preschool children. The present study evaluated the psychometric properties of the BIQ in a Dutch community sample of children with a broad age range. For this purpose, the reliability and validity of the BIQ was evaluated in three age groups: 4- to 7-year-olds, 8- to 11-year-olds, and 12- to 15-year-olds. The results indicated that the internal consistency of most BIQ scales was satisfactory in all three age groups. Principal component analysis of the BIQ yielded a six-factor model that was largely in keeping with the hypothesized structure consisting of the social and non-social components of behavioral inhibition. Confirmatory factor analysis indicated that this model provided a reasonable fit for the data. Further, support for the validity of the measure was obtained in all age groups. That is, BIQ scores were positively correlated with a wide range of anxiety symptoms, although the most substantial links were found for symptoms of social anxiety. Finally, a self-report version of the BIQ, which was administered to children aged 9 years and above, was found to possess good internal consistency and adequate parent-child agreement. Altogether, the results of this study suggest that the BIQ might be a reliable and valid measure for assessing behavioral inhibition not only in preschoolers but also in older children and adolescents.

Introduction

Behavioral inhibition can be defined as a temperament characteristic referring to the tendency to be unusually shy and to respond with fearfulness and withdrawal in new and unfamiliar social and non-social situations (Hirshfeld-Becker et al., 2004). Behavioral inhibition has a genetic basis (Robinson, Kagan, Reznick, & Corley, 1992) and about 10 to 15 percent of the children can be categorized as highly inhibited (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984). Research has indicated that behaviorally inhibited children seem to run a higher risk for developing an anxiety disorder. For example, Biederman and colleagues (1990) found in their study on psychiatric correlates of behavioral inhibition in young children of parents with and without psychiatric disorders, that inhibited children more often displayed multiple anxiety disorders than uninhibited children. A three-year follow-up of this sample revealed that children initially categorized as inhibited showed a marked increase in anxiety problems that was not observed in the uninhibited group (Biederman et al., 1993). In specific, the rates of multiple anxiety disorders, separation anxiety disorder, and social anxiety disorder had substantially increased.

Although there is evidence indicating that behavioral inhibition should be conceived as a general risk factor that predisposes children to a wide range of anxiety problems, some authors have suggested that behavioral inhibition represents a more specific risk factor that would only be relevant for the development of social anxiety symptoms. For example, Mick and Telch (1998) asked 38 undergraduates with high levels of social anxiety and/or generalized anxiety symptoms, and 38 undergraduates with low levels of such symptoms to retrospectively report their levels of behavioral inhibition during childhood. They found that behavioral inhibition was positively linked to social anxiety, but not to generalized anxiety symptoms. Gladstone, Parker, Mitchell, Wilhelm, and Mahli (2005) found further evidence for the relation between childhood behavioral inhibition and social anxiety in a sample of 189 adult patients with major depression. Patients were divided in three groups scoring low, moderate, or high on behavioral inhibition. Patients who retrospectively reported high levels of behavioral inhibition during childhood were more likely to qualify for a diagnosis of social phobia, but not for other anxiety disorder diagnoses, than patients who reported low or moderate levels of behavioral inhibition. Moreover, there is also a study providing longitudinal support for behavioral inhibition being a specific risk factor for social anxiety problems. In their three-year prospective study among 261 non-clinical children aged 5 to 8 years, Muris, Van Brakel, Arntz, and Schouten (in press) investigated the role of behavioral inhibition as a specific risk factor in the development of a broad range of anxiety disorder symptoms. Results indicated that behavioral inhibition was only predictive of social anxiety symptoms and not for anxiety symptoms in general.

The issue whether behavioral inhibition should be viewed as a specific vulnerability factor of social anxiety or as a more general feature that predisposes children to a broad range of anxiety problems, may have repercussions for the assessment of this temperamental trait. In young children, behavioral inhibition has been typically assessed by means of laboratory procedures in which children are exposed to various types of social (e.g., an unknown peer or adult) as well as non-social (e.g, a black box or a novel computer game)

stimuli. During these procedures, behavioral observations (e.g., spontaneous talk, smiling, looking at the experimenter, and response latency) are obtained that are considered to be indicative for the inhibited temperament. These laboratory procedures for measuring behavioral inhibition are quite extensive and time-consuming, and therefore it is important to note that a number of rating scales have been constructed (Muris, Meesters, & Spinder, 2003; Van Brakel & Muris, 2006; Van Brakel, Muris, & Bögels, 2004). Unfortunately, it seems that these rating scales are somewhat biased to the assessment of the social aspects of the construct of behavioral inhibition (for a more extensive discusion, see Van Brakel, Muris, & Bögels, 2001), and this could provide a plausible explanation for that fact that behavioral inhibition is generally found to be more strongly related to social anxiety than to other types of anxiety problems.

The recently developed Behavioral Inhibition Questionnaire (BIQ; Bishop et al., 2003) seems to be an improvement in this regard as this parent-rating scale measures children's levels of behavioral inhibition in various social and non-social domains. So far, two studies have been conducted to examine the psychometric properties of the BIQ, and these have generally yielded positive results (Bishop et al., 2003; Edwards, 2007). First of all, the BIQ shows good internal consistency (with Cronbach's alphas for the total score and subscales being > .70). Second, the test-retest stability over a 12-month period appeared to be satisfactory (*r*s ranging from .49 to .79). Third, strong convergence was found between the ratings of mothers and fathers (*r*s in the .70-.80 range), whereas the convergence between parents and teachers was more moderate but still acceptable (*r*s between .43 and .62). Fourth, the validity of the scale also proved to be satisfactory. That is, the BIQ correlated in a theoretically meaningful way with subscales of other temperament scales that measure inhibited behavior, as well as with observations of this temperamental characteristic. Further, confirmatory factor analysis yielded support for a model differentiating BIQ items in various social and non-social factors, which are nevertheless allowed to correlate as they seem to represent a higher-order behavioral inhibition factor. Finally, the BIQ was found to be positively associated with a broad range of anxiety symptoms, supporting the idea that if behavioral inhibition is assessed by a scale covering social and non-social aspects, it can best be conceived as a general vulnerability factor.

The BIQ was originally developed for measuring behavioral inhibition in children aged 2 to 6 years, and as such it is not surprising that previous psychometric evaluations have primarily targeted preschool children. However, there are good reasons to believe that this scale may also be relevant for older youths. Behavioral inhibition has been described as an enduring temperament variable that remains relatively stable from (early) childhood to adolescence and even adulthood (Gest, 1997; Kagan, Reznick, & Snidman, 1988; Scarpa, Raine, Venables, & Mednick, 1995). As behavioral inhibition is considered to be a vulnerability factor to anxiety pathology operating throughout the entire childhood (Fox, Henderson, Marshall, Nichols, & Ghera, 2005), the need for an instrument like the BIQ may go well beyond the preschool age. Therefore the current study examined the psychometric properties of the BIQ in a Dutch community sample of children and adolescents with a broad age range (i.e., 4 to 15 years). The parents of these youths completed the BIQ as well as a scale for measuring children's anxiety disorder symptoms.

Children aged 9 years and above also completed a child version of the BIQ. In this way, the reliability and validity of the BIQ was examined in three age groups: 4- to 7-year-olds, 8- to 11-year-olds, and 12- to 15-year-olds. It was hypothesized that the psychometric properties of the BIQ would be highly comparable in various age groups. Furthermore, we were able to investigate the reliability of the self-report version of the BIQ, as well as its relation to the parent version. Overall, the BIQ was expected to be a reliable scale with a clear-cut factor structure with distinct but related components representing various social and non-social aspects of behavioral inhibition. In addition, we predicted the BIQ to be positively associated with anxiety symptoms. More specifically, it was hypothesized that the social components of the BIQ would be most strongly associated with social anxiety symptoms, whereas the non-social components would be more convincingly linked to other anxiety symptoms.

Method

Participants

Participants were 531 children aged 4 to 15 years (*M* = 9.60 years, *SD* = 3.41; 230 boys and 301 girls) and their primary caregivers (451 mothers, 44 fathers, 26 mothers/fathers, and 1 older sister). Children were divided in three age groups: 4- to 7-year-olds (*n* = 172; *M* = 5.42 years, *SD* = 1.09; 81 boys and 91 girls), 8- to 11-year-olds (*n* = 146; *M* = 9.44 years, *SD* = 1.13; 63 boys and 83 girls), and 12- to 15-year-olds (*n* = 213; *M* = 13.08 years, *SD* = 0.94; 86 boys and 127 girls). Parents of children from three primary schools and two secondary schools in Rotterdam, Nieuwerkerk aan den IJssel, and Goes, The Netherlands, were invited to participate in this study by providing them with an information letter along with a consent form. Approximately 23 percent of the parents (540 out of 2363 parents) responded positively to this mailing and completed the set of questionnaires (see below). Nine parents were excluded from the data analysis because their questionnaires contained too many missing values. The majority of the children (*n* = 514; 96.8%), mothers (*n* = 456; 85.9%), and fathers were from Dutch descent (*n* = 472; 88.9%). No other information about the socioeconomic background was available, although it should be mentioned that in the Netherlands non-Caucasian ethnicity is generally associated with a lower socioeconomic status. The present sample seemed to represent the population of the schools which participated in this study rather well. One exception was a primary school with a fairly high percentage of migrant children, which were clearly underrepresented in their school sample and the total sample for this study.

Questionnaires

***Behavioral Inhibition Questionnaire*.** The Behavioral Inhibition Questionnaire (BIQ; Bishop et al., 2003) consists of 30 items assessing behavioral inhibition in three domains: social novelty, situational novelty, and physical challenges. Social novelty is represented by 14 items and is measured in 3 contexts: adults (4 items; e.g., “Is very talkative to adult strangers”), peers (6 items; e.g., “Will happily approach a group of unfamiliar children and join their play”), and performance situations (4 items; e.g., “Enjoys being the center of attention”). Situational novelty consists of 12 items and is measured in two contexts, namely preschool/separation (4 items; e.g., “Quickly adjusts to new situations”) and

unfamiliar situations (8 items; e.g., "Approaches new situations or activities very hesitantly"). The physical challenges domain contains 4 items (e.g., "Is cautious in activities that involve physical challenge"). Items are rated on a 6-point scale ranging from 1 (*hardly ever*) to 6 (*almost always*). Sixteen items are reverse scored (e.g., "Enjoys being the center of attention"). After recoding the reverse scored items, total BIQ (range 30 to 180) and subscale scores can be calculated by summing across relevant items[2].

***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 anxiety disorder symptoms in younger children. More precisely, the PAS-R includes 30 items representing symptoms of generalized anxiety disorder (7 items; e.g., "Has difficulty stopping him/herself from worrying"), social anxiety disorder (7 items; e.g., "Is afraid to go up to a group of children to join their activities"), obsessive-compulsive disorder (2 items; e.g., "Becomes distressed by thoughts or images in his/her head"), specific fears (i.e., specific phobia; 9 items; e.g., "Is frightened of dogs"), and separation anxiety disorder (5 items; e.g., "Would be upset at sleeping away from home"). Parents are asked to score each item on a 5-point scale, with anchors 1 (*not at all true*) and 5 (*very often true*). PAS-R total (range 30 to 150) and subscale scores can be computed by summing across relevant items.

Psychometric evaluations of the original and revised versions of the PAS have generally yielded positive results. Data have demonstrated that, with exception of the obsessive-compulsive disorder scale (which consists of only 2 items), all scales display moderate to good internal consistency, cross-informant reliability, and test-retest stability (Edwards, 2007; Spence et al., 2001). First evidence has also been obtained for the validity of the PAS and the PAS-R. That is, factor analysis indicated that symptoms cluster into components that are nicely in keeping with the anxiety disorders as described in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000; Edwards, 2007; Spence et al., 2001). Further, PAS and PAS-R (sub)scales are substantially and positively correlated with the internalizing problems scale of the Child Behavior Checklist (Achenbach, 1991), whereas fairly low and often non-significant correlations are observed with the externalizing problems scales (Edwards, 2007; Spence et al., 2001).

Child version of the BIQ. The child version of the BIQ was identical to the questionnaire that was completed by the parents, except that instructions and items were rephrased in terms of children's perspective (e.g., "I am shy when first meeting new children").

Procedure

All parents received an information letter, a consent form, and a set of questionnaires which were handed out by their child's teacher. When parents decided to participate, they completed the PAS-R and BIQ at home and returned these materials to the researchers via the teacher. Children aged 9 to 15 years completed the child version of the BIQ during regular classes at school. In most of the schools, children received a small present (i.e., a toy) or candy in return for their participation in this study. Children in one

[2] Minor changes were made to some BIQ items in order to make them appropriate for the older children in our sample. For instance, the item "Quickly adjusts to new situations (e.g., kindergarten, preschool, childcare)" was changed into "Quickly adjusts to new situations (e.g., a new class or sporting club)".

school were rewarded with playing materials for the entire class (e.g., soft balls, foot-balls).

Data analysis

Exploratory factor analysis was employed because this is the first study examining the structure of the Dutch BIQ. Previous research has examined the structure of this parent-rating scale in English-speaking countries, but of course it remains to be seen whether this translation of the BIQ behaves psychometrically in a similar way as the original version. Furthermore, it is also the first time this questionnaire is used with older children and adolescents instead of preschoolers. In addition, confirmatory factor analysis (CFA) was conducted using Analysis of Moment Structures (AMOS; version 16). The estimation method employed was maximum likelihood. CFA was used to estimate how well the proposed model (a six correlated factors model) explained the sample data. Various indices were used to evaluate the goodness-of-fit of this model: the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the chi square per degree of freedom (χ2/df; Byrne, 2001; Hu & Bentler, 1999). The possible values of the CFI range from 0 to 1, with bigger values indicating better fit and values exceeding .90 indicating good fit. For the RMSEA values < .08 indicate an acceptable model fit and for the χ^2/df statistic values between 2 and 4 indicate sufficient model fit.

Results

Exploratory factor analysis

Principal component analysis with varimax rotation was conducted on the BIQ data of the total sample and the three age groups separately in order to explore the factor structure of the scale. For all three age groups the factor analysis based on the eigenvalue > 1 rule, yielded a six-factor solution which seemed to be nicely in keeping with the six intended subscales. In the total sample, this model accounted for 68.28% of the total variance (eigenvalues for the six factors were 12.64, 2.18, 1.94, 1.41, 1.19, and 1.11), and these figures were comparable in the separate age groups. Table 1 displays the factor loadings of various BIQ items for the total sample and also shows whether items loaded on similar factors in each of the three age groups. As can be seen, items generally clustered in the hypothesized factors as described by Bishop et al. (2003) and Edwards (2007), except for the items referring to unfamiliar situations, which displayed more convincing loadings on other factors (e.g., preschool/separation and adults). Otherwise, few substantial (i.e., > .40) secondary factor loadings emerged, which was true in all three age groups.

Confirmatory factor analysis

A CFA was carried out to test the fit of the hypothesized six correlated factors model of the BIQ as described for the original version (Bishop et al., 2003; Edwards, 2007). The fit indices indicated that this model provided a reasonable fit for the data (i.e., χ^2/df = 3.25, CFI = .92, and RMSEA = .07). Separate analyses were conducted for the three age groups and yielded comparable fit indices (with χ^2/df values between 1.74 and 2.34, CFI between .88 and .91, and RMSEA between .07 and .08).

Reliability

Internal consistency coefficients (Cronbach's alphas) and item-total correlations of the total scale and subscales of the BIQ in each of the three age groups are displayed in Table 2. As can be seen, internal consistencies and item-total correlations were all satisfactory and this appeared true for children of various ages. More precisely, Cronbach's alphas varied between .79 and .96 in 4- to 7-year-olds, .67 and .95 in 8- to 11-year-olds, and .73 and .95 in 12- to 15-year-olds. In a similar vein, item-total correlations ranged between .29 and .84 in 4- to 7-year-olds, .19 and .87 in 8- to 11-year-olds, and .38 and .82 in 12- to 15-year-olds.

A series of 3 (age groups) × 2 (gender) analyses of variance was performed to examine the influence of these demographic variables on various BIQ scales. As shown in Table 2, the three age groups differed significantly on only two BIQ subscales (with $F[2,525]$s ≥ 4.03, all ps < .05, partial η^2s > .02). Post-hoc comparisons revealed that on the BIQ performance situations subscales, children aged 8 to 11 years scored significantly lower than children aged 12 to 15 years (p < .01), and that 4- to 7- and 8- to 11-year-olds displayed significantly lower scores on the BIQ physical challenges subscale as compared to 12- to 15-year-olds (p < .001).

Further, a significant main effect of gender ($F[1,525] = 40.46$, p < .001, partial η^2 = .07) and a significant interaction effect of age groups and gender ($F[2,525] = 4.27$, p < .05, partial η^2 = .02) were observed for the BIQ performance situations subscale. Post-hoc comparisons indicated that in 4- to 7-year-olds ($t[170] = 3.61$, p < .001, partial η^2 = .53) and 8- to 11-year-olds ($t[144] = 5.80$, p < .001, partial η^2 = .88) boys had significantly higher scores on this BIQ subscale than girls, whereas the scores of boys and girls among 12- to 15-year-olds were not significantly different ($t[211] = 1.71$, p = .09, partial η^2 = .25).

Validity

Before discussing the findings concerning the validity of the BIQ, it should be mentioned that all subscales of the PAS-R displayed good internal consistency (Cronbach's alphas > .70), except for the obsessive-compulsive subscale (Cronbach's α = .47 which is not surprising given that this subscale only contains two items).

Table 3 shows correlations between the scores on the parent version of the BIQ and the PAS-R. As can be seen, a similar pattern of correlations between BIQ and PAS-R scores emerged for all three age groups. To begin with, the BIQ and PAS-R total scores were substantially correlated (all rs > .66). Further, significant and positive correlations were generally found between the BIQ subscale scores and scores on all PAS-R subscales. There were two obvious exceptions to this rule. First, scores on the BIQ performance situations subscale were less convincingly connected to various PAS-R scales. Second, symptoms of OCD as indexed by the PAS-R were only to some extent related to BIQ scales in 12- to 15-year-olds but not in the younger age groups.

Table 1. Results of a principal components analysis (varimax rotation) performed on the BIQ items of the total sample of children (*N* = 531)

Items (abbreviated)	Factor loadings					
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Adults						
Talkative to adult strangers (R)	.79 $_{1,2,3}$					
Chatting to new (adult) visitors (R)	.79 $_{1,2,3}$					
Quiet with adult strangers	.79 $_{1,2,3}$					
Quiet around new (adult) guests	.75 $_{1,2,3}$					
Unfamiliar situations						
Happily approaches new situations or activities (R)		.63 $_{1,2,3}$				
Comfortable in new situations (R)		.63 $_{2}$		.41$_{1,3}$		
Independent		.61 $_{1,2,3}$				
Outgoing (R)	$_{3}$	.53 $_{2}$	.44$_{1}$			
Settles quickly when visiting homes of unknown people (R)	.55 $_{1,2,3}$	.47				
Nervous or uncomfortable in new situations	$_{2}$	.37		.43$_{1,3}$		
Hesitant in approaching new situations or activities	$_{2}$	.23		.51$_{1,3}$		
Clingy in homes of unknown people	.48$_{1,2}$	.02		.47$_{3}$		
Peers						
Approaching group of unfamiliar children and join in			.75 $_{1,2,3}$			
Watching other children rather than join			.74 $_{1,2,3}$			
Asking other children to play (R)			.70 $_{1,2,3}$			
Approaching group of unfamiliar children and play (R)			.68 $_{1,2,3}$			
Shy when first meeting new children			.68 $_{1,2,3}$			
Friendly with children he/she just met (R)	$_{3}$	.52$_{1,2}$	.26			

Preschool/separation					
Upset when left alone in new situation			.73 $_{1,2,3}$		
Takes many days to adjust to new situations			.73 $_{1,2,3}$		
Quickly adjusts to new situations (R)	.59$_{2}$		.52 $_{1,,3}$		
Happily separates in new situations (R)	.51$_{2}$	$_{3}$	.45 $_{1}$		
Performance situations					
Happy to perform in front of others (R)				.84 $_{1,2,3}$	
Reluctant to perform in front of others				.81 $_{1,2,3}$	
Dislikes being center of attention				.79 $_{1,2,3}$	
Enjoys being center of attention (R)				.72 $_{1,2,3}$	
Physical challenge					
Cautious in activities involving physical challenge					.82 $_{1,2,3}$
Confident in activities involving physical challenge (R)					.75 $_{1,2,3}$
Hesitant to explore new play equipment	$_{3}$				.64 $_{1,2}$
Happily explores new play equipment (R)	.46$_{2,3}$				.54 $_{1}$

Note. Subscripts refer to the three age groups (1 = 4- to 7-year-olds, 2 = 8- to 11-year-olds, and 3 = 12- to 15-year-olds) and indicate whether items load on the pertinent factor in that particular age group. BIQ = Behavioral Inhibition Questionnaire. Only factor loadings on hypothesized factors and secondary loading > .40 are shown.

Table 2. Means (standard deviations), Cronbach's alphas, and item-total correlations for various BIQ scales in 4- to 7-, 8- to 11-, and 12- to 15-year-olds

	4–7-year-olds (*n* = 172)			8–11-year-olds (*n* = 146)			12–15-year-olds (*n* = 213)		
	M (*SD*)	α	Item-total *r*	*M* (*SD*)	α	Item-total *r*	*M* (*SD*)	A	Item-total *r*
BIQ									
Total score	86.72 (24.68)	.96	.29 - .83	82.96 (24.91)	.95	.19 - .82	87.67 (23.91)	.95	.38 - .76
Peers	17.91 (6.21)	.89	.48 - .81	16.98 (5.65)	.84	.42 - .77	18.76 (6.17)	.87	.39 - .80
Unfamiliar adults	12.37 (5.18)	.92	.77 - .84	11.81 (5.14)	.92	.79 - .86	11.65 (4.71)	.89	.73 - .81
Performance situations	$13.42\ (4.67)_{ab}$	.90	.72 - .82	$12.49\ (4.91)_{a}$	.83	.54 - .73	$14.13\ (5.18)_{b}$	.87	.69 - .77
Preschool/separation	10.54 (3.89)	.84	.55 - .74	9.87 (4.25)	.86	.61 - .79	9.56 (3.30)	.79	.58 - .70
Unfamiliar situations	24.03 (7.28)	.91	.57 - .83	23.36 (7.83)	.92	.60 - .87	23.23 (6.95)	.89	.43 - .82
Physical challenges	$8.45\ (3.53)_{a}$	.79	.53 - .73	$8.45\ (3.64)_{a}$	.67	.27 - .56	$10.22\ (3.90)_{b}$	.73	.39 - .62

Note. BIQ = Behavioral Inhibition Questionnaire. Means with different subscripts differ after Bonferroni correction at $p < .05$.

To examine whether behavioral inhibition as indexed by the BIQ is significantly stronger related to symptoms of social anxiety than to other anxiety symptoms, two statistical procedures were conducted. First, in all three age groups, tests were carried out to compare the correlations (Meng, Rosenthal, & Rubin, 1992) between BIQ (sub)scales and PAS-R social anxiety and the most substantial correlations between BIQ (sub)scales and another type of PAS-R anxiety symptoms. These analyses indicated that within each age group the BIQ total score correlated significantly stronger with PAS-R social anxiety than with PAS-R generalized anxiety, which was the second type of anxiety symptoms that correlated most substantially with this scale (4- to 7-year-olds: $Z = 6.71$, $p < .001$; 8- to 11-year-olds: $Z = 4.19$, $p < .001$; 12- to 15-year-olds: $Z = 5.80$, $p < .001$). A similar pattern was observed for the BIQ subscales (all Zs ≥ 2.44, $p < .05$), except for BIQ physical challenges (all age groups) and BIQ preschool/separation subscales (8- to 11-year-olds and 12- to 15-year-olds). Thus, BIQ subscale scores were in general more convincingly related to symptoms of social anxiety than to other anxiety symptoms.

Second, a series of stepwise regression analyses was conducted to examine the relative contributions of the PAS-R social anxiety subscale and the subscales measuring other types of anxiety symptoms to various BIQ scales. In all three age groups, PAS-R social anxiety turned out to be the only significant predictor of most BIQ scales, accounting for between 7 and 68% of the variance (all Fs ≥ 13.19, $p < .001$). For the non-social (preschool/separation and unfamiliar situations) and physical challenges subscales, other types of anxiety symptoms were also found to explain a significant proportion of the variance (all Fs ≥ 8.71, ps $< .001$; all R^2 change values between .01 and .14). For the non-social subscales PAS-R social anxiety still made the largest contribution to the model, but for the physical challenges subscale other types of anxiety symptoms were the main predictors. That is, in 4- to 7-year-olds PAS-R specific fears (ß = .24, $p < .001$) was the only significant predictor of BIQ physical challenges scores. In 8- to 11-year-olds PAS-R generalized anxiety (ß = .33, $p < .01$) and specific fears (ß = .27, $p < .01$) were found to make a significant contribution, whereas in 12- to 15-year-olds PAS-R social anxiety (ß = .30, $p < .001$) and specific fears (ß = .26, $p < .01$) turned out to be significant predictors of this BIQ component.

Parent-child agreement

Table 4 displays mean scores (and standard deviations) on the parent-rated and self-report version of the BIQ, the internal consistencies of the child version, and the correlations between parent- and child-rated behavioral inhibition. Note that the internal consistency of the self-report version of the BIQ was somewhat lower than that of the parent version (see Table 2) but generally still in an acceptable range (i.e., Cronbach's alphas varied between .65 and .91). Only the physical challenges subscale had an internal consistency that was too low (Cronbach's $\alpha = .49$). Further, on some BIQ subscales children rated themselves as (slightly) more inhibited than their parents did. More precisely, paired t-tests revealed that children scored higher on BIQ scales referring to unfamiliar adults ($t[292] = 2.98$, $p < .01$, partial $\eta^2 = .08$), preschool/separation ($t[292] = 3.05$, $p < .01$, partial $\eta^2 = .06$), and unfamiliar situations ($t[289] = 2.30$, $p < .05$, partial $\eta^2 = .07$). Finally, correlations between parent- and child-rated behavioral inhibition were

moderate to high and varied between .39 (BIQ preschool/separation) and .59 (BIQ total score). This agreement between parents and children did not vary as a function of age. That is, comparable results were found when computing separate parent-child correlations for youths aged 9 to 11 years (*r*s between .32 and .59) and 12 to 15 years (*r*s between .34 and .58).

Table 3. Correlations between the parent-reported BIQ and PAS-R for the three age groups separately

			PAS-R			
BIQ	Total	Social	GAD	SAD	Fears	OCD
4-7-year-olds						
Total score	.74*	.83*	.58*	.51*	.38*	.20
Peers	.66*	.78*	.57*	.38*	.29*	.20
Unfamiliar adults	.56*	.73*	.34*	.36*	.30*	.16
Performance situations	.41*	.58*	.28*	.22	.17	.05
Preschool/separation	.66*	.66*	.55*	.55*	.35*	.16
Unfamiliar situations	.71*	.77*	.58*	.52*	.37*	.23
Physical challenges	.41*	.27*	.35*	.37*	.37*	.12
8-11-year-olds						
Total score	.66*	.75*	.56*	.42*	.33*	.21
Peers	.63*	.73*	.50*	.36*	.35*	.25
Unfamiliar adults	.47*	.59*	.38*	.35*	.18	.07
Performance situations	.17	.36*	.07	.09	-.00	-.05
Preschool/separation	.66*	.65*	.61*	.48*	.34*	.27
Unfamiliar situations	.63*	.68*	.56*	.40*	.31*	.21
Physical challenges	.51*	.43*	.47*	.23	.43*	.28
12-15-year-olds						
Total score	.66*	.77*	.54*	.42*	.37*	.31*
Peers	.57*	.76*	.44*	.36*	.27*	.23
Unfamiliar adults	.45*	.62*	.34*	.21	.23	.15
Performance situations	.23	.42*	.20	.07	.00	.02
Preschool/separation	.70*	.65*	.59*	.54*	.51*	.43*
Unfamiliar situations	.67*	.70*	.59*	.49*	.40*	.36*
Physical challenges	.50*	.45*	.41*	.33*	.41*	.32*

Note. *n* (4- to 7-year-olds) = 172; *n* (8- to 11-year-olds) = 146; *n* (12- to 15-year-olds) = 213; BIQ = Behavioral Inhibition Questionnaire; PAS-R = Preschool Anxiety Scale - Revised; Total = PAS-R total scale; Social = PAS-R Social anxiety; GAD = PAS-R Generalized anxiety; SAD = PAS-R separation anxiety; Fears = PAS-R specific fears; OCD = PAS-R obsessive-compulsive disorder. * $p < .001$.

Table 4. Comparison of the mean scores of the parents and children (9- to 15-year-old) and correlations between the parent and children's scores

	Parents	Children		
Scale	*M* (*SD*)	*M* (*SD*)	α	Parent/child *r*
BIQ				
Total score	86.22 (23.98)	88.61 (23.40)	.91	.59*
Peers	18.35 (6.04)	18.47 (5.62)	.72	.45*
Unfamiliar adults	$11.72\ (4.80)_a$	$12.57\ (5.03)_b$	.83	.50*
Performance situations	13.49 (5.11)	13.16 (4.69)	.71	.51*
Preschool/separation	$9.65\ (3.55)_a$	$10.35\ (3.65)_b$	.65	.40*
Unfamiliar situations	$23.43\ (7.00)_a$	$24.37\ (7.53)_b$	.82	.55*
Physical challenges	9.68 (3.90)	9.85 (3.70)	.49	.43*

Note. N = 293. BIQ = Behavioral Inhibition Questionnaire. Means with different subscripts differ at $p < .05$ after Bonferroni correction. * $p < .001$.

Discussion

The present study examined the psychometric properties of the BIQ in a community sample of Dutch children and adolescents with a broad age range (i.e., 4 to 15 years). In general, the results were in line with findings of previous research (Bishop et al., 2003; Edwards, 2007) and indicate that the BIQ has good reliability and validity and that this is not only the case in preschoolers but also in older youths.

Exploratory factor analysis of the BIQ yielded support for the six-factor model as suggested by Bishop et al. (2003) and Edwards (2007), and this appeared true in all three age groups. The items describing inhibited behaviors in relation to peers, preschool/separation, adults, performance situations, and physical challenges nicely clustered into separate components. The only exception was the unfamiliar situations factor which did not emerge clearly in this study, with many of its items loading more convincingly on other BIQ factors. This has probably to do with the fact that items of the BIQ unfamiliar situations subscale are formulated in a more general way. That is, most of these items pertain to "unknown people" or "new situations and activities", which likely cover the specific situations as described in the items of other BIQ subscales. For instance, the "unknown people" as described in the BIQ unfamiliar situations subscale probably include the "adult strangers", "new adult guests", "unfamiliar children", and "new children" of the BIQ adults and peers subscales. In a similar vein, the "new situations and activities" as referred to in items of the BIQ unfamiliar situations subscale also involve more specific novel experiences as described in the BIQ preschool/separation (i.e., adjustment to new situations) and physical challenge (i.e., exploration of new play equipment) subscales. Thus, it remains unclear to what extent the BIQ unfamiliar situations subscale really represents an independent component of behavioral inhibition. Confirmatory factor analysis on the other hand yielded a reasonable fit for the six correlated factors model as proposed by Bishop and colleagues (2003), and this appeared not only true in the total sample, but also in the three age groups separately. Altogether,

the conclusion seems warranted that the BIQ (Bishop et al., 2003) adequately covers different social and non-social aspects of children's inhibited temperament.

The internal consistency of the BIQ was satisfactory, and this was generally also true for the child version that we administered to children aged 9 years and above. It should be mentioned, however, that the reliability coefficient of the physical challenges subscale of the self-report version was below acceptable limits (Cronbach's alpha = .49). This finding is not very surprising given the fact that this BIQ subscale only consists of four items referring to situations that do not occur very often (e.g., physical challenges, new play equipment). Future studies should further examine the reliability of the physical challenge subscale, and such investigation should also address the test-retest stability of this and other self-report BIQ scales.

Only minor age effects were found for the BIQ on the performance situations and physical challenges subscale. Especially the effect on the performance situations subscale was as expected, with the oldest children (i.e., 12- to 15-year-olds) exhibiting the highest levels of inhibited responses in performance situations such as singing and dancing in front of a group. Clearly, these results mimic the age patterns as observed for social anxiety in children (Muris et al., 2000). However, no support was found for the suggestion that younger children would score higher on non-social aspects of behavioral inhibition, whereas older children would score higher on scales representing the social components of this temperamental trait (Broeren & Muris, 2008; Hirshfeld-Becker et al., 2004). On the contrary, an age trend was observed showing that older children (i.e., 12- to 15-year-olds) displayed higher inhibition scores in physical challenge situations (which can be considered as a non-social aspect of behavioral inhibition) than children in the younger age groups. In the meantime, it should be noted that this result is nicely in keeping with the observation in anxiety research that fears of bodily injury and physical danger typically arise during middle childhood (Bauer, 1976). It is possible that the upcoming of these fears makes children more cautious and inhibited in situations involving physical challenges, and as such may explain the age trend as found for this BIQ subscale.

In the current study there were few gender differences in behavioral inhibition, which is well in line with previous research (Edwards, 2007; Garcia-Coll, Kagan, & Reznick, 1984). However, some authors have suggested that gender differences in behavioral inhibition depend on the context in which the trait is assessed. For example, Kochanska (1991) observed that boys were more inhibited in new environments, whereas girls primarily showed such behaviors in response to new persons. The gender difference as found in the present study, namely that boys scored higher on the BIQ performance situations scale than girls is not in keeping with this observation (Edwards, 2007). However, the finding that boys are more reluctant to dance and sing in front of others is not that surprising. When looking at children on a schoolyard we often see groups of girls dancing and singing, while boys are playing football or engage in other physical activities (Thorne, 1993). Further, Ryan (2004) observed significantly more anxious behaviors in boys prior to and during a performance situation (i.e., a musical performance) than in girls. Thus, although gender differences in behavioral inhibition and social anxiety seem to be small, future research is needed to further explore this issue.

This study also provides support for the validity of the BIQ in younger as well as older children. That is, substantial and positive correlations were found between BIQ total and subscale scores and scores on the PAS-R, a questionnaire for measuring DSM-defined anxiety symptoms, and this appeared true in children of all ages. Although BIQ scales were significantly associated with a broad range of anxiety symptoms, the data also indicated that social anxiety was most convincingly related to social as well as non-social aspects of this temperamental trait. Obviously, these findings are in keeping with the idea that behavioral inhibition is more important as a specific risk factor for social phobia than for other types of anxiety disorders (Mick & Telch, 1998; Muris et al., in press). Surprisingly, even the non-social BIQ scales correlated most strongly with symptoms of social anxiety. One explanation for this unexpected result may be that these scales, although they intended to measure the non-social aspects of behavioral inhibition, still refer to social aspects of the inhibited temperament. For instance, items of the non-social BIQ scales such as "Is clingy when we visit homes of people we don't know well", "Is outgoing", and "Gets upset at being left in new situations for the first time (e.g., kindergarten, preschool, child care)" do not merely reflect non-social events but clearly incorporate social elements. The only real exception to this rule was the physical challenge subscale, which only contained items of a non-social nature. Interestingly, it was this particular BIQ scale that correlated equally strong with social anxiety and other anxiety symptoms. Thus, it seems that the strong correlation between non-social inhibition and social anxiety can be partly explained by the way non-social inhibition is measured.

Moderate to high correlations were found between parent- and child-rated inhibition. In addition, children rated themselves as slightly more inhibited than their parents did. On first sight, parent-child correlations in the .40 and .50 range do not seem that substantial, but these figures compare rather favorable to those obtained in previous studies on child characteristics (Achenbach, McConaughy, & Howell, 1987; Kolko & Kazdin, 1993). For example, Achenbach et al. (1987) conducted a meta-analysis on the cross-informant agreement of various psychopathology questionnaires, and found a mean parent-child correlation of .25. Moreover, parent-child correlations for internalizing phenomena, like behavioral inhibition and anxiety, are generally even lower than those found for externalizing characteristics (Kolko & Kazdin, 1993). Thus, the parent-child agreement as reported in this study can be considered as quite good.

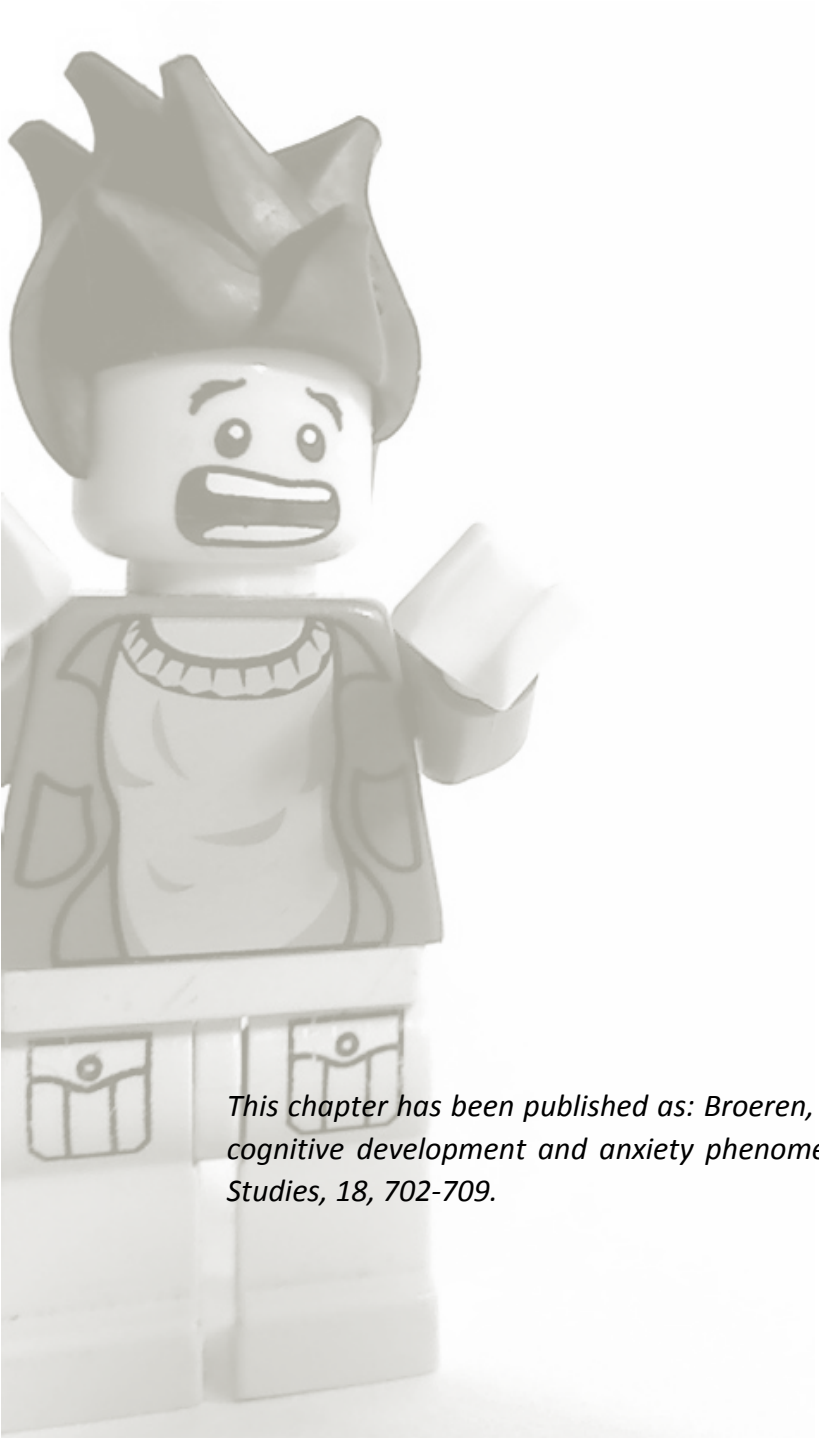
Several limitations of the present study should be noted. A first limitation pertains to the relatively low response percentage of the parents (approximately 23%) who participated in the study. Most participants were Caucasian, and although not adequately documented, migrant parents and children were relatively underrepresented. Thus, research in populations that contain children and adolescents from various ethnic groups is required and this is of particular interest as data have shown that ethnic minority groups in the Netherlands report higher levels of anxiety disorder symptoms (Hale, Raaijmakers, Muris, & Meeus, 2005) and hence may also display greater vulnerability to develop such problems. Second, this study relied on normal, psychologically healthy youths, and so the reliability and validity of the BIQ in clinically referred youths remains to be established. Third, a number of psychometric properties of the BIQ remain to be

tested. As mentioned earlier, the current study did not examine the test-retest reliability of the BIQ, and also the predictive and discriminant validity of the scale need to be investigated. In spite of these limitations, the present findings are encouraging as they yield first evidence for the reliability and validity of the BIQ as an index for measuring various aspects behavioral inhibition in youths with a broad age range.

Summarized, this study provides preliminary support for the reliability and validity of the BIQ in a Dutch non-clinical sample including children and adolescents. In all age groups the internal consistency of most BIQ scales was found to be satisfactory. Exploratory factor analysis yielded a multiple-factor model that was largely in keeping with the hypothesized structure consisting of the social and non-social components of behavioral inhibition, and a CFA demonstrated reasonable fit for a six correlated factors model in the total sample as well as in the three age groups separately. Further, BIQ scores were positively correlated with a wide range of anxiety symptoms, although the most substantial links were found for symptoms of social anxiety. Finally, a self-report version of the BIQ, which was administered to children aged 9 years and above, also possessed good internal consistency and adequate parent-child agreement. Therefore, it can be concluded that the BIQ seems to be a promising scale for assessing various aspects of behavioral inhibition that is not only suitable for preschoolers but also for older children and adolescents.

Chapter 4

The relation between cognitive development and anxiety phenomena in children



This chapter has been published as: Broeren, S., & Muris, P. (2009). The relation between cognitive development and anxiety phenomena in children. Journal of Child and Family Studies, 18, 702-709.

Abstract

The current study examined the relation between cognitive development and fear, anxiety, and behavioral inhibition in a non-clinical sample of 226 Dutch children aged 4 to 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.

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, King, & Frary, 1989), with a substantial minority of them displaying symptoms of anxiety disorders (Bell-Dolan, Last, & Strauss, 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, Hastings, Stewart, Henderson, & Chen, 1997). For example, the confrontation with an unfamiliar peer will evoke a social withdrawal response in behaviorally inhibited pre-school 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, Miller, & Miller, 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, Cummins,

& King, 1996; King, Josephs, Gullone, Madden, & Ollendick, 1994; Muris, Merckelbach, & Luijten, 2002; Ramirez & 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, Merckelbach, Meesters et al., 2002) and more frequently interpret physical symptoms as a sign of anxiety (Muris, Mayer, Vermeulen, & Hiemstra, 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 to 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 the 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 & 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).

Assessment - Children

***Theory-of-Mind test*.** The shortened version of the Theory-of-Mind (TOM) test (Muris, Steerneman 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 and colleagues (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. (2002) 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, Meesters, Mayer 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, Meesters, Mayer 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 to 20 minutes. 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; both *t*[222]s ≥ 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	*M* (*SD*)	Cronbach's α	Item-total *r*
PAS-R			
Total score	59.85 (16.73)	.92	.21 - .71
Separation anxiety	8.33 (3.19)	.76	.44 - .64
Generalized anxiety	14.83 (5.38)	.87	.43 - .75
BIQ			
Total score	86.09 (25.04)	.95	.33 - .81
Social novelty	43.30 (13.45)	.92	.47 - .75
Non-social novelty	42.88 (13.18)	.93	.39 - .82
KFQ			
Total score	54.41 (11.95)	.91	.12 - .64
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.

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

Scale	4-5-year-olds (n = 92)	6-7-year-olds (n = 80)	8-9-year-olds (n = 54)
PAS-R			
Total score	58.27 (15.56)	60.89 (16.34)	61.02 (19.12)
Separation anxiety	8.05 (3.10)	8.43 (2.98)	8.65 (3.65)
Generalized anxiety	$13.40\ (4.88)_a$	$15.75\ (5.29)_b$	$15.90\ (5.84)_b$
BIQ			
Total score	85.73 (25.98)	87.86 (23.20)	84.09 (26.31)
Social novelty	43.32 (14.32)	44.15 (12.76)	41.98 (13.05)
Non-social novelty	42.41 (13.01)	43.71 (12.19)	42.88 (14.99)
KFQ			
Total score	$57.65\ (12.72)_a$	$52.44\ (11.73)_b$	$51.81\ (9.65)_b$
Fear of the unknown	$10.53\ (3.08)_a$	$8.30\ (2.75)_b$	$7.69\ (2.00)_b$

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

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 (rs being -.19 and -.20, ps < .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, 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%).

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

	Age	TOM-test	Conservation tasks	
Scale	ß	ß	ß	R^2
PAS-R				
Total score	.19*	-.09	-.08	.02
Separation anxiety	.23*	.02	-.24**	.04
Generalized anxiety	.24**	-.01	-.01	.05
BIQ				
Total score	.11	-.24**	.03	.03
Social novelty	.06	-.26**	.08	.04
Non-social novelty	.15	-.19*	-.02	.02
KFQ				
Total score	-.12	-.06	-.10	.06
Fear of the unknown	-.25**	-.13	-.13	.19

Note. PAS-R = Preschool Anxiety Scale - Revised; BIQ = Behavioral Inhibition Questionnaire; KFQ = Koala Fear Questionnaire; TOM-test = Theory-of-Mind test. * $p < .05$, ** $p < .01$.

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 & Costa, 2005; Westenberg, Siebelink, Warmenhoven, & Treffers, 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 & 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 is 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.

Chapter 5

The course of childhood anxiety disorder symptoms: Developmental trajectories and child-related variables in normal children

This chapter has been submitted for publication as: Broeren, S., Muris, P., & Diamantopoulou, S. The course of childhood anxiety disorder symptoms: Developmental trajectories and child-related variables in normal children.

Abstract

This prospective study examined developmental trajectories for various types of anxiety disorder symptoms (i.e., social anxiety, fear, generalized anxiety, and separation anxiety) and their relation to a number of child-related variables in a community sample of 224 children aged 4 to 11 years. Anxiety symptoms, behavioral inhibition, and psychosocial adjustment were measured on Time 1 by means of parent-rated questionnaires, whereas social-cognitive abilities were assessed by means of an interview with the child. Latent Class Growth Analyses (LCGAs) identified multiple developmental trajectories in child-hood anxiety disorder symptoms of which the 'stable-low' or 'stable-medium' reflected the normative trajectories. Further, multinomial regression analyses indicated that the higher developmental trajectories of anxiety were associated with higher levels of behavioral inhibition and social-cognitive abilities on Time 1. In sum, the results show heterogeneity in the development of anxiety symptoms, and underline the importance of early prevention programs for children at high risk for developing an anxiety disorder.

Introduction

Childhood anxiety disorders represent a common psychiatric problem affecting between 10 and 20% of children and adolescents (Cartwright-Hatton et al., 2006; Costello et al., 2003). Typically, these disorders are characterized by subjective apprehension and distress, worrisome thoughts, avoidance behavior, and physiological arousal in relation to specific stimuli and situations (American Psychiatric Association, 2000). These fear and anxiety problems cause significant impairment in social, emotional, and school functioning (Strauss et al., 1987; Woodward & Fergusson, 2001) and also pose a risk for the development of (other) internalizing and externalizing disorders in childhood (Last et al., 1996), adolescence (Bittner et al., 2007), and even adulthood (Pine et al., 1998). The profound impact of anxiety disorders on the lives of children highlights the need to understand the development of this psychiatric problem. In the current study, we explored developmental trajectories in anxiety disorder symptoms in children and examined how these trajectories were associated with a number of child-related variables that are thought to be involved in the etiology and manifestation of this form of psychopathology.

Normal childhood fears and anxieties show clear developmental patterns (Gullone, 2000). In their preschool years, children's fears are focused on imaginary creatures such as ghosts and witches, animals, the dark, and thunderstorms, whereas in middle childhood fears of physical danger, loss, and bodily injury become more prominent. Anxiety related to school performance and social relationships also increases during this developmental period (see also Muris et al., 2000). In late childhood and adolescence, fear and anxiety are more focused on social evaluation, social interactions, illness, and death (Bernstein & Allen, 1969).

Anxiety symptoms tend to be stable over time (e.g., Ialongo, Edelsohn, Werthamer-Larsson, Crockett, & Kellam, 1995; Keller et al., 1992; Pine et al., 1998). Hale, Raaijmakers, Muris, Van Hoof, and Meeus (2008) described the developmental course of specific anxiety disorder symptoms over time in a community sample of adolescents. They found that over the course of 5 years, panic disorder, school phobia, and separation anxiety disorder symptoms showed a slight decrease, while social anxiety symptoms remained fairly stable over time. Gender differences were observed for symptoms of generalized anxiety disorder: Such symptoms tended to slightly increase over time among girls but decreased among boys. However, all of the above studies examined general patterns of anxiety and anxiety disorder symptoms in the total sample of children and/or adolescents, and thus neglected to examine individual-level differences in the developmental course of anxiety across time (Nandi, Beard, & Galea, 2009). In other words, it may well be the case that there are different subgroups of children whose anxiety problems may follow diverging developmental courses.

There is indeed evidence from prospective studies indicating that there seems to be a certain degree of heterogeneity in the development of fear and anxiety in children. For example, Côté and colleagues (2002) identified three distinct trajectory groups when analyzing teacher-rated fearfulness in primary school children. Most children followed a stable low or medium fear trajectory, while a minority was following a stable high fear

trajectory. Similar research has revealed up to four distinct trajectories in childhood and adolescent anxiety or more broadly internalizing symptoms (Côté et al., 2009; Crocetti, Klimstra, Keijsers, Hale, & Meeus, 2009; Duchesne, Vitaro, Larose, & Tremblay, 2008; Feng, Shaw, & Silk, 2008; Sterba, Prinstein, & Cox, 2007): Two groups show stable low or medium symptom levels, one of which represents the normative group (depending on the population under the study). Then, there seems to be a high-declining group which starts with high levels of anxiety symptoms, which gradually decline over time, and a chronic high group which shows severe and persistent symptoms of anxiety. However, all these previous studies examined developmental trajectories in general anxiety or broader internalizing symptoms. It therefore remains unknown whether these developmental trajectories can also be observed for specific types of anxiety symptoms.

Various factors are thought to be involved in the development of fear and anxiety in youths (Muris, 2007; Weems & Stickle, 2005). In the current study, we will specifically focus on a number of child-related factors, and examine their association with the different trajectories in various types of childhood anxiety disorder symptoms, which seems to be a gap in the existing research literature. The first child-related variable is the temperamental trait of behavioral inhibition, which can be defined as the tendency to be unusually shy and to respond with fearfulness and withdrawal in new and unfamiliar social and non-social situations (Hirshfeld-Becker et al., 2004). This characteristic has a genetic basis (Robinson et al., 1992) and about 10 to 15% of children can be categorized as highly inhibited (e.g., Kagan et al., 1984). Research has shown that behavioral inhibition puts children at heightened risk for developing anxiety disorders. For example, Biederman and colleagues (1990) found that inhibited children more often displayed multiple anxiety disorders than uninhibited children. A three-year follow-up of this sample revealed that children initially categorized as inhibited showed a marked increase in various types of anxiety problems (e.g., separation anxiety, social phobia) that was not observed in the uninhibited group (Biederman et al., 1993).

A second factor is cognitive development, which is also assumed to be associated with the development of childhood anxiety (Vasey, 1993). This is not surprising given the fact that fear and anxiety originate from threat which has to be conceptualized, and cognitive abilities are needed for this conceptualization. Bauer (1980), for instance, assumed that there should be a relationship between children's cognitive shift from concrete to more abstract thinking capacity and changes in the content of fears. However, the empirical evidence for this link between cognitive development and anxiety is relatively sparse (Broeren & Muris, 2009). There is some evidence showing that increasing levels of cognitive skills make children more capable of worrying (Muris, Merckelbach, Meesters et al., 2002), anxious interpretations of physical symptoms (Muris et al., 2007), and more vulnerable to display social-evaluative fears (Westenberg et al., 2004).

A third and final child-related variable associated with anxiety pertains to psychosocial adjustment. Strauss, Frame, and Forehand (1987), for instance, found that anxious children showed greater impairment in peer relations, lower levels of self-esteem, and poorer school performance as compared to non-anxious children. In a similar vein, Ginsburg, La Greca, and Silverman (1998) showed that social anxiety was associated with

lower levels of social acceptance and lower self-esteem, and more negative peer interactions. In the meantime, there are indications that high anxiety is associated with low levels of externalizing problems, including aggression (e.g., Keiley, Lofthouse, Bates, Dodge, & Petit, 2003; Wright, Zakriski, & Drinkwater, 1999), although most research is showing that internalizing and externalizing problems and disorders frequently co-occur (Mesman & Koot, 2000; Newman et al., 1996; Verhulst & Van der Ende, 1993). These research findings suggest that it may be important to distinguish various types of psychosocial adjustment within the context of childhood anxiety.

In sum, the present study investigated developmental patterns in anxiety disorder symptoms in children aged 4 to 11 years. More specific, the purpose of this study was (a) to identify distinct developmental trajectories for different categories of anxiety disorders symptoms, and (b) to investigate to what extent the child-related variables of behavioral inhibition, social-cognitive development, and psychosocial adjustment, which were measured at study onset, were predictive of the developmental trajectories of these anxiety disorders symptoms. In light of previous findings, we expected to find multiple, predominantly stable trajectories for various anxiety symptoms, with most children being assigned to the low or medium symptom trajectories and only a minority of children being allocated to the high symptom trajectories. With respect to the child-related variables, it was hypothesized that behavioral inhibition, cognitive development, and psychosocial adjustment (except for externalizing difficulties) would be positively associated with elevated trajectories of anxiety symptoms.

Method

Participants

For this three-wave longitudinal study, which was approved by the Ethical Committee Psychology of the Erasmus University Rotterdam, children and parents were recruited from three primary schools in and around Rotterdam, The Netherlands. Children were between age 4 and 9 at the first assessment (Time 1). Prior to the study, parents received information about the project and were asked to complete an informed consent form; approximately 25% of the invited parents responded favorably to this invitation and agreed to participate. In the first wave, 224 children (103 boys and 121 girls) and their parents (209 mothers and 15 fathers) participated. The average age of these children was 6.09 years (*SD* = 1.55). The majority of these children was from original Dutch descent (*n* = 219; 97.8%). Only 5 children were born outside the Netherlands (Surinam, Germany, Netherlands-Antilles, South-Africa, and the United States). For one child the nationality was not reported. As to the background of the parents, 87.6% of the fathers (*n* = 198) and 83.2% of the mothers (*n* = 188) were born in the Netherlands. Other parents were born in 48 other counties and mainly had a non-Caucasian ethnicity. Two parents did not report their nationality. Furthermore, children and their parents were all living in neighborhoods in which inhabitants had an average income/socioeconomic status.

Of the 224 parents and children who participated in the first assessment, 211 children and parents (94.2% of the original sample) participated again in the second assessment one year later, whereas 196 parents and children (87.5%) were assessed again after

another year. No significant differences in age, sex, or anxiety levels were found between the group of children and parents who participated in all three data waves of the study and the group who withdrew from the study at some point-in-time (all *t*s < 1.10, *p*s > .27, and $\chi^2 < 1$).

Assessment

Anxiety. Symptoms of anxiety were measured by means of the *Preschool Anxiety Scale - Revised* (PAS-R; Edwards, 2007; Spence et al., 2001), which is a 30-item parent-based questionnaire for measuring symptoms of the following DSM-defined anxiety disorders in young children: social phobia (e.g., "Is afraid of meeting or talking to unfamiliar people"), generalized anxiety disorder (e.g., "Has difficulty stopping him/herself from worrying"), separation anxiety disorder (e.g., "Becomes distressed if separated from parents"), specific fears (representing specific phobia; e.g., "Is afraid of doctors and/or dentists"), and obsessive-compulsive disorder (e.g., "Becomes distressed by thoughts or images in his/her head"). Parents were asked to rate the anxiety symptoms of their child on a 5-point scale, ranging from 1 (*not at all true*) to 5 (*very often true*). PAS-R subscale and total scores were calculated by summing the scores on relevant items, with higher scores being indicative of higher levels of anxiety.

Research has shown that, with exception of the obsessive-compulsive disorder subscale, all (sub)scales of the PAS-R display satisfactory psychometric properties (Broeren & Muris, 2008; Edwards, 2007; Spence et al., 2001) and this seems also true for the Dutch version of the scale (Broeren & Muris, 2008). More specific, subscales display moderate to good internal consistency, cross-informant reliability, and test-retest stability, whereas a factor analysis indicated that symptoms cluster into components that are in keeping with the anxiety disorders as described in the DSM. Further, all (sub)scales were substantially and positively correlated with the internalizing problems scale of the Child Behavior Checklist (CBCL; Achenbach, 1991), whereas fairly low correlations were observed with the externalizing problems scale (Broeren & Muris, 2008; Edwards, 2007; Spence et al., 2001). In the current study, internal consistency coefficients (Cronbach's alphas) of the PAS-R scales were .92 for total anxiety, .76 for separation anxiety, .87 for generalized anxiety, .90 for social anxiety, .72 for specific fears, and .54 for obsessive-compulsive disorder. The obsessive-compulsive disorder subscale was not included in the data analyses, because of the low reliability of this subscale.

Child-related variables. Parents filled out the *Behavioral Inhibition Questionnaire* (BIQ; Bishop et al., 2003; Edwards, 2007), which is a 30-item scale that assesses behavioral inhibition in three domains (i.e., social novelty, situational novelty, and physical challenges). Items (e.g., "Is shy when first meeting new children", "Seems nervous or uncomfortable in new situations") are rated on a 6-point scale (1 = *hardly ever,* 6 = *almost always*). After recoding reversed items, a total score can be computed, with higher scores being indicative of higher levels of behavioral inhibition. The reliability and validity of both the English and the Dutch version of the BIQ have been shown to be adequate (Bishop et al., 2003; Broeren & Muris, 2010; Edwards, 2007). More precisely, the BIQ shows moderate to high internal consistency, cross-informant reliability, and test-retest stability (Bishop et al., 2003; Edwards, 2007). Further, the convergent validity of the scale is also

satisfactory. That is, the BIQ correlates substantially with the approach scale of the Short Temperament Scale for Children (Sanson, Smart, Prior, Oberklaid, & Pedlow, 1994) and observational indexes of behavioral inhibition (Edwards, 2007). In this study, Cronbach's alpha of the total BIQ scale was .95.

Psychosocial adjustment was assessed with the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997), which contains 25 items that can be divided in five subscales: hyperactivity-inattention (e.g., "Restless, overactive, cannot stay still for long"), emotional symptoms (e.g., "Often complains of headaches, stomach-aches, or sickness"), conduct problems (e.g., "Often fights with other children or bullies them"), peer problems (e.g., "Rather solitary, tends to play alone"), and prosocial behavior (e.g., "Considerate of other people's feelings"). Items have to be rated on a 3-point scale with 0 = *Not true*, 1 = *Somewhat true*, and 2 = *Certainly true*. After recoding reversed items, subscale scores can be obtained by summing across relevant items. For this study, a social-emotional problems score (which was obtained by summing the scores of the emotional symptoms and peer problems subscales), an externalizing difficulties score (which was obtained by summing the scores of the hyperactivity-inattention and the conduct problems subscales), and the prosocial behavior score were included as child-related variables. The reliability and validity of the SDQ have been examined in various studies (Goodman, 1997; Goodman, 1999, 2001; Goodman & Scott, 1999). Factor analysis has generally yielded a five-factor solution that corresponds with the hypothesized domains of psychological difficulties and strengths (e.g., Goodman, 2001). The internal consistency and test-retest stability of the SDQ are also satisfactory and cross-informant correlations are moderate (e.g., Goodman, 1997). SDQ subscale scores correlate substantially with relevant CBCL subscale scores (Achenbach, 1991; Goodman & Scott, 1999) and were found to discriminate between children with and without psychopathological symptoms (Goodman, 1999). Furthermore, psychometric evaluations of the Dutch version of the SDQ has also yielded comparable psychometric properties (Muris, Meesters, & van den Berg, 2003; van Widenfelt, Goedhart, Treffers, & Goodman, 2003). Internal consistency coefficients in the present study were .69 for SDQ social-emotional problems, .79 for externalizing difficulties, and .65 for prosocial behavior.

Social-cognitive abilities were assessed with the shortened version of the *Theory-of-Mind (TOM) test* (Muris, Steerneman et al., 1999), an interview-based measure consisting of nine stories, drawings, and vignettes about which children have to answer 38 questions. Questions refer to various aspects of social-cognitive ability, namely recognition of basic emotions (e.g., "Who in this picture is angry?"), first-order beliefs (i.e., what children think about real events, e.g., "Peter thinks that Sue is sad"), second-order beliefs (i.e., what children think about other people's thoughts, e.g., "Father thinks that Stefan thinks he is disappointed in him"), pretense (e.g., "Do as if you brush your teeth"), understanding false belief (i.e., comprehension of other people's wrong beliefs, e.g., the "Smarties" test), and understanding humor and sarcasm. Each question is scored as either passed (1) or failed (0). A TOM total score can be obtained by summing all passed items, with higher scores reflecting more developed social-cognitive (i.e., theory-of-mind) abilities. The TOM-test is a reliable and valid measure of theory-of-mind and has been

shown to possess sufficient to good internal consistency, test-retest stability, and interrater-reliability (Muris, Steerneman et al., 1999). Moreover, the test discriminates between normal children and children with a pervasive development disorder, which are known to display deficits in this cognitive domain (Muris, Steerneman et al., 1999). The Cronbach's alpha of the TOM-test in this study was .91.

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, parents were annually asked to complete the PAS-R, BIQ, and SDQ, whereas children were individually tested on Time 1 in a separate room at school. During this testing session, which lasted for approximately 15 to 20 minutes the TOM-test was administered along with a number of other tasks (which are not reported in this article). With regard to the measures of other child-related variables, only the data of Time 1 were used (see statistical analyses).

In two of the schools, children received a small present in return for their participation on each assessment point of the study (e.g., colored pencils, crayons, booklets). Children in the third school were rewarded with playing materials for the entire classroom during each wave (e.g., footballs, tennis balls).

Statistical Analyses

Unobserved heterogeneity in developmental trajectories of anxiety was modeled using latent class growth analysis (LCGA; Nagin & Tremblay, 2001). Model parameters were estimated with the Mplus software program (Muthén & Muthén, 2008), which computes full information maximum likelihood estimates in the presence of missing data. To avoid local solutions and to ensure the stability of the trajectory solutions, models were estimated using 200 random permutations of starting values generated by the program. Models were considered stable when similar solutions were obtained with different sets of starting values.

The developmental trajectories for all anxiety constructs were modeled with the censored normal distribution as a large portion of the sample had a 0 score on the various anxiety construct items. Previous research led us to expect to find up to four trajectories for each anxiety type (Côté et al., 2009; Côté et al., 2002; Crocetti et al., 2009; Feng et al., 2008). Therefore, we explored models with an intercept and a linear or (linear and) quadratic growth function, with one through five distinctive trajectories.

We relied on recommended criteria to assess model fit (Nylund, Asparouhov, & Muthén, 2007). First, we used the bootstrapped likelihood ratio test (BLRT) to determine the number of trajectories. The BLRT tests the null hypothesis that a given model fits no better than a model with one trajectory less. A failure to reject the null hypothesis provides evidence for the model with one trajectory less. Second, among the models that yielded a significant BLRT, we chose the model with the lowest (i.e., closest to 0) Bayesian information criterion (BIC). Note that the BIC tends to favor models with fewer classes because it rewards parsimony. Third, the quality of the models for classifying individuals in distinct trajectories was assessed by the average posterior probabilities (PP) of the trajectories. For individuals classified into a given trajectory the average PP of belonging

to this class should be high (i.e., close to 1) and the average PP of belonging to any of the other trajectories should be low. Hence, the third criterion for assessing model fit that we applied was a minimum average PP of .80 for each trajectory.

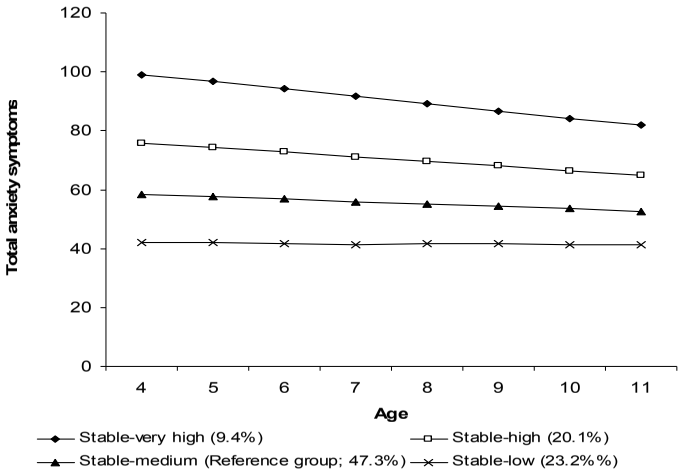
We conducted multinomial regression analyses to predict trajectory membership for each anxiety construct, from child-related variables measured on Time 1. In these analyses, we selected the normative course as reference group (i.e., the trajectory containing the majority of children), which was either the low-level or medium-level trajectory depending on the type of anxiety symptoms under study. In the analyses, trajectory membership was predicted from Time 1 child-related variables in relation to this normative trajectory. The child-related variables were standardized prior to the analyses.

Results

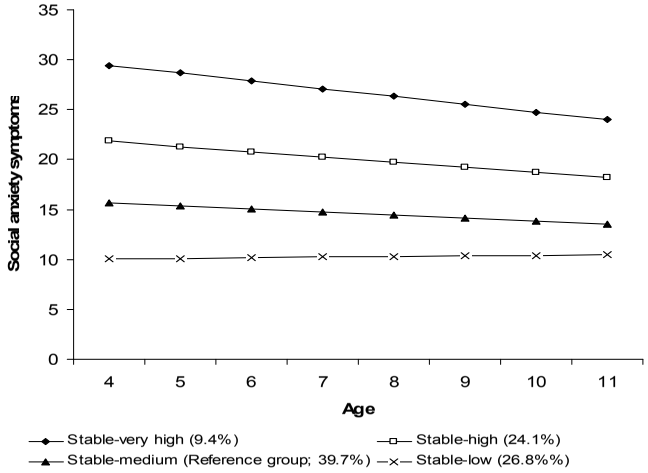
Results of the LCGAs are displayed in Table 1 and Figure 1. As can be seen in Table 1, according to the model selection criteria (i.e., significant BLRT, lowest BIC value, and average PP ≥ .80) the best fitting model for *total anxiety* problems was a five-class linear model (i.e., a model containing five trajectories with only a linear growth factor). However, because this five-class model included one trajectory which contained only 5 children, we indentified the four-class linear model as the best fitting model for reasons of parsimony. The four trajectories of this model had significant intercepts but no significant slopes, that is, although the initial level of anxiety scores following various trajectories differed, the development of the total anxiety scores within each trajectory did not differ. As can be seen in Figure 1a, 23.2% of the children followed a stable-low trajectory, 47.3% followed a stable-medium trajectory, and the model yielded also two high-level trajectories, that is a stable-high trajectory comprising 20.1% of the children and stable-very-high-trajectory consisting of 9.4% of the children.

A similar four-class linear model was obtained for *social anxiety* symptoms (see Figure 1b). The four trajectories had significant intercepts but no significantly different slopes. The best fitting model for *fear* symptoms according to the model selection criteria was also a linear model with four classes with significantly different intercepts. However, this model not only contained stable trajectories (stable-medium, stable-high, and stable-very-high) but also a low-declining trajectory (i.e., this trajectory had a significant negative linear slope; see Figure 1c). Furthermore, the best fitting model for both *generalized anxiety* and *separation anxiety* was a three-class linear model with stable-low, stable-medium, and stable-high trajectories (see Figure 1d and 1e). All trajectories had significant intercepts but no significant linear slopes.

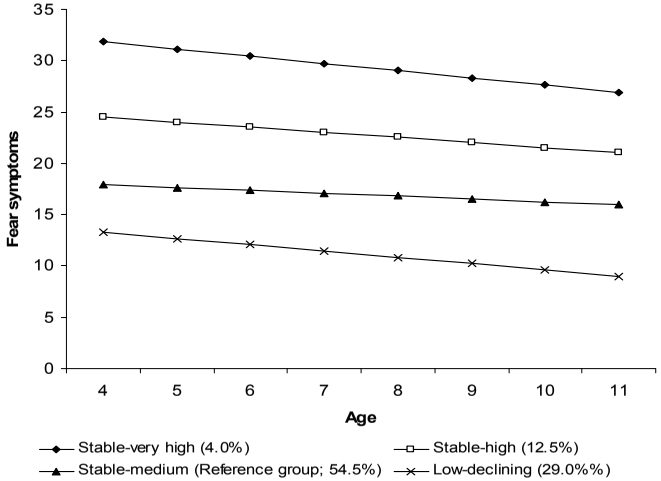
(a)


Total anxiety symptoms
120
100
80
60
40
20
0
4
5
6
7
8
9
10
11
Age
Stable-very high (9.4%)
Stable-high (20.1%)
Stable-medium (Reference group; 47.3%)
Stable-low (23.2%%)

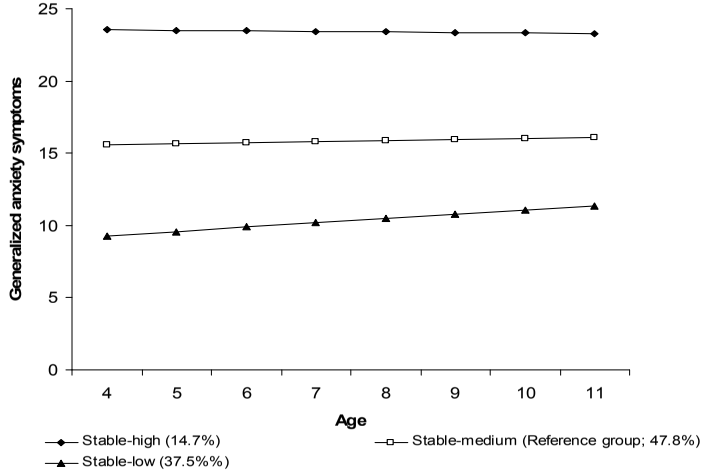
(b)


Social anxiety symptoms
35
30
25
20
15
10
5
0
4
5
6
7
8
9
10
11
Age
Stable-very high (9.4%)
Stable-high (24.1%)
Stable-medium (Reference group; 39.7%)
Stable-low (26.8%%)

(c)


Fear symptoms
35
30
25
20
15
10
5
0
4
5
6
7
8
9
10
11
Age
Stable-very high (4.0%)
Stable-high (12.5%)
Stable-medium (Reference group; 54.5%)
Low-declining (29.0%%)

(d)


Generalized anxiety symptoms
25
20
15
10
5
0
4
5
6
7
8
9
10
11
Age
Stable-high (14.7%)
Stable-medium (Reference group; 47.8%)
Stable-low (37.5%%)

(e)

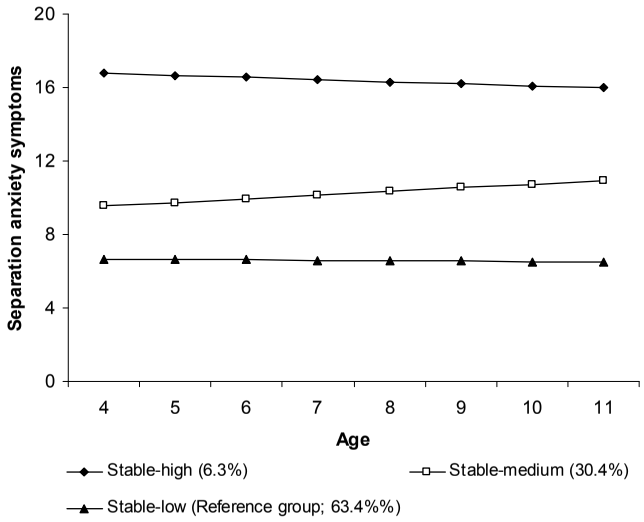


Figure 1. Developmental trajectories from ages 4 to 11 for (a) total anxiety symptoms, (b) social anxiety symptoms, (c) fear symptoms, (d) generalized anxiety symptoms, and (e) separation anxiety symptoms.

Table 1. Model fit statistics of trajectory models for the various types of anxiety

	Linear			Quadratic		
	BIC	BLRT (*p* value)	PP (Min/Max)	BIC	BLRT (*p* value)	PP (Min/Max)
Total anxiety symptoms						
2 trajectories	4.723	<.01	.92/.96	4.682	<.01	.93/96
3 trajectories	4.650	<.01	.88/.94	4.664	<.01	.90/.93
4 trajectories	4.620	<.01	.87/.96	4.636	<.01	.88/.96
5 trajectories	4.612	<.01	.83/.90	4.627	ns	.86/.92
Fear symptoms						
2 trajectories	3.408	<.01	.91/.95	3.417	<.01	.91/.95
3 trajectories	3.317	<.01	.87/.97	3.331	<.01	.87/.97
4 trajectories	3.308	<.01	.87/.95	Did not converge		
Separation anxiety symptoms						
2 trajectories	2.876	<.01	.93/.98	2.882	<.01	.91/.97
3 trajectories	2.846	<.01	.85/.97	2.859	<.01	.83/.98
4 trajectories	2.854	<.01	.84/.99	2.864	<.01	.83/.98
Social anxiety symptoms						
2 trajectories	3.496	<.01	.93/.96	3.504	<.01	.93/.96
3 trajectories	3.418	<.01	.90/.94	3.424	<.01	.90/.96
4 trajectories	3.410	<.01	.84/.95	3.415	<.01	.82/.94
5 trajectories	3.405	<.01	.79/.87	3.411	<.01	.86/.92
Generalized anxiety symptoms						
2 trajectories	3.395	<.01	.92/.95	3.405	<.01	.91/.96
3 trajectories	3.329	<.01	.90/.93	3.332	<.01	.90/.94
4 trajectories	3.324	Ns	.81/.93	3.326	ns	.83/.89

Note. BIC = Bayesian Information Criterion; BLR= Bootstrapped likelihood ratio test; PP = Posterior Probability.

Table 2. Associations between child-related variables and trajectory group membership for the various types of anxiety

Covariate	*B*	*SE*	Odds ratio	*B*	*SE*	Odds ratio	*B*	*SE*	Odds ratio
Total anxiety symptoms	*Stable-very high vs. stable-medium*			*Stable-high vs. stable-medium*			*Stable-low vs. stable-medium*		
Behavioral inhibition	2.85*	0.52	17.22	1.12*	0.26	3.07	-1.32*	0.27	0.27
Theory of Mind	1.00*	0.33	2.73	0.46	0.23	1.58	-0.52*	0.19	0.60
SDQ Social-Emotional problems	0.13	0.27	1.14	-0.13	0.19	0.88	0.10	0.17	1.10
SDQ Externalizing difficulties	0.99*	0.27	2.69	0.39	0.21	1.48	-0.09	0.19	0.91
SDQ Prosocial behavior	0.89	0.37	2.42	0.24	0.23	1.27	0.22	0.25	1.25
Social anxiety symptoms	*Stable-very high vs. stable-medium*			*Stable-high vs. stable-medium*			*Stable-low vs. stable-medium*		
Behavioral inhibition	4.12*	0.72	61.70	2.54*	0.45	12.67	-1.93*	0.37	0.15
Theory of Mind	1.03*	0.38	2.79	0.55	0.24	1.74	-0.03	0.19	0.97
SDQ Social-Emotional problems	0.13	0.33	1.14	0.27	0.23	1.31	-0.09	0.19	0.91
SDQ Externalizing difficulties	0.45	0.31	1.56	0.12	0.28	1.13	0.05	0.17	1.05
SDQ Prosocial behavior	0.04	0.38	1.04	-0.18	0.26	0.84	-0.01	0.22	0.95
Fear symptoms	*Stable-very high vs. stable-medium*			*Stable-high vs. stable-medium*			*Low-declining vs. stable-medium*		
Behavioral inhibition	1.19*	0.43	3.28	0.50	0.25	1.65	-0.23	0.16	0.80
Theory of Mind	0.35	0.33	1.40	0.01	0.21	1.01	-0.08	0.16	0.92
SDQ Social-Emotional problems	-0.33	0.27	0.72	0.15	0.21	1.16	-0.03	0.15	0.97
SDQ Externalizing difficulties	0.22	0.26	1.24	0.18	0.23	1.19	0.01	0.16	1.01
SDQ Prosocial behavior	0.33	0.36	1.39	-0.01	0.24	0.99	0.11	0.17	1.12
Generalized anxiety symptoms				*Stable-high vs. stable-medium*			*Stable-low vs. stable-medium*		
Behavioral inhibition				1.24*	0.30	3.45	-1.09*	0.24	0.34
Theory of Mind				0.25	0.23	1.28	-0.49*	0.17	0.62
SDQ Social-Emotional problems				-0.01	0.22	0.99	0.03	0.15	1.03
SDQ Externalizing difficulties				0.79*	0.23	2.20	-0.28	0.18	0.76
SDQ Prosocial behavior				0.63	0.33	1.88	0.12	0.18	1.13

Separation anxiety symptoms	*Stable-high vs. stable-low*			*Stable-low vs. stable-low*		
Behavioral inhibition	1.98*	0.44	7.22	0.73*	0.18	2.08
Theory of Mind	0.32	0.30	1.38	0.32	0.17	1.38
SDQ Social-Emotional problems	-0.50	0.36	0.61	-0.16	0.15	0.86
SDQ Externalizing difficulties	0.55	0.32	1.73	0.26	0.16	1.30
SDQ Prosocial behavior	0.55	0.40	1.73	0.10	0.18	1.11

* $p < .01$

Multinomial logistic regression analyses

Multinomial regression analyses were conducted with the normative trajectory (i.e., the trajectory containing the majority of children) as reference. For total anxiety, social anxiety, generalized anxiety, and fear, the stable-medium trajectory was the reference, whereas for separation anxiety the stable-low trajectory was used as reference. As shown in Table 2, the multinomial logistic regression model for total anxiety symptoms indicated that behavioral inhibition and, to some extent, TOM ability differentiated lower and higher trajectories from the normative stable-medium trajectory. More specifically, compared to the normative anxiety trajectory, children in the stable-high and stable-very high anxiety trajectories, exhibited *higher* levels of behavioral inhibition on Time 1, while children in the stable-low trajectory exhibited *lower* levels of behavioral inhibition than children in the normative trajectory. Further, children in the stable-very high trajectory displayed more advanced social-cognitive skills as compared to the normative trajectory group, whereas children in the stable-low trajectory scored significantly lower in this regard. A final finding was that children in the stable-very high trajectory could also be differentiated from the children in the normative trajectory by their higher levels of externalizing difficulties.

A similar pattern of findings was observed for social anxiety symptoms. That is, behavioral inhibition and social-cognitive abilities differentiated the stable-very high anxiety trajectory from the normative trajectory, with the children in the highest anxiety trajectory showing more behavioral inhibition and higher levels of TOM on Time 1. Further, children the low anxiety trajectory displayed lower behavioral inhibition scores than children in the normative trajectory.

Behavioral inhibition on Time 1 was also able to differentiate between the high and normative separation anxiety, generalized anxiety, and fear trajectories, with again the more anxious/fearful children showing significantly higher levels of behavioral inhibition. TOM ability differentiated between the children in the stable-low and the normative generalized anxiety trajectory either, with the low anxious children displaying lower levels of social-cognitive ability. Finally, children in the stable-high generalized anxiety trajectory displayed higher levels of externalizing difficulties than children in the normative anxiety trajectory.

Discussion

The present study is the first to investigate developmental patterns in various types of childhood anxiety disorder symptoms. The “person-centered”, group-based trajectory method as employed in this study made it possible to uncover developmental patterns in anxiety disorder symptoms that would not have been detected by examining mean-level changes or rank-order consistency (Nagin, 2005). In this way, subgroups of children were identified showing an atypical developmental course in anxiety symptoms over time. The results of this study revealed three to four distinguishable developmental trajectories for various types of anxiety symptoms in non-clinical school-aged children: Most of which were fairly stable over time. Most children belonged to the low or medium level anxiety

trajectories (which seem to reflect the normative course of anxiety symptoms), whereas a minority of children was assigned to the high and very high anxiety trajectories. These findings are congruent with previous research indicating that in this age range children's general anxiety symptoms tend to remain relatively stable over time (e.g., Ialongo et al., 1995; Keller et al., 1992) and follow up to 4 distinct developmental trajectories (Côté et al., 2009; Crocetti et al., 2009; Duchesne et al., 2008; Feng et al., 2008; Sterba et al., 2007).

It should be noted that most of the developmental trajectories as documented in this study were stable. This is not fully in keeping with previous studies which have generally also found anxiety trajectories with increasing and decreasing levels of anxiety/internalizing symptoms. However, there are some differences between the present study and previous research which might partly explain these differential findings. First, in our study we only assessed children's anxiety symptoms on three points-in-time over a two-year period, whereas previous studies (Côté et al., 2009; Crocetti et al., 2009; Duchesne et al., 2008; Feng et al., 2008; Sterba et al., 2007) collected data over a more extended period of time. It seems plausible that when there is less time between data collection points, more stable trajectories will be found. Second, the age range differed in the various studies. In our study, the sample consisted of children between age 4 and 9 (at study onset), whereas other studies (Côté et al., 2009) relied on populations of younger children (i.e., 1.5 to 5 year-olds) or adolescents (Crocetti et al., 2009). Therefore, a longitudinal study in which children are followed during their entire youth would provide a more detailed picture on the developmental course of various types of anxiety symptoms. Nonetheless, the results of this study and previous research indicate that differences in various types of anxiety problems can already been observed in children from the preschool years.

An additional aim of this study was to investigate the relation between developmental trajectories in children's anxiety disorder symptoms and a number of child-related variables known to be associated with the development of this type of child psychopathology. As hypothesized, behavioral inhibition on Time 1 emerged as a consistent predictor of the high anxiety trajectories and this was true for all types of anxiety disorder symptoms. Although some previous research findings (e.g., Gladstone et al., 2005; Muris et al., in press) indicate that behavioral inhibition is a specific risk factor for social anxiety problems, the current study shows that behavioral inhibition is not only a predictor of high social anxiety trajectories, but also of high trajectories for other types of anxiety disorder symptoms. Thus, behavioral inhibition seems to constitute a general risk factor associated with a wide range of anxiety problems in primary school-aged children.

Social-cognitive development was also positively associated with elevated total anxiety and social anxiety symptoms. This finding is in line with the sparse research showing that increasing levels of cognitive development seem to make children more prone to display certain types of anxiety symptoms, such as fear of anxiety-related physical symptoms, worry, and social-evaluative anxiety (Muris et al., 2007; Muris, Merckelbach, Meesters et al., 2002; Westenberg et al., 2004). Obviously, these anxiety phenomena require a certain amount of self-reflection and/or thinking capacity. Thus, it may well be the case that

social-cognitive skills are predictive of elevated levels of fear and anxiety, because such skills enable children to conceptualize threat and consequently perceive more situations in their daily lives as (potentially) threatening.

Finally, externalizing problems also predicted membership of the highest total anxiety and generalized anxiety trajectories. Children in these high trajectories displayed significantly higher levels of externalizing problems as compared to children in the normative anxiety trajectory. Note that this result is in line with previous findings showing that internalizing and externalizing problems frequently occur together (Mesman & Koot, 2000; Newman et al., 1996; Verhulst & Van der Ende, 1993), and as such is in line with the idea that children with the highest levels of anxiety problems are also prone to display externalizing difficulties.

Contrary to our hypothesis, difficulties with psychosocial adjustment did not emerge as a significant predictor of children's high anxiety trajectories. These findings are not in line with previous research (e.g., Ginsburg et al., 1998; Strauss et al., 1987), which demonstrated that anxious children display clear impairments in social and emotional functioning. Furthermore, this study neither found significant associations between prosocial behavior and trajectory classifications of various anxiety disorder symptoms. Apparently, children with high anxiety levels do not necessarily show clear deficits in social-emotional functioning.

It should be acknowledged that the current study suffers from various limitations. First, this study only employed one instrument either completed by parents or children for measuring each construct. Preferably, research of this type should rely on a multi-trait, multi-method approach. Second, the sample of children in this study predominantly had a Caucasian background and was of average socioeconomical status (SES). Future research should also include lower SES families and families with a migrant background to make the results more generalizable to the general population. Third, our sample size was not sufficiently large to test whether boys and girls follow similar developmental trajectories of anxiety disorder symptoms. This seems particularly relevant as previous studies have demonstrated gender differences in developmental trajectories of anxiety/internalizing symptoms (Crocetti et al., 2009; Hale et al., 2008; Sterba et al., 2007). Fourth, it is also important to note that the child-related variables that were included in this research are just a selection of a wide range of variables involved in childhood anxiety symptoms. Developmental psychopathology accounts propose that anxiety problems in children are the result from multiple factors, including genetics, parenting, cognitive biases, and learning experiences (Muris, 2007). Finally, as mentioned earlier, the age range (i.e., 4 to 11 years) of the population in this study was restricted and children were only followed for two years. Future research should include adolescents and need to follow children over an extended period in time to get a better and more precise understanding of the developmental course of anxiety symptoms during the entire youth.

Despite these limitations, this study is the first study to identify childhood developmental trajectories in various types of anxiety disorder symptoms employing a prospective design. It adds to the literature by providing a description of the development of childhood anxiety symptoms over the primary school-years and showing heterogeneity in

this development. Additionally, several child-related variables were identified that distinguished between typical and atypical development of these symptoms. Results of the current study also indicated that anxiety disorder symptoms tend to remain fairly stable over time. Altogether, these findings suggest that high-risk children with atypical, chronic high levels of anxiety symptoms can already be identified at an early age, and that a child-related variable such as behavioral inhibition can be reliably used to identify these children. This points at the importance of early interventions targeting these high-risk children to prevent that they will develop serious anxiety problems. Recently, Rapee, Kennedy, Ingram, Edwards, and Sweeney (2005) developed such an early intervention parent-education program aimed at preventing the development of anxiety in highly inhibited/withdrawn preschool children. Their program was shown to be effective: Children whose parents participated in the program showed a significantly greater decrease in anxiety diagnoses at a 1-year follow-up as compared to children of whom the parents did not receive an intervention. Therefore, future research should aim to replicate these findings and study preventive interventions and their impact on developmental trajectories in childhood anxiety symptom.

Chapter 6

The role of repetitive negative thoughts in the vulnerability for emotional problems in non-clinical children

This chapter is accepted for publication as: Broeren, S., Muris, P., Bouwmeester, S., Van der Heijden, K. B., & Abee, A. (in press). The role of repetitive negative thoughts in the vulnerability for emotional problems in non-clinical children. Journal of Child and Family Studies.

Abstract

The current study examined the role of repetitive negative thoughts in the vulnerability for emotional problems in non-clinical children aged 8-13 years (*N* = 158). Children completed self-report questionnaires for assessing (1) neuroticism and behavioral inhibition as indicators of general vulnerability, (2) worry and rumination which are two important manifestations of repetitive negative thoughts, and (3) emotional problems (i.e., anxiety, depression, and sleep difficulties). Results demonstrated that there were positive correlations between measures of general vulnerability, repetitive negative thoughts, and emotional problems. Further, support was found for a model in which worry and rumination acted as partial mediators in the relation between neuroticism and symptoms of anxiety and depression. In the case of sleep difficulties, no evidence was obtained for such a mediation model. In fact, data suggested that sleeping difficulties are better conceived as an epiphenomenon of high symptom levels of anxiety and depression or as a risk factor for the development of other types of psychopathology. Finally, besides neuroticism, the temperamental trait of behavioral inhibition appeared to play a unique direct role in the model predicting anxiety symptoms but not in the models predicting depressive symptoms or sleep difficulties. To conclude, the current findings seem to indicate that worry and rumination contribute to children's vulnerability for anxiety and depression.

Introduction

Emotional problems such as anxiety and depression are common among children. For example, Costello, Mustillo, Erkanli, Keeler, and Angold (2003) estimated in their longitudinal community study among children that by the age of 16, 7.7% of all children had met the diagnostic criteria for an anxiety disorder, whereas 7.3% had met the diagnostic criteria for any depressive disorder. These disorders are associated with significant impairment in social, emotional, and school functioning (Fleming & Offord, 1990; Strauss et al., 1987). Sleep problems have been found to frequently co-occur with symptoms of anxiety and depression (e.g., Ryan et al., 1987) and are even part of the DSM-IV criteria of major depressive disorder (MDD), post traumatic stress disorder, and generalized anxiety disorder (GAD; American Psychiatric Association, 2000). In children diagnosed with an anxiety disorder for instance, Alfano, Ginsberg, and Kingery (2007) noted that 88% reported at least one sleep-related difficulty (e.g., insomnia, sleep initiation and maintenance problems, nightmares). In a similar vein, Liu and colleagues (2007) observed that approximately two out of three children with MDD reported sleep difficulties. These high comorbidity figures have made some authors to propose that sleep difficulties should be seen as a direct consequence of other psychiatric problems rather than as a primary psychopathology on its own (Lichstein, 2006). However, research in adults seems to indicate that, contrary to the widely held belief that sleep difficulties can best be seen as "secondary psychopathology", insomnia can be better viewed as a primary psychopathology in that it often develops before its comorbid disorders such as MDD and anxiety disorders, and hence should be regarded as a risk factor for the development of these comorbid psychiatric disorders (Harvey, 2001b). Nonetheless, sleep disturbances can also have a large negative impact on the daily functioning of non-clinical children and adolescents, with disturbed sleep leading to significant daytime sleepiness, which in its turn is associated with behavioral difficulties, decreased positive mood, and impairments in academic performance and attention (Fallone, Owens, & Deane, 2002). Therefore, it is not only important to investigate factors involved in the etiology and maintenance of anxiety and depression, but also factors involved in the pathogenesis of sleep difficulties.

Repetitive negative thoughts are generally viewed as a specific cognitive vulnerability factor that seems to be involved in the etiology and maintenance of emotional problems. Two prominent examples of repetitive negative thoughts are worry and rumination. Worry can be defined as a relatively uncontrollable chain of thoughts about the possible negative outcome of future events (Borkovec, Robinson, Pruzinsky, & DePree, 1983), whereas rumination can be defined as a tendency to repeatedly think about one's feelings and problems (Nolen-Hoeksema, 1998; Nolen-Hoeksema, 2000; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). The concepts of worry and rumination seem to show considerable overlap (McLaughlin, Sibrava, Behar, & Borkovec, 2006; Nolen-Hoeksema et al., 2008): Both constructs seem to tap repetitive negative thoughts that are focused on the self (Segerstrom, Tsao, Alden, & Craske, 2000), share an over-general style of thinking (Watkins & Teasdale, 2001), and are associated with cognitive inflexibility and poor problem-solving (e.g., Davey, 1994; Watkins & Moulds, 2005). However, both phenomena differ in their orientation and the type of threat they focus on: While worry

tends to be more future-oriented and focuses on events that might occur, but have not occurred yet, rumination involves thinking about past events and wondering about the causes and meaning of those events. Additionally, various studies have shown that worry and rumination are related but statistically distinguishable constructs (e.g., Fresco, Frankel, Mennin, Turk, & Heimberg, 2002; Hong, 2007).

There is increasing evidence that both worry and rumination are already discernable in childhood and are also possibly linked to symptoms of anxiety and depression in youths. For example, in a non-clinical sample of 7- to 12-year-old children, Silverman, La Greca, and Wasserstein (1995) showed that worry was significantly correlated with anxiety. Further, it was found that various worry parameters were able to successfully discriminate between high and low anxious children, thereby providing further support for the intimate link between worry and anxiety. Comparable results have been documented in research investigating the relation between rumination and childhood depression. Exemplary is a study by Abela, Brozina, and Haigh (2002), who explored the relation between rumination and depressive symptoms in young people and demonstrated that rumination scores prospectively predicted increases in depressive symptoms over a 6-week period. A recent meta-analytic review by Rood, Roelofs, Bögels, Nolen-Hoeksema, and Schouten (2009) which assessed the cross-sectional and longitudinal relations between emotion-focused rumination and depressive symptoms also indicated that rumination was associated with concurrent and future levels of depression in children and adolescents.

However, while most researchers tend to relate worry exclusively to anxiety and rumination solely to depression, there is now an increasing amount of research data showing that worry is also related to depression, whereas rumination is also connected to anxiety, and this is not only the case for adults (e.g., Starcevic, 1995) but also for youths. For instance, Muris, Roelofs, Meesters, and Boomsma (2004) conducted a study on the relations between worry, rumination, anxiety, and depression in a sample of young non-clinical adolescents. Results indicated that worry and rumination displayed different features, but were nevertheless substantially related to each other. In addition, it was found that both types of repetitive negative thoughts were significantly related to anxiety as well as depression, with worry being the most convincing correlate of these emotional symptoms (see also Muris, Fokke, & Kwik, 2009).

While the link between worry and rumination on the one hand, and emotional problems on the other hand gets increasing research attention, so far, no studies have been conducted to examine the link between these repetitive negative thoughts and sleep difficulties in children. Nevertheless, it seems intuitively plausible that repetitive negative thought processes are involved in such problems and there is tentative evidence from a study in adults to support this notion. Evidence is found that rumination is related to lower (subjective) sleep quality (Guastella & Moulds, 2007; Kirkegaard Thomsen, Mehlsen, Christensen, & Zachariae, 2003) and sleep difficulties (Carney, Edinger, Meyer, Lindman, & Istre, 2006), whereas pre-sleep worries seem to be associated with insomnia (Harvey, 2001a) and prolonged self-reported and objective sleep latencies (Harvey, 2000; Wicklow & Espie, 2000).

Recently, Muris and colleagues (2005) have formulated a theoretical model on the role of repetitive negative thoughts in emotional problems which is based on the notion of Segerstrom et al. (2000) that worry and rumination seem to represent one underlying cognitive factor and the observation that both constructs are substantially linked to neuroticism. In this model, worry and rumination are both seen as cognitive factors that follow from the general vulnerability factor of neuroticism (Eysenck, 1967), which predisposes individuals to develop high symptom levels of anxiety and depression. Indeed, Muris et al. (2005) obtained support for this model in a sample of undergraduate students as they demonstrated that the cognitive factors of worry and rumination acted as mediators in the relationship between neuroticism and symptoms of anxiety and depression. However, it has to be kept in mind that the data of this study were correlational in nature, so no cause-effect relations could be established, although from a theoretical point of view this chain of relationships among these variables seems plausible (e.g., Norton, Sexton, Walker, & Norton, 2005; Sexton, Norton, Walker, & Norton, 2003). Furthermore, Roelofs, Huibers, Peeters, Arntz, and van Os (2008) also found support for this model in a sample of clinically depressed individuals. The results of their study showed that worry and rumination both acted as mediators in the relation between neuroticism and symptoms of anxiety and depression. However, when worry and rumination were entered simultaneously in a mediation model, only rumination was found to mediate the relation between neuroticism and both types of emotional symptoms.

Further, while it can be assumed that neuroticism serves as a vulnerability factor for childhood anxiety symptoms, behavioral inhibition, which can be defined as the tendency to withdraw from new situations (Kagan, 1994), may even be more important when studying etiological models of this type of psychopathology (Fox et al., 2005). Behavioral inhibition is sometimes seen as the perceptible (behavioral) manifestation of temperament or personality traits such as emotionality, negative affectivity, or neuroticism (e.g., Craske, 1997; Lonigan & Phillips, 2001) and there is indeed empirical evidence for a link between behavioral inhibition and neuroticism (Muris, Bos et al., 2009; Muris & Dietvorst, 2006). However, other research shows that behavioral inhibition might better be seen as the *combination* of high neuroticism and low extraversion or regulative traits (Muris & Dietvorst, 2006; Van Brakel & Muris, 2006). Children scoring high on behavioral inhibition seem to be at heightened risk for developing an anxiety disorder (e.g., Biederman et al., 2001; Biederman et al., 1993). So far, research has emphasized that behavioral inhibition is a risk factor for developing childhood anxiety disorders. However, there are two studies by Muris and colleagues who also link behavioral inhibition to depressive symptoms (Muris, Merckelbach, Schmidt, Gadet, & Bogie, 2001; Muris, Merckelbach, Wessel, & van de Ven, 1999). These studies showed that high behaviorally inhibited children not only displayed heightened levels of anxiety but also elevated levels of depressive symptoms. The link between behavioral inhibition and sleep problems has not been studied yet.

Although the role of worry and rumination in the etiology of emotional problems is increasingly investigated in youths (Muris, Fokke et al., 2009; Muris et al., 2004), so far no study can be found that examined the mediation model "neuroticism → wor-

ry/rumination → anxiety/depression" in a child population, notwithstanding the fact that research has shown that repetitive negative thoughts are already present in children. Better insight into the pathogenic mechanisms of emotional problems might contribute to the development of more optimal psychological interventions. For instance, if rumination and worry play an important role in the pathogenesis of anxiety and depression, it would support the importance of cognitive treatment approaches directed at correction of these cognitive factors. With this in mind the present study was conducted. Children aged 8 to 12 years (*N* = 158) completed a survey containing scales for measuring neuroticism, worry and rumination, and symptoms of emotional problems. Besides a correlational analysis of the relations among these variables and a test of the hypothesized mediation model, a number of additional issues were explored. To begin with, we not only included measures of anxiety and depression as symptom variables, but also an index of children's sleep difficulties, although we are well aware of the possible overlap between sleep problems and symptoms of MDD and GAD. This provided the opportunity for a first exploration of the links between worry and rumination and sleep difficulties in a population of youths, and to test whether the mediation model described earlier also applies to this type of emotional problem. Further, while it can be assumed that neuroticism serves as a vulnerability factor for childhood anxiety and depressive symptoms, behavioral inhibition might also play an important role in the etiology of psychopathology in children, especially anxiety symptoms pathology (Fox et al., 2005). Therefore, it would be interesting to examine whether this temperament variable accounts for unique variance (even when controlling for neuroticism) in the prediction of repetitive negative thoughts and symptoms of psychopathology, and anxiety symptoms in particular.

We hypothesized that in this sample of non-clinical children (a) neuroticism would be positively associated with symptoms of anxiety, depression, and sleep problems, (b) neuroticism would also be positively associated with worry and rumination, (c) both worry and rumination would be positively associated with symptoms of anxiety, depression, and sleep problems, and (d) the associations between neuroticism and the various types of psychopathology would be reduced (partial mediation) or eliminated (full mediation) when controlling for the mediating variables of worry and rumination. Further, we predicted that behavioral inhibition would remain a significant predictor of anxiety symptoms when controlling for neuroticism, while we explored whether this temperament characteristic has unique predictive value for depressive symptoms or sleep difficulties.

Method

Participants

One-hundred and fifty-eight children (84 boys and 74 girls) participated in this study. The mean age of the children was 10.73 years (*SD* = 1.01; range 8-13). The majority of the children were from original Dutch descent (98.10%). Children were recruited from four primary schools in Zwijndrecht and Barendrecht, the Netherlands. Prior to the study parents were asked to fill in an informed consent form; 38% of the invited parents agreed

to participate. This study was approved by the local ethical committee of the Institute of Psychology of the Erasmus University Rotterdam.

Assessment

A subscale of the *Big Five Questionnaire for Children* (BFQ-C; Barbaranelli, Caprara, Rabasca, & Pastorelli, 2003) was employed to measure the personality trait of neuroticism. Items such as "I get nervous for silly things" and "I am in a bad mood" have to be rated on a 4-point Likert scale with 1 = *not true* to 4 = *very true*, and a total score can be computed by summing all items. Previous research has demonstrated that this subscale of the BFQ-C is reliable in terms of internal consistency (with Cronbach's alpha = .83) and possesses adequate validity as demonstrated by a positive correlation (r = .71) with its counterpart subscale of the Junior version of the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1985; see Muris, Meesters, & Diederen, 2005).

Behavioral inhibition was measured with the *Behavioral Inhibition Questionnaire for Children - Short Form* (BIQ-SF; Bishop et al., 2003), which consists of 14 items assessing children's inhibited behaviors in social and non-social contexts (e.g., "I am very quiet with adult strangers", "I am cautious in activities that involve physical challenge"). Items are rated on a 6-point scale ranging from 1 = *hardly ever* to 6 = *almost always*. A total BIQ-C-SF score can be calculated by summing across all items. The self-report version of the BIQ-C-SF has not been used in research before, but Edwards (2007) examined the psychometric properties of the parent version of this questionnaire (BIQ-SF) and documented good internal consistency (with a Cronbach's alpha of .89) and validity as indicated by a positive correlation (r = .87) with another measure of inhibited and shy behavior (i.e., the Short Temperament Scale for Children; Prior et al., 1989).

The *Penn State Worry Questionnaire for Children* (PSWQ-C; Chorpita, Tracey, Brown, Collica, & Barlow, 1997) is a 14-item scale for measuring the tendency to engage in excessive, generalized, and uncontrollable worry. Items such as "Once I start worrying, I can't stop" and "I notice that I have been worrying about things" are rated on a 4-point Likert-scale with 1 = *not at all true* and 4 = *always true*. A PSWQ-C total score can be computed by summing across all items. The psychometric properties of the PSWQ-C are found to be adequate. That is, the questionnaire has been shown to possess adequate reliability in terms of internal consistency (with Cronbach's alphas in the .80 range) and temporal stability (r = .91) over a one-week interval (Chorpita et al., 1997). In addition, the PWSQ-C correlates positively with scores on anxiety questionnaires (rs between .44 - .71), which supports the validity of the scale.

Rumination was assessed with the *Children's Response Style Scale* (CRSS; Ziegert & Kistner, 2002). This questionnaire contains 10 items for measuring the ruminative response styles of children when confronted with feelings of depression (e.g., "When I feel sad, I think back to other times I felt this way"). Items have to be scored on a 5-point scale with 1 = *never* and 5 = *always.* Ziegert and Kistner (2002) have demonstrated that the rumination scale of the CRSS is reliable in terms of internal consistency (Cronbach's α = .81) and test-retest stability (3-week period: r = .69). Furthermore, CRSS rumination scores were positively associated with depression (r = .25) and an alternative self-report

measure of the ruminative response style (*r* = .39), which provides at least some support for the criterion and construct validity.

The *Revised Children's Anxiety and Depression Scale* (RCADS; Chorpita, Yim, Moffit, Umemoto, & Francis, 2000) measures symptoms of DSM-IV-defined anxiety disorders and major depression. The shortened version of this scale (Muris, Meesters, & Schouten, 2002) consists of 25 items (e.g., "I am afraid to talk in front of class" and "I feel that nothing is much fun anymore") that have to be rated on a 4-point scale with 1 = *never* to 4 = *always*. Total RCADS anxiety and depression scores can be obtained by summing across relevant items. The psychometric properties of the short version of the RCADS are shown to be adequate (Muris, Meesters et al., 2002). That is, the RCADS subscales display sufficient to good internal consistency (with Cronbach's alphas between .71 and .83), except from the 5-item depression subscale which shows moderate internal consistency (Cronbach's alpha = .65), and all scales show adequate test-retest stability (one week period: *r*s between .79 and .87). Further, positive associations (*r*s between .27 and .78) have been found between various RCADS scales and other measures of childhood anxiety and depression (Chorpita et al., 2000; Muris, Meesters et al., 2002).

The *Sleep Self Report* (SSR; Owens, Maxim, Nobile, McGuinn, & Msall, 2000) is a 26-item self-report questionnaire for assessing various sleep difficulties in children, namely problematic sleep behavior (e.g., "Do you wake up at night when your parents think you are asleep?"), sleep onset problems (e.g., "Do you fall asleep in about 20 minutes?"), and daytime sleepiness (e.g., "Do you feel sleepy during the day?"). After recoding reversed items, a total score can be computed by summing all relevant items. So far, few studies have been carried out to investigate the psychometric properties of the SSR. Research by Owens et al. (2000) has shown that children's SSR scores are positively associated with scores on a parent measure of sleeping difficulties (*r*s between .35 and 1.00). In the present study, a SSR total scale was employed, which displayed good internal consistency (Cronbach's α = .80).

Procedure

Parents received an informed consent letter via their child's teacher. After obtaining informed consent from their parents, children were visited at school by a research assistant who asked them to complete a survey, which contained the BIQ-C-SF, BFQ-C, PSWQ-C, CRSS, RCADS, and SSR. During the administration of the questionnaires, the research assistant was present to answer questions if necessary and to ensure confidentiality and independent responding. Children were rewarded with a small present (e.g., booklet, pen) in return for their participation.

Data analysis

Data were analyzed by means of correlational analyses and independent *t*-tests. To control for type I error, *p*-values were adjusted to the number of tests that were carried out for the main analyses. Furthermore, a number of multiple mediator models were tested. The hypothesized mediation models were estimated using regression analyses in combination with a bootstrapping procedure. The personality trait of neuroticism was used as the independent variable in the mediation models. In the case of anxiety symptoms, an additional model was tested in which not only neuroticism was included as an

independent variable but also behavioral inhibition. Worry and rumination were the mediators in the model, whereas one type of psychopathology symptoms (i.e., anxiety, depression, or sleep difficulties) was employed as the dependent variable. To reduce the chance of a type I error, alpha was here also adjusted to .05/9 (i.e., the total number of models tested in the mediation analyses). Furthermore, the regression weights and standard errors for the direct effects (i.e., between the independent and dependent variable) were estimated in the usual way, that is, by means of regression analysis. However, this was not possible for the indirect effects (i.e., the links between the independent variable and the mediators and between the mediators and the dependent variable), because these effects have to be calculated from the product of two direct effects and the distribution of this product can not assumed to be normal (Preacher & Hayes, 2008). This non-normality is particularly problematic when the sample size is moderate, as was the case in the present study (i.e., *N* = 158). In addition, it should be mentioned that the Sobel (1986) test, which is commonly used to examine indirect effects and mediation hypotheses, also requires a normal distribution of the variables involved. Because of the relatively small sample size and the intention to test the effects of two mediators simultaneously, it was not recommendable to employ the Sobel test. To explore the indirect effects and to test the mediation hypotheses, we employed Preacher and Hayes' (2008) bootstrapping procedure by means of a special macro that was programmed in SPSS. This macro was used to estimate a 95% (bias corrected) confidence interval for the total and specific indirect effects of the mediators. When applicable, pairwise contrasts of indirect effects were used to test whether differences in the size of indirect effects were statistically significant.

Results

General findings

Before addressing the main results of the study, a number of general findings will be reported. To begin with, as can be seen in Table 1, questionnaires were generally reliable in terms of internal consistency, with most Cronbach's alpha coefficients being > .70. Only the RCADS depression subscale displayed a lower internal consistency coefficient (Cronbach's α = .58), which could have been due to the fact that only 5 items were included in this subscale that measured quite different symptoms of major depressive disorders (e.g., "I feel that nothing is much fun anymore" and "I feel like I don't want to move"). Further, significant gender differences were found for PSWQ-C worry, CRSS rumination, and RCADS anxiety symptoms. More precisely, girls displayed higher levels of worry (t[128.84] = 3.18, p < .01), rumination (t[156] = 2.29, p < .05), and anxiety symptoms (t[135.07] = 2.49, p < .05) as compared to boys (see Table 1). Finally, age was negatively associated with RCADS depression (r = -.21, p < .01) and SSR Total sleep difficulties (r = -.22, p < .01).

Table 1. Descriptive statistics (means, standard deviations, gender differences, and reliability coefficients) of the measures used in this study

	Total group (*N* = 158)	Boys (*n* = 84)	Girls (*n* = 74)	α
BFQ-C Neuroticism	21.24 (5.71)	$20.93\ (5.47)_a$	$21.59\ (5.97)_a$	.84
BIQ-C-SF Behavioral inhibition	33.12 (13.03)	$32.95\ (13.13)_a$	$33.31\ (13.00)_a$	.89
PSWQ-C Worry	23.99 (8.71)	$21.94\ (6.95)_a$	$26.32\ (9.89)_b$	.95
CRSS Rumination	24.67 (8.63)	$23.21\ (8.01)_a$	$26.32\ (9.06)_b$	.90
RCADS Anxiety	30.16 (6.85)	$28.89\ (5.80)_a$	$31.61\ (7.66)_b$	.87
RCADS Depression	7.28 (1.76)	$7.15\ (1.65)_a$	$7.43\ (1.89)_a$	.58
SSR Total sleep difficulties	33.43 (6.61)	$34.94\ (6.63)_a$	$35.99\ (6.94)_a$	.80

Note. BFQ-C = Big Five Questionnaire for Children, BIQ-C-SF = Behavioral Inhibition Questionnaire for Children - Short Form, PSWQ-C = Penn State Worry Questionnaire for Children, CRSS = Children's Response Styles Scale, RCADS = Revised Child Anxiety and Depression Scale, SSR = Sleep Self Report. Means with different subscripts differ at $p < .05$.

Table 2. Partial correlations between the different measures employed in this study for the total sample (controlling for age and gender) and for boys and girls separately (controlling for age)

	1	2	3	4	5	6	1. Boys/girls	2. Boys/girls	3. Boys/girls	4. Boys/girls	5. Boys/girls	6. Boys/girls
1. BFQ-C Neuroticism												
2. BIQ-C-SF BI	.48*						.24/.71*					
3. PSWQ-C Worry	.57*	.41*					.55*/.61*	.30*/.50*				
4. CRSS Rumination	.47*	.37*	.57*				.36*/.61*	.21/.52*	.61*/.59*			
5. RCADS Anxiety	.63*	.53*	.71*	.62*			.51*/.76*	.45*/.60*	.80*/.70*	.52*/.74*		
6. RCADS Depression	.63*	.43*	.54*	.44*	.65*		.53*/.70*	.32*/.53*	.48*/.59*	.37*/.52*	.57*/.72*	
7. SSR Total Sleep difficulties	.48*	.30*	.36*	.27*	.51*	.51*	.30*/.65*	.18/.43*	.19/48*	.15/.44*	.40*/.62*	.29*/.69*

Note. *N* = 158; *n* boys = 84, *n* girls = 74. BFQ-C = Big Five Questionnaire for Children, BIQ-C-SF = Behavioral Inhibition Questionnaire for Children - Short Form, BI = Behavioral Inhibition; PSWQ-C = Penn State Worry Questionnaire for Children, CRSS = Children's Response Styles Scale, RCADS = Revised Child Anxiety and Depression Scale, SSR = Sleep Self Report. * $p < .01$.

Correlational analysis

Table 2 shows the partial correlations (while controlling for age and gender) between the variables measured in this study. First, the personality trait of neuroticism was strongly and positively correlated with the temperamental trait of behavioral inhibition (r = .48, p < .001). Second, rumination and worry scores were also strongly and positively associated (r = .57, p < .001). Third, substantial positive correlations were found between neuroticism and symptoms of anxiety (r = .63, p < .001), depression (r = .63, p < .001), and sleep difficulties (r = .48, p < .001), whereas behavioral inhibition was clearly related to symptoms of anxiety (r = .53, p < .001). Fourth, positive associations were observed between neuroticism and behavioral inhibition, on the one hand, and the presumed mediators of worry and rumination on the other hand (rs being between .37 and .57, all ps < .001). Additionally, the mediators worry and rumination were also positively associated with the dependent variables (i.e., various types of emotional problems: anxiety, depression, and sleep difficulties; rs being between .27 and .71, all ps < .001).

Table 2 also shows partial correlations (while controlling for age) for boys and girls separately. As can be seen, the same pattern of correlations as described above was observed, although in boys generally somewhat lower correlations among various concepts were observed than in girls.

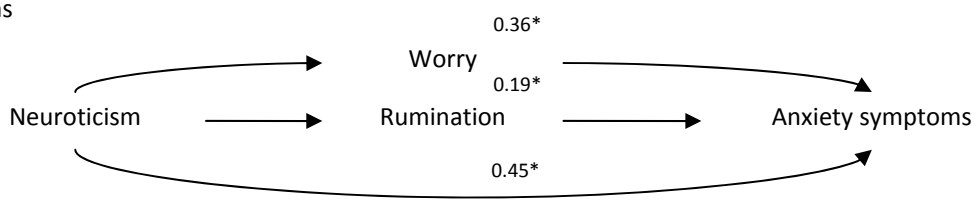
Mediation analyses

***Anxiety symptoms*.** The first model examined whether the relation between neuroticism and anxiety symptoms was mediated by worry and rumination. Figure 1 displays this hypothesized mediation model and its main results. A significant relation was found between neuroticism and anxiety symptoms (B = .78, SE = .07, p < .001). Neuroticism, worry, and rumination together explained 65.51% of the variance in anxiety symptoms. Forty-five percent of this explained variance consisted of the direct relation between neuroticism and anxiety and this direct link appeared to be significant (B = .35, SE = .07, p < .001). The remaining 55% of the explained variance consisted of the total indirect effect through worry and rumination. The total indirect effect from neuroticism through worry and rumination to anxiety symptoms was significant (95% CI [.29 - .57]). Additionally, the specific indirect effects via worry (95% CI [.14 - .42]) and rumination (95% CI [.06 - .26]) were also significant, and accounted for respectively 36% and 19% of the variance. A pairwise contrast indicated that there was no significant difference in the size of these indirect effects (95% CI [-.07 - .32]), which means that worry and rumination did not made a different contribution to the model.

Given the high comorbidity between anxiety and depression, this analysis was also conducted including depressive symptoms as a covariate. Results were similar to the result of the previous analyses: there was still a significant relation between neuroticism and anxiety symptoms (B = .48, SE = .09, p < .001). Neuroticism, worry and rumination together explained 69% of the variance in anxiety symptoms (while controlling for depressive symptoms). Forty-five percent of this explained variance consisted of the direct relation between neuroticism and anxiety and this direct link appeared to be significant (B = .22, SE = .08, p < .01). The remaining 55% of the explained variance consisted of the total indirect effect through worry and rumination. The total indirect

effect from neuroticism through worry and rumination to anxiety symptoms was significant (95% CI [.14 - .42]). Additionally, the specific indirect effects via worry (95% CI [.07 - .31]) and rumination (95% CI [.04 - .18]) were also significant, and accounted for respectively 36% and 19% of the variance. A pairwise contrast indicated that there was no significant difference in the size of these indirect effects (95% CI [-.04 - .22]), thus that worry and rumination did not have a significantly different contribution to the model. These findings indicate that (even when controlling for depressive symptoms) worry and rumination together indeed explained unique variance in anxiety symptoms over and above the personality trait of neuroticism, and that both variables acted as partial mediators in the relation between neuroticism and anxiety symptoms in children.

Figure 1. Mediation effects of rumination and worry on the relation between neuroticism and anxiety symptoms



Note. Numbers in the figure are percentages of explained variance in anxiety symptoms.

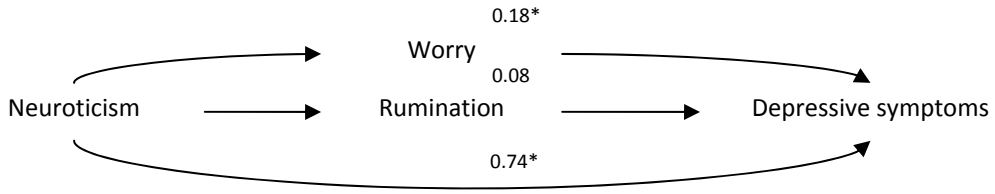
* Path significant at $p < .01$.

Analyses that included behavioral inhibition instead of neuroticism in the mediation model generally yielded similar findings. That is, the relation between behavioral inhibition and anxiety symptoms was partly mediated by worry and rumination. Additionally, a mediation model was tested in which the relation between behavioral inhibition and anxiety symptoms was examined while controlling for neuroticism to examine whether behavioral inhibition still had a significant effect when controlling for neuroticism. Behavioral inhibition, worry, and rumination together explained 65% of the variance in anxiety scores (while controlling for neuroticism). Of the total effect (while controlling for neuroticism), 67% of the variance could be explained by the direct relation between behavioral inhibition and anxiety symptoms ($B = .10$, $SE = .03$, $p < .001$), whereas the remaining 33% of the explained variance consisted of the indirect effect through worry (accounting for 20% of this explained variance) and rumination (accounting for 13%). However, the total indirect effect was not significant (95% CI [-.00 - .10]) and neither were the two specific indirect effects. These findings indicate that when controlling for neuroticism, the temperamental trait of behavioral inhibition still played a unique and significant direct role in the prediction of anxiety symptoms, but had no indirect effect via the mediators of worry and rumination. Additionally, adding symptoms of depression to the analysis as a covariate yielded comparable results.

***Symptoms of depression*.** The next model examined whether worry and rumination mediated the relation between neuroticism and depressive symptoms. Results revealed a significant relation between neuroticism and depression ($B = .20$, $SE = .02$, $p < .001$). Neuroticism, worry, and rumination together explained 45% of the variance in depressive

symptoms. As shown in Figure 2, 74% of this variance was explained by the direct relation between neuroticism and depression and this direct relation was significant (*B* = .14, *SE* = .02, *p* < .001). The remaining 26% was accounted for by the total indirect effect of the mediators worry and rumination, which was also found to be significant (95% CI [.02 - .09]). A significant proportion of 18% was accounted for by worry (95% CI [.00 - .07]), whereas only 8% was explained by rumination, an effect which was not significant (95% CI [-.01 - .04]). These findings indicate that part of the relation between neuroticism and depressive symptoms was mediated by worry.

Figure 2. Mediation effects of rumination and worry on the relation between neuroticism and depressive symptoms



Note. Numbers in the figure are percentages of explained variance in depressive symptoms.
* Path significant at *p* < .01.

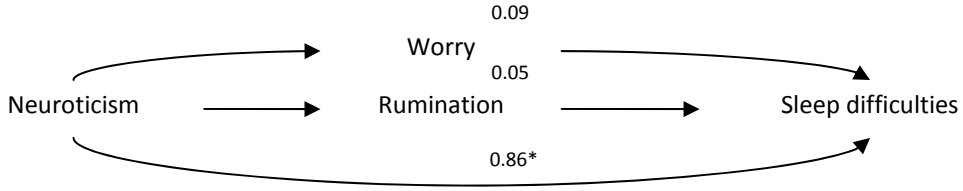
However, when adding anxiety symptoms as a covariate to this model, a somewhat different picture emerged. Although the relation between neuroticism and depression (*B* = .11, *SE* = .02, *p* < .001) was still significant and neuroticism, worry, and rumination together explained 50% of the variance in depressive symptoms (when controlling for anxiety symptoms), now 98% of this variance was explained by the direct relation between neuroticism and depression and this direct relation was significant (*B* = .11, *SE* = .03, *p* < .001). The remaining 2% was accounted for by the total indirect effect of the mediators worry and rumination, which appeared to be non-significant (95% CI [-.01 - .02]) and the same was true for the unique indirect effects of worry (95% CI [-.01 - .01]) and rumination (95% CI [-.01 - .01]). These findings indicate the relation between neuroticism and depressive symptoms was not mediated by worry or rumination when controlling for anxiety symptoms.

Additionally, a model including behavioral inhibition instead of neuroticism as independent variable was also tested to examine whether behavioral inhibition also plays a role in other types of psychopathology such as depression. This analysis indicated that there was no significant relation between behavioral inhibition and depression when controlling for neuroticism (*B* = .06, *SE* = .01, *p* < .001). Moreover, behavioral inhibition, worry, and rumination together explained only 18% of the variance in depression scores when controlling for neuroticism. Of the total effect, 38% of the variance could be explained by the indirect effect through worry and rumination (95% CI [.02 - .11]), with worry accounting for 26% of this explained variance (95% CI [.01 - .09]) and rumination for 12% (95% CI [-.01 - .07]), with the latter effect being non-significant. These findings indicate that when controlling for neuroticism, the temperamental trait of behavioral inhibition did not play a unique direct role in the prediction of depression symptoms, but

there was a significant indirect effect of behavioral inhibition on depressive symptoms via the mediator of worry. When adding anxiety symptoms as a covariate to this model the relation between behavioral inhibition and depression was no longer significant (*B* = .01, *SE* = .01, *p* = .30) and neither behavioral inhibition (*B* = .01, *SE* = .01, *p* = .30, 98% of the explained variance) nor worry (95% CI [-.003 - .002]) and rumination (95% CI [-.003 - .001]) were significantly associated with depressive symptoms. These findings point out that when controlling for neuroticism and anxiety symptoms, the temperamental trait of behavioral inhibition did not play a role in the prediction of depression symptoms.

***Sleep difficulties*.** Results indicated that there was a significant relation between neuroticism and sleep difficulties (*B* = .59, *SE* = .08, *p* < .001). Neuroticism, worry, and rumination together accounted for 27% of the variance in sleep difficulties (see Figure 3). Eighty-six percent of this explained variance consisted of the direct pathway between neuroticism and sleep difficulties. This direct relation was significant (*B* = .51, *SE* = .10, *p* < .001). The remaining 14% was explained by the indirect path via worry (9%) and rumination (5%). However, this total indirect effect was not significant (95% CI [-.05 - .21]), and this was also true for the specific indirect effects of worry (95% CI [-.09 - .19]) and rumination (95% CI [-.08 - .13]). Thus, neither worry nor rumination emerged as mediators in the relationship between neuroticism and sleep difficulties.

Figure 3. Mediation effects of rumination and worry on the relation between neuroticism and sleep difficulties



Note. Numbers in the figure are percentages of explained variance in sleep difficulties.
* Path significant at *p* < .01.

Further, a model including behavioral inhibition instead of neuroticism as independent variable was also tested for sleeping difficulties. Results indicated that there was no significant relation between behavioral inhibition and sleep difficulties. Behavioral inhibition, worry, and rumination together accounted for 18% of the variance in sleep difficulties. Sixty-two percent of this explained variance consisted of the direct pathway between behavioral inhibition and sleep difficulties, whereas the remaining 38% was explained by the indirect path via worry (26%) and rumination (12%). Although the direct effect of behavioral inhibition on sleep difficulties was not significant, the total indirect effect was significant (95% CI [.02 - .11]), and this was also the case for the specific indirect effect of worry (95% CI [.01 - .09]) but not for rumination (95% CI [-.01 - .07]). However, when controlling for neuroticism in this model, no significant direct effect of behavioral inhibition or indirect effect of worry or rumination on sleep difficulties was found, only a significant partial effect of neuroticism on sleep difficulties (*B* = .47, *SE* = .11,

$p < .001$). These findings indicate that when controlling for neuroticism, the temperamental trait of behavioral inhibition did not have a unique direct effect or an indirect effect via worry and/or rumination on sleep difficulties.

Additionally, as sleep difficulties in children may arise as a consequence of symptoms of anxiety and depression, or may predispose children to symptoms of psychopathology, further models were examined in which these ideas were statistically tested. First, a mediation model was tested in which symptoms of anxiety and depression mediated the link between neuroticism and sleep difficulties. As noted previously, the relation between neuroticism and sleep difficulties was significant ($B = .59$, $SE = .08$, $p < .001$). In this model, neuroticism, anxiety, and depression together explained 37% of the variance in sleep difficulties scores. Thirty-six percent of this explained variance ran through the direct pathway between neuroticism and sleep difficulties, but this relation was not significant ($B = .21$, $SE = .11$, $p = .05$). The remaining 64% of the variance in sleep difficulties scores was explained by the indirect pathway via depression and anxiety. The total indirect effect was significant (95% CI [.22 - .57]) and this was also true for the specific indirect effects via depression (95% CI [.06 - .32]) and anxiety (95% CI [.05 - .34]). Thirty-four percent of the variance was accounted for by the indirect effect via depression, whereas 30% was explained by the indirect effect via anxiety. These findings indicate that symptoms of anxiety and depression mediated the relation between neuroticism and sleep difficulties.

Second, two models were tested in which sleep difficulties mediated the link between neuroticism and symptoms of depression and anxiety. In the first model, which included symptoms of anxiety, the relation between neuroticism and anxiety symptoms was significant ($B = .61$, $SE = .08$, $p < .001$) and neuroticism and sleep difficulties together explained 48% of the variance in anxiety scores. Seventy-nine percent of this explained variance ran through the direct pathway between neuroticism and anxiety problems ($B = .78$, $SE = .07$, $p < .001$), whereas the remaining 21% of the variance was explained by the indirect pathway via sleep difficulties. This indirect effect was significant (95% CI [.08 - .29]). Thus, sleep difficulties emerged as a (partial) mediator of the relation between neuroticism and anxiety problems.

The second model included symptoms of depression instead of anxiety as outcome measure. Results indicated that neuroticism and sleep difficulties together accounted for 47% of the variance in depressive symptoms. Seventy-six percent of this explained variance consisted of the direct pathway between neuroticism and depression, whereas the remaining 24% was explained by the indirect path via sleep difficulties. The direct effect ($B = .15$, $SE = .02$, $p < .001$) and the indirect effect (95% CI [.02 - .08]) were both significant. That is, sleep problems emerged as a (partial) mediator of the relation between neuroticism and depressive symptoms.

Discussion

The present study examined the role of worry and rumination as indicators of repetitive negative thoughts in the vulnerability for emotional problems in non-clinical children aged 8 to 13 years. The main results can be catalogued as follows. To begin with, as

hypothesized, significant positive correlations between measures of general vulnerability (neuroticism), repetitive negative thoughts (worry and rumination), and various types of emotional symptoms (anxiety, depression, and sleep difficulties) were found. Further and most importantly, support was found for the hypothesized model in which worry and rumination partly mediated the relation between neuroticism and symptoms of anxiety and depression. This finding is not only in line with the notion that repetitive negative thoughts are involved in the pathogenesis of emotional symptoms in children (see for reviews Abela & Hankin, 2007; Muris, 2007), but also indicates that worry and rumination in young people seem to play a similar role in the vulnerability for such problems as in adults (Muris, Roelofs et al., 2005; Roelofs et al., 2008).

The personality trait of neuroticism has been widely acknowledged as a general vulnerability factor that makes individuals prone to exhibit symptoms of psychopathology (e.g., Eysenck & Eysenck, 1985), and the current data indicate that this also appears to be the case in youths (see for reviews Muris & Ollendick, 2005; Nigg, 2006). Meanwhile, several authors have criticized this notion by pointing out that neuroticism is in fact "a non-informative marker of vulnerability to psychopathology", because it is largely unknown what underlying mechanisms cause the high symptom levels of individuals who display the typical features of this trait (Ormel, Rosmalen, & Farmer, 2004, p. 906). As such, it is of interest to note that researchers have begun to examine whether vulnerability for emotional problems can be better perceived in terms of a hierarchical model in which the general vulnerability factor of neuroticism is associated with a variety of specific vulnerability markers, which in turn determine the specific categories of psychopathology (e.g., Norton & Mehta, 2007; Sexton et al., 2003). In line with this, the model described by Muris and colleagues (2005) proposes that repetitive negative thoughts should be seen as a cognitive concomitant of neuroticism (cf. Segerstrom et al., 2000), which predisposes individuals to develop symptoms of anxiety and depression. To the present authors' knowledge, the present data are the first to support that such a hierarchical model of the vulnerability for emotional problems also applies to youths. Obviously, more research is needed to investigate other variables (e.g., anxiety sensitivity, intolerance of uncertainty, meta-cognition; see Norton & Mehta, 2007; Sexton et al., 2003) that may act as mediators in the link between general vulnerability (i.e., neuroticism) and various types of internalizing problems in children and adolescents.

The hypothesized mediation model "neuroticism → worry/rumination → emotional problems" did not apply to children's sleep problems. More precisely, although positive and significant correlations were observed among scales for measuring neuroticism, worry/rumination, and sleep difficulties, no evidence was obtained for the idea that indices of repetitive negative thoughts acted as an intermediate variable in the link between general vulnerability and such problems. Thus, while it seems intuitively plausible that children who display high levels of worry and rumination also exhibit certain troublesome sleep behaviors (e.g., problems with falling asleep), sleep difficulties were mainly explained by the direct path of neuroticism and not by the indirect path via the cognitive mediators worry and rumination. Several explanations may account for this result. First, it should be noted that the index that was used in this study for assessing

sleep difficulties (i.e., the SSR) might have been too broad as it also measures a variety of problematic sleep behaviors (e.g., nightmares, fighting with parents about going to bed, falling asleep in the same bed every night) that seem to be less susceptible to repetitive negative thoughts. Second, there might be another mechanism that accounts for the specific vulnerability to develop sleep difficulties. One candidate may be low vagal activity, which is known as a physiological marker of vulnerability that is associated with poor stress regulation (Porges, 1992). There is research showing that a low vagal tone is associated with the personality trait of neuroticism (Haug et al., 1994) and also appears to be related to children's sleep problems (El-Sheikh, Erath, & Keller, 2007). As such, it would be interesting to examine a mediation model in which low vagal activity acts as a mediator between the general vulnerability of neuroticism and sleep difficulties. Third and finally, it is also possible that sleep difficulties do not represent a unique psychopathological entity, but rather should be regarded as an additional symptom of other emotional problems or the other way around may predispose children to symptoms of psychopathology. Additionally, these ideas were also statistically tested in this study. Analyses yielded a model in which anxiety and depression mediated the relation between neuroticism and sleep difficulties, whereas support was also found for models in which sleep problems partly mediated the relation between neuroticism and symptoms of anxiety and depression.

However, due to the cross-sectional nature of this study, no cause-effect relations could be established, and therefore it remains unclear whether sleep difficulties in children can best be seen as an epiphenomenon of high levels of anxiety or depression (Lichstein, 2006), or may predispose children to symptoms of psychopathology (Fallone et al., 2002; Harvey, 2001b), or even whether there is a reciprocal relation between these concepts in which sleep problems and daytime sleepiness enhance the risk of developing anxiety and depressive symptoms, whereas these symptoms in turn also make children more vulnerable for sleep difficulties. Longitudinal studies are needed to address this issue. Moreover, the current study only assessed a limited number of relevant variables. In reality the relation between sleep difficulties and emotional problems in youths might be far more complicated, and involves various biological, psychological and social processes (Dahl & Lewin, 2002).

Previous data also confirmed the notion that behavioral inhibition represents a vulnerability factor for anxiety problems in youths (Fox et al., 2005). As hypothesized, even when controlling for neuroticism, this temperament factor still accounted for a significant and unique proportion of the variance in children's anxiety scores (see also Muris, Bos et al., 2009). Behavioral inhibition did not account for a significant proportion of the variance in children's depression or sleep disturbances scores when controlling for neuroticism. Thus, it seems that behavioral inhibition is a unique vulnerability factor for anxiety problems and not for depression or sleep disturbances. Interestingly, the results also indicated that while the relation between neuroticism/behavioral inhibition and anxiety symptoms was partly mediated by repetitive negative thoughts, behavioral inhibition only had a direct effect on anxiety symptoms once controlling for neuroticism. These findings can be explained by bearing in mind that behavioral inhibition can best be

seen as a mixture of the personality traits of neuroticism and extraversion (Muris, Bos et al., 2009; Muris & Dietvorst, 2006; Shatz, 2005). Thus, the part of behavioral inhibition that overlaps with neuroticism seems to partially exert its influence on anxiety via the mediators of worry and rumination, whereas the part mapping on extraversion might influence these symptoms via another mechanism (e.g., avoidant coping). Further studies are needed to further elucidate the role of neuroticism, extraversion, and behavioral inhibition in anxiety pathology, and the precise mechanisms by which these general vulnerability factors operate.

In line with previous research in children (Muris, Fokke et al., 2009; Muris et al., 2004) and adults (Fresco et al., 2002; Muris, Roelofs et al., 2005; Roelofs et al., 2008; Segerstrom et al., 2000), the present results demonstrated that (1) worry and rumination were closely related to each other, and (2) both types of repetitive negative thoughts were convincingly associated with symptoms of both anxiety and depression. Meanwhile, the mediation analyses examining worry and rumination as specific vulnerability factors revealed that worry and rumination both made a significant contribution to the model for anxiety symptoms, and that this was also true when controlling for depressive symptoms. Worry only declared a significant proportion of the variance in the model for depressive symptoms. However, when controlling for anxiety symptoms none of the mediators made a significant contribution to the model. While the findings of the analyses correspond nicely with those obtained by Muris et al. (2009; 2004), they are certainly not in agreement with the original idea that worry would be more relevant for anxiety, whereas rumination would be more pertinent to depression. It may well be that sample differences account for this pattern of results. That is, the present study as well as previous investigations by Muris and colleagues (2009; 2004) relied on non-clinical youths, for which it may well be the case that worry is a more common phenomenon than rumination. However, research by Roelofs et al. (2008) demonstrated that in a sample of clinically depressed patients, rumination emerged as the main predictor of anxiety and depressive symptoms, in spite of the fact that worry was also linked to both types of emotional symptoms. For these patients, rumination may have been a more recognizable type of repetitive negative thought as compared to worry. Future studies examining the relative contributions of worry and rumination to various emotional problems in clinical and non-clinical adult and child populations might further clarify this issue.

The results from the present study may have implications for clinical practice. Although it must be kept in mind that this study was cross-sectional in nature, the current findings indicate that repetitive negative thoughts could play a role in anxiety and depression. This would underline the importance of cognitive treatment approaches directed at correcting and modifying these cognitive factors. The treatment of anxiety and depressive may focus on strategies to diminish the tendency to worry or ruminate. One recent potential treatment to change these tendencies might be mindfulness-based cognitive therapy for depression (Segal, Williams, & Teasdale, 2002) which might be suitable for youths as well. This therapy aims to let participants focus on the present and to observe their (repetitive negative) thoughts instead of dwelling on them. Preliminary evidence shows that, at least in adults, a mindfulness-based cognitive therapy specifically focused on reducing rumina-

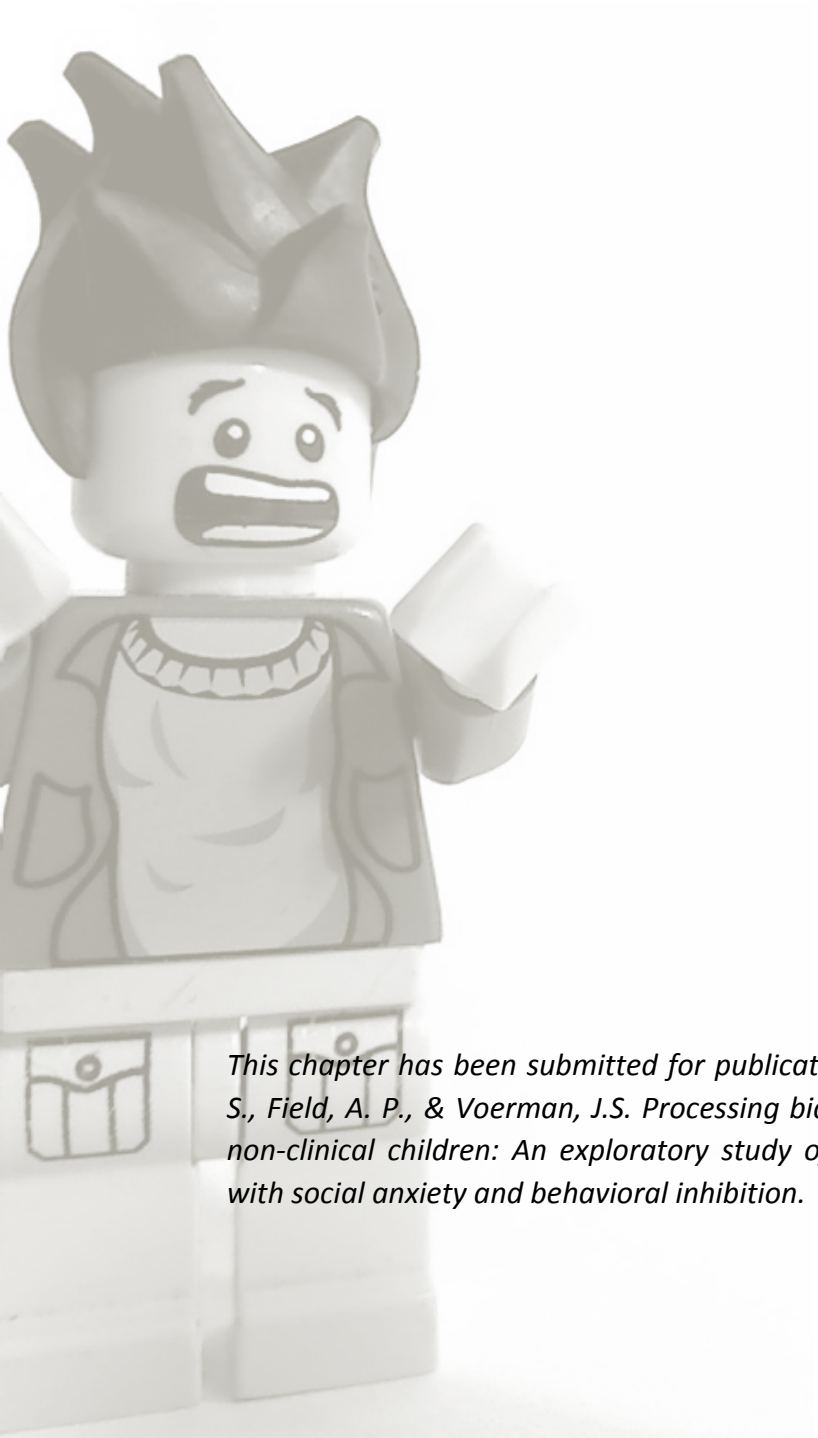
tive thoughts was effective in reducing rumination and depressive symptoms in medication-refractory depression (Watkins et al., 2007)

It should be acknowledged that the present study suffers from various limitations. First, this research was correlational in nature, and hence it is not possible to draw conclusions on cause-effect relationships between neuroticism, repetitive negative thought, and emotional problems. However, there are good reasons to believe that neuroticism acts as a precursor rather than as a consequence of child psychopathology (see Muris & Ollendick, 2005) and current theories in clinical psychology assume that neuroticism is a higher-order vulnerability factor, whereas repetitive negative thoughts can better be qualified as a second-order vulnerability factor (Norton et al., 2005; Sexton et al., 2003). Second, as mentioned earlier, the study merely included non-clinical subjects. In addition, no diagnostic instrument was employed to identify children who really suffered from anxiety, depressive, and sleeping disorders, and therefore it remains unclear to what extent these findings can be generalized to samples of clinically diagnosed youths. Also our sample size was too restricted to test separate models for boys and girls. However, girls in our sample did tend to worry and ruminate more than boys and previous research also showed that girls are more prone to develop a depressive or an anxiety disorder than boys (e.g., Craske, 2003; Lewinsohn, Clarke, Seeley, & Rohde, 1994). Therefore, it would be interesting for future research to test separate mediational models for boys and girls to study whether differences in repetitive negative thought play a role in the gender difference in prevalence of depressive and anxiety symptoms and disorders. Third, results of this study should be interpreted with some caution due to confounding of measures. That is, some of the items of the anxiety scale explicitly referred to worry, the depression subscale included an item about tiredness, the rumination subscale contained items that refer to symptoms of depression, whereas repetitive negative thought, and more specific worry are a prominent feature of generalized anxiety disorders. Further, this investigation solely relied on children's self-report and only employed one instrument for measuring each of the constructs. Future studies should use a multi-trait, multi-method approach to get around this problem and include parent- and/or teacher rating, and objective measures of sleep such as actigraphy data next to children's self-reports. Fourth and finally, it is also important to note that the vulnerability models that were tested in this research are a simplification of the reality. Developmental psychopathology accounts propose that emotional problems in youths are the result from multiple factors, reflecting risk as well as resilience, that operate in dynamic interaction (Cicchetti & Cohen, 1995), and hence research that includes other relevant variables would be especially welcome.

In spite of these limitations, the current findings seem to indicate that worry and rumination contribute to children's vulnerability for anxiety and depression. As it is increasingly acknowledged that proneness to internalizing psychopathology becomes particularly manifest when youths are exposed to stressful life events (e.g., Brozina & Abela, 2006; Morris, Ciesla, & Garber, 2008), it might be also interesting for future studies to prospectively examine the role of repetitive negative thoughts in the vulnerability for emotional problems within a diathesis-stress context.

Chapter 7

Processing biases for emotional faces in 4- to 12-year-old non-clinical children: An exploratory study of developmental patterns and relationships with social anxiety and behavioral inhibition



This chapter has been submitted for publication as: Broeren, S., Muris, P., Bouwmeester, S., Field, A. P., & Voerman, J.S. Processing biases for emotional faces in 4- to 12-year-old non-clinical children: An exploratory study of developmental patterns and relationships with social anxiety and behavioral inhibition.

Abstract

The present study examined (a) processing biases for emotional facial stimuli in a sample of 355 4- to 12-year-old non-clinical children, (b) developmental patterns of such biases, and (c) to what extent biases were related to social anxiety and the temperamental trait of behavioral inhibition in children of various ages. Processing biases were assessed with a dot probe task and a dynamic emotion recognition paradigm (i.e., morph task), whereas children's levels of anxiety and behavioral inhibition were measured by means of parent-report. Results showed that on the morph task children were generally faster in detecting happy faces as compared to angry faces, and this effect was not qualified by age, social anxiety, or behavioral inhibition. Further analyses revealed no significant effect of age on bias scores. However, analyses did reveal two classes in the data with one class mainly consisting of younger children and the other class predominatly composed of older children: Younger children were in general slower, less accurate, and displayed more variance in their scores on the processing biases tasks than older children. Results of this study underline the need of the development and use of more age-appropriate, non-reaction time-based tasks for measuring processing bias in younger children.

Introduction

Anxiety disorders constitute a common psychiatric problem in children and adolescents (Cartwright-Hatton et al., 2006; Costello et al., 2003) and are associated with significant impairment in social, emotional, and school functioning (Strauss et al., 1987). If left untreated, anxiety poses a risk for the development of (other) internalizing and externalizing disorders in childhood (Last et al., 1996), adolescence (Bittner et al., 2007), and adulthood (Pine et al., 1998). The profound impact of anxiety disorders on the lives of children highlights the need to understand the factors underlying the origins of this type of psychopathology.

Research efforts have increasingly been devoted to the role of information-processing factors in the pathogenesis of anxiety disorders in both adults (Mathews & MacLeod, 2005) and, more recently, children (Muris & Field, 2008). Biased attention for emotionally negative information is often viewed as an important cognitive factor involved in the etiology and maintenance of these disorders (e.g., Daleiden & Vasey, 1997; Lonigan et al., 2004). Numerous studies (e.g., Dalgleish, Moradi, Taghavi, Neshat-Doost, & Yule, 2001; Dalgleish et al., 2003; Martin, Horder, & Jones, 1992; Taghavi, Dalgleish, Moradi, Neshat-Doost, & Yule, 2003; Taghavi, Neshat-Doost, Moradi, Yule, & Dalgleish, 1999; Vasey, Daleiden, Williams, & Brown, 1995) have demonstrated that anxious youths selectively attend to threat-related stimuli in a similar way to anxious adults (see Puliafico & Kendall, 2006 for a review). This research has yielded evidence for both selective attention away from threat (e.g., Pine et al., 2005), which reflects avoidance or some other strategy not to engage attention towards threat stimuli, and selective attention towards threat (e.g., Monk et al., 2008), which indicates vigilance or difficulty to disengage attention from threat stimuli.

As to the developmental course of these attentional phenomena, Kindt and colleagues (Kindt, Bierman, & Brosschot, 1997; Kindt & Brosschot, 1999; Kindt, Brosschot, & Everaerd, 1997; Kindt, Van den Hout, De Jong, & Hoekzema, 2000) have found evidence to suggest that threat-related processing biases are not only present in anxious youths, but are a common phenomenon in all younger children. Kindt and Van den Hout's (2001) cognitive inhibition hypothesis states that biases in attention depend on the ability of children to inhibit their selective processing of threat cues. Children younger than 10 years generally lack the ability to regulate attentional processes to threat and therefore frequently display threat-related biases. With increasing age, anxious children, unlike non-anxious children, fail to develop this inhibitory control, and therefore a processing bias for threatening stimuli persists. Although there is some support for this hypothesis (e.g., Eschenbeck, Kohlmann, Heim-Dreger, Koller, & Leser, 2004; Waters, Lipp, & Spence, 2004), a direct test of this account by Morren, Kindt, Van den Hout, and Van Kasteren (2003) yielded disappointing results. Morren et al. tested the cognitive inhibition hypothesis by assessing high and low spider fearful children aged 7 to 11 years with an emotional Stroop task, which is a frequently employed paradigm to assess attentional bias (see Nightingale, Field, & Kindt, 2010 for a review). The cognitive inhibition hypothesis led them to predict that irrespective of children's fear levels, all 8- and 9-year-olds would show a processing bias for spider-related stimuli, whereas with increasing age this

bias would decline in low fearful children, but remain present in high fearful children. Contrary to this prediction, data revealed a pattern indicating that children responded *faster* to spider words than to control words, but this effect was neither moderated by age nor by children's fear levels. As such, it remains largely unknown whether processing biases should be regarded as normative developmental phenomena or as an indicator of anxiety pathology or the risk of developing such problems.

Paradigms such as the emotional Stroop task and the dot probe task that are so often used to assess biases in attentional processing of emotionally negative information in children (Garner, 2010; Nightingale et al., 2010) mostly rely on threat and negative words as stimuli (e.g., Dalgleish et al., 2003; Taghavi et al., 1999; Vasey et al., 1995). Verbal material is less suitable for younger children because of their restricted reading abilities and a need has been identified for information processing research that uses age-appropriate tasks (Hadwin & Field, 2010). With this in mind, recent studies (e.g., Hadwin et al., 2003; Waters & Valvoi, 2009) have employed emotional faces as ecologically valid stimuli that saliently depict threat (Öhman, 1993). The ability to recognize facial emotional expressions is crucial for adequate social functioning, and gradually improves with age (Boyatzis, Chazan, & Ting, 1993; Philippot & Feldman, 1990) with happiness being recognized earliest, followed by anger, sadness, and eventually expressions of surprise and fear. The ability to discriminate between basic emotions seems to be already present in infants (e.g., Nelson & Dolgin, 1985; Serrano, Iglesias, & Loeches, 1995; Young-Browne, Rosenfeld, & Horowitz, 1977), although the speed of emotion recognition increases as children grow older, especially for negative facial expressions (De Sonneville et al., 2002). Furthermore, while socially anxious and shy children seem to be less able to correctly identify emotional facial expressions (Battaglia et al., 2004; Richards, French, Nash, Hadwin, & Donnelly, 2007), it should be noted that studies on threat-related biases using pictures or pictorial stimuli of emotional faces instead of linguistic stimuli seem to yield more consistent results in anxious youths (e.g., Hadwin et al., 2003; Heim-Dreger, Kohlmann, Eschenbeck, & Burkhardt, 2006; Monk et al., 2006; Stirling, Eley, & Clark, 2006; Waters et al., 2004; Waters, Mogg, Bradley, & Pine, 2008).

While pictorial stimuli of emotional faces seem to possess more ecological validity than linguistic stimuli when studying threat-related processing biases in youths, there are also authors who question their utility (Wallbott & Scherer, 1986). So far most studies have relied on static pictures or schematic displays of emotional expressions, which do not capture the liveliness and true form of the facial expressions that occur during social interactions (Montirosso, Peverelli, Frigerio, Crespi, & Borgatti, 2010); static images display only a small number of the configurations of all the possible combinations of muscle contractions the face is able to make (Carroll & Russell, 1997). Dynamic stimuli (i.e., gradually changing stimuli, such as a movie of an evolving facial expression) can be seen as an improvement in this respect. There are some indications that such moving emotional facial expressions are identified more accurately than static ones (Bassili, 1979; Knight & Johnston, 1997; Sato & Yoshikawa, 2004): However, studies using dynamic facial expressions are scarce, and until now these stimuli have been used only occasionally in emotion recognition research (De Sonneville et al., 2002; e.g., Herba et al., 2008; Monti-

rosso et al., 2010). Recently, Joormann and Gotlib (2006) made a first attempt to use dynamic stimulus material to study biases in the identification of emotional facial expressions. These researchers employed a task developed by Niedenthal and colleagues (2002; 2000) during which participants have to watch a series of computerized movies of faces which are gradually "morphed" from a neutral expression to a full emotional expression (i.e., happy, sad, angry). For each movie, participants identify the pertinent emotion as quickly as possible. Joormann and Gotlib (2006) administered this task to adult patients with either major depressive disorder or social phobia and control participants. Results showed that socially phobic patients needed less emotional intensity to correctly identify an angry facial expression compared to controls and depressed patients. Clearly, this finding suggests that social anxiety, at least in adults, is associated with a processing bias in emotion recognition. Despite the fact that social anxiety or its temperamental antecedent (i.e., behavioral inhibition; Kagan et al., 1984) are already frequently observed in childhood (see Beidel, Morris, & Turner, 2004 for a review), no studies have been conducted using such a dynamic emotion recognition paradigm to study processing biases in young people.

With this omission in mind, the present study investigates processing biases in children using a dynamic emotion recognition task that was based on Joormann and Gotlib's (2006) morphed faces paradigm. A more established paradigm for studying threat-related bias in youths – a pictorial dot probe task (which also employed emotional faces as stimuli) – was also included in the research (Garner, 2010), because the morphed face task is a new and untested procedure in children. Both tasks measure processing bias in a different way. The pictorial dot probe and morph tasks were used to examine (a) processing biases for emotional facial stimuli in a large sample of 4- to 12-year-old non-clinical children, (b) developmental patterns in such biases, and (c) whether in children of various ages, this bias was related to social anxiety or the temperamental trait of behavioral inhibition, i.e., the tendency to become extremely shy and to withdraw from novel situations (Kagan, 1994), which is considered as an important vulnerability factor for social anxiety disorder (e.g., Biederman et al., 2001; Muris et al., in press). Additionally, it was explored whether (1) this type of processing bias is present in all children, or mainly a characteristic of those who are already socially anxious or who display the vulnerability to develop such anxiety problems, and (2) the magnitude of the processing bias decreases with age in low anxious children and remains fairly stable in high anxious children as proposed by the cognitive inhibition theory of Kindt and Van den Hout (2001).

Method

Participants

Parents of children from five regular primary schools in and around Rotterdam (The Netherlands) were sent a letter inviting their offspring to participate in this study. Approximately 40% of the parents responded positively to this invitation by returning the written consent form to the researchers. Eventually, complete data for 355 children (189 boys and 166 girls) and their parents were collected. Children were aged between 4 and

12 years, with a mean age of 7.93 years (*SD* = 2.50). The majority of them (97.5%) were from original Dutch descent. Other demographic variables were not obtained.

Materials

***Parent questionnaires*.** Symptoms of social anxiety were assessed by means of the *Preschool Anxiety Scale - Revised* (PAS-R; Edwards, 2007; Spence et al., 2001), which is a 30-item parent-based questionnaire for measuring symptoms of DSM-defined anxiety disorders in young children. The social anxiety scale (Cronbach's α = .85) contains 7 items that have to be rated on a 5-point scale ranging from 1 (*not at all true*) to 5 (*very often true*). Research has shown that the psychometric properties of the PAS-R are satisfactory (Edwards, 2007; Spence et al., 2001) and this seems also true for the Dutch version of the scale (Broeren & Muris, 2008).

Behavioral inhibition was measured with the *Behavioral Inhibition Questionnaire - Short Form* (BIQ-SF; Bishop et al., 2003; Edwards, 2007), which includes 14 items that assess behavioral inhibition in three domains: social novelty, situational novelty, and physical challenges. Parents have to rate items on a 6-point scale ranging from 1 (*hardly ever*) to 6 (*almost always*). A total score (Cronbach's α = .91) can be computed, with higher scores reflecting higher levels of behavioral inhibition. The BIQ-SF possesses good internal consistency, test-retest reliability, and validity (Edwards, 2007).

***Apparatus for reaction time tasks*.** The reaction time tasks were presented on a Sony VGN-FE41S laptop with a 15.4-inch color monitor and were programmed in E-prime 2.0 (Psychology Software Tools Inc.) for stimulus presentation. Reaction times were recorded using a response box with 5 buttons (model 200A; Psychology Software Tools Inc.), from which only the outer two buttons were used during this experiment. Children were seated in front of the laptop at a comfortable distance with the response box between them and the computer screen. Instructions were visible on the screen and were also read aloud by the experimenter. Stimuli were colored pictures of male and female faces with a neutral, happy, or angry facial expression, and were selected from the NimStim Set of Facial Expressions (Tottenham et al., 2009).

***Dot probe task*.** The stimulus material for the dot probe task consisted of 24 pictures of 8 models (4 male and 4 female) showing 3 facial expressions: neutral, angry, and happy. A total of 64 trials were administered in which a neutral face picture was always paired with either a happy or an angry face picture of the same model. The location (i.e., left or right) of the emotional picture (i.e., angry or happy) was counterbalanced. A trial started with a fixation cross presented for 1500 ms in the center of the computer screen. This cross was followed by two pictures of facial expressions (10.2 by 12.7 cm) appearing on the left and right side of the screen for 500 ms. Then pictures disappeared and one of them was replaced by a dot (i.e., a purple square of 1.2 by 1.2 cm). After children made their response to this probe, the fixation cross reappeared and the next trial started. Children were instructed to focus on the fixation cross prior to the presentation of the faces, and to indicate the location of the dot (i.e., left or right side of the screen) as quickly as possible by either pressing the left or right button on the response box. Reaction times (RTs) in milliseconds (ms) were recorded. As in previous research (MacLeod & Mathews, 1988), for each type of emotional expression (i.e., angry and happy) a

bias score was calculated by subtracting the average detection time on congruent trials (i.e., trials in which the happy or angry picture was replaced by the dot) from the average detection time on incongruent trials (i.e., trials in which the neutral picture was replaced by the dot). A negative bias score indicates avoidance/attention away from the emotional (i.e., happy or angry) picture, whereas a positive bias score indicates vigilance/attention towards the emotional picture.

***Morph task*.** Stimulus material consisted of 20 neutral pictures (10 male and 10 female), and 10 happy and 10 angry pictures of the same model (also from the NimStim Set of Facial Expressions, Tottenham et al., 2009). MorphMan 4.0 (STOIK Imaging, 2003) was used to make a series of 75-frame digital movies (13.3 x 17.3 cm) in which the picture with a neutral facial expression gradually changed into either a full-blown happy or angry expression (see Appendix for examples). "Happy" and "angry" movies were randomly presented to the children. Each movie was preceded by a fixation cross for 1000 ms. For each movie, children were instructed to watch the changing face and to decide as quickly and accurately as possible whether the face was going to be happy or angry by pressing the appropriate button on the response box. After children responded, the fixation cross reappeared on the screen and the next movie started. Movies morphed in ten seconds from a neutral to a fully emotional expression. Reaction times (in ms) were recorded as was the accuracy of children's responses. If children did not respond before the face was completely morphed (i.e., after 10 seconds), the trial was considered as a false response. RTs were averaged separately for the neutral-to-angry and the neutral-to-happy trials. The number of incorrect responses on the neutral-to-angry and neutral-to-happy trials were also calculated.

Appendix. Five frames (including the first and the last one) selected from a neutral-to-angry digital movie (top) and a neutral-to-happy digital movie (bottom)

Procedure

Parents received an information 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-SF. Subsequently, children were individually tested in a

separate room at school. Children were administered the dot-probe task and the morph task within one testing session, which lasted for approximately 10 to 15 minutes. The order of the tasks was counterbalanced across children. Because young children were included in this study, the actual dot probe experiment was preceded by a practice phase during which children gradually got acquainted with the various elements of the task (i.e., fixation cross, probe, stimulus material, and response box). Such a practice phase also preceded the morph task: That is, children first carried out an emotion recognition task during which they first categorized pictures as either happy or angry, and were then exposed to a series of movies to practice the real task. At the end of the session, children received a small present in return for their participation in the study (e.g., stickers, colored pencils, eraser).

Data preparation and statistical analyses

For the dot probe task, the mean number of incorrect responses on the 64 trials was 2.13 and the RTs for these trials were excluded from the analyses. Furthermore, data of children who had less than 75% correct responses were also excluded (n = 9). Reaction times < 200 ms and RTs below and above 2.5 standard deviation of the individual mean were deleted. For the morph task, incorrect trials and trials with RTs < 200 ms were also removed. Further, data of children with more than two mistakes during the emotion recognition practice phase were excluded from the data analyses.

Previous research (e.g., Kail, 1991) showed that younger children have higher RTs and larger variance in RTs than older children. Thus, RTs show heteroscedasticity over age. A statistical analysis technique that can deal with the problem of younger children having higher RTs than older children is a latent class regression analysis (Vermunt & Magidson, 2005). The second problem of large variance in RTs in younger children compared to older children can be solved by adding a random intercept effect to correct for initial differences in RTs.

Therefore, for the morph task a latent class regression analysis was conducted with reaction time as dependent variable, condition (neutral-to-happy, neutral-to-angry trials), behavioral inhibition and social anxiety scores, gender, and age (in years) as independent variables. Note that condition and gender were dummy coded variables because these variables were categorical.

A second regression was done with accuracy of the morph task as dependent variable, condition (neutral-to-happy, neutral-to-angry trials), behavioral inhibition and social anxiety scores, gender, and age (in years) as independent variables. Because accuracy was a dichotomous variable (i.e., 0 = incorrect, 1 = correct), we conducted a logistic multiple regression analysis.

The bias-scores on the dot probe task had the same properties as reaction times (large variation related to age thus heteroscedasticity), therefore we again conducted a latent class regression analysis with a random intercept effect to correct for initial differences in bias score. In these analyses either the angry or the happy bias score was entered as dependent variable, and behavioral inhibition and social anxiety scores, gender, and age (in years) as independent variables.

The program Latent Gold (Vermunt & Magidson, 2005) was used to fit the latent class regression models.

Results

General findings

Morph task. Paired sample *t*-tests were used to examine whether children, independent of their age or social anxiety/behavioral inhibition score, differed in their reaction times and accuracy to trials involving angry and happy faces during the morph task. Results indicated that children overall made significantly more mistakes on the neutral-to-angry trials (M = 1.14, SD = 1.96) compared to the neutral-to-happy trials (M = 0.85, SD = 1.47; $t[339] = 2.70$, $p < .01$) and that they were quicker to respond to faces changing to a happy (M = 4769.34, SD = 2397.82) than to the faces changing to an angry expression (M = 5237.92, SD = 2651.33; $t[329] = 7.18$, $p < .001$).

Dot probe task. On the dot probe task, a slightly negative bias score for the happy trials was found (M = -0.86, SD = 239.83) while a somewhat positive bias score emerged for the angry trials (M = 4.35, SD = 447.74), but one-sample *t*-tests revealed that these bias scores were not significantly different from zero (*t*s < 1). Furthermore, the large *SD*s for the bias scores on the dot probe and the RTs on the morph task indicate that there is large variability in RTs and bias scores (which are based on RTs) in this sample of primary school children.

Developmental patterns and anxiety/behavioral inhibition effects

Morph task: RTs. The results of the latent class regression analysis with a random intercept on the morph task RTs showed that a two-class model (BIC = 121673.87) had a better fit than a one-class model (BIC = 125131.42) in terms of the Bayesian Information Index (BIC), therefore it could be concluded that different regression functions applied for different classes. The first class consisted of 75% of the sample, and the second class consisted of 25% of the sample. The effect of age on latent classes was significant (effect age = -.56, SE = 0.07, $p < .001$). This result indicates that young children were in particular presented in class 2 whereas older children had highest probability to be presented in class 1. The fixed intercept and random intercept terms of the regression functions showed that the average RT in class 1 are much smaller (4299.73 ms fixed; 1102.20 ms random) than the average reaction times in class 2 (7900.78 ms fixed; -2701.01 ms random). This result is in keeping with the idea that young children had longer reaction times than older children. The standard errors of the intercept terms show that there is more variation in reaction times in class 2 (i.e., mainly youngest children: SE = 394.80 fixed; SE = 194.62 random) than in class 1 (i.e., mainly older children: SE = 127.91 fixed; SE = 42.25 random).

Furthermore, in class 1 (i.e., older children) the effect of social anxiety (effect social anxiety: -23.88, SE = -1.99, $p < .05$) and the interaction effect Social anxiety × Gender (effect: 58.18, SE = 23.46, $p < .05$) were significant. For boys, higher social anxiety scores are related to higher RTs, whereas for girls, higher social anxiety scores are related to lower RTs. No significant main-effects were found in class 2 (i.e., younger children), but the interaction effect Condition × Gender (effect: 1272, SE = 731.46, $p < .05$) and Condi-

tion × Gender × Behavioral inhibition (effect: -83.36, *SE* = 27.84, *p* < .005) were significant. Girls had lower RTs on the neutral-to-angry trials than on the neutral-to-happy trials but this effect was tempered by a high behavioral inhibition score, whereas boys had higher RTs on the neutral-to-angry than on the neutral-to-happy trials and this effect was tempered by a high behavioral inhibition score too.

***Morph task: accuracy*.** The results of the logistic regression analysis with accuracy score as dependent variable showed only a main effect of age (effect: 0.136, *SE* = 0.051, *p* < .05) with older children having a higher probability to give a correct answer than younger children. None of the interaction effects were significant.

***Dot probe task*.** Two latent class regression analyses were conducted on the angry and happy bias score of the dot probe task. Overall, the results of the latent class analysis on the dot probe bias scores resembled the results found with this analysis on the RTs of the morph task. That is, results of the latent class analysis for the dot probe task showed that a two-class model had a better fit than a one-class model.

***Dot probe task: happy bias score*.** The results of the latent class analysis with the happy bias score as dependent variable showed that the two-class model (BIC = 4019.11) had a better fit than the one-class model (BIC = 4567.29). Therefore, it could be concluded that different regression functions applied for different classes. The first class consisted of 78% of the sample, and the second class consisted of 22% of the sample. The effect of Age on latent classes was significant (effect age = .60, *SE* = 0.09, *p* < .0001). The results showed that young children were in particular presented in class 2 and older children had highest probability to be presented in class 1. The fixed intercept of regression functions showed that the average bias scores in class 1 was positive (31.08, *SE* = 11.48, *p* < .01) and in class 2 was negative (-64.65, *SE* = 51.91, *p* > .05) though not significant. However, the random intercept effect was significant in class 2 (i.e., younger children, -498.48, *SE* =15.54, *p* < .001) but not in class 1 (0.00, *SE* = 16.24, *p* > .90). Thus, this finding indicates that the happy bias score varied substantially among the children in the class that consisted of mainly the youngest children. No significant main- or interaction effects for Behavioral inhibition, Social anxiety, or Gender were observed for both classes.

***Dot probe task: angry bias score*.** The results of the latent class analysis with the angry bias score as dependent variable showed that the two-class model (BIC = 3959.26) had a better fit than the one-class model (BIC=4551.59). The first class consisted of 83% of the sample, and the second class consisted of 17% of the sample. Again, the effect of Age on latent classes was significant (effect age = .58, *SE* = 0.09, *p* < .0001) and young children were in particular presented in class 2 and older children had highest probability to be presented in class 1. The fixed intercept of regression functions showed that the average bias scores in class 1 was positive (5.20, *SE* = 10.81, *p* = .63) but not significant, whereas the fixed intercept in class 2 was negative (-235.17, *SE* = 50.03, *p* < .05) and significant. However, the random intercept effect was positive and significant in class 2 (524.49, *SE* = 15.21, *p* < .001). The random intercept was not significant in class 1 (0.00, *SE* = 17.01, *p* > .90). Thus, the average intercept of class 2 was positive (289.32), but the large random intercept effect shows the large spread in angry bias scores in this class (mainly younger

children), which are also in effect negative for a lot of children from this class, which the interpretation of this intercept in bias direction (i.e., vigilance/avoidance) impossible. For class 2, a significant main effects for Social Anxiety (26.56, *SE* = 5.80, $p < .001$) was found, with the more socially anxious children showing higher bias scores (or less negative bias scores). Furthermore, a main effect of Gender (281.58, *SE* = 51.22, $p < .001$, and the interaction effect Social anxiety × Gender (14.34, *SE* = 5.83, $p < .01$) were significant in Class 2 (i.e., younger children) too. Boys on average had higher positive bias scores but this effect was diminished by higher social anxiety scores. Girls on average had higher negative bias scores but this effect was diminished by higher social anxiety scores. There were no significant main- or interaction effects for Behavioral inhibition, Social anxiety, or Gender in class 1 (i.e., older children).

Discussion

The current study investigated processing biases for emotional facial stimuli and developmental patterns in these biases in a large sample of 4- to 12-year-old non-clinical children. Furthermore, it was examined to what extent this bias was related to social anxiety or behavioral inhibition in children of various ages. Results showed that in general, independent of age and behavioral inhibition or social anxiety score, children more quickly detected happy faces compared to angry faces and more often inaccurately stated that the face in the morph movie was going to change to a happy expression rather than to the (correct) angry expression. Moreover, no significant processing bias for happy or angry faces was found in the total sample with the dot probe task. Additionally, for both processing bias tasks analyses revealed two classes: A class mainly consisting of the younger children and a class mainly consisting of the older children, with first class being slower, having more variation in RTs and in bias scores (which are based on RTs) than the second class of older children. Finally, children in the younger class also made more mistakes than children in the older class.

These findings are partly congruent with results of previous studies. Results of the morph task showed that children in general were quicker to respond to happy faces compared to angry faces. This finding seems in line with findings from earlier research showing that the facial expression of happiness is correctly recognized at a lower intensity than anger (e.g., Herba et al., 2008). Additionally, children more often inaccurately stated that the face in the morph movie was going to change to a happy expression rather than to the (correct) angry expression. This could have been a side-effect of the aforementioned finding in that as children make their decisions at lower intensities of facial expression (thus quicker) for happy faces, they might also be tended to make more mistakes, as the expression of the morphed face at time of responding is than still more ambiguous as when they would have waited longer to respond. However, it could also have been a general response bias in favor of happy faces.

When also looking at age and social anxiety/behavioral inhibition effects, analyses showed that younger children more often gave an incorrect answer on the morph task than older children. Furthermore, in the youngest class, girls had lower RTs on the neutral-to-angry trials than on the neutral-to-happy trials, whereas boys had higher RTs

on the neutral-to-angry trials than on the neutral-to-happy trials, and both effects were tempered by a high behavioral inhibition score. Thus, it seems that girls responded quicker to angry faces as compared to happy faces, a finding which could be interpreted as girls being more vigilant towards angry or threatening facial expressions than boys. This finding is in line with a posteriori evidence from previous research (see Garner, 2010) which suggests that girls are more likely to show vigilance (Ehrenreich & Gross, 2002; Waters et al., 2004, Experiment 1), whereas boys are more likely to show avoidance towards threat-related stimuli (Ehrenreich & Gross, 2002; Vasey, El-Hag, & Daleiden, 1996). Furthermore, in the oldest class on the other hand, in boys higher social anxiety scores were associated with higher RTs over both condition of the morph task, whereas in girls higher social anxiety scores were associated with lower RTs. This finding could also be interpreted as socially anxious girls more likely to be vigilant towards emotional facial expressions overall, negative as well as positive ones, instead of only threatening/negative ones, whereas socially anxious boys are more likely to avoid emotional facial expressions, a finding which again is in line with abovementioned evidence and which might perhaps contribute to the greater prevalence of anxiety in girls than boys (Garner, 2010).

For the dot probe task, a gender by social anxiety effect was only found on the angry bias score in the youngest class. Here boys on average had higher *positive* bias scores, reflecting being more vigilant towards angry faces, whereas girls had higher *negative* bias scores, reflecting being more avoidant of angry faces, an effect which was again diminished by higher social anxiety scores. These effects are not line with and even contrary to the findings from the morph task and previous preliminary evidence, which indicates that girls are more vigilant instead of avoidant towards negative faces than boys. Furthermore, the tempering effect of social anxiety and behavioral inhibition on bias scores and RTs (thus indirectly on vigilance/avoidance) cannot be explained and is counterintuitive seen the previous extensive evidence for processing biases specifically in anxious and/or behaviorally inhibited children as compared to control children (see Puliafico & Kendall, 2006 for a review).

However, on both the morph as on the dot probe task analyses showed large variability in RTs, and consequently bias scores, especially in the youngest children, which makes the interpretation of these findings (nearly) impossible. This is especially true for the dot probe task for which both a lot of large positive *and* negative bias scores are observed in the sample, which causes that the average bias score gets uninterpretable. Additionally, the observed large variation in RTs also implies that these RTs are measured with great uncertainty/unreliability (large measurement error). When for calculation the bias score and subtracting the average RTs on the congruent trials from the average RTs on the incongruent trials this implies that one subtracts two things which both include a large measurement error, so the product of this subtracting also consists for a large part of measurement error. This makes it very difficult to (i.e., one needs very large effects to) still be able to find significant interactions between RTs and bias scores on one hand and social anxiety/behavioral inhibition scores on the other hand. However, we do find some effects of social anxiety and behavioral inhibition in the present study, especially in the

younger class, which implies that there must some social anxiety and behavioral inhibition effects there.

Seen the particularly large variation in RTs and bias scores in the youngest class, it seems that it might be the case that these experimental reaction time-based tasks were chiefly challenging for the younger children, who still do not have such well-developed regulation skills to inhibit processing of threatening information (Davidson, Amso, Anderson, & Diamond, 2006; Harnishfeger, 1995), which made that the difference between the high and low socially anxious/behaviorally inhibited children became manifest mainly in this age group. However, no evidence was obtained to support the cognitive inhibition theory of Kindt and Van den Hout (2001), which states that the magnitude of the processing bias decreases with age in low anxious children and remains fairly stable in high anxious children. In fact, the current study found no clear-cut indications for age trends in bias scores. Nevertheless, this finding is in keeping with Morren and colleagues (2003) who also could not provide any support for this developmental hypothesis of processing bias in children.

An additional finding of this study was that the two processing bias tasks yielded quite different results. This could be explained by the fact that both tasks seem to tap different types of cognitive biases. That is, the dot probe task seems to measure attentional bias, whereas the morph task is more likely to tap interpretation or RED bias. Note that previous research has also shown that even two tasks that intend to measure the same type of cognitive bias (i.e., two attentional bias tasks: the dot probe and the Stroop task, or a pictorial and a word dot probe) did not correlate (Dalgleish et al., 2003; Watts & Weems, 2006), which seriously questions the validity of at least one of these bias indexes. Little is known about the psychometric properties of these cognitive performance tasks (but see Schmukle, 2005) and it is generally assumed that these tasks suffer from methodological issues, which seems in particular true when employing them in youths (Hadwin & Field, 2010; Vasey, Dalgleish, & Silverman, 2003). Obviously, future research is needed to establish the reliability and validity of processing biases measures, especially in children.

Finally, the results of this study were not in line with those documented by Joormann and Gotlib (2006), who found that socially anxious adults were faster than controls in identifying morphing angry expressions: The present study did not show that speeded detection of such faces depended on social anxiety score. One explanation for these differential findings pertains to the samples of both studies: Joorman and Gotlib conducted their research in clinically referred adults, whereas the present study assessed non-clinical children. Furthermore, as mentioned before, the variance in RT data in this study was quite large and differed considerably between younger and older children. Perhaps then reaction time-based paradigms are less appropriate in young people, because these developmental trends in response times overshadow the more subtle effects of social anxiety or behavioral inhibition. Other measures of selective attention, such as an eye movement paradigm or cognitive accuracy data (as obtained with the current morph task) might be more useful, as they involve less processing constraints (Hadwin & Field, 2010). Future research should take these methodological considerations

into account and try to develop non-reaction time-based indices for measuring processing bias in children.

This study had several limitations. The non-clinical nature of the sample restricts the generalization of the findings. Additionally, it could be the case that the effects found in this study with a non-clinical sample are weaker than would have been found as a clinical anxious sample had been studied, as a recent study by Waters, Henry, Mogg, Bradley, and Pine (2010) showed that clinically anxious children with more severe anxiety did show an attentional bias towards angry faces, but clinically anxious children with mild anxiety and non-anxious controls showed no attentional bias. Therefore, it might be interesting to conduct a similar study in a sample of clinically referred children with social anxiety disorder. Other shortcomings relate to the experimental tasks. For example, during the morph task the movies of changing faces were presented with a fixed speed of 7.5 frames per second to allow children to respond. However, research by Sato and Yoshikawa (2004) and Kamachi et al. (2001) has demonstrated that various types of facial expressions are probably seen as most natural and are most correctly identified at different morphing speeds. For example, they found that happiness was most accurately identified with a fast changing sequence, whereas anger was most optimally detected with a sequence changing at a medium pace (Kamachi et al., 2001). Therefore, it is possible that by giving children time to respond to the changing faces, that we sacrificed in naturalness of emotions. Furthermore, the dot probe task employed in this study lacked trials in which two neutral pictures of the same model were paired. This made it impossible to identify the exact nature of the bias found. That is, research has indicated that selective attention towards threat can comprise two specific components, namely vigilance (i.e., facilitated attention towards threat) and/or a difficulty to disengage attention from threat (Koster, Crombez, Verschuere, & De Houwer, 2004), whereas selective attention away from threat can comprise either initial avoidance and/or a strategy not to engage attention towards threat at all (Legerstee et al., 2009). Koster et al. (2004) and Legerstee et al. (2009) have shown that to distinguish these specific attentional components one needs to incorporate neutral-neutral trials in the dot probe task, which was not the case in the present study.

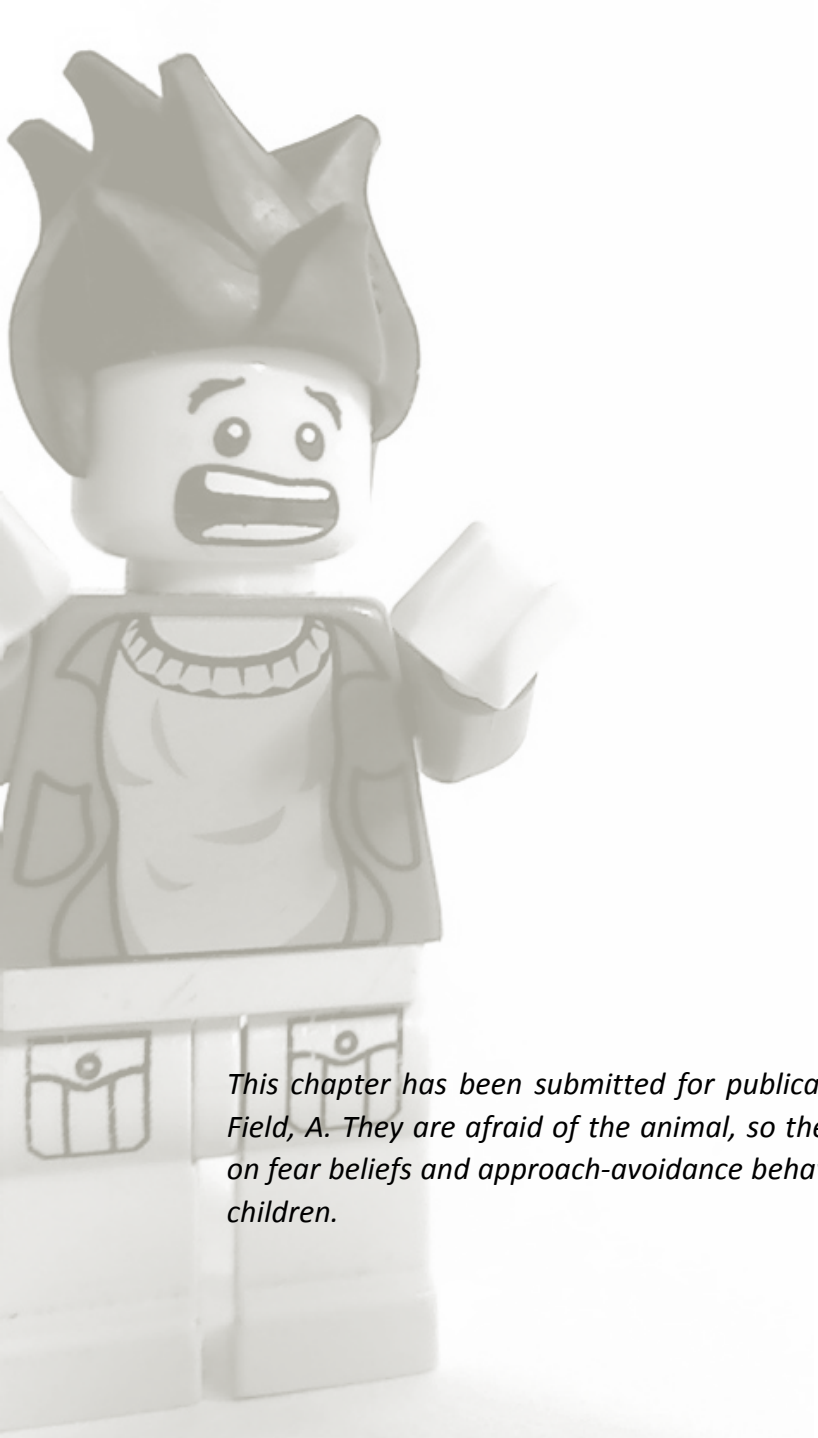
To conclude, a processing bias with a speeded detection of happy faces as compared to angry faces was found in all children irrespective of their age or level of social anxiety/behavioral inhibition. Furthermore, two classes of children could be identified in this sample: A younger and an older class, with children in the younger class showing much larger variability in RTs and bias scores, being slower to respond, and making more mistakes than the older children. Regrettably, this large variability in scores made it nearly impossible to interpret findings and especially the findings of the dot probe task as there either large positive and negative biases scores were found. Therefore, it can be concluded that the processing bias tasks, and especially the RT-based parts are probably not so well suited for young children. As mentioned before, other measures of selective attention, such as an eye movement paradigm or cognitive accuracy data might be more useful, as they involve less processing constraints (Hadwin & Field, 2010). Future research

should try to study processing bias in young children in a more age-appropriate way and try to develop non-reaction time-based indices for measuring processing bias in children.

Additionally, some interaction effect of social anxiety/behavioral inhibition and gender were found in this study. To date, less is known about possible differences in processing biases between boys and girl. However, some first preliminary evidence suggests that girls are more vigilant towards threat which might partly explain the higher prevalence rates for girls on phobias and most anxiety disorders (see Garner, 2010). However, clearly more research is needed to support this hypothesis. Finally, no anxiety or behavioral inhibition-linked threat-related bias found in this sample and as such, this study does not support the notion that socially anxious and inhibited children show deficits in their emotion recognition skills (Foa, Franklin, & Kozak, 2001) or are better at identifying emotional expressions (Joormann & Gotlib, 2006). Also no support was found for the cognitive inhibition theory of Kindt and Van den Hout (2001), which states that the magnitude of the processing bias decreases with age in low anxious children and remains fairly stable in high anxious children. However, the main conclusion from this study seems that age-appropriate processing bias tasks should be developed and used to reliably study processing bias in young children.

Chapter 8

They are afraid of the animal, so therefore I am too: Influence of peer modeling on fear beliefs and approach-avoidance behaviors towards animals in typically developing children



This chapter has been submitted for publication as: Broeren, S., Lester, K., Muris, P., & Field, A. They are afraid of the animal, so therefore I am too: Influence of peer modeling on fear beliefs and approach-avoidance behaviors towards animals in typically developing children.

Abstract

This study investigated the effect of filmed peer modeling on fear beliefs and approach-avoidance behaviors towards animals in 8- to 10-year-old typically developing children. Ninety-seven children randomly received either a positive or negative modeling film in which they saw peers interact with a novel animal. Before and after this film, children's fear beliefs and avoidance tendencies towards the modeled and non-modeled control animal were measured. A behavioral approach task was also administered post-modeling. Following positive peer modeling, children's fear beliefs and avoidance tendencies towards the modeled but also towards the non-modeled animal decreased significantly. After negative modeling, children's fear beliefs towards the modeled animal increased significantly, but did not change for the non-modeled animal. Negative modeling did not change avoidance tendencies for the modeled animal, while it decreased children's avoidance of the non-modeled animal. No significant changes were observed during the behavioral approach task. These results support Rachman's indirect pathway of modeling/vicarious learning as a plausible mechanism by which children can acquire fears of novel stimuli and stresses the important fear-reducing effects of positive peer modeling. Clinical implications and directions for future research are discussed.

Introduction

Phobias and anxiety disorders are among the most prevalent psychological problems in childhood (Bernstein et al., 1996; Cartwright-Hatton et al., 2006; Costello et al., 2003) and are associated with a number of adverse outcomes in social, emotional, and school functioning (Strauss et al., 1987). If left untreated, childhood anxiety can pose a risk factor for the development of (other) internalizing and externalizing disorders in childhood (Last et al., 1996), adolescence (Bittner et al., 2007), and adulthood (Pine et al., 1998). The profound impact of anxiety on the lives of young children highlights the need to advance our understanding of the acquisition of this type of psychopathology.

Rachman's (1977) three pathways to fear model represents a useful framework for examining the acquisition of fears. This model suggests that fears can be acquired via: (1) a direct route of aversive classical conditioning, and two indirect routes of (2) modeling/vicarious learning (i.e., learning by observing others), and (3) negative information transmission. Empirical research supports both direct as well as indirect pathways to fear acquisition (see reviews by Askew & Field, 2008; King, Gullone, & Ollendick, 1998; Muris & Field, 2010). However, much of this evidence has relied on retrospective studies (e.g., Grüner, Muris, & Merckelbach, 1999; Muris, Steerneman, Merckelbach, & Meesters, 1996), and therefore the causal role of these pathways in the acquisition of fear cannot be established. Fortunately, recent studies have developed prospective paradigms to explore the role of indirect vicarious learning experiences for the development of childhood fear (Askew & Field, 2007; Gerull & Rapee, 2002).

This study will focus on the role of modeling, a specific form of vicarious learning, which, in its most basic, traditional form, is defined as demonstrating non-fearful behavior in a potentially fear/anxiety-evoking situation and showing a more adaptive response with the feared stimulus or in the feared situation (Dubi, Rapee, Emerton, & Schniering, 2008; Gerull & Rapee, 2002). Conversely, fearful behaviors and less adaptive responses can also be modeled. Modeling can be live or symbolic (filmed).

The role of modeling in fear acquisition has been examined experimentally in infants and toddlers, with mothers as live models (De Rosnay et al., 2006; Dubi et al., 2008; Gerull & Rapee, 2002). Results of these studies showed that toddlers displayed greater fear expressions and avoidance towards novel, fear-relevant and fear-irrelevant stimuli, and strangers following negative maternal modeling. Further, next to the negative role of maternal modeling, past research has also identified a protective role for positive modeling (Egliston & Rapee, 2007; Kelly, Barker, Field, Wilson, & Reynolds, 2010). Egliston and Rapee (2007) demonstrated that toddlers who observed their mother interact positively with a fear-relevant stimulus, showed more positive reactions and approach behaviors towards that stimulus compared to toddlers who did not observe their mother interact positively with the stimulus. Kelly and colleagues (2010) on the other hand showed that in 6- to 8-year-olds, positive information and modeling about an animal led to lower fear beliefs and avoidance behavior than a control condition. Taken together, these results suggest that young children can acquire fear beliefs and avoidance behaviors towards fear-relevant and fear-irrelevant stimuli through (experimentally induced)

negative maternal modeling, while positive maternal modeling may serve to reduce the risk for developing fear and avoidance behavior in young children.

Askew and Field (2007) used an experimental, prospective design to determine the effect of vicarious learning on fear cognitions and avoidance behavior of novel animals in children aged 7 to 9 years. In this study, children were presented with images of novel animals, which were paired with images of either happy, scared, or neutral faces (control condition). Children's directly and indirectly measured fear beliefs towards the animals changed in a direction congruent with the facial expressions with which they were paired during the vicarious learning phase. At a 3-month follow-up assessment, indirectly measured fear beliefs persisted. In a second study, Askew and Field (2007), observed that children were significantly slower to approach a touch-box they believed to contain an animal they had previously seen paired with scared faces. Altogether, these results support Rachman's theory (1977), which assumes that vicarious learning represents a viable pathway through which cognitive and behavioral aspects of fear can be learned. However, previous studies on the role of modeling in fear learning and fear reduction have some limitations. First, Askew and Field's paradigm does not resemble vicarious learning in the real world: It is very artificial and used rather pure and unrealistic unconditioned stimuli (USs), which might explain the relatively weak effects (certainly compared to verbal information) they found. Therefore, this paradigm is likely to be (much) less potent than a real world vicarious learning event in establishing fear beliefs in children. However, those studies employing more naturalistic approaches (e.g., De Rosnay et al., 2006; Dubi et al., 2008; Egliston & Rapee, 2007; Gerull & Rapee, 2002) are also limited in that they only used mothers as models. Therefore, the paradigm used in the current study tried to improve on this by using more ecologically valid stimuli, namely videos in which children see unknown peers approach a box, which they believe contains a novel animal in either in a happy, confident manner (positive modeling) or in a hesitant, fearful manner (negative modeling).

To date, very few studies have examined the effect of peer modeling on young children's fear cognitions and behaviors, especially not using a prospective, experimental design. However, there is reason to believe that when children grow older, peers become an important source of information about the world and how to react in different situations, second only to their parents (e.g., Schunk, 1987; Schunk & Hanson, 1985). Previous studies have also mainly focused on the effects of positive peer modeling as a means by which to reduce pre-existing fears. Both Bandura and Menlove (1968) and Hill, Liebert, and Mott (1968) studied the effect of filmed modeling on young children's (pre-existing) fear of dogs. Both studies showed that following positive peer modeling, children achieved larger increases in approach behaviors towards the dogs relative to the no-modeling control condition. Children facing hospitalization, surgery, or dental sessions also report less fear and apprehension prior to their procedure if they have observed a film of a peer undergoing the same procedure compared to children who view an unrelated control film or a demonstration film without a peer model (Melamed & Siegel, 1975; Melamed, Yurcheson, Fleece, Hutcherson, & Hawes, 1978). Third, children fearful of water showed less fear of swimming after being exposed to a peer-coping or peer-

mastery model during their swimming sessions than fearful children who had their swimming lessons without being matched with a peer model (Weiss, McCullagh, Smith, & Berlant, 1998). On balance, previous research evidence indicates that filmed and live modeling is an efficacious intervention in the treatment of childhood phobias and anxiety disorders (see for a review Ollendick & King, 1998).

Despite past research demonstrating a role for peer modeling in the reduction of childhood fears, the role of peer modeling in the *acquisition* of children's fear related beliefs and behaviors has not yet been studied. Therefore, the current study investigated the effect of filmed peer modeling on fear beliefs and approach-avoidance behaviors towards unknown animals in 8- to 10-year-old typically developing children. An experiment is reported in which children viewed peers modeling positive approach or negative avoidance behavior about one of two unknown animals with the second animal serving as a no-modeling control condition. To determine the effect of peer modeling, children's fear beliefs and avoidance tendencies about both animals were assessed before and after seeing the modeling films. Children's actual approach behavior towards both the modeled and non-modeled animal was assessed using a touch-box task.

We hypothesized that children's fear beliefs and avoidance tendencies towards the modeled animal would change as a function of the valence of peer modeling observed, with fear and avoidance increasing after negative peer modeling and decreasing after positive peer modeling. We anticipated no change in fear beliefs for the no-modeling animal. Further, it was anticipated that children in the negative modeling condition would show less approach behavior towards the modeled animal compared to children in the positive modeling condition.

Method

Participants

Ninety-seven children (51 boys and 46 girls, *M* age = 8.58 years, *SD* = 0.89, range 8-10 years) participated from a primary school in the UK. This age range was appropriate as children of this age normally display animal-related fears (Field & Davey, 2001) and animal phobias typically have their onset during middle childhood. Participants were randomly assigned to the positive (n = 49) or negative modeling condition (n = 48) and the animal about which they received peer modeling was counterbalanced across participants. Modeling groups were comparable at baseline for age, state and trait anxiety, and gender (all ts < 1.52, ps > .13). This study was approved by the School of Life Sciences Research Ethics and Governance committee of the University of Sussex.

Materials

Animals. Pictures of two rare types of guinea pigs were used throughout the experiment. The animals were named after their type/Latin name. The Cavia is a bald guinea pig, while the Lunkarya is a very furry guinea pig.

State-Trait Anxiety Inventory for Children (STAI-C). The STAI-C (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1973) comprises of 20 items to assess trait anxiety and 20 items to assess state anxiety with items scored on a 3-point Likert-scale. The STAI-C is a reliable and valid measure to assess anxiety in children (Field & Lawson, 2003). Cronbach's alphas

ranging from .78 to .81 and moderate test-retest stability (*r*s between .68 and .71) after an eight-week time interval have been reported (Field, 2006; Field, Lawson, & Banerjee, 2008). Cronbach's alphas in this sample were .80 for state anxiety and .83 for trait anxiety. The mean trait anxiety score of the present sample was 35.15 (*SD* = 6.79, range 21-49), which is comparable to the norm of 37.30 for an unselected elementary school sample as reported by Spielberger et al.

Fear Beliefs Questionnaire (FBQ). The FBQ (Field & Lawson, 2003) assesses children's fear beliefs about the guinea pigs. The FBQ consists of 8 questions about each animal (e.g., "Would you feel scared if you saw a Cavia?") with responses made on a 5-point Likert-scale (0 = *No, not at all* to 4 = *Yes, definitely*). Each question is presented in a random order with a picture of the animal to which it refers. A mean fear belief score is calculated for each animal ranging from 0 (no fear belief) to 4 (maximum fear belief). The FBQ has shown moderate to good internal consistency (see Field & Lawson, 2003). For example, Field (2006) reported Cronbach's alphas between .84 and .98. Reliabilities found in the current study were consistent with past research: before the film, Cronbach's α = .82 (Cavia) and α = .79 (Lunkarya), and after film, α = .89 (Cavia) and α = .86 (Lunkarya).

Nature Reserve Task (NRT). The NRT measures children's avoidance tendencies towards the guinea pigs (Field & Storksen-Coulson, 2007). The task uses a rectangular wooden board, which is covered with green material covered with fences, bushes and trees (made from brown and green pipe cleaners), and flowers (small yellow balls), to make it look like a nature reserve. The child is asked to imagine that they are visiting this nature reserve and they are told that the guinea pigs live in this nature reserve. A picture of each guinea pig is placed on opposite edges of the board in turn and the child is given a Lego figure (a boy figure for boys and a girl figure for girls) that represents them and is asked to place this figure on the board to show where they would like to be when they visit the nature reserve, and when the animal is present. The distance (in millimeters) from the Lego figure to the centre of the animal picture is used as a measure of avoidance tendency towards the animal.

Behavioral Approach Task (BAT). Two identical wooden boxes, each labeled with a picture of a guinea pig, were developed. These touch boxes were a variant of the touch boxes successfully used by Field and colleagues in other studies (e.g., Field & Lawson, 2003; Field et al., 2008; Field & Storksen-Coulson, 2007). Each box contained straw and an ipod and speakers playing guinea pig and rustling sounds. The front of each box had 10 small holes arranged vertically while the back contained a small hinged door. The children were not able to look inside the box. Children were told that each box contained the guinea pig shown and they were then asked to place their finger into the 10 holes (one hole at a time), starting with the upper hole and working their way down to the lowest hole (thus approaching the animal). Children always first approached the box containing the animal they saw in the movie they were assigned to. The number of holes completed was taken as a measure of behavioral approach. After each hole, the child was asked to indicate how anxious they felt on a 10-point scale (1 = *not anxious at all* to 10 = *very anxious*). Afterwards, a mean anxiety rating (over the completed holes) for each box was calculated.

***Peer modeling paradigm*.** Children viewed on a laptop screen either a positive or negative modeling film (without sound) in which they saw 4 peers (2 boys and 2 girls of 8 to 12 years of age) approach the same wooden box as is used in the BAT. The positive and negative films were approximately matched for length and the same child models were used in both conditions. In the positive film, children watched the peer models happily approach the box, open the door, put their arm in the box, and appear to stroke the animal inside the box (at no time was the animal seen). In the negative film, children watched the peer models approach the box hesitantly, very carefully open the door, and then not dare to touch the animal.

Procedure

Informed parental consent was obtained for all children and verbal assent from children prior to participation. First, the child was introduced to the experimenter, and it was stressed that the child was free to withdraw at any point in the experiment. The child began by completing the STAI-C (state and trait anxiety) before being introduced to the guinea pigs via pictures. Following this, children completed the FBQ and NRT about both animals before watching the peer modeling video. Next, the child completed the BAT to assess his/her behavioral approach of each animal. Upon completion, the FBQ and NRT were readministered. Finally, all children were debriefed individually and told that there was no real animal in the box.

Statistical analyses

A series of 2 (valence modeling film: negative versus positive) × 2 (animal: modeled versus non-modeled) × 2 (time: before and after film) mixed ANOVAs were performed on FBQ and NRT scores, while 2 (valence) × 2 (animal) mixed ANOVAs were performed on number of holes completed on the BAT and BAT mean anxiety ratings. No significant association was observed between STAI-C trait anxiety and changes in fear beliefs and NRT scores over time. Therefore, trait anxiety was not considered in the analyses. No significant gender differences were found on the STAI-C state, STAI-C trait, FBQ, NRT, BAT number of holes, or BAT mean anxiety rating (all ts < 1.71, ps > .09). Therefore, gender was not considered in further analyses either.

Results

Effects on children's self-reported fear beliefs

Figure 1 shows children's mean fear beliefs scores before and after seeing the modeling film for the positive and negative modeling condition. A mixed ANOVA yielded a significant interaction effect of valence × time (F[1,95] = 6.44, p < .05, d = .52), with children's mean fear beliefs significantly decreasing after positive modeling (F[1,48] = 10.64, p < .01, d = .94, 1.48 vs. 1.23), with no significant change after negative modeling (F[1,47] = 0.43, p = .52, 1.46 vs. 1.52). A time × animal interaction was also found (F[1,95] = 6.09, p < .05, d = .51) with no significant change in mean fear ratings for the modeled animal (t[96] = 0.05, p = .96, 1.46 vs. 1.47), but a significant decrease in fear beliefs about the non-modeled animal (t[96] = 2.74, p < .01, d = .41, 1.48 vs. 1.29). More important, a significant three-way interaction of valence × animal × time (F[1,95] = 5.63, p < .05, d = .49) was found. To tease apart this significant 3-way interaction, separate analyses were

performed for the positive and negative modeling conditions. Subsequent mixed ANOVAs found no significant animal × time interaction effect in the positive modeling group (F[1,48] = 0.01, p = .95). After watching the positive modeling film, a significant decrease in fear belief scores was observed for both the modeled (t[48] = 2.73, p < .01, d = .55, 1.49 vs. 1.25) and non-modeled animal (t[48] = 2.55, p < .05, d = .52, 1.46 vs. 1.21), with the effect size marginally bigger for the modeled animal. In the negative modeling group, a significant animal × time interaction was found (F[1,47] = 11.20, p < .01, d = .97). As shown in Figure 1, children's fear belief scores for the modeled animal increased (t[47] = 2.08, p < .05, d = .44, 1.43 vs. 1.69), with a small but non-significant reduction in fear beliefs for the non-modeled animal (t[47] = 1.31, p = .20, 1.49 vs. 1.36).

Effects on avoidance tendencies and approach behaviors

A mixed ANOVA performed on NRT scores (see Figure 2) revealed that NRT scores decreased significantly across time (F[1,95] = 19.97, p < .01, d = .92, 100.94 vs. 77.78). The valence × time interaction also reached significance (F[1,95] = 5.36, p < .05, d = .47), with NRT scores decreasing significantly in the positive modeling condition (F[1,48] = 26.98, p < .01, d = 1.50, 97.58 vs. 62.43), whereas NRT scores did not change across time in the negative modeling condition (F[1,47] = 2.01, p = .16, 104.29 vs. 93.13). More important, the hypothesized three-way valence × animal × time interaction reached significance (F[1,95] = 8.03, p < .01, d = 0.58). To tease apart this interaction, positive and negative modeling groups were examined separately. Subsequent mixed ANOVAs found a non significant animal × time interaction effect for the positive modeling group (F[1,48] = 1.95, p = .17), but a significant animal × time interaction for the negative modeling group (F[1,47] = 6.12, p < .05, d = .72). As shown in Figure 2, after watching the negative modeling film, children's avoidance tendency in relation to the non-modeled animal significantly decreased (t[47] = 3.06, p < .01, d = 0.63, 112.8 vs. 86.85), whereas there was a non-significant increase in avoidance tendencies towards the negatively modeled animal (t[47] = 0.33, p = .75, 95.77 vs. 99.40). However, after watching the positive modeling film, children's avoidance tendencies of both the modeled (t[48] = 4.67, p < .01, d = 1.03, 101.96 vs. 60.84) and non-modeled animal (t[48] = 4.11, p < .01, d = 0.83, 93.20 vs. 64.02) decreased significantly.

Finally, a series of 2 (valence) × 2 (animal) mixed ANOVAs were performed on number of holes completed on the BAT and BAT mean anxiety ratings. However, no significant main or interaction effects were found (all Fs < 1.26, ps > .26).

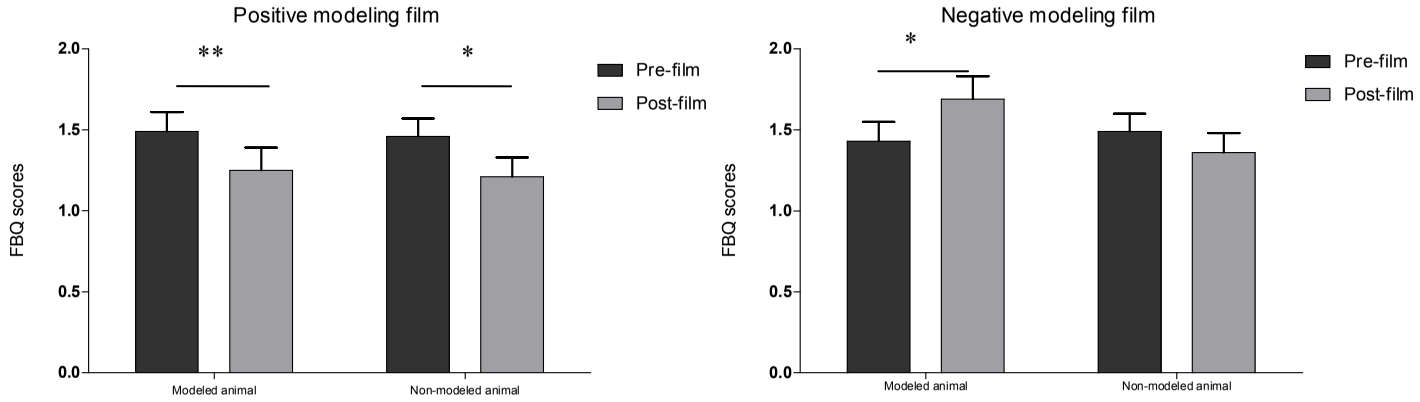


Figure 1. Children's mean fear belief scores for the modeled and non-modeled animal before and after presentation of the positive (left) and negative (right) modeling film. Error bars represent standard errors of the FBQ scores. * $p < .05$ ** $p < .01$

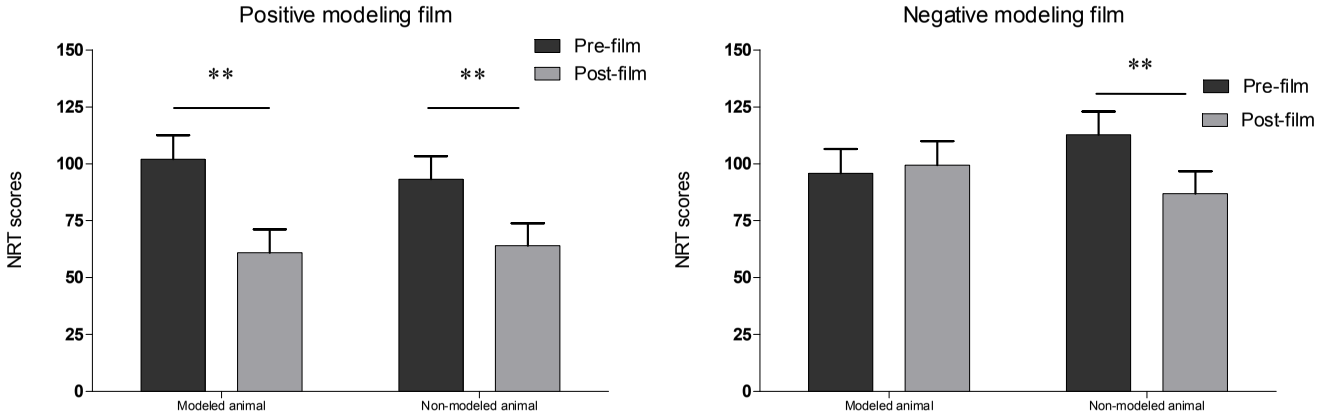


Figure 2. Children's mean NRT scores for the modeled and non-modeled animal before and after presentation of positive (left) and negative (right) modeling film. Error bars represent standard errors of the NRT scores. * $p < .05$ ** $p < .01$

Discussion

The present study investigated the effect of filmed peer modeling on fear beliefs, avoidance tendencies, and approach behaviors towards unknown animals in typically developing children. Results were partly in line with our predictions: Children's fear beliefs towards the modeled but also the non-modeled animal significantly decreased after positive peer modeling, whereas their fear beliefs increased after negative peer modeling for the modeled animal, but did not change significantly for the non-modeled animal. Furthermore, after positive modeling children demonstrated decreased avoidance tendencies towards the modeled as well as the non-modeled animal, whereas after negative modeling avoidance tendencies did not change for the modeled animal, but decreased for the non-modeled animal too. No significant results were obtained with the behavioral approach task.

The effect of positive and negative peer modeling for the modeled animal on children's fear beliefs and self-reported avoidance tendencies is consistent with previous studies demonstrating that after positive peer modeling children report lower levels of fear towards the animal and are more willing to approach it (Bandura & Menlove, 1968; Hill et al., 1968). While no previous research can be found on the role of negative *peer* modeling, results of earlier studies on the role of maternal modeling in the acquisition of childhood fears are in line with the findings obtained in the current study: Children report higher levels of fear towards the novel stimulus after negative modeling (De Rosnay et al., 2006; Dubi et al., 2008; Gerull & Rapee, 2002). In terms of the development of fears in children, these findings support the modeling/vicarious learning pathway of Rachman's (1977) model of fear learning as a plausible mechanism through which fears can be acquired. These results also show that modeling can be a tool by which to diminish fears, which is consistent with results of treatment outcome studies which show that modeling can play a role in overcoming fears (King, Muris, Ollendick, & Gullone, 2005).

However, the effect of positive and negative modeling on the non-modeled control animal was somewhat less clear. We hypothesized that the non-modeled control animal would show no change in fear beliefs and avoidance tendencies. However, a significant reduction of fear and avoidance was observed for the non-modeled animal after seeing the positive modeling film (as it was for the modeled animal), with slightly stronger effects for the modeled animal than the non-modeled animal. Thus, it seems that the effects of positive modeling generalized to the non-modeled animal. However, after negative modeling a different picture emerged. Here a small but non-significant reduction in fear beliefs for the non-modeled animal was observed after watching the negative modeling film, whereas a significant reduction in avoidance tendencies for the non-modeled animal was observed. While it is not entirely clear why this difference in results emerged, we speculate that a comparison effect could be responsible with children comparing the non-modeled animal more favorably when contrasted with the modeled animal, which they have just observed their peers react negatively towards. Furthermore, the effect of negative modeling compared to positive modeling seemed generally slightly weaker (range *d*s negative modeling: .44 - .97 and range *d*s positive modeling: .52 - 1.50). This could be a consequence of administering the second FBQ and NRT after children had

undertaken the BAT. In doing so, children assigned to negative peer modeling who placed their finger in one or more holes would have quickly learned that there were no explicit negative consequences of approaching the modeled animal (e.g., they were not bitten by the animal). These direct non-aversive personal experiences are likely to have been more powerful sources of information about potential threat than the previous filmed modeling and thus may have served to (partly) undo the effects of the negative modeling film.

Finally, no significant effects of type of modeling were found on the behavioral approach task. Previous studies using similar procedures to investigate the effect of negative information and vicarious learning on approach behavior have found effects on this touch-box measure (Askew & Field, 2007; Field & Lawson, 2003). It is difficult to explain why our study did not find any results on this measure but did find effects on fear beliefs and indirectly assessed avoidance tendencies. Perhaps the fear beliefs questionnaire and the nature reserve task are more vulnerable to be biased by the compliance of children to the demands of the experiment than the behavioral approach task. Another possibility is that the touch box task is less sensitive to pick up changes in fearful behavior than the other measures. Moreover, the "modeling intervention" used in this study was rather subtle (effect sizes on the other tasks were also fairly moderate with a range between .52 - .1.03) and it remains plausible that differential behavioral effects may simply have been too weak to be actually observed. Alternatively, it could be that not peer modeling but current anxiety level at time of assessment is more likely to influence children's performance on this task. Looking at the data, we found some support for this hypothesis: That is, the mean anxiety rating on this task (i.e., "How anxious do you feel right now?") was positively correlated with children's state anxiety (r = .29 for the modeled animal and .24 for the non-modeled animal, ps < .05), whereas the mean anxiety rating during the behavioral approach task was negatively associated with the number of holes children completed (r = -.56 for the box with the modeled animal and -.66 for the non-modeled animal, ps < .01). However, state anxiety was not significantly linked to number of completed holes directly.

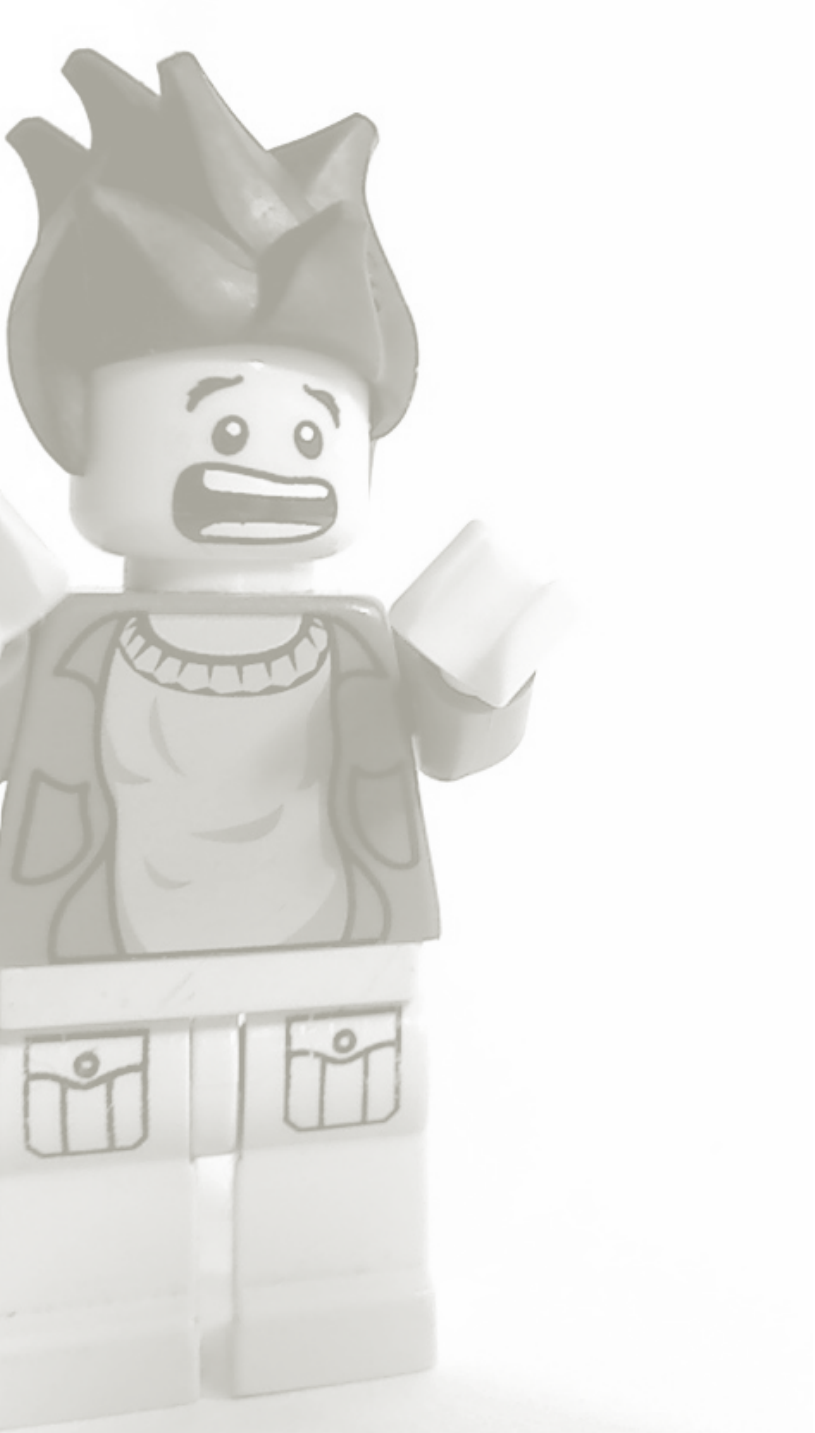
The results of the current study are limited by a number of factors. First, although this study did show that peer modeling may play a role in children's fear learning, the extent to which these processes also play a role in the natural environment remains to be empirically scrutinized. Moreover, other factors such as providing negative information, maternal modeling, and negative experiences have also been shown to play a role in the acquisition and persistence of childhood fears. It needs to be established which types of modeling, children learn most effectively from. It may well be the case that the impact of modeling by either an adult, a parent, or a peer changes over age and that when children become older and peers become a more important source of information about the world that the impact of peer modeling increases whereas the impact of parental modeling declines. Second, this study only tested whether peer modeling had a short-term effect on children's fear beliefs and approach-avoidance tendencies within a single experimental session, and it remains unclear whether these effects will last over a longer period of time. However, there is some reason to believe that vicariously learned fear beliefs will persist over time, as Askew and Field (2007) showed in their vicarious learning

study that indirectly measured fear beliefs persisted over a 3-month period. Third, while this study selected guinea pig stimuli that were unusual/rare and therefore likely to be novel to the participants, it remains the case that most of the children in the study were likely to have prior knowledge/experiences with guinea pigs. This prior experience/knowledge may have served to weaken the effects of the peer modeling manipulation. Future research could examine whether the effects of peer modeling are strengthened by the use of truly novel animal stimuli about which children are unlikely to have had any previous experience. Additionally, the use of a non-clinical sample makes inferences about the development of phobias and implications for treatment rather speculative and therefore these ideas should also be tested in a clinical sample. Finally, fear beliefs were only measured by means of self-report, which may have been biased by the compliance of children to the demands of the experimenter. Including implicit measures to evaluate fear beliefs may strengthen the design and generalisablity of future studies as these tasks are more resilient to demand effects.

In spite of these shortcomings, the current study makes an important contribution to the limited data available on the development of fear in children. While most empirical studies on fear learning focus on the role of parents, this study made a first attempt to explore the influence of positive and negative *peer* modeling on the acquisition and reduction of childhood fears under more ecologically valid conditions. Furthermore, the experimental design, sample size, and the inclusion of a behavioral measure next to the self-report measure were strengths of the study. The results indicate that negative peer modeling might play a role in the acquisition of childhood fears, whereas positive peer modeling may have fear-reducing effects and may encourage approach behavior. This is interesting from a therapeutic point-of-view and has implications for the prevention and treatment of anxiety disorders. Recent research has shown that specific interventions using vicarious learning and verbal information interventions can be used to unlearn fears experimentally induced using threat information (Kelly et al., 2010). Providing children with positive verbal information or positive modeling experiences led to reductions in self-reported fear beliefs and reduced behavioural avoidance. Furthermore, positive modeling is a key component of existing cognitive-behavioral interventions for phobias in youths (Dadds & Barrett, 2001; James, Soler, & Weatherall, 2005; Ollendick & King, 1998; Rapee et al., 2009). The power of this positive modeling, especially of peer modeling, and the circumstances under which it is most effective should be studied more extensively.

Chapter 9

General discussion



Summary and discussion

The main objectives of the present dissertation were to gain more insight in the development of anxiety disorder symptoms in non-clinical children, and second, to study a number of factors that are hypothesized to play a role in the etiology and maintenance of anxiety problems, and to clarify their role in the development of this type of psychopathology. Furthermore, the psychometric properties of three questionnaires for measuring anxiety symptoms (or broader internalizing difficulties) and the temperamental vulnerability factor of behavioral inhibition were examined. In the current chapter, a summary of the main results of the studies as reported in Chapters 2 to 8 of this dissertation will be given, followed by an integration and discussion of these findings. This chapter concludes with suggestions for further research and some concluding remarks.

Summary of the main results

First, in **Chapter 2**, the acceptability, reliability, and validity of two parent-rated questionnaires for assessing anxiety (or broader internalizing problems) in young children, namely, the Preschool Anxiety Scale (PAS; Spence et al., 2001) and the Children's Moods Fears and Worries Questionnaire (CMFWQ; Bayer et al., 2006) were examined in a Dutch community sample of 275 preschool children aged 2 to 6 years. Results showed that the acceptability of both the PAS and CMFWQ items was good. PAS and CMFWQ scales displayed moderate to high internal consistency coefficients. Furthermore, support was found for the construct validity of both measures and CMFWQ and PAS scores discriminated reasonably between children scoring in the normal, subclinical, and clinical range of various Child Behavior Checklist subscales (Achenbach, 1992). Altogether, both scales seemed to be reliable and valid instruments for measuring emotional difficulties in young children. The PAS appeared particularly useful when measuring a variety of fear and anxiety symptoms, whereas the CMFWQ seemed to be a suitable index for assessing a broader range of internalizing problems.

Chapter 3 described a study on the psychometrics of a questionnaire measuring behavioral inhibition, a temperament characteristic referring to the tendency to be unusually shy and to respond with fearfulness and withdrawal in new and unfamiliar social and non-social situations (Hirshfeld-Becker et al., 2004). Behavioral inhibition is considered to be a vulnerability factor for the development of anxiety disorders (e.g., Biederman et al., 1993; Hirshfeld-Becker et al., 2007). In this study, the psychometric properties of the Behavioral Inhibition Questionnaire (BIQ; Bishop et al., 2003), a questionnaire measuring social- and non-social components of this temperamental trait, were examined in a Dutch community sample of children aged 4 to 15 years (N = 531). As the BIQ was only examined in preschool samples in previous studies (Bishop et al., 2003; Edwards, 2007), the reliability and validity of the BIQ was evaluated in three age groups (i.e., 4- to 7-year-olds, 8- to 11-year-olds, and 12- to 15-year-olds) in order to explore whether this questionnaire also displays good psychometric properties in older children and adolescents. The results indicated that, in all three age groups, the internal consistency of most BIQ subscales was satisfactory. Further, support for the construct validity of the measure was obtained: BIQ

scores were positively correlated with a wide range of anxiety symptoms, although the most substantial links were found with symptoms of social anxiety. Finally, children aged 9 and above also filled out a self-report version of the BIQ. This version was also found to possess good internal consistency and showed adequate parent-child agreement. In sum, the results of this study suggest that the BIQ might be a reliable and valid measure for assessing behavioral inhibition not only in preschoolers but also in older children and adolescents.

After having established the reliability and validity of a number of the measures that were to be used in the studies carried out for this dissertation, Chapter 4 and 5 focused on developmental patterns in childhood anxiety problems. The study reported in **Chapter 4** made an attempt to clarify the often assumed, but barely empirically investigated notion that children's cognitive development mediates developmental patterns in anxiety phenomena (e.g., Muris, 2007; Vasey, 1993). This chapter described a cross-sectional study that specifically focused on the relation between (social-)cognitive development on the one hand, and fear, anxiety, and behavioral inhibition on the other hand (N = 226, age range 4-9 years). Results showed significant age trends for general fearfulness, "fear of the unknown", and generalized anxiety with younger (i.e., 4- and 5-year-old) children displaying higher fear scores, whereas older (i.e., 6- and 7-year-old and 8- and 9-year-old) children exhibited higher generalized anxiety scores. More importantly, results of regression analyses showed that the impact of developmental factors on various anxiety phenomena was fairly limited. Age accounted for a substantial proportion of the infantile fears (e.g., fears of the dark, imaginary creatures, etc.; i.e., 18.9%), suggesting that this type of fear is clearly a function of maturation. However, for 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.

While the study on developmental patterns in childhood anxiety described in Chapter 4 was cross-sectional of nature, the study reported in **Chapter 5** investigated developmental patterns in anxiety disorder symptoms in children aged 4 to 11 years (N = 224) using a 2-year prospective design. More specific, the purpose of this study was (a) to identify distinct developmental trajectories for different categories of anxiety disorder symptoms (i.e., social anxiety, fear, generalized anxiety, and separation anxiety), and (b) to investigate to what extent the child-related variables of behavioral inhibition, social-cognitive development, and psychosocial adjustment, which were measured at study onset, were predictive of the developmental trajectories of these anxiety disorders symptoms. Analyses revealed three to four distinguishable developmental trajectories for the various types of anxiety symptoms: Most of which were fairly stable over time and for which the 'stable-low' or 'stable-medium' reflected the normative trajectory. Further, analyses indicated that the higher developmental trajectories of anxiety were associated with higher levels of behavioral inhibition and social-cognitive abilities at study-onset. In sum, the results show heterogeneity in the development of anxiety symptoms. Furthermore, these findings suggest that high-risk children with atypical, chronic high levels of

anxiety symptoms can already be identified at an early age, and that a child-related variable such as behavioral inhibition can be reliably used to identify these children.

The last three studies described in Chapter 6 to 8 addressed various specific vulnerability factors that are hypothesized to be involved in the etiology and maintenance of anxiety problems, namely repetitive negative thoughts, information-processing biases, and peer modeling. First, the study reported in **Chapter 6** examined the role of repetitive negative thoughts (i.e., worry and rumination), not only in the vulnerability for anxiety problems, but also for other emotional problems (i.e., symptoms of depression and sleep problems) in typically developing children aged 8-13 years (*N* = 158). More specifically, a model was examined in which worry and rumination statistically mediated the link between the personality trait of neuroticism and symptoms of anxiety, depression, and sleep problems. Furthermore, it also explored whether behavioral inhibition accounted for unique variance in the prediction of repetitive thought and psychopathological symptoms, and anxiety problems in particular. Results demonstrated positive associations between measures of general vulnerability (i.e., neuroticism), repetitive negative thoughts, and emotional problems. Further, support was found for a model in which worry and rumination acted as partial mediators in the relation between neuroticism and symptoms of anxiety and depression. In the case of sleep difficulties, no evidence was obtained for such a mediation model. In fact, data suggested that sleep difficulties are better conceived as an epiphenomenon of high symptom levels of anxiety and depression or as a risk factor for the development of other types of psychopathology. Finally, besides neuroticism, the temperamental trait of behavioral inhibition appeared to play a unique direct role in the model predicting anxiety symptoms but not in the models predicting depressive symptoms or sleep difficulties. Thus, these results are in keeping with the idea that worry and rumination contribute to children's vulnerability for anxiety and depression.

Second, **Chapter 7** described a study examining (a) processing biases for emotional facial stimuli in a sample of 355 4- to 12-year-old non-clinical children, (b) developmental patterns of such biases, and (c) to what extent biases were related to social anxiety and the temperamental trait of behavioral inhibition in children of various ages. Results showed that children were generally faster in detecting happy faces as compared to angry faces, and this effect was not qualified by age, social anxiety, or behavioral inhibition. No significant effect of age on bias scores was found, indicating that there were no developmental patterns in processing biases. However, further analyses revealed two classes in the data with one class mainly consisting of younger children and the other class predominantly containing older children. Younger children were in general slower, less accurate, and displayed more variance in their scores on the processing biases tasks than older children. Results of this study underline the need of the development and use of more age-appropriate, non-reaction time-based tasks for measuring processing biases in younger children.

Finally, the effect of peer modeling on fear beliefs and approach-avoidance behaviors towards animals in 8- to 10-year-old typically developing children (*N* = 97) was examined in a study which was reported in **Chapter 8**. For this study children were randomly

assigned to view either a positive or negative modeling film in which they saw peers interact with an unknown animal. Results of this study showed that following positive peer modeling, children's fear beliefs and avoidance tendencies towards the modeled but also towards the non-modeled animal decreased significantly. After negative modeling, children's fear beliefs towards the modeled animal increased significantly, but did not change for the non-modeled animal. Negative modeling did not change avoidance tendencies for the modeled animal, while it decreased children's avoidance of the non-modeled animal. No significant changes were observed during the behavioral approach task. Thus, the effects of positive modeling seemed to generalize to the non-modeled animal, whereas after negative modeling a comparison effect seemed to emerge, causing children to compare the non-modeled animal more favorably when contrasted with the modeled animal. Taken together, these results indicate that negative peer modeling might play a role in the acquisition of childhood fears, whereas positive peer modeling may have fear-reducing effects and may encourage approach behavior.

Discussion

After having summarized the main results of the studies included in this dissertation, these results will be discussed in the light of this dissertation's purposes. For reasons of readability the discussion is divided into four parts, namely results on: questionnaires, developmental course, the role of (social-)cognitive development, and vulnerability factors.

Questionnaires

There are clear indications that anxiety problems already reveal themselves at a very young age (e.g., Egger & Angold, 2006) and that distinct markers of anxiety pathology such as behavioral inhibition can already be observed in preschool children. This presence of clear-cut signs of anxiety in the preschool years combined with the severe impact that these problems can have on children's lives (e.g., Strauss et al., 1987; Woodward & Fergusson, 2001), made various authors stress the importance of identifying anxious children as early as possible (e.g., Hirshfeld-Becker & Biederman, 2002). Early identification would not only be important for children who already meet the diagnostic criteria of an anxiety disorder, but also for children with subclinical levels of anxiety, as it would become possible to implement early prevention and intervention programs (e.g., Dadds et al., 1999; Rapee, 2002). To achieve this goal, psychometrically sound instruments for screening anxiety symptoms and related vulnerability factors such as behavioral inhibition in (young) children are urgently needed. Therefore, Chapter 2 and 3 described studies that assessed three parent-rated questionnaires that seem useful for this purpose. Results showed that these questionnaires (i.e., PAS, CMFWQ, and BIQ) generally displayed good psychometric properties. Furthermore, the PAS seems to be particularly useful for measuring a variety of fear and anxiety symptoms, whereas the CMFWQ might be a suitable index of a broader range of internalizing problems. The BIQ on the other hand, seems to be a promising scale for assessing social and non-social aspects of behavioral inhibition in preschoolers as well as older children and adolescents. Thus, reliable and valid instruments are available that can be employed to identify young

children displaying high levels of anxiety symptoms or behavioral inhibition, which is an important prerequisite for the implementation of prevention or early intervention programs. However, further research is needed to establish the practical utility of these questionnaires in clinical populations.

Developmental course

After having established the psychometrics of some questionnaires that were used in the other studies in this dissertation, Chapter 4 and 5 cross-sectionally (Chapter 4) and prospectively (Chapter 5) studied developmental patterns in anxiety disorder symptoms and their relation with (amongst other things) cognitive development. First, cross-sectional data (Chapter 4) showed significant age trends for general fearfulness, infantile fears (e.g., the dark, imaginary creatures), and generalized anxiety. That is, younger (i.e., 4- and 5-year-old) children displayed higher levels of fear, whereas older (i.e., 6- and 7-year-old, and 8- and 9-year-old) children exhibited higher levels of generalized anxiety. These age trends were in keeping with those reported in previous studies (e.g., Bauer, 1976; Muris et al., 2000). However, not all predicted age patterns were documented in this study: The predicted decline in symptoms of separation anxiety did not emerge. In fact, a quite complex and seemingly contradicting pattern of results was found: Separation anxiety symptoms slightly increased as children got older, while these symptoms declined with increasing cognitive maturation. It may well be that the expected decline in separation anxiety symptoms did not emerge because of the limited age range of the sample under study (i.e., 4- to 9-year-olds), however it could also be the case that separation anxiety is characterized by diverging symptoms (e.g., Silverman & Dick-Niederhauser, 2004) which may exhibit a differential developmental pattern. That is, on the one hand, separation anxiety may reflect a rather childish desire not to be separated from the parent, which is likely to decrease during the course of development. On the other hand, this type of anxiety may also be 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 a sample with a broader age range.

However, the former study was cross-sectional of nature. A prospective study in which children are followed over time would provide a more detailed picture of the developmental course of anxiety. Therefore, a 2-year prospective, multi-cohort study on developmental patterns of anxiety disorder symptoms in children was also conducted (Chapter 5). Most previous studies on the development of anxiety over time examined general patterns of anxiety and anxiety disorder symptoms in the total sample of children and/or adolescents (e.g., Ialongo et al., 1995; Keller et al., 1992; Pine et al., 1998) by means of mean-level changes or rank-order consistency (Nagin, 2005), and therefore neglected to examine individual-level differences in the developmental course of anxiety over time (Nandi et al., 2009). However, it may well be the case that there are different subgroups of children whose anxiety problems may follow diverging developmental courses. Indeed, the results of our prospective study showed heterogeneity in the developmental course for various types of anxiety symptoms within a group of non-clinical school-aged children. Most trajectories that were found were fairly stable over time and the low or medium

level anxiety trajectories seemed to reflect the normative trajectories of anxiety symptoms, with only a minority of children being assigned to the high and very high anxiety trajectories. This stability of developmental trajectories over time is not fully in keeping with previous studies which have generally also found anxiety trajectories with increasing and decreasing levels of anxiety/internalizing symptoms, and with the developmental patterns which were documented in our cross-sectional study (Chapter 4). However, there are some differences between the present study and previous research which might partly explain these diverging findings. First, in our study, children's anxiety symptoms were only assessed on three points-in-time over a two-year period, whereas previous studies (Côté et al., 2009; Crocetti et al., 2009; Duchesne et al., 2008; Feng et al., 2008; Sterba et al., 2007) collected data over a more extended period of time. It seems plausible that when there is less time between data collection points, more stable trajectories will be found. Second, the age range differed considerably in various studies. In our study, the sample consisted of children between age 4 and 9 (at study onset), whereas other studies (Côté et al., 2009) relied on populations of younger children (i.e., 1.5 to 5 year-olds) or adolescents (Crocetti et al., 2009). Therefore, a longitudinal study in which children are followed during their entire youth would provide a more detailed picture on the developmental course of various types of anxiety symptoms. Nonetheless, the results of the study reported in Chapter 5 clearly indicate that individual differences in various types of anxiety problems can already be observed in children from the preschool years.

The role of (social-)cognitive development

The often assumed, but barely empirically studied notion that children's cognitive development might also play a role in the development of anxiety in children (e.g., Muris, 2007; Vasey, 1993), was also assessed in two studies in this dissertation (Chapter 4 and 5). A prospective study (Chapter 5) assessed whether social-cognitive development (i.e., Theory-of-Mind) at the time of study onset was predictive of high anxiety trajectories. It was indeed shown that social-cognitive development was positively associated with elevated total anxiety and social anxiety symptom trajectories. This finding is in line with the sparse research showing that increasing levels of cognitive development seem to make children more prone to display certain types of anxiety symptoms, such as fear of anxiety-related physical symptoms, worry, and social-evaluative anxiety (Muris et al., 2007; Muris, Merckelbach, Meesters et al., 2002; Westenberg et al., 2004). Obviously, these anxiety phenomena require a certain amount of self-reflection and/or thinking capacity. Thus, it may well be the case that social-cognitive skills are predictive of elevated levels of fear and anxiety, because such skills enable children to conceptualize threat and consequently perceive more situations in their daily lives as (potentially) threatening. The cross-sectional study (Chapter 4) however, shows that impact of developmental factors (as measured by a Theory-of-Mind interview and Piagetian conservation tasks) on various anxiety phenomena was fairly limited. Age accounted for a substantial proportion of infantile fears (i.e., 18.9%), suggesting that this anxiety phenomenon clearly is a function of maturation. However, for other anxiety phenomena (i.e., general fearfulness, anxiety), 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 these anxiety phenomena. Note that this notion fits nicely with the theoretical model of childhood fear and anxiety (Muris, 2007), which assumes that children's developmental level only acts as a moderating variable which partly determines the content of children's fear and anxiety at various ages, as well as the cognitive processes underlying these anxiety phenomena (e.g., cognitive biases). It seems to be the case that children's current levels of fear and anxiety are more determined by their present constellation of vulnerability factors and protective factors. Thus, when considering the fact that this study was more focused on measuring the intensity and frequency of fear and anxiety, the small percentage of explained variance by cognitive maturation might not be that surprising.

Vulnerability factors

The last studies in this dissertation (Chapter 6, 7, and 8) described studies on a number of specific vulnerability factors that are thought to play a role in the pathogenesis of anxiety problems and made an attempt to clarify their role in the development of childhood anxiety pathology. In sum, these studies showed that a variety of factors play a role in the development of anxiety problems in children, which again stresses the importance of considering dynamic multifactorial models when explaining the etiology of this type of pathology. The first vulnerability factor that will be discussed here is behavioral inhibition, which was shown to be an important variable in the study of childhood anxiety throughout various chapters in this dissertation (Chapter 3, 5, and 6). To begin with, it was shown that behavioral inhibition was specifically associated with anxiety and not with other emotional disturbances such as depression and sleep problems (Chapter 6). Furthermore, it was demonstrated that behavioral inhibition (at study onset) was a consistent predictor of high anxiety trajectories (Chapter 5) and although some previous research findings (e.g., Gladstone et al., 2005; Muris et al., in press) indicate that behavioral inhibition is a specific risk factor for social anxiety problems, the present data indicated that this was true for all types of anxiety disorder symptoms. Thus, behavioral inhibition seems to constitute a general vulnerability factor associated with a broad range of anxiety problems in primary school-aged children. The possibility of identifying children at high risk for anxiety by means of a measure such as the Behavioral Inhibition Questionnaire (Chapter 3), makes it possible to implement early intervention programs. In the clinical implications section, these findings will be elaborated a bit more on.

A second vulnerability factor of repetitive negative thoughts (i.e., worry and rumination) was also shown to play a role in anxiety problems. That is, worry and rumination seemed to act as partial mediators of the relation between neuroticism or behavioral inhibition and anxiety symptoms. This is in line with the notion that vulnerability to psychopathology is hierarchically structured with higher-order vulnerability factors such as neuroticism constituting a risk for the development of all types of anxiety problems, whereas second-order vulnerability factors (e.g., worry and rumination) are more specifically related to the manifestation of specific types of anxiety problems (see also Norton et al., 2005; Sexton et al., 2003). However, this study was cross-sectional in nature, thus the direction of effects (cause and effect) cannot be established. Therefore,

it is necessary to study vulnerability as well as protective factors that are thought to play a role in the pathogenesis of anxiety longitudinally and to establish their dynamic interaction in future studies.

A third variable of peer modeling was also demonstrated to play a role in the acquisition, as well as the reduction of childhood fears (Chapter 8). Previous experimental studies (De Rosnay et al., 2006; Dubi et al., 2008; Egliston & Rapee, 2007; Gerull & Rapee, 2002; Kelly et al., 2010) already established the role of maternal modeling in fear acquisition and reduction. However, the role of peer modeling remained unclear, while there is reason to believe that when children grow older, peers become an important source of information about the world and how to react in various situations too (Schunk, 1987; Schunk & Hanson, 1985). And indeed, after positive peer modeling, children's fear beliefs and avoidance tendencies towards animals decreased, while after negative peer modeling, children's fear beliefs towards the (modeled) animal increased. Thus, it seems that not only maternal modeling, but also peer modeling plays a role in the development of childhood fears. Furthermore, this finding supports the vicarious learning/modeling pathway of Rachman's (1977) fear learning model as a plausible mechanism through which fears can be acquired but also stresses the fear-reducing effects of positive peer modeling. Especially, these fear-reducing effects are also interesting from a therapeutic point-of-view and the clinical implications of these findings will be described in the clinical implications section below.

Finally, information-processing biases were investigated as a possible vulnerability factor involved in the development of anxiety (Chapter 7). However, no anxiety-related processing biases or developmental patterns in processing biases could be documented in this study. Yet, it was observed that younger children were generally slower, less accurate, and with more variance in scores on the processing bias tasks than older children. These findings are not fully in keeping with results of previous studies which have shown anxiety-related processing biases in children (e.g., Garner, 2010; Nightingale et al., 2010). However, most studies have not included children as young as the children in our sample (age 4-12), but children age 8 and up. Generally, it seems that anxiety-related processing biases have only been consistently established in late childhood and adolescence, whereas findings before this age are mixed (Hadwin & Field, 2010). The mixed results of previous studies on processing biases in young children together with our findings of younger children responding differently on the processing biases tasks (i.e., being slower, less accurate, and with more variance in scores) than older children seem to indicate that reaction time-based processing bias tasks, which are now predominantly used to study processing biases in children and adolescents, are probably not well-suited for younger children. Developmental trends in reaction times may overshadow the more subtle effect of anxiety, which may (partly) explain the mixed findings in young children. This underlines the need of developing more age-appropriate, non-reaction time-based tasks for measuring information-processing bias in young children.

Taken together, these findings support the premise of the dynamic multifactorial model of childhood fear and anxiety as described by Muris (2007), and show that various factors play a role in the etiology and maintenance of childhood anxiety. However, it

seems plausible that these factors, which were now mainly studied in isolation and in oversimplified models, do not act in isolation in the development of anxiety pathology, but interact in a complex, dynamic way with each other and with protective factors.

Limitations

So far, mainly the theoretical implications of the findings of the research described in this dissertation were discussed. However, there are some methodological constraints that have to be considered. The more specific limitations of each study of this dissertation have already been outlined in the discussion section of the individual chapters. However, here, a number of more general limitations will be addressed.

First, only non-clinical children participated in the studies described in this dissertation. All studies were conducted in community samples because we were interested in studying the development of anxiety in normal children, thus, with anxiety levels over the entire anxiety continuum from 'not anxious at all' to 'pathologically anxious'. Furthermore, as anxiety is hypothesized to be represented as a dimensional construct, thus with 'fluid' boundaries between high levels of anxiety, sub-clinical, and clinical levels of anxiety, then research with non-clinical children would also be effective and applicable to the less accessible clinical population. However, it still remains unclear whether this assumption is truly valid and thus, whether our results are generalisable to clinical populations.

Second, a selection bias could have affected the generalizability of the results of the studies presented in this dissertation. A selection bias could be in play when children (and parents) participating in a study are different from children (and parents) who are not participating (Rothman & Greenland, 1998). The response-rate for the studies reported in this dissertation ranged between approximately 25 and 70%. However, it is likely that non-response was not random. Children from lower social-economic backgrounds and ethnic minorities were underrepresented. However, there is evidence to suggest that anxiety problems are just as prevalent or even more prevalent in ethnic minority children (Hale et al., 2005). Therefore, it remains unclear to what extent the results of the studies in this dissertation can be generalized to these non-Caucasian populations and populations including children from lower social-economic backgrounds.

Third, most studies in this dissertation only relied on one instrument completed by one informant for measuring the concept under study. Preferably, studies should use a multi-trait, multi-method approach. The use of more than one informant seems especially important when assessing internalizing difficulties such as anxiety, as these are not always easily observable for parents and/or teachers, and this will increase the validity of the assessment of the behavior under study (Achenbach & Edelbrock, 1984; Achenbach et al., 1987).

Fourth, most studies described in this dissertation were correlational or cross-sectional in nature, and hence it was not possible to draw conclusions on cause-effect relationships. This is especially troubling in the study of vulnerability factors as it then cannot be established whether the hypothesized vulnerability factors (e.g., repetitive negative thoughts or information-processing biases) truly cause anxiety problems, or whether they

are only a consequence of anxiety pathology. Furthermore, when interpreting the results of these studies one always has to keep in mind the possible influence of confounders, in particular variables that are not measured which may potentially affect the study outcomes (Field, 2009).

Additionally, although the sample sizes of the studies included in this dissertation were large enough for our study purposes, they were not (all) large enough to investigate additional relevant issues, such as gender differences in the developmental course of anxiety and influence of vulnerability factors. The study of possible gender differences in the development of anxiety and the role of potential vulnerability and protective factors might help to clarify the higher prevalence of anxiety in girls (e.g., Craske, 2003).

Suggestions for further research

Suggestions for further research for every study individually have already been described. However, in this paragraph, several general issues will be considered that need further research attention.

First, the vulnerability models tested in the studies described in this dissertation are all oversimplifications of reality. That is, they only tested one or two factors that are thought to be involved in the development of anxiety. Developmental psychopathology accounts propose that emotional problems in children are the result from multiple factors, reflecting both risk and resilience, that operate in dynamic interaction (Cicchetti & Cohen, 1995), and hence research that includes multiple relevant factors and examines the interactions among them would be especially welcome. Further research should also focus more on protective factors and their interactions with vulnerability factors in the development of anxiety. Additionally, more longitudinal studies on the development of anxiety and associated vulnerability and protective factors within a developmental psychopathology framework in which children are followed over their entire childhood and adolescence period are urgently needed. These studies could clarify the dynamic interplay between vulnerability and protective factors in the development of anxiety problems which has remained unclear so far.

Second, it is also increasingly acknowledged that the proneness to anxiety (and other internalizing psychopathology) becomes particularly manifest when children are exposed to stressful life events (e.g., Brozina & Abela, 2006; Morris et al., 2008), and therefore it might be interesting for future studies to prospectively examine the role of vulnerability factors (and protective factors) in the development of anxiety within a diathesis-stress context.

Finally, future studies on the developmental course of anxiety and related vulnerability factors are also recommended to explicitly test gender differences to try to clarify which factors contribute to the greater prevalence of anxiety in girls than boys. There are some indications that the developmental course and impact of vulnerability factors might be different for boys and girls. In Chapter 7, for example, preliminary evidence was found which suggested that differences can be observed between boys and girls in their tendency to respond to threat-related stimuli. Results from the morph task employed in this study and previous evidence (Ehrenreich & Gross, 2002; Waters et al., 2004) indi-

cated that (socially) anxious girls might be more vigilant towards emotional facial expressions, whereas boys are more likely to avoid these expressions. However, more research is needed to establish this issue.

Clinical implications

Although most of the studies described in this dissertation concern relatively fundamental research in non-clinical populations, which has often no immediate clinical relevance, the results of these studies do give some directions that may be used to inform the diagnosis, prevention, and (early) intervention of childhood anxiety disorders. First, the psychometric studies as well as the prospective study show that high-risk children with atypical, chronic high levels of anxiety symptoms can already be identified at an early age, and that a vulnerability factor such as behavioral inhibition can be reliably used to identify these children. This provides an opportunity of implementing early interventions which target these high-risk children to prevent that they will develop serious anxiety problems. Recently, Rapee, Kennedy, Ingram, Edwards, and Sweeney (2005) developed such an early intervention parent-education program aimed at the prevention of the development of anxiety in highly inhibited preschool children and their program was shown to be effective. That is, children whose parents participated in the program showed a significantly greater decrease in anxiety diagnoses at a 1-year follow-up compared to children of whom the parents did not receive an intervention.

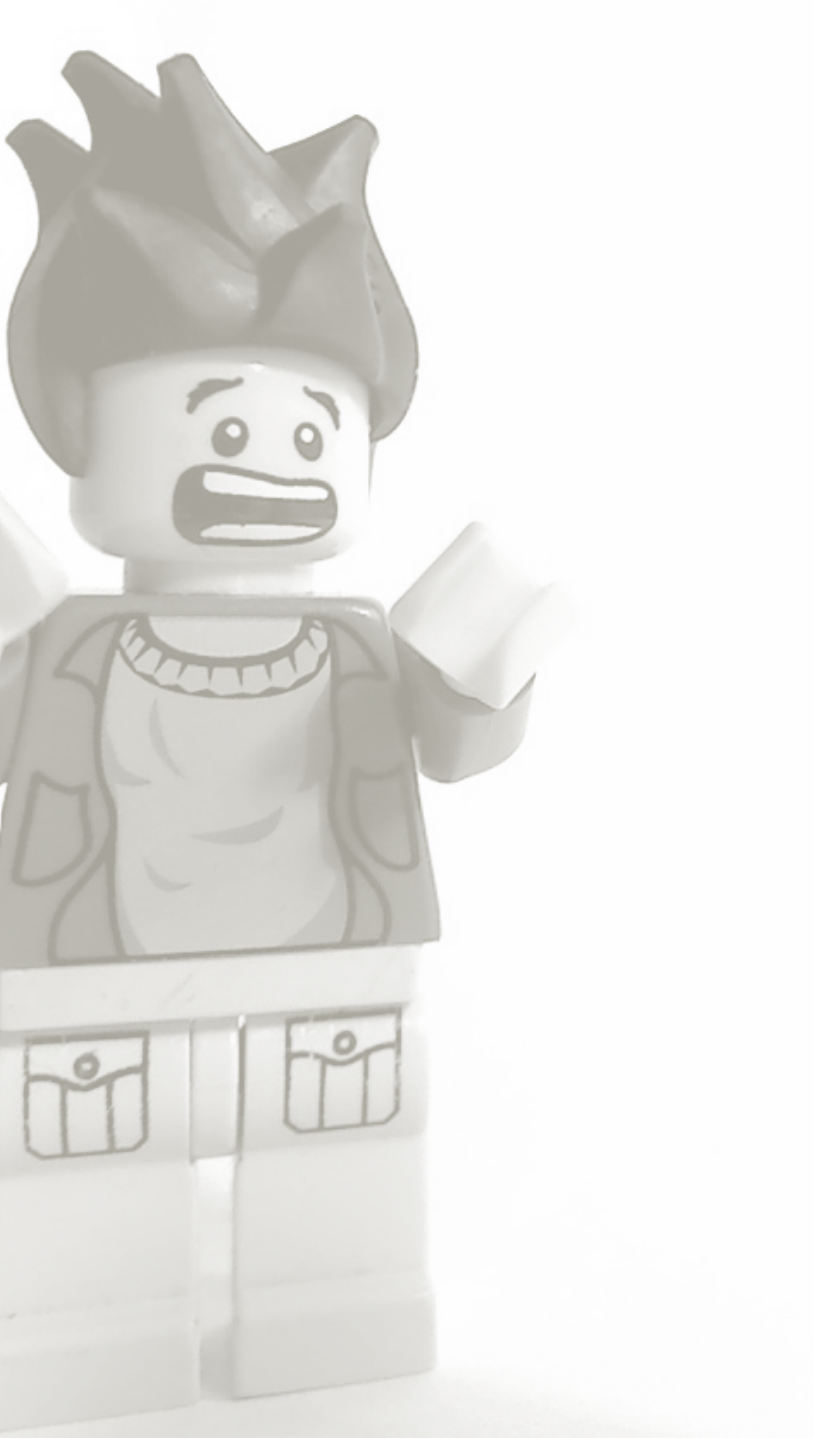
The results of the peer modeling study (Chapter 8) may also have clinical implications. This study and previous research (e.g., Bandura & Menlove, 1968; Hill et al., 1968; Kelly et al., 2010) shows that modeling not only plays a role in the acquisition of fears, but that positive modeling can be used to decrease fears (Kelly et al., 2010). Thus, providing children with positive modeling experiences leads to a reduction in self-reported fear beliefs and behavioral avoidance. Furthermore, positive modeling is a key component of existing cognitive-behavioral interventions for phobias in children and adolescents (Dadds & Barrett, 2001; James et al., 2005; Ollendick & King, 1998; Rapee et al., 2009).

Furthermore, the notion that repetitive negative thoughts might play a role in the development of anxiety problems, underlines the importance of cognitive treatment approaches directed at identifying and modifying these thoughts, and thus, the employment of strategies to diminish the tendency to worry and/or ruminate. One recent potential treatment to change these tendencies might be mindfulness-based cognitive therapy (Segal et al., 2002). This treatment has now been mainly used in the treatment of depression but seems also suitable to target repetitive negative thoughts in anxiety. This therapy teaches participants to focus on the present and to observe their (repetitive negative) thoughts instead of dwelling on them. Preliminary evidence shows that mindfulness-based therapy seems useful in the treatment of anxious children. That is, anxious children (7- to 12-year-olds) showed reductions in internalizing and externalizing symptoms following a mindfulness-based training program (Lee, Semple, Rosa, & Miller, 2008; Semple, Reid, & Miller, 2005).

Conclusion

Anxiety disorders are among the most common psychiatric disorders in childhood (Cartwright-Hatton et al., 2006; Costello et al., 2003) and their profound impact on the lives of children highlights the need to understand the development of anxiety and factors associated with the etiology and maintenance of these problems. Therefore, this dissertation aimed at extending the current knowledge about the developmental course of childhood anxiety disorder symptoms and associated vulnerability factors, and to assess measures to identify anxious children or children at high-risk for developing anxiety problems. The main findings of the studies described in this dissertation can be summarized as follows: Anxiety and associated vulnerability factors such as behavioral inhibition are already observable in young children. There appears to be considerable heterogeneity in the developmental course of childhood anxiety, with most children displaying stable low or moderate levels of anxiety and a minority displaying stable high levels of anxiety. Furthermore, various vulnerability factors seem to play a role in the pathogeneses of anxiety. More specifically, this dissertation showed that although children's levels of (social-)cognitive development seem to play a role in anxiety problems, the extent to which it plays a role seems rather limited. Furthermore, this dissertation showed that behavioral inhibition is an important vulnerability factor associated with increased levels of anxiety in children and that repetitive negative thoughts and peer modeling may also play a role in childhood anxiety problems. Thus, it seems that a variety of factors plays a role in the etiology and maintenance of fear and anxiety in children. These results support the use of a dynamic, multifactorial model within a developmental psychopathology framework such as proposed by Muris (2007) to depict the development of childhood fear and anxiety. However, more research is need to establish how vulnerability factors and protective factors act within this model, not only in isolation, but more importantly in dynamic interplay with each other.

References



Abela, J. R. Z., Brozina, K., & Haigh, E. P. (2002). An examination of the response styles theory of depression in third- and seventh-grade children: A short-term longitudinal study. *Journal of Abnormal Child Psychology, 30*, 515-527.

Abela, J. R. Z., & Hankin, B. L. (2007). *Childhood and adolescent depression: Causes, treatment, and prevention*. New York: Guilford Press.

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist 4-18 and 1991 Profile*. Burlington,VT: University of Vermont, Department of Psychiatry.

Achenbach, T. M. (1992). *Manual for the Child Behavior Checklist/2-3 and 1992 Profile*. Burlington: University of Vermont, Department of Psychiatry.

Achenbach, T. M., & Edelbrock, C. S. (1984). Psychopathology of childhood. *Annual Review of Psychology, 35*, 227-256.

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: Implications of cross-informant correlations for situational specificity. *Psychological Bulletin, 101*, 213-232.

Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA Preschool Forms & Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Alfano, C. A., Ginsburg, G. S., & Kingery, J. N. (2007). Sleep-related problems among children and adolescents with anxiety disorders. *Journal of American Academy of Child and Adolescent Psychiatry, 46*, 224-232.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th edition text revision ed.). Washington, DC: American Psychiatric Association.

Aschenbrand, S. G., Angelosante, A. G., & Kendall, P. C. (2005). Discriminant validity and clinical utility of the CBCL with anxiety disordered youth. *Journal of Clinical Child and Adolescent Psychology, 34*, 735-746.

Askew, C., & Field, A. P. (2007). Vicarious learning and the development of fears in childhood. *Behaviour Research and Therapy, 45*, 2616-2627.

Askew, C., & Field, A. P. (2008). The vicarious learning pathway to fear 40 years on. *Clinical Psychology Review, 28*, 1249-1265.

Bandura, A., & Menlove, F. L. (1968). Factors determining vicarious extinction of avoidance behavior through symbolic modeling. *Journal of Personality and Social Psychology, 8*, 99-108.

Barbaranelli, C., Caprara, G. V., Rabasca, A., & Pastorelli, C. (2003). A questionnaire for measuring the Big Five in late childhood. *Personality and Individual Differences, 34*, 645-664.

Bassili, J. N. (1979). Emotion recognition: The role of facial movement and the relative importance of upper and lower areas of the face. *Journal of Personality and Social Psychology, 37*, 2049-2058.

Battaglia, M., Ogliari, A., Zanoni, A., Villa, F., Cotterio, A., Binaghi, F., Fossati, A., & Maffei, C. (2004). Children's discrimination of expressions of emotions: Relationship with indices of social anxiety and shyness. *Journal of the American Academy for Child and Adolescent Psychiatry, 43*, 358-365.

Bauer, D. H. (1976). An exploratory study of developmental changes in children's fears. *Journal of Child Psychology and Psychiatry, 17*, 69-74.

Bauer, D. H. (1980). Childhood fears in developmental perspective. In L. Hersov & I. Berg (Eds.), *Out of school: Modern perspectives in truancy and school refusal* (pp. 189-208). New York: Wiley.

Bayer, J. K., Sanson, A. V., & Hemphill, S. A. (2006). Children's Moods, Fears, and Worries: Development of an Early Childhood Parent Questionnaire. *Journal of Emotional and Behavioral Disorders, 14*, 41-49.

Beidel, D. C., Morris, T. L., & Turner, M. W. (2004). Social phobia. In T. L. Morris & J. S. March (Eds.), *Anxiety disorders in children and adolescents*. New York: The Guilford Press.

Bell-Dolan, D. J., Last, C. G., & Strauss, C. C. (1990). Symptoms of anxiety disorders in normal children. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 759-765.

Bernstein, D. A., & Allen, G. J. (1969). Fear survey schedule (II): Normative data and factor analyses based upon a large college sample. *Behaviour Research and Therapy, 7*, 403-407.

Bernstein, G. A., Borchardt, C. M., & Perwien, A. R. (1996). Anxiety disorders in children and adolescents: A review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry, 35*, 1110-1119.

Biederman, J., Hirshfeld-Becker, D. R., Rosenbaum, J. F., Friedman, D., Snidman, N., Kagan, J., & Faraone, S. V. (2001). Further evidence of the association between behavioral inhibition and social anxiety in children. *American Journal of Psychiatry, 158*, 1673-1679.

Biederman, J., Rosenbaum, J. F., Bolduc-Murphy, E. A., Faraone, S. V., Chaloff, J., Hirshfeld, D. R., & Kagan, J. (1993). A 3-year follow-up of children with and without behavioral inhibition. *Journal of the American Academy of Child and Adolescent Psychiatry, 32*, 814-821.

Biederman, J., Rosenbaum, J. F., Hirshfeld-Becker, D. R., Faraone, S. V., Bolduc, E. A., Gersten, M., Meminger, S. R., Kagan, J., Snidman, N., & Reznick, J. S. (1990). Psychiatric correlates of behavioral inhibition in young children of parents with and without psychiatric disorders. *Archives of General Psychiatry, 47*, 21-26.

Bishop, G., Spence, S. H., & McDonald, C. (2003). Can parents and teachers provide a reliable and valid report of behavioral inhibition? *Child Development, 74*, 1899-1917.

Bittner, A., Egger, H. L., Erkanli, A., Costello, J., Foley, D. L., & Angold, A. (2007). What do childhood anxiety disorders predict? *Journal of Child Psychology and Psychiatry, 48*, 1174-1183.

Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy, 21*, 9-16.

Boyatzis, C. J., Chazan, E., & Ting, C. Z. (1993). Preschool children's decoding of facial emotions. *Journal of Genetic Psychology, 154*, 375-382.

Broeren, S., & Muris, P. (2008). Psychometric evaluation of two new parent-rating scales for measuring anxiety symptoms in young Dutch children. *Journal of Anxiety Disorders, 22*, 949-958.

Broeren, S., & Muris, P. (2009). The relation between cognitive development and anxiety phenomena in children. *Journal of Child and Family Studies, 18*, 702-709.

Broeren, S., & Muris, P. (2010). A psychometric evaluation of the Behavioral Inhibition Questionnaire in a non-clinical sample of Dutch children and adolescents. *Journal of Child Psychiatry and Human Development, 41*, 214-229.

Brozina, K., & Abela, J. R. Z. (2006). Behavioural inhibition, anxious symptoms, and depressive symptoms: A short-term prospective examination of a diathesis-stress model. *Behaviour Research and Therapy, 44*, 1337-1346.

Byrne, B. M. (2001). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum.

Carney, C., Edinger, J., Meyer, B., Lindman, L., & Istre, T. (2006). Symptom-focused rumination and sleep-disturbance. *Behavioral Sleep Medicine, 4*, 228-241.

Carroll, J. M., & Russell, J. A. (1997). Facial expressions in Hollywood's protrayal of emotion. *Journal of Personality and Social Psychology, 72*, 164-176.

Cartwright-Hatton, S., McNicol, K., & Doubleday, E. (2006). Anxiety in a neglected population: Prevalence of anxiety disorders in pre-adolescent children. *Clinical Psychology Review, 26*, 817-833.

Chorpita, B. F., Tracey, S. A., Brown, T. A., Collica, T. J., & Barlow, D. H. (1997). Assessment of worry in children and adolescents: An adaptation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 35*, 569-581.

Chorpita, B. F., Yim, L., Moffit, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale. *Behaviour Research and Therapy, 38*, 835-855.

Cicchetti, D., & Cohen, D. J. (1995). Perspectives on developmental psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Volume 1. Theory and methods* (pp. 3-20). New York: Wiley.

Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry, 60*, 837-844.

Côté, S. M., Boivin, M., Liu, X., Nagin, D. S., Zoccolillo, M., & Tremblay, R. E. (2009). Depression and anxiety symptoms: Onset, developmental course, and risk factors during early childhood. *Journal of Child Psychology and Psychiatry, 50*, 1201-1208.

Côté, S. M., Tremblay, R. E., Nagin, D. S., Zoccolillo, M., & Vitaro, F. (2002). The development of impulsivity, fearfulness, and helpfulness during childhood: Patterns of consistency and change in the trajectories of boys and girls. *Journal of Child Psychology and Psychiatry, 43*, 609-618.

Craske, M. G. (1997). Fear and anxiety in children and adolescents. *Bulletin of the Menninger Clinic, 61*, 4-36.

Craske, M. G. (2003). *Origins of phobias and anxiety disorders. Why more women than men?* Oxford: Elsevier.

Crocetti, E., Klimstra, T., Keijsers, L., Hale, W. W., & Meeus, W. (2009). Anxiety trajectories and identity development in adolescence: A five-wave longitudinal study. *Journal of Youth and Adolescence, 38*, 839-849.

Dadds, M. R., & Barrett, P. M. (2001). Practitioner review: Psychological management of anxiety disorders in childhood. *Journal of Child Psychology and Psychiatry, 42*, 99-1011.

Dadds, M. R., Holland, D. E., Laurens, K. R., Mullins, M., Barrett, P. M., & Spence, S. H. (1999). Early intervention and prevention of anxiety disorders: Results at two-year follow-up. *Journal of Consulting and Clinical Psychology, 67*, 145-150.

Dahl, R. E., & Lewin, D. S. (2002). Pathways to adolescent health: Sleep regulation and behavior. *Journal of Adolescent Health, 31*, 175-184.

Daleiden, E. L., & Vasey, M. W. (1997). An information-processing perspective on childhood anxiety. *Clinical Psychology Review, 17*, 407-429.

Dalgleish, T., Moradi, A. R., Taghavi, M. R., Neshat-Doost, H. T., & Yule, W. (2001). An experimental investigation of hypervigilance for threat in children and adolescents with posttraumatic stress disorder. *Psychological Medicine, 31*, 541-547.

Dalgleish, T., Taghavi, R., Neshat-Doost, H., Moradi, A., Canterbury, R., & Yule, W. (2003). Patterns of processing bias for emotional information across clinical disorders: A comparison of attention, memory, and prospective cognition in children and adolescents with depression, generalized anxiety, and posttraumatic stress disorder. *Journal of Clinical Child and Adolescent Psychology, 32*, 10-21.

Davey, G. C. L. (1994). Worrying, social problem solving abilities, and problem-solving confidence. *Behaviour Research and Therapy, 32*, 327-330.

Davidson, M. C., Amso, D., Anderson, L. C., & Diamond, A. (2006). Development of cognitive control and executive functions from 4 to 13 years: Evidence from manipulations of memory, inhibition, and task switching. *Neuropsychologia, 44*, 2037-2078.

De Rosnay, M., Cooper, P. J., Tsigaras, N., & Murray, L. (2006). Transmission of social anxiety from mother to infant: An experimental study using a social referencing paradigm. *Behaviour Research and Therapy, 44*, 1165-1175.

De Sonneville, L. M. J., Verschoor, C. A., Njiokiktjien, C., Op het Veld, V., Toorenaar, N., & M., V. (2002). Facial identity and facial emotions: Speed, accuracy, and processing strategied in children and adults. *Journal of Clinical and Experimental Neuropsychology, 24*, 200-213.

Dubi, K., Rapee, R., Emerton, J., & Schniering, C. (2008). Maternal modeling and the acquisition of fear and avoidance in toddlers: Influence of stimulus preparedness and child temperament. *Journal of Abnormal Child Psychology, 36*, 499-512.

Duchesne, S., Vitaro, F., Larose, S., & Tremblay, R. (2008). Trajectories of anxiety during elementary-school years and the prediction of high school noncompletion. *Journal of Youth and Adolescence, 37*, 1134-1146.

Edwards, S. L. (2007). *Temperament and environmental risk factors contributing to anxiety symptoms in preschool-aged children.* Unpublished doctoral dissertation, Macquarie University, Sydney, Australia.

Egger, H. L., & Angold, A. (2006). Common emotional and behavioral disorders in preschool children: Presentation, nosology, and epidemiology. *Journal of Child Psychology and Psychiatry, 47*, 313-337.

Egliston, K.-A., & Rapee, R. M. (2007). Inhibition of fear acquisition in toddlers following positive modelling by their mothers. *Behaviour Research and Therapy, 45*, 1871-1882.

Ehrenreich, J. T., & Gross, A. M. (2002). Biased attentional behavior in childhood anxiety: A review of theory and current empirical investigation. *Clinical Psychology Review, 22*, 991-1008.

El-Sheikh, M., Erath, S. A., & Keller, P. S. (2007). Children's sleep and adjustment: The moderating role of vagal regulation. *Journal of Sleep Research, 16*, 396-405.

Eschenbeck, H., Kohlmann, C.-W., Heim-Dreger, U., Koller, D., & Leser, M. (2004). Processing bias and anxiety in primary school children: A modified emotional Stroop colour-naming task using pictorial facial expressions. *Psychology Science, 46*, 451-465.

Eysenck, H. J. (1967). *The biological basis of personality*. Springfield, IL: Charles C. Thomas.

Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences*. New York: Plenum Press.

Fallone, G., Owens, J. A., & Deane, J. (2002). Sleepiness in children and adolescents: Clinical implications. *Sleep Medicine Reviews, 6*, 287-306.

Feng, X., Shaw, D. S., & Silk, J. S. (2008). Developmental trajectories of anxiety symptoms among boys across early and middle childhood. *Journal of Abnormal Psychology, 117*, 32-47.

Field, A. P. (2006). Watch out for the beast: Fear information and attentional bias in children. *Journal of Clinical Child and Adolescent Psychology, 35*, 337-345.

Field, A. P. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage Publications.

Field, A. P., & Lawson, J. (2003). Fear information and the development of fears during childhood: Effects on implicit fear responses and behavioural avoidance. *Behaviour Research and Therapy, 41*, 1277-1293.

Field, A. P., Lawson, J., & Banerjee, R. (2008). The verbal threat information pathway to fear in children: The longitudinal effects on fear cognitions and the immediate effects on avoidance behavior. *Journal of Abnormal Psychology, 117*, 214-224.

Field, A. P., & Storksen-Coulson, H. (2007). The interaction of pathways to fear in childhood anxiety: A preliminary study. *Behaviour Research and Therapy, 45*, 3051-3059.

Flavell, J. H., Miller, P. H., & Miller, S. (2002). *Cognitive development* (4th. ed.). New-Jersey: Prentice-Hall.

Fleming, J. E., & Offord, D. R. (1990). Epidemiology of childhood depressive disorders: A critical review. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 571-580.

Foa, E. B., Franklin, M. E., & Kozak, M. J. (2001). Social phobia: An information-processing perspective. In S. G. Hofmann & P. M. DiBartolo (Eds.), *From social anxiety to social phobia: Multiple perspectives* (pp. 268-280). Needham Heights, MA: Allyn & Bacon.

Fox, N. A., Henderson, H. A., Marshall, P. J., Nichols, K. E., & Ghera, M. M. (2005). Behavioral inhibition: Linking biology and behavior within a developmental framework. *Annual Review of Psychology, 56*, 235-262.

Fresco, D. M., Frankel, A. N., Mennin, D. S., Turk, C. L., & Heimberg, R. G. (2002). Distinct and overlapping features of rumination and worry: The relationship of cognitive production to negative affective states. *Cognitive Therapy and Research, 26*, 179-188.

Garcia-Coll, C., Kagan, J., & Reznick, J. S. (1984). Behavioral inhibition in young children. *Child Development, 55*, 1005-1019.

Garner, M. (2010). Selective attention to threat in childhood anxiety: Evidence from visual probe paradigms. In J. A. Hadwin & A. P. Field (Eds.), *Information processing biases and anxiety: a developmental perspective*. Chichester: Wiley-Blackwell.

Gerull, F. C., & Rapee, R. M. (2002). Mother knows best: effects of maternal modelling on the acquisition of fear and avoidance behaviour in toddlers. *Behaviour Research and Therapy, 40*, 279-287.

Gest, S. D. (1997). Behavioral inhibition: Stability and associations with adaptation from childhood to early adulthood. *Journal of Personality and Social Psychology, 72*, 467-475.

Ginsburg, G. S., La Greca, A. M., & Silverman, W. K. (1998). Social anxiety in children with anxiety disorders: Relation with social and emotional functioning. *Journal of Abnormal Child Psychology, 26*, 175-185.

Gladstone, G. L., Parker, G. B., Mitchell, P. B., Wilhelm, K. A., & Malhi, G. S. (2005). Relationship between self-reported childhood behavioral inhibition and lifetime anxiety disorders in a clinical sample. *Depression and Anxiety, 22*, 103-113.

Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38*, 581-586.

Goodman, R. (1999). The extended version of the Strengths and Difficulties Questionnaire as a guide to child psychiatric caseness and consequent burden. *Journal of Child Psychology and Psychiatry, 40*, 791-799.

Goodman, R. (2001). Psychometric properties of the Strengths and Difficulties Questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*, 1337-1345.

Goodman, R., & Scott, S. (1999). Comparing the Strengths and Difficulties Questionnaire and the Child Behavior Checklist: Is small beautiful? *Journal of Abnormal Child Psychology, 27*, 17-24.

Grüner, K., Muris, P., & Merckelbach, H. (1999). The relationship between anxious rearing behaviors and anxiety disorders symptomatology in normal children. *Journal of Behavior Therapy and Experimental Psychiatry, 30*, 27-35.

Guastella, A. J., & Moulds, M. L. (2007). The impact of rumination on sleep quality following a stressful life event. *Personality and Individual Differences, 42*, 1151-1162.

Gullone, E. (2000). The development of normal fear: A century of research. *Clinical Psychology Review, 20*, 429-451.

Gullone, E., Cummins, R. A., & King, N. J. (1996). Self-reported fears: A comparison study of youths with and without an intellectual disability. *Journal of Intellectual Disability Research, 40*, 227-240.

Hadwin, J. A., Donnelly, N., French, C. C., Richards, A., Watts, A., & Daley, D. (2003). The influence of children's self-report trait anxiety and depression on visual search for

emotional faces. *Journal of Child Psychology & Psychiatry and Allied Disciplines, 44*, 432-444.

Hadwin, J. A., & Field, A. P. (2010). Theoretical and methodological issues in researching information processing biases in anxious children and adolescents. In J. A. Hadwin & A. P. Field (Eds.), *Information processing biases and anxiety: A developmental perspective*. Chichester: Wiley-Blackwell.

Hale, W. W., Raaijmakers, Q., Muris, P., & Meeus, W. (2005). Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED) in the general adolescent population. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*, 283-290.

Hale, W. W., Raaijmakers, Q., Muris, P., Van Hoof, A., & Meeus, W. (2008). Developmental trajectories of adolescent anxiety disorder symptoms: A 5-year prospective community study. *Journal of the American Academy for Child and Adolescent Psychiatry, 47*, 556-564.

Harnishfeger, K. K. (1995). The development of cognitive inhibition. Theories, definitions, and research evidence. In F. N. Dempster & C. J. Brainerd (Eds.), *Interference and inhibition in cognition* (pp. 175-204). San Diego: Academic Press.

Harvey, A. G. (2000). Pre-sleep cognitive activity: A comparison between sleep-onset insomniacs and good sleepers. *British Journal of Clinical Psychology, 39*, 275-286.

Harvey, A. G. (2001a). I can't sleep, my mind is racing! An investigation of strategies of though control in insomnia. *Behavioural and Cognitive Psychotherapy, 29*, 3-11.

Harvey, A. G. (2001b). Insomnia: Symptoms or diagnosis? *Clinical Psychology Review, 21*, 1037-1059.

Haug, T. T., Svebak, S., Hausken, T., Wilhemsen, I., Berstad, A., & Ursin, H. (1994). Low vagal activity as mediating mechanisms for the relationship between personality factors and gastric symptoms in functional dyspepsia. *Psychosomatic Medicine, 56*, 181-186.

Heim-Dreger, U., Kohlmann, C.-W., Eschenbeck, H., & Burkhardt, U. (2006). Attentional biases for threatening faces in children: Vigilant and avoidant processes. *Emotion, 6*, 320-325.

Herba, C. M., Benson, P., Landau, S., Russell, T., Goodwin, C., Lemche, E., Santosh, P., & Phillips, M. (2008). Impact of familiarity upon children's developing facial experssion recognition. *Journal of Child Psychology and Psychiatry, 49*, 201-210.

Hill, J. H., Liebert, R. M., & Mott, D. E. W. (1968). Vicarious extinction of avoidance behavior through films: An initial test. *Psychological Reports, 22*, 192.

Hirshfeld-Becker, D. R., & Biederman, J. (2002). Rationale and principles of early intervention with young children at risk for anxiety disorders. *Clinical Child and Family Psychology Review, 5*, 161- 172.

Hirshfeld-Becker, D. R., Biederman, J., Henin, A., Faraone, S. V., Davis, S., Harrington, K., & Rosenbaum, J. F. (2007). Behavioral inhibition in preschool children at risk is a specific predictor of middle childhood social anxiety: A five-year follow-up. *Journal of Developmental and Behavioral Pediatrics, 28*, 225-233

Hirshfeld-Becker, D. R., Biederman, J., & Rosenbaum, J. F. (2004). Behavioral inhibition. In T. L. Morris & J. S. March (Eds.), *Anxiety disorders in children and adolescents* (2 ed., pp. 27-58). New York: Guilford Press.

Hong, R. Y. (2007). Differential associations with anxious and depressive symptoms and coping behavior. *Behaviour Research and Therapy, 45*, 277-290.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling, 6*, 1-55.

Ialongo, N., Edelsohn, G., Werthamer-Larsson, L., Crockett, L., & Kellam, S. (1995). The significance of self-reported anxious symptoms in first grade children: Prediction to anxious symptoms and adaptive functioning in fifth grade. *Journal of Child Psychology and Psychiatry, 36*, 427-437.

James, A. A. C. J., Soler, A., & Weatherall, R. R. W. (2005). Cognitive behavioural therapy for anxiety disorders in children and adolescents. [Electronic Version]. *Cochrane Database of Systematic Reviews*, DOI: 10.1002/14651858.CD14004690.pub1465-1852.

Joormann, J., & Gotlib, I. H. (2006). Is This Happiness I See? Biases in the Identification of Emotional Facial Expressions in Depression and Social Phobia. *Journal of Abnormal Psychology, 115*, 705-714.

Kagan, J. (1989). The concept of behavioral inhibition to the unfamiliar. In J. S. Reznick (Ed.), *Perspectives on behavioral inhibition* (pp. 1-23). Chicago: The University of Chicago Press.

Kagan, J. (1994). *Galen's prophecy*. New York: Basic Books.

Kagan, J., Reznick, J. S., Clarke, C., Snidman, N., & Garcia-Coll, C. (1984). Behavioral inhibition to the unfamiliar. *Child Development, 55*, 2212-2225.

Kagan, J., Reznick, J. S., & Snidman, N. (1988). Biological bases of childhood shyness. *Science, 240*, 167-171.

Kail, R. (1991). Developmental change in speed of processing during childhood and adolescence. *Psychological Bulletin, 109*, 490-501.

Kamachi, M., Bruce, V., Mukaida, S., Gyoba, J., Yoshikawa, S., & Akamatsu, S. (2001). Dynamic properties influence the perception of facial expressions. *Perception, 30*, 875-887.

Kasius, M. C., Ferdinand, R. F., Van den Berg, H., & Verhulst, F. C. (1997). Associations between different diagnostic approaches for child and adolescent psychopathology. *Journal of Child Psychology and Psychiatry, 38*, 625-632.

Keiley, M., Lofthouse, N., Bates, J., Dodge, K., & Petit, G. (2003). Differential risks of covarying and pure components in mother and teacher reports of externalizing and internalizing behavior across ages 5 to 14. *Journal of Abnormal Child Psychology, 31*, 267-283.

Keller, M. B., Lavori, P. W., Wunder, J., Beardslee, W. R., Schwartz, C. E., & Roth, J. (1992). Chronic course of anxiety disorders in children and adolescents. *Journal of American Academy of Child and Adolescent Psychiatry, 31*, 595-599.

Kelly, V. L., Barker, H., Field, A. P., Wilson, C., & Reynolds, S. (2010). Can Rachman's indirect pathways be used to un-learn fear? A prospective paradigm to test whether

children's fears can be reduced using positive information and modelling a non-anxious response. *Behaviour Research and Therapy, 48*, 164-170.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*, 593-602.

Kim-Cohen, J., Caspi, A., Moffitt, T. E., Harrington, H., Milne, B. J., & Poulton, R. (2003). Prior juvenile diagnoses in adults with mental disorder: Developmental follow-back of a prospective-longitudinal cohort. *Archives of General Psychiatry, 60*, 709-717.

Kindt, M., Bierman, D., & Brosschot, J. F. (1997). Cognitive bias in spider fear and control children: Assessment of emotional interference by a card format and a single-trial format of the Stroop task. *Journal of Experimental Child Psychology, 66*, 163-179.

Kindt, M., & Brosschot, J. F. (1999). Cognitive bias in spider-phobic children: Comparison of a pictorial and a linguistic spider Stroop. *Journal of Psychopathology and Behavioral Assessment, 21*, 207-220.

Kindt, M., Brosschot, J. F., & Everaerd, W. (1997). Cognitive processing bias of children in a real life stress situation and a neutral situation. *Journal of Experimental Child Psychology, 64*, 79-97.

Kindt, M., & Van Den Hout, M. (2001). Selective attention and anxiety: A perspective on developmental issues and the causal status. *Journal of Psychopathology and Behavioral Assessment, 23*, 193-202.

Kindt, M., Van den Hout, M., De Jong, P., & Hoekzema, B. (2000). Cognitive bias for pictorial and linguistic threat cues in children. *Journal of Psychopathology and Behavioral Assessment, 22*, 201-219.

King, N. J., Gullone, E., & Ollendick, T. H. (1998). Etiology of childhood phobias: current status of Rachman's three pathways theory. *Behaviour Research and Therapy, 36*, 297-309.

King, N. J., Josephs, A., Gullone, E., Madden, C., & Ollendick, T. H. (1994). Assessing the fears of children with disability using the Revised Fear Survey Schedule for Children: A comparative study. *British Journal of Medical Psychology, 67*, 377-386.

King, N. J., Muris, P., Ollendick, T. H., & Gullone, E. (2005). Childhood fears and phobias: Advances in assessment and treatment. *Behaviour Change, 22*, 199-211.

Kirkegaard Thomsen, D., Mehlsen, M., Christensen, S., & Zachariae, R. (2003). Rumination - Relationship with negative mood and sleep quality. *Personality and Individual Differences, 34*, 1293-1301.

Knight, B., & Johnston, A. (1997). The role of movement in face recognition. *Visual Cognition, 4*, 265-273.

Kochanska, G. (1991). Patterns of inhibition to the unfamiliar in children of normal and affectively ill mothers. *Child Development, 62*, 250-263.

Kolko, D. J., & Kazdin, A. E. (1993). Emotional/behavioral problems in clinic and nonclinic children: Correspondence among child, parent and teacher reports. *Journal of Child Psychology and Psychiatry, 34*, 991-1006.

Koster, E. H. W., Crombez, G., Verschuere, B., & De Houwer, J. (2004). Selective attention to threat in the dot probe paradigm: Differentiating vigilance and difficulty to disengage. *Behaviour Research and Therapy, 42*, 1183-1192.

Last, C. G., Perrin, S., Hersen, M., & Kazdin, A. E. (1996). A prospective study of childhood anxiety disorders. *Journal of American Academy of Child and Adolescent Psychiatry, 35*, 1502-1510.

Lee, J., Semple, R. J., Rosa, D., & Miller, L. (2008). Mindfulness-based cognitive therapy for children: Results of a pilot study. *Journal of Cognitive Psychotherapy, 22*, 15-28.

Legerstee, J. S., Tulen, J. H. M., Kallen, V. L., Dieleman, G. C., Treffers, P. D. A., Verhulst, F. C., & Utens, E. M. W. J. (2009). Threat-related selective attention predicts treatment success in childhood anxiety disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 48*, 196-205.

Lewinsohn, P. M., Clarke, G. N., Seeley, J. R., & Rohde, P. (1994). Major depression in community adolescents: Age at onset, episode duration, and time to recurrence. *Journal of the American Academy of Child and Adolescent Psychiatry, 33*, 809-818.

Lichstein, K. L. (2006). Secondary insomnia: A myth dismissed. *Sleep Medicine Reviews, 10*, 3-5.

Liu, X., Buysse, D. J., Gentzler, A. L., Kiss, E., Mayer, L., Kapornai, K., Vetro, A., & Kovacs, M. (2007). Insomnia and hypersomnia associated with depressive phenomenology and comorbidity in childhood depression. *Sleep, 30*, 83-90.

Lonigan, C. J., & Phillips, B. M. (2001). Temperamental influences on the development of anxiety disorders. In M. W. Vasey & M. R. Dadds (Eds.), *The developmental psychopathology of anxiety* (pp. 60-91). New York: Oxford University Press.

Lonigan, C. J., Vasey, M. W., Phillips, B. M., & Hazen, R. A. (2004). Temperament, anxiety, and the processing of threat-relevant stimuli. *Journal of Clinical Child and Adolescent Psychology, 33*, 8-20.

MacLeod, C. (1991). Clinical anxiety and the selective encoding of threatening information. *International Review of Psychiatry, 3*, 279-292.

MacLeod, C., & Mathews, A. (1988). Anxiety and the allocation of attention to threat. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology, 38*, 659-670.

Marks, I. M. (1987). The development of normal fear: A review. *Journal of Child Psychology and Psychiatry, 28*, 667-697.

Martin, M., Horder, P., & Jones, G. V. (1992). Integral bias in naming of phobia-related words. *Cognition and Emotion, 6*, 479-486.

Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability in emotional disorders. *Annual Review of Clinical Psychology, 1*, 167-195.

McLaughlin, K., Sibrava, N., Behar, E., & Borkovec, T. D. (2006). Recurrent negative thinking in emotional disorders: Worry, depressive rumination, and trauma recall. In S. Sassaroli, G. Rugerio & R. Lorenzini (Eds.), *Worry need of control, and other core cognitive constructs in anxiety and eating disorders* (pp. 37-67). Milan, Italy: Raphael Cortina.

Melamed, B. G., & Siegel, L. J. (1975). Reduction of anxiety in children facing hospitalization and surgery by use of filmed modeling. *Journal of Consulting and Clinical Psychology, 43*, 511-521.

Melamed, B. G., Yurcheson, R., Fleece, E. L., Hutcherson, S., & Hawes, R. (1978). Effects of film modeling on the reduction of anxiety-related behaviors in individuals varying in level of previous experience in the stress situation. *Journal of Consulting and Clinical Psychology, 46*, 1357-1367.

Meng, X., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin, 111*, 172-175.

Mesman, J., & Koot, H. M. (2000). Common and specific correlates of preadolescent internalizing and externalizing psychopathology. *Journal of Abnormal Psychology, 109*, 428-437.

Mick, M. A., & Telch, M. J. (1998). Social anxiety and history of behavioral inhibition in young adults. *Journal of Anxiety Disorders, 12*, 1-20.

Monk, C. S., Nelson, E. E., McClure, E. B., Mogg, K., Bradley, B. P., Leibenluft, E., Blair, R. J. R., Chen, G., Charney, D. S., Ernst, M., & Pine, D. S. (2006). Ventrolateral prefrontal cortex activation and attentional bias in response to angry faces in adolescents with generalized anxiety disorder. *American Journal of Psychiatry, 163*, 1091-1097.

Monk, C. S., Telzer, E. H., Mogg, K., Bradley, B. P., Mai, X., Louro, H. M. C., Chen, G., McClure-Tone, E. B., Ernst, M., & Pine, D. S. (2008). Amygdala and ventrolateral prefrontal cortex activation to masked angry faces in children and adolescents with generalized anxiety disorder. *Archives of General Psychiatry, 65*, 568-576.

Montirosso, R., Peverelli, M., Frigerio, E., Crespi, M., & Borgatti, R. (2010). The development of dynamic facial expression recognition at different intensities in 4- to 18-year-olds. *Social Development, 19,* 71-92.

Morren, M., Kindt, M., Van den Hout, M., & Van Kasteren, H. (2003). Anxiety and the processing of threat in children: Further examination of the cognitive inhibition hypothesis. *Behaviour Change, 20*, 131-142.

Morris, M. C., Ciesla, J. A., & Garber, J. (2008). A prospective study of the cognitive-stress model of depressive symptoms in adolescents. *Journal of Abnormal Psychology, 117*, 719-734.

Mouton-Simien, P., McCain, A. P., & Kelley, M. L. (1997). The development of the Toddler Behavior Screening Inventory. *Journal of Abnormal Child Psychology, 25*, 59-64.

Muris, P. (2007). *Normal and abnormal fear and anxiety in children and adolescents*. Burlington: Elsevier Science.

Muris, P., Bos, A. E. R., Mayer, B., Verkade, R., Thewissen, V., & Dell'Avvento, V. (2009). Relations among behavioral inhibition, Big Five personality factors, and anxiety disorder symptoms in non-clinical children. *Personality and Individual Differences, 46*, 525-529.

Muris, P., & Dietvorst, R. (2006). Underlying personality characteristics of behavioral inhibition in children. *Child Psychiatry and Human Development, 36*, 437-445.

Muris, P., & Field, A. P. (2008). Distorted cognition and pathological anxiety in children and adolescents. *Cognition and Emotion, 22*, 395-421.

Muris, P., & Field, A. P. (2010). The role of verbal threat information in the development of childhood fear. "Beware the jabberwock!" *Clinical Child and Family Psychology Review, 13*, 129-150.

Muris, P., Fokke, M., & Kwik, D. (2009). The ruminative response style in adolescents: An examination of its specific link to symptoms of depression. *Cognitive Therapy and Research, 33*, 21-32.

Muris, P., Mayer, B., Vermeulen, L., & Hiemstra, H. (2007). Theory-of-mind, cognitive development, and children's interpretation of anxiety-related physical symptoms. *Behaviour Research and Therapy, 45*, 2121-2132.

Muris, P., Meesters, C., & Diederen, R. (2005). Psychometric properties of the Big Five Questionnaire for Children (BFQ-C) in a Dutch sample of young adolescents. *Personality and Individual Differences, 38*, 1757-1769.

Muris, P., Meesters, C., Mayer, B., Bogie, N., Luijten, M., Geebelen, E., Bessems, J., & Smit, C. (2003). The Koala Fear Questionnaire: A standardized self-report scale for assessing fears and fearfulness in pre-school and primary school children. *Behaviour Research and Therapy, 41*, 597-617.

Muris, P., Meesters, C., & Schouten, E. (2002). A brief questionnaire of DSM-IV defined anxiety and depression symptoms among children. *Clinical Psychology and Psychotherapy, 9*, 430-442.

Muris, P., Meesters, C., & Spinder, M. (2003). Relationships between child- and parent-reported behavioural inhibition and symptoms of anxiety and depression in normal adolescents. *Personality and Individual Differences, 34*, 759-771.

Muris, P., Meesters, C., & van den Berg, F. (2003). The Strengths and Difficulties Questionnaire (SDQ): Further evidence for its reliability and validity in a community sample of Dutch children and adolescents. *European Child and Adolescent Psychiatry, 12*, 1-8.

Muris, P., Merckelbach, H., Gadet, B., & Moulaert, V. (2000). Fears, worries, and scary dreams in 4- to 12-year-old children: Their content, developmental pattern, and origins. *Journal of Clinical Child Psychology, 29*, 43-52.

Muris, P., Merckelbach, H., & Luijten, M. (2002). The connection between cognitive development and specific fears and worries in normal children and children with below-average intellectual abilities: A preliminary study. *Behaviour Research and Therapy, 40*, 37-56.

Muris, P., Merckelbach, H., Meesters, C., & van den Brand, K. (2002). Cognitive development and worry in normal children. *Cognitive Therapy and Research, 26*, 775-785.

Muris, P., Merckelbach, H., Schmidt, H., Gadet, B., & Bogie, N. (2001). Anxiety and depression as correlates of self-reported behavioural inhibition in normal adolescents. *Behaviour Research and Therapy, 39*, 1051-1061.

Muris, P., Merckelbach, H., Wessel, I., & van de Ven, M. (1999). Psychopathological correlates of self-reported behavioural inhibition in normal children. *Behaviour Research and Therapy, 37*, 575-584.

Muris, P., & Ollendick, T. (2005). The role of temperament in the etiology of child psychopathology. *Clinical Child and Family Psychology Review, 8*, 271-289.

Muris, P., Roelofs, J., Meesters, C., & Boomsma, P. (2004). Rumination and worry in non-clinical adolescents. *Cognitive Therapy and Research, 28*, 539-554.

Muris, P., Roelofs, J., Rassin, E., Franken, I., & Mayer, B. (2005). Mediating effects of rumination and worry on the links between neuroticism, anxiety, and depression. *Personality and Individual Differences, 39*, 1105-1111.

Muris, P., Steerneman, P., Meesters, C., Merckelbach, H., Horselenberg, R., van den Hogen, T., & van Dongen, L. (1999). The TOM test: A new instrument for assessing theory of mind in normal children and children with pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 29*, 67-80.

Muris, P., Steerneman, P., Merckelbach, H., & Meesters, C. (1996). The role of parental fearfulness and modeling in children's fear. *Behaviour Research and Therapy, 34*, 265-268.

Muris, P., Van Brakel, A. M. L., Arntz, A., & Schouten, E. (in press). Behavioral inhibition as a risk factor for the development of childhood anxiety disorders: A longitudinal study. *Journal of Child and Family Studies*.

Muthén, L. K., & Muthén, B. O. (2008). Mplus user's guide (3rd ed.). Los Angeles: Muthén & Muthén.

Nagin, D. S. (2005). *Group-based modeling of development*. Cambridge, Massachusetts: Harvard University Press.

Nagin, D. S., & Tremblay, R. E. (2001). Analyzing developmental trajectories of distinct but related behaviors: A group-based method. *Psychological Methods, 6*, 18-34.

Nandi, A., Beard, J., & Galea, S. (2009). Epidemiologic heterogeneity of common mood and anxiety disorders over the lifecourse in the general population: A systematic review. *BMC Psychiatry, 9*, 31.

Nelson, C. A., & Dolgin, K. (1985). The generalized discrimination of facial experssions by 7-month-old infants. *Child Development, 56*, 58-61.

Newman, D. L., Moffitt, T. E., Caspi, A., Magdol, L., Silva, P. A., & Stanton, W. R. (1996). Psychiatric disorders in a birth cohort of young adults: Prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *Journal of Consulting and Clinical Psychology, 64*, 552-562.

Niedenthal, P. M., Brauer, M., Robin, L., & Innes-Ker, Å. H. (2002). Adult attachment and the perception of facial expression of emotion. *Journal of Personality and Social Psychology, 82*, 419-433.

Niedenthal, P. M., Halberstadt, J. B., Margolin, J., & Innes-Ker, Å. H. (2000). Emotional state and the detection of change in facial expression of emotion. *European Journal of Social Pscyhology, 30*, 211-222.

Nigg, J. T. (2006). Temperament and developmental psychopathology. *Journal of Child Psychology and Psychiatry, 47*, 395-422.

Nightingale, Z. C., Field, A. P., & Kindt, M. (2010). The Emotional Stroop task in anxious children. In J. A. Hadwin & A. P. Field (Eds.), *Information processing bises and anxiety: A developmental perspective*. Chichester: Wiley-Blackwell.

Nolen-Hoeksema, S. (1998). Ruminative coping with depression. In J. Heckhausen & C. S. Dweck (Eds.), *Motivation and self-regulation across the life span* (pp. 237-256). New York: Cambridge University Press.

Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology, 109*, 504-511.

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*, 400-424.

Norton, P. J., & Mehta, P. D. (2007). Hierarchical model of vulnerabilities for emotional disorders. *Cognitive Behavior Therapy, 36*, 240-254.

Norton, P. J., Sexton, K. A., Walker, J. R., & Norton, G. R. (2005). Hierarchical model of vulnerabilities for anxiety: Replication and extension with a clinical sample. *Cognitive Behaviour Therapy, 34*, 50 - 63.

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling-A Multidisciplinary Journal, 14*, 535-569.

Öhman, A. (1993). Fear and anxiety as emotional phenomena: Clinical phenomenology, evolutionarry perspectives, and information-processing mechanisms. In M. Levis & J. Haviland (Eds.), *Handbook of emotion* (pp. 511-536). New York and London: Plenum Press.

Ollendick, T. H., & King, N. J. (1998). Empirically supported treatments for children with phobic and anxiety disorders: Current status. *Journal of Clinical Child Psychology, 27*, 156-167.

Ollendick, T. H., King, N. J., & Frary, R. B. (1989). Fears in children and adolescents: Reliability and generalizability across gender, age and nationality. *Behaviour Research and Therapy, 27*, 19-26.

Ormel, J., Rosmalen, J., & Farmer, A. (2004). Neuroticism: A non-informative marker of vulnerability to psychopathology. *Social Psychiatry and Psychiatric Epidemiology, 39*, 906-912.

Owens, J. A., Maxim, R., Nobile, C., McGuinn, M., & Msall, M. (2000). Parental and self-report of sleep in children with attention-deficit/hyperactivity disorder. *Archives of Pediatrics & Adolescent Medicine, 154*, 549-555.

Philippot, P., & Feldman, R. S. (1990). Age and social competence in preschoolers' decoding of facial expression. *Biological Psychiatry, 54*, 504-514.

Piaget. (1970). Piaget's theory. In P. H. Mussen (Ed.), *Carmichael's manual of child psychology* (Vol. I, pp. 703-732). New York: Wiley.

Pine, D. S., Cohen, P., Gurley, D., Brook, J., & Ma, Y. (1998). The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Archives of General Psychiatry, 55*, 56-64.

Pine, D. S., Mogg, K., Bradley, B. P., Montgomery, L., Monk, C. S., McClure, E., Guyer, A. E., Ernst, M., Charney, D. S., & Kaufman, J. (2005). Attention bias to threat in maltreated children: Implications for vulnerability to stress-related psychopathology. *American Journal of Psychiatry, 162*, 291-296.

Porges, S. W. (1992). Vagal tone: A physiologic marker of stress vulnerability. *Pediatrics, 90*, 498-504.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879-891.

Prior, M., Sanson, A., & Oberklaid, F. (1989). The Australian temperament project. In D. Kohnstamm, J. Bates & M. Rothbart (Eds.), *Temperament in childhood* (pp. 537-554). Chichester, UK: Wiley.

Psychology Software Tools Inc. E-Prime 2.0. Pittsburgh.

Puliafico, A. C., & Kendall, P. C. (2006). Threat-related attentional bias in anxious youth: A review. *Clinical Child and Family Psychology Review, 9*, 162-180.

Rachman, S. (1977). The conditioning theory of fearacquisition: A critical examination. *Behaviour Research and Therapy, 15*, 375-387.

Ramirez, S. Z., & Kratochwill, T. R. (1997). Self-reported fears in children with and without mental retardation. *Mental Retardation, 35*, 83-92.

Rapee, R. (2001). The development of generalised anxiety. In M. W. Vasey & M. R. Dadds (Eds.), *The developmental psychopathology of anxiety* (pp. 481-504). Oxford: Oxford University Press.

Rapee, R., & Spence, S. H. (2004). The etiology of social phobia: Empirical evidence and an initial model. *Clinical Psychology Review, 24*, 737-767.

Rapee, R. M. (2002). The development and modification of temperamental risk for anxiety disorders: Prevention of a lifetime of anxiety? *Biological Psychiatry, 52*, 947-957.

Rapee, R. M., Kennedy, S., Ingram, M., Edwards, S., & Sweeney, L. (2005). Prevention and early intervention of anxiety disorders in inhibited preschool children. *Journal of Consulting and Clinical Psychology, 73*, 488-497.

Rapee, R. M., Schniering, C. A., & Hudson, J. L. (2009). Anxiety disorders during childhood and adolescence: Origins and treatment. *Annual Review of Clinical Psychology, 5*, 311-341.

Richards, A., French, C. C., Nash, G., Hadwin, J. A., & Donnelly, N. (2007). A comparison of selective attention and facial processing biases in typically developing children who are high and low in self-reported trait anxiety. *Development and Psychopathology, 19*, 481-495.

Richman, N., Stevenson, J., & Graham, P. J. (1982). *Pre-school to school: A behavioral study*. London and New York: Academic Press.

Robinson, J. L., Kagan, J., Reznick, J. S., & Corley, R. (1992). The heritability of inhibited and uninhibited behavior: A twin study. *Developmental Psychology, 28*, 1030-1037.

Roelofs, J., Huibers, M., Peeters, F., Arntz, A., & van Os, J. (2008). Rumination and worrying as possible mediators in the relation between neuroticism and symptoms of depression and anxiety in clinically depressed individuals. *Behaviour Research and Therapy, 46*, 1283-1289.

Rood, L., Roelofs, J., Bögels, S. M., Nolen-Hoeksema, S., & Schouten, E. (2009). The influence of emotion-focused rumination and distraction on depressive symptoms in non-clinical youth: A meta-analytic review. *Clinical Psychology Review, 29*, 607-616.

Rothman, K. J., & Greenland, S. (1998). Precision and validity in epidemiologic studies. In K. J. Rothman & S. Greenland (Eds.), *Modern epidemiology* (2nd ed., pp. 115-134). Philadephia: Lippincott Wiliams & Wilkins.

Rubin, K. H., Hastings, P. D., Stewart, S. L., Henderson, H. A., & Chen, X. (1997). The consistency and concomitants of inhibition: Some of the children, all of the time. *Child Development, 68*, 467-483.

Ryan, C. (2004). Gender differences in children's experience of musical performance anxiety. *Psychology of Music, 32*, 89-103.

Ryan, D. N., Puig-Antich, J., Rabinovich, H., Robinson, D., Ambrosini, P. J., Nelson, B., Mengar, S., & Twomey, J. (1987). The clinical picture of major depression in children and adolescents. *Archives of General Psychiatry, 44*, 854-861.

Sanson, A. V., Smart, D. F., Prior, M., Oberklaid, F., & Pedlow, R. (1994). The structure of temperament from age 3 to 7 years: Age, sex, and sociodemographic influences. *Merrill Palmer Quarterly, 40*, 233-252.

Sato, W., & Yoshikawa, S. (2004). The dynamic aspects of emotional facial experssions. *Cognition and Emotion, 18*, 701-710.

Scarpa, A., Raine, A., Venables, P. H., & Mednick, S. A. (1995). The stability of inhibited/uninhibited temperament from ages 3 to 11 years in Mauritian children. *Journal of Abnormal Child Psychology, 23*, 607-618.

Schmukle, S. C. (2005). Unreliability of the dot probe task. *European Journal of Personality, 19*, 595-605.

Schunk, D. H. (1987). Peer models and children's behavioral change. *Review of Educational Research, 57*, 149-174.

Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77*, 313-322.

Segal, Z. V., Williams, J. M. C., & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression - A new approach to preventing relapse*. New York: Guilford Press.

Segerstrom, S. C., Tsao, J. C. I., Alden, L. I., & Craske, M. G. (2000). Worry and rumination: Repetitive thoughts as a concomitant and a predictor of negative mood. *Cognitive Therapy and Research, 24*, 671-688.

Semple, R. J., Reid, E. F. G., & Miller, L. (2005). Treating anxiety with mindfulness: An open trial of mindfulness training for anxious children. *Journal of Cognitive Psychotherapy: An International Quarterly, 19*, 379-392.

Serrano, J. M., Iglesias, J., & Loeches, A. (1995). Infants' responses to adult static facial expressions. *Infant Behavior and Development, 18*, 477-482.

Sexton, K. A., Norton, P. J., Walker, J. R., & Norton, G. R. (2003). Hierarchical model of generalized and specific vulnerabilities in anxiety. *Cognitive Behavior Therapy, 32*, 82-94.

Shamir-Essakow, G., Ungerer, J. A., & Rapee, R. M. (2005). Attachment, behavioral Inhibition, and anxiety in preschool children. *Journal of Abnormal Child Psychology, 33*, 131-143.

Shatz, S. M. (2005). The psychometric properties of the behavioral inhibition scale in a college-aged sample. *Personality and Individual Differences, 39*, 331-339.

Silverman, W. K., & Dick-Niederhauser, A. (2004). Separation anxiety disorder. In T. L. Morris & J. S. March (Eds.), *Anxiety disorders in children and adolescents* (pp. 164-188). New York: Guilford.

Silverman, W. K., La Greca, A. M., & Wasserstein, S. (1995). What do children worry about? Worries and their relation to anxiety. *Child Development, 66*, 671-686.

Sobel, M. E. (1986). Some new results on indirect effects and their stadard errors in covariance structure models. In N. Tuma (Ed.), *Sociological Methodology 1986* (pp. 159-186). Washington: American Sociological Association.

Spence, S. H., Rapee, R., McDonald, C., & Ingram, M. (2001). The structure of anxiety symptoms among preschoolers. *Behaviour Research and Therapy, 39*, 1293-1316.

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1973). *State-trait anxiety inventory for children: How I feel questionnaire - Professional Manual*: Mind Garden Inc.

Starcevic, V. (1995). Pathological worry in major depression: A preliminary report. *Behaviour Research and Therapy, 33*, 55-56.

Sterba, S. K., Prinstein, M. J., & Cox, M. J. (2007). Trajectories of internalizing problems across childhood: Heterogeneity, external validity, and gender differences. *Development and Psychopathology, 19*, 345-366.

Stirling, L. J., Eley, T. C., & Clark, D. M. (2006). Preliminary evidence for an association between social anxiety symptoms and avoidance of negative faces in children. *Journal of Clinical Child and Adolescent Psychology, 35*, 341-439.

STOIK Imaging. (2003). MorphMan 4.0. Moscow, Russia.

Strauss, C. C., Frame, C. L., & Forehand, R. (1987). Psychosocial impairment associated with anxiety in children. *Journal of Clinical Child and Adolescent Psychology, 16*, 235 - 239.

Taghavi, M. R., Dalgleish, T., Moradi, A. R., Neshat-Doost, H. T., & Yule, W. (2003). Selective processing of negative emotional information in children and adolescents with generalized anxiety disorder. *British Journal of Clinical Psychology 42*, 221-230.

Taghavi, M. R., Neshat-Doost, H. T., Moradi, A. R., Yule, W., & Dalgleish, T. (1999). Biases in visual attention in children and adolescents with clinical anxiety and mixed anxiety-depression. *Journal of Abnormal Child Psychology 27*, 215-223.

Thorne, B. (1993). Gender play: Girls and boys in school. New Brunswick, NY: Academic Internet Publishers.

Tottenham, N., Tanaka, J., Leon, A. C., McCarry, T., Nurse, M. H., T.A., Marcus, D. J., Westerlund, A., Casey, B. J., & Nelson, C. A. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research, 168*, 242-249.

Van Brakel, A. L. (2007). Behavioral inhibition as a risk factor for the development of childhood anxiety disorders. Unpublished doctoral dissertation. Maastricht University, Maastricht, The Netherlands.

Van Brakel, A. M. L., & Muris, P. (2006). A brief scale for measuring "Behavioral Inhibition to the Unfamiliar" in children. *Journal of Psychopathology and Behavioral Assessment, 28*, 79-84.

Van Brakel, A. M. L., Muris, P., & Bögels, S. M. (2001). Gedragsinhibitie als risicofactor voor het ontwikkelen van angststoornissen bij kinderen: Een overzicht. (Behavioral inhibition as a risk factor for the development of anxiety disorders in children: A review). *Nederlands Tijdschrift voor de Psychologie en haar grensgebieden, 56*, 57-68.

Van Brakel, A. M. L., Muris, P., & Bögels, S. M. (2004). Relations between parent-and teacher-reported behavioral inhibition and behavioral observations of this temperamental trait. *Journal of Clinical Child and Adolescent Psychology, 33*, 579-589.

van Widenfelt, B. M., Goedhart, A. W., Treffers, P. D. A., & Goodman, R. (2003). Dutch version of the Strengths and Difficulties Questionnaire (SDQ). *European Child and Adolescent Psychiatry, 12*, 281-289.

Vasey, M. W. (1993). Development and cognition in childhood anxiety: The example of worry. *Advances in Clinical Child Psychology, 15*, 1-39.

Vasey, M. W., & Dadds, M. R. (2001). An introduction to the developmental psychopathology of anxiety. In M. W. Vasey & M. R. Dadds (Eds.), *The developemental psychopathology of anxiety* (pp. 3-26). New York: Oxford University Press.

Vasey, M. W., Daleiden, E. L., Williams, L. L., & Brown, L. M. (1995). Biased attention in childhood anxiety disorders: A preliminary study. *Journal of Abnormal Child Psychology, 23*, 267-279.

Vasey, M. W., Dalgleish, T., & Silverman, W. K. (2003). Research on information-processing factors in child and adolescent psychopathology: A critical commentary. *Journal of Clinical Child and Adolescent Psychology, 32*, 81-93.

Vasey, M. W., El-Hag, N., & Daleiden, E. L. (1996). Anxiety and the processing of emotionally threatening stimuli: Distinctive patterns of selective attention among high- and low-test-anxious children. *Child Development, 67*, 1173-1185.

Verhulst, F. C., & Van der Ende, J. (1993). “Comorbidity” in an epidemiological sample: A longitudinal perspective. *Journal of Child Psychology and Psychiatry, 34*, 767-783.

Vermunt, J. K., & Magidson, J. (2005). *Latent Gold 4.0 User's Guide*. Belmont, Massachusetts: Statistical Innovations Inc.

Wallbott, H. G., & Scherer, K. R. (1986). Cues and channels in emotion recognition. *Journal of Personality and Social Psychology, 51*, 690-699.

Waters, A. M., Henry, J., Mogg, K., Bradley, B. P., & Pine, D. S. (2010). Attentional bias towards angry faces in childhood anxiety disorders. *Journal of Behavior Therapy and Experimental Psychiatry, 41*, 158-164.

Waters, A. M., Lipp, O. V., & Spence, S. H. (2004). Attentional bias toward fear-related stimuli: An investigation with nonselected children and adults and children with anxiety disorders. *Journal of Experimental Child Psychology, 89*, 320-337.

Waters, A. M., Mogg, K. P. D., Bradley, B. P., & Pine, D. S. M. D. (2008). Attentional bias for emotional faces in children with generalized anxiety disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 47*, 435-442.

Waters, A. M., & Valvoi, J. S. (2009). Attentional bias for emotional faces in peadiatric anxiety disorders: An investigation using the emotional go/no go task. *Journal of Behavior Therapy and Experimental Psychiatry, 40*, 306-316.

Watkins, E., & Moulds, M. (2005). Distinct modes of ruminative self-focus: Impact of abstract versus concrete rumination on problem solving in depression. *Emotion, 5*, 319-328.

Watkins, E., Scott, J., Wingrove, J., Rimes, K., Bathurst, N., Steiner, H., Kennell-Webb, S., Moulds, M., & Malliaris, Y. (2007). Rumination-focused cognitive behaviour therapy for residual depression: A case series. *Behaviour Research and Therapy, 45*, 2144-2154.

Watkins, E., & Teasdale, J. D. (2001). Rumination and an overgeneral memory in depression: Effects on self-focus and analytic thinking. *Journal of Abnormal Psychology, 110*, 353-357.

Watts, S., & Weems, C. (2006). Associations among selective attention, memory bias, cognitive errors and symptoms of anxiety in youth. *Journal of Abnormal Child Psychology, 34*, 838-849.

Weems, C. F., & Costa, N. M. (2005). Developmental differences in the expression of childhood anxiety symptoms and fears. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*, 656-663.

Weems, C. F., & Stickle, T. R. (2005). Anxiety disorders in childhood: Casting a nomological net. *Clinical Child and Family Psychology Review, 8*, 107-134.

Weiss, M. R., McCullagh, P., Smith, A. L., & Berlant, A. R. (1998). Observational learning and the fearful child: Influence of peer models on swimming skill performance and psychological responses. *Research Quarterly of Exercise and Sport, 69*, 380-394.

Westenberg, P. M., Drewes, M. J., Goedhart, A. W., Siebelink, B. M., & Treffers, P. D. A. (2004). A developmental analysis of self-reported fears in late childhood through mid-adolescence: Social-evaluative fears on the rise? *Journal of Child Psychology and Psychiatry, 45*, 481-495.

Westenberg, P. M., Siebelink, B. M., Warmenhoven, N. J. C., & Treffers, P. D. A. (1999). Separation anxiety and overanxious disorders: Relations to age and level of psychosocial maturity. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*, 1000-1007.

Wicklow, A., & Espie, C. A. (2000). Intrusive thoughts and their relationship to actigraphic measurement of sleep: Towards a cognitive model of insomnia. *Behaviour Research and Therapy, 38*, 679-693.

Woodward, L. J., & Fergusson, D. M. (2001). Life course outcomes of young people with anxiety disorders in adolescence. *Journal of American Academy of Child and Adolescent Psychiatry, 40*, 1086-1093.

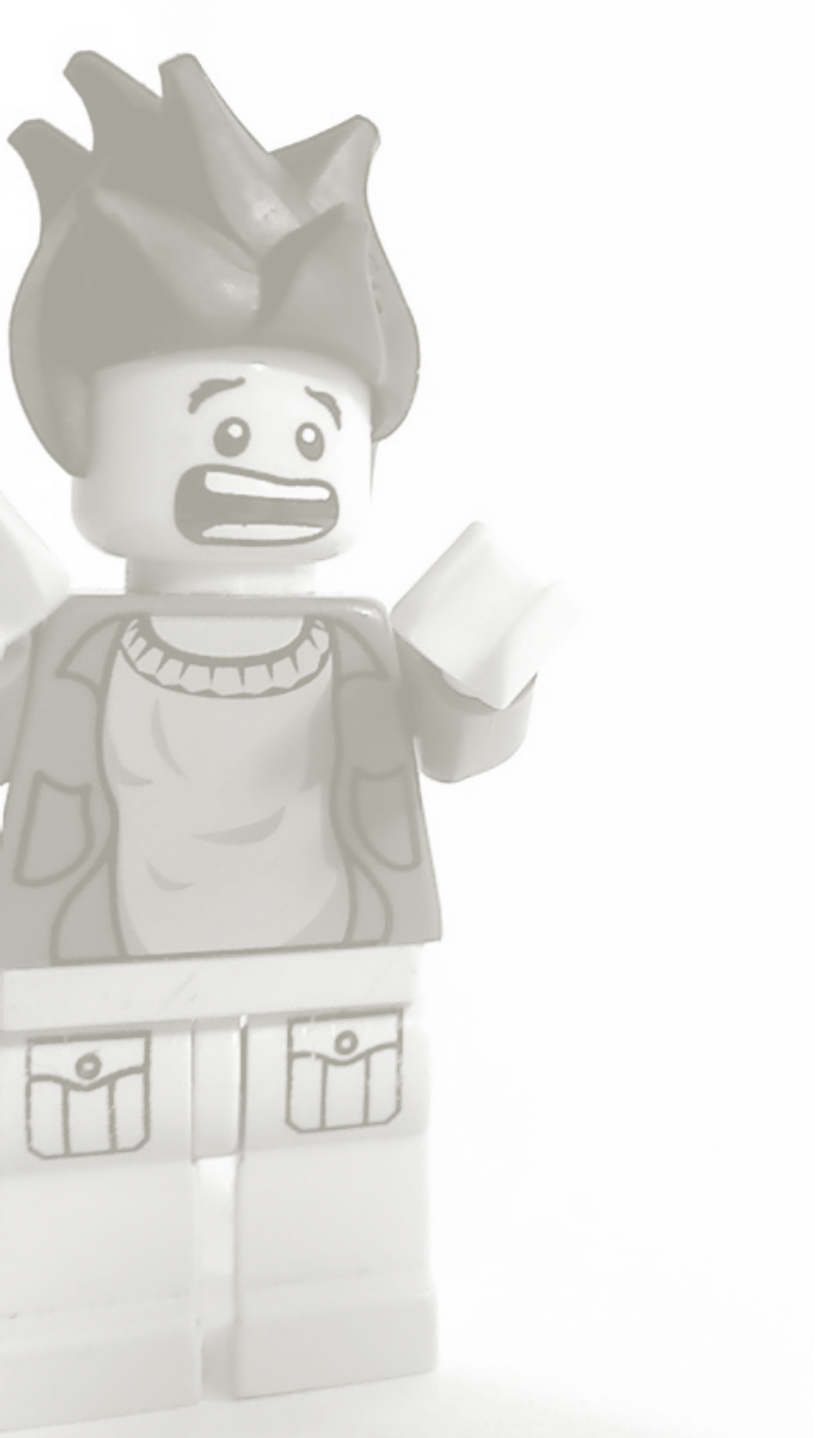
Wright, J., Zakriski, A., & Drinkwater, M. (1999). Developmental psychopathology and the reciprocal patterning of behaviour and environment: Distinctive situational and beha-

vioral signatures of internalizing, externalizing, and mixed-syndrome children. *Journal of Consulting and Clinical Psychology, 67*, 95-107.

Young-Browne, G., Rosenfeld, H. M., & Horowitz, F. D. (1977). Infant discrimination of facial expressions. *Child Development, 48*, 555-562.

Ziegert, D. I., & Kistner, J. A. (2002). Response styles theory: Downward extension to children. *Journal of Clinical Child and Adolescent Psychology, 31*, 325-334.

Samenvatting



De belangrijkste doelen van dit proefschrift waren meer inzicht krijgen in de ontwikkeling van angststoornissymptomen bij niet-klinische kinderen, en ten tweede, een aantal factoren bestuderen waarvan verondersteld wordt dat ze een rol spelen bij het ontstaan en voortbestaan van angstproblemen en ten slotte de rol te verhelderen van deze factoren in de ontwikkeling van dit type psychopathologie. Verder werden de psychometrische eigenschappen van drie vragenlijsten, die angstsymptomen (of breder internaliserende problemen) en de temperamentstrek gedragsinhibitie meten, onderzocht. In de volgende paragraaf zal een samenvatting gegeven worden van de belangrijkste bevindingen die gerapporteerd werden in Hoofdstuk 2 tot en met 8 van dit proefschrift.

Overzicht van de belangrijkste bevindingen

In **Hoofdstuk 2** wordt de betrouwbaarheid en validiteit onderzocht van twee oudervragenlijsten om angst (of breder internaliserende problemen) bij jonge kinderen te meten, namelijk de *Preschool Anxiety Scale* (PAS; Spence et al., 2001) en de *Children's Moods, Fears, and Worries Questionnaire* (CMFWQ; Bayer et al., 2006). Dit onderzoek werd uitgevoerd onder 275 kinderen uit de algemene populatie in de leeftijd van 2 tot en met 6 jaar. De resultaten van deze studie toonden aan dat de ouders de items van zowel de PAS als de CMFWQ goed begrepen. De PAS en CMFWQ subschalen lieten gemiddelde tot hoge interne consistentie coëfficiënten zien. Daarnaast werd er steun gevonden voor de constructvaliditeit van beide vragenlijsten en konden de CMFWQ en PAS scores redelijk onderscheid maken tussen kinderen die scooden in het normale, subklinische en klinische bereik van verschillende *Child Behavior Checklist* schalen (Achenbach, 1992). Beide vragenlijsten lijken dus betrouwbare en valide instrumenten te zijn om emotionele moeilijkheden bij jonge kinderen te meten. De PAS is vooral bruikbaar voor het meten van verschillende angstsymptomen, terwijl de CMFWQ een geschikte vragenlijst lijkt voor het onderzoeken van internaliserende problemen in het algemeen.

Hoofdstuk 3 beschrijft een studie naar de psychometrische eigenschappen van een vragenlijst die gedragsinhibitie meet, een temperamentskenmerk dat verwijst naar de neiging om zeer verlegen te zijn en te reageren met angst en terugtrekgedrag in nieuwe en onbekende sociale en niet-sociale situaties (Hirshfeld-Becker et al., 2004). Gedragsinhibitie wordt beschouwd als een kwetsbaarheidsfactor voor het ontwikkelen van angststoornissen (bijv. Biederman et al., 1993; Hirshfeld-Becker et al., 2007). In deze studie werden de psychometrische eigenschappen van de Behavioral Inhibition Questionnaire (BIQ; Bishop et al., 2003) nader onderzocht in een steekproef uit de algemene populatie van kinderen tussen de 4 en 15 jaar (N = 531). Omdat de BIQ in eerdere studies alleen werd gebruikt bij peuters en kleuters (Bishop et al., 2003; Edwards, 2007), werd de betrouwbaarheid en validiteit van de vragenlijst in deze studie onderzocht in drie leeftijdsgroepen (namelijk 4-7 jaar, 8-11 jaar en 12-15 jaar). Op deze manier kon worden bekeken of deze vragenlijst ook goede psychometrische kwaliteiten laat zien bij oudere kinderen en adolescenten. De resultaten geven aan dat de interne consistentie van de meeste BIQ subschalen in alle drie de leeftijdsgroepen bevredigend is. Bovendien werd er steun gevonden voor de constructvaliditeit van de vragenlijst: BIQ scores waren positief gecorreleerd met verschillende typen angstsymptomen, hoewel de meest substantiële

verbanden werden gevonden met sociale angst. Ten slotte vulden kinderen van 9 jaar en ouder ook een zelfrapportage versie van de BIQ in. Deze versie bleek ook een goede interne consistentie te bezitten en liet een adequate ouder-kind overeenstemming zien. Kortom de resultaten van deze studie suggereren dat de BIQ niet alleen een betrouwbare en valide maat voor gedragsinhibitie zou kunnen zijn voor peuters en kleuters, maar ook voor oudere kinderen en adolescenten.

Na de betrouwbaarheid en validiteit te hebben vastgesteld van een aantal vragenlijsten die gebruikt zouden gaan worden in de overige studies van dit proefschrift, richten Hoofdstuk 4 en 5 zich op ontwikkelingspatronen in angstproblemen bij kinderen. De studie die gerapporteerd wordt in **Hoofdstuk 4** doet een poging de vaak veronderstelde, maar nauwelijks empirisch onderzochte stelling, dat de cognitieve ontwikkeling van kinderen ontwikkelingspatronen in angstverschijnselen medieert (bijvoorbeeld Muris, 2007; Vasey, 1993), te verhelderen. Dit hoofdstuk beschrijft een cross-sectionele studie die zich specifiek richtte op de relatie tussen (sociaal-)cognitieve ontwikkeling aan de ene kant, en vrees, angst en gedragsinhibitie aan de andere kant (*N* = 226, leeftijdsrange 4-9 jaar). Resultaten lieten significante leeftijdstrends zien voor totale vrees, “angst voor het onbekende” en gegeneraliseerde angst, waarbij jongere kinderen (4 en 5 jaar) hogere totale vrees en “angst voor het onbekende” scores lieten zien, terwijl oudere kinderen (6-7 jaar en 8-9 jaar) hogere gegeneraliseerde angstscores rapporteerden. De resultaten van de regressie analyses lieten zien dat de impact van ontwikkelingsfactoren op verschillende angstfenomenen vrij beperkt was. Leeftijd verklaarde een substantieel deel van de infantiele angsten (bijvoorbeeld angst voor het donker en magische wezens; 18.9%), wat suggereert dat dit type angst duidelijk een functie is van maturatie. Echter voor de overige angstfenomenen (totale vrees, verschillende andere typen angst en gedragsinhibitie) werd een veel kleiner percentage van de variantie verklaard door leeftijd en cognitieve ontwikkeling (< 6%). Deze bevinding lijkt erop te duiden dat er andere factoren zijn die een belangrijkere rol spelen in het ontstaan van angstfenomenen.

Waar de studie naar ontwikkelingspatronen in kinderangst, zoals beschreven in Hoofdstuk 4, cross-sectioneel van aard was, onderzoekt de studie gerapporteerd in **Hoofdstuk 5** ontwikkelingspatronen in angststoornissymptomen bij 4- tot en met 12-jarige kinderen (*N* = 224) met behulp van een 2-jarig prospectief design. Meer specifiek was het doel van deze studie (a) het identificeren van afzonderlijke ontwikkelingstrajecten voor verschillende categorieën van angststoornissymptomen (sociale angst, vrees, gegeneraliseerde angst en separatieangst), en (b) het onderzoeken in welke mate de variabelen gedragsinhibitie, sociaal-cognitieve ontwikkeling en psychosociale aanpassing, die gemeten werden aan het begin van de studie, voorspellend waren voor de ontwikkelingstrajecten van deze angststoornissymptomen. Analyses lieten 3 tot 4 van elkaar te onderscheiden ontwikkelingstrajecten zien voor de verschillende typen angstsymptomen: de meeste daarvan waren redelijk stabiel over de tijd en daarbij leken de “stabiel-laag” of “stabiel-gemiddeld” trajecten de normatieve trajecten te reflecteren. Bovendien gaven de analyses aan, dat de hogere angst trajecten geassocieerd werden met hogere niveaus van gedragsinhibitie en social-cognitieve vaardigheden, zoals gemeten aan het begin van de studie. Kortom, de resultaten tonen heterogeniteit aan in de ontwikkeling van angstsymp-

tomen. Verder suggereren deze bevindingen dat hoog-risico kinderen met atypische, chronisch hoge niveaus van angstsymptomen al op jonge leeftijd geïdentificeerd kunnen worden en dat een kwetsbaarheidsfactor, zoals gedragsinhibitie, gebruikt kan worden om deze kinderen op te sporen.

De laatste drie studies die werden beschreven in Hoofdstuk 6 tot en met 8 richten zich op verschillende specifieke kwetsbaarheidsfactoren, waarvan wordt gesteld dat zij een rol spelen bij het ontstaan en voortbestaan van angstproblemen, namelijk terugkerende negatieve gedachten, informatieverwerkingsbiases en voorbeeldgedrag door leeftijdsgenootjes. Als eerste onderzocht de studie beschreven in **Hoofdstuk 6** de rol van terugkerende negatieve gedachten (piekeren en rumineren), niet alleen in de kwetsbaarheid voor angstproblemen, maar ook voor andere emotionele problemen (symptomen van depressie en slaapproblemen), bij niet-klinische kinderen in de leeftijd van 8 tot 13 jaar (*N* = 158). Meer specifiek, werd er een model getest waarin piekeren en rumineren statistisch de relatie tussen de persoonlijkheidstrek neuroticisme en symptomen van angst, depressie of slaapproblemen medieerde. Bovendien werd ook onderzocht of gedragsinhibitie unieke variantie verklaarde in het voorspellen van terugkerende gedachten en psychopathologische symptomen in het algemeen, en angstproblemen in het bijzonder. De resultaten lieten zien dat er positieve verbanden waren tussen de algemene kwetsbaarheidsfactor (neuroticisme), terugkerende gedachten en emotionele problemen. Verder werd er steun gevonden voor een model waarin piekeren en rumineren de relatie tussen neuroticisme en symptomen van angst en depressie deels medieerden. In het geval van slaapproblemen werd er geen bewijs gevonden voor een dergelijk mediatie model. In feite suggereerden de data dat slaapproblemen beter gezien kunnen worden als een epifenomeen (bijverschijnsel) van hoge symptoomniveaus van angst en depressie, of juist als een risicofactor voor het ontwikkelen van andere vormen van psychopathologie. Ten slotte lijkt naast neuroticisme de temperamenttrek gedragsinhibitie een unieke rol te spelen in het model dat angstsymptomen voorspelt, maar niet in de modellen die depressieve symptomen of slaap problemen voorspellen. Deze resultaten komen dus overeen met het idee dat piekeren en rumineren bijdragen aan de kwetsbaarheid van kinderen voor angst en depressie.

Ten tweede, in **Hoofdstuk 7** wordt een studie beschreven die (a) informatieverwerkingsbiases voor emotionele gezichtsstimuli onderzocht in een steekproef van 355 niet-klinische kinderen in de leeftijd van 4 tot en met 12 jaar. Verder werd gekeken naar (b) ontwikkelingspatronen in zulke biases en (c) in welke mate biases gerelateerd waren aan sociale angst en het temperamentkenmerk gedragsinhibitie bij kinderen van verschillende leeftijden. Resultaten lieten zien dat kinderen over het algemeen sneller waren in het detecteren van blije gezichten in vergelijking met boze gezichten, en dit effect werd niet bepaald door leeftijd, sociale angst of gedragsinhibitie. Er werd geen significant effect van leeftijd op de biasscores gevonden, wat aangeeft dat er geen ontwikkelingspatronen werden geobserveerd in verwerkingsbiases. Verdere analyses onthulden echter wel twee klassen in de data waarvan één klasse voornamelijk bestond uit jongere kinderen en de andere klasse vooral oudere kinderen bevatte. Jongere kinderen waren over het algemeen langzamer, minder accuraat en lieten meer variatie in hun scores op de verwer-

kingsbias-taken zien, dan oudere kinderen. De bevindingen van deze studie onderstrepen de behoefte aan het ontwikkelen en het gebruiken van meer bij de leeftijd passende, niet-reactietijdgebaseerde taken voor het meten van informatieverwerkingsbiases bij jonge kinderen.

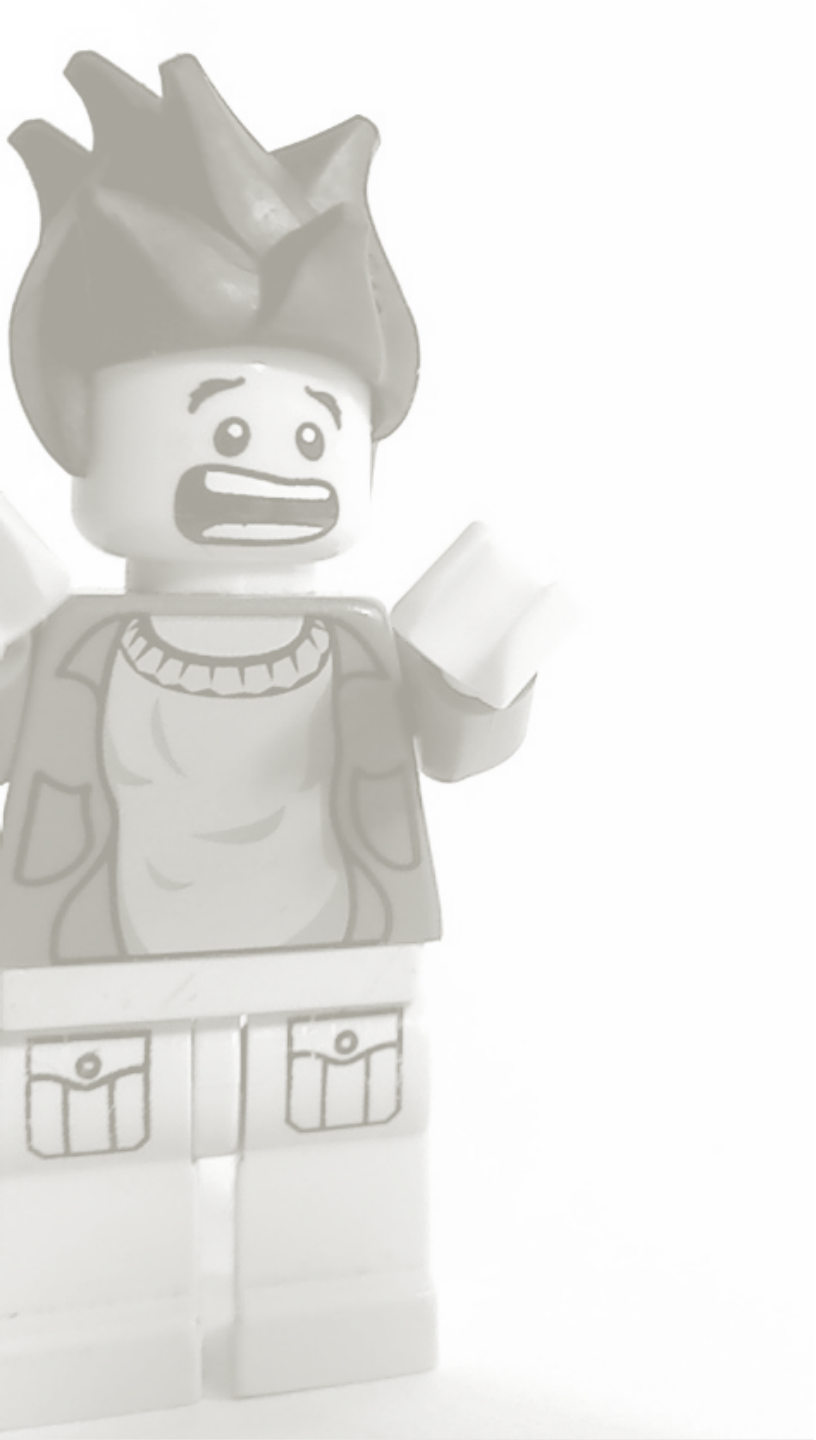
Ten slotte werd het effect van voorbeeldgedrag van leeftijdsgenootjes op de angstovertuigingen en toenaderings- en vermijdingsgedrag van onbekende dieren door 8- tot en met 10-jarige kinderen (*N* = 97) onderzocht in een studie die is beschreven in **Hoofdstuk 8**. Voor deze studie werden kinderen random toegewezen aan ofwel de positieve conditie, waarin zij een film te zien kregen waarin leeftijdsgenootjes op een positieve manier een onbekend dier benaderden, ofwel de negatieve conditie, waarin zij een film te zien kregen waarin leeftijdsgenootjes op een negatieve manier een onbekend dier benaderden. De resultaten van deze studie lieten zien dat na positief voorbeeldgedrag van leeftijdsgenootjes de angstovertuigingen en vermijdingstendensen van kinderen ten opzichte van het dier waarover zij de film te zien kregen, significant verminderden en dit effect lijkt te generaliseren naar een dier waarover zij geen informatie ontvingen. Echter na negatief voorbeeldgedrag namen de angstovertuigingen van kinderen voor het dier uit de film significant toe, maar veranderden niet voor het dier waarover zij geen informatie kregen. Daarnaast veranderde negatief voorbeeldgedrag de vermijdingstendensen van kinderen ten opzichte van het dier waarover zij de film te zien kregen niet, terwijl deze afnamen voor het dier waarover zij geen informatie ontvingen. Er werd geen verschil gevonden tussen de positieve en negatieve condities in daadwerkelijk (toenaderings)gedrag tot de kooien van de dieren. Samengevat lijken deze resultaten aan te geven dat negatief voorbeeldgedrag van leeftijdsgenootjes een rol zou kunnen spelen bij het ontstaan van angsten bij kinderen, terwijl positief voorbeeldgedrag angstreducerende effecten kan hebben en toenaderingsgedrag zou kunnen stimuleren.

Conclusie

Angststoornissen behoren tot de meest voorkomende psychiatrische stoornissen in de kindertijd (Cartwright-Hatton et al., 2006; Costello et al., 2003) en de negatieve impact van deze stoornissen op het dagelijks leven van kinderen benadrukt de behoefte om de ontwikkeling van angst en factoren, die in verband worden gebracht met de ontwikkeling en het voortbestaan van deze problemen, beter te begrijpen. Daarom was het doel van dit proefschrift om de huidige kennis over het ontwikkelingsverloop van angststoornissymptomen bij kinderen en daarmee geassocieerde kwetsbaarheidsfactoren te vergroten, en om vragenlijsten te onderzoeken die gebruikt kunnen worden om angstige kinderen of kinderen die een hoog risico lopen om angstproblemen te ontwikkelen, te identificeren. De belangrijkste bevindingen van de studies beschreven in dit proefschrift kunnen als volgt worden samengevat: Angst en daarmee geassocieerde kwetsbaarheidsfactoren zoals gedragsinhibitie zijn al observeerbaar bij jonge kinderen. Er lijkt aanzienlijke heterogeniteit te bestaan in het ontwikkelingsverloop van kinderangsten, waarbij de meeste kinderen stabiel lage of gemiddelde niveaus van angst laten zien, terwijl een minderheid van de kinderen stabiel hoge niveaus van angst laat zien. Bovendien lijken verscheidene kwestbaarheidsfactoren een rol te spelen bij het ontstaan van angst. Met

name gedragsinhibitie is geassocieerd met verhoogde angstniveaus bij kinderen en dat lijkt ook te gelden voor terugkerende negatieve gedachten en voorbeeldgedrag van leeftijdsgenootjes. Het lijkt er dus op dat een verscheidenheid aan factoren een rol speelt bij het ontstaan en voortbestaan van vrees en angst bij kinderen. Deze resultaten ondersteunen het dynamische, multifactoriële model zoals voorgesteld door Muris (2007) om de ontwikkeling van vrees en angst bij kinderen weer te geven. Er is echter meer onderzoek nodig om vast te stellen hoe kwetsbaarheidsfactoren en beschermende factoren binnen dit model werken, niet alleen in isolatie, maar ook in dynamische interactie met elkaar.

Dankwoord



Ik ben erg dankbaar voor alle hulp, bemoedigende en relativerende woorden, geduld, vertrouwen en adviezen die ik van zo veel mensen heb mogen ontvangen de afgelopen 3 jaar. Zonder jullie was ik nooit zo snel, zo ver gekomen. Ik wil jullie daarvoor allemaal bedanken; echter een aantal mensen wil ik in het bijzonder bedanken.

Als eerste Peter Muris, mijn promotor: ik wil jou bedanken voor de vliegende start en jouw begeleiding en advies bij mijn eerste stappen op het onderzoekspad. Je bent een geweldige leermeester en hebt een fantastisch schrijftalent. Ik heb veel geleerd van jou en je "slayer-pen". Ik ben je ook dankbaar voor de kansen die je me hebt gegeven, niet alleen op het gebied van mijn promotieonderzoek, maar ook om mijn eigen onderzoeksideeën uit te werken, een periode onderzoek te doen in het buitenland en om activiteiten te ontplooien buiten mijn werk, die hadden kunnen interfereren met mijn promotietraject, zoals mijn raadslidmaatschap. Bedankt voor je vertrouwen!

Ik wil ook de mensen bedanken die plaats hebben willen nemen in mijn promotiecommissie voor hun tijd en bereidheid mijn proefschrift te lezen en te beoordelen: Guus Smeets, Frank Verhulst, Else de Haan, Andy Field, Eric Rassin, Ingmar Franken en Jorg Huijding.

Daarnaast zou ik graag de scholen, ouders en kinderen bedanken die aan mijn studies hebben meegewerkt, in het bijzonder de Gideonschool, de Ds. J. J. Buskesschool en de Tuinstad voor het mogen uitvoeren van mijn studies en de hulp en medewerking van alle leerkrachten, locatieleiders, (adjunct-) directeuren en ondersteunend personeel bij alle drie de metingen. Zonder jullie was de dataverzameling nooit zo vlot verlopen!

Ook mijn kamergenootjes Janneke, Kiki en Lisette: bedankt voor al jullie hulp, kletspraatjes, gezelligheid, steun, jullie luisterend oor en opbeurende woorden wanneer het tegen zat. Jullie waren fijne kamergenootjes en ik zal jullie missen! Janneke en Kiki, bedankt dat jullie mij als paranimf willen bijstaan.

Mijn (ex)collega's van de klinische sectie: Arjan, Birgit, Colin, Elke, Hans, Ilse, Katrien, Marlies, Renske, Susan, Angela, Anita, Anja, Ivo, Leonie, Maartje, Marianne en Reshmi, en mijn andere collega's van het Instituut voor Psychologie, bedankt voor de gezelligheid en de inspirerende werksfeer. Angela, Leonie, Birgit, Jorg en Samantha wil ik in het bijzonder bedanken. Angela en Leonie, voor de gezellige (werk)trips en gesprekken. Birgit, voor je hulp, relativerende woorden en de gezellige squashsessies. Jorg, voor je hulp bij mijn onderzoek en Samantha, voor je uitleg en hulp bij het oplossen van al mijn statistische problemen. Daarnaast wil ik Mirella, Hanny, Marja en medewerkers van het onderwijsbureau en psyweb bedanken voor hun hulp bij allerlei praktische zaken. Christiaan, Jeffrey, Marcel, Freek en Gerrit-Jan, bedankt voor jullie technische ondersteuning, geduld en hulp bij het oplossen van al mijn computer-, Eprime- en "(cavia)geluid"problemen. Zonder jullie waren een heleboel van mijn experimenten nooit van de grond gekomen!

Eveneens wil ik de studenten bedanken die een deel van de dataverzameling voor hun rekening genomen hebben: Lotte Timmerman, Annemieke Abee en Jessica Voerman. Bedankt en heel veel succes met jullie verdere carrière! Jessica, ik hoop dat ik over een paar jaar getuige mag zijn van jouw promotie: zet hem op, je kan het!

Daarnaast wil ik Kristaan van der Heijden bedanken voor zijn hulp bij de “slaap-studie”. Sofia Diamantopoulou, thank you for your help with the “trajectory modeling” analyses and Mplus.

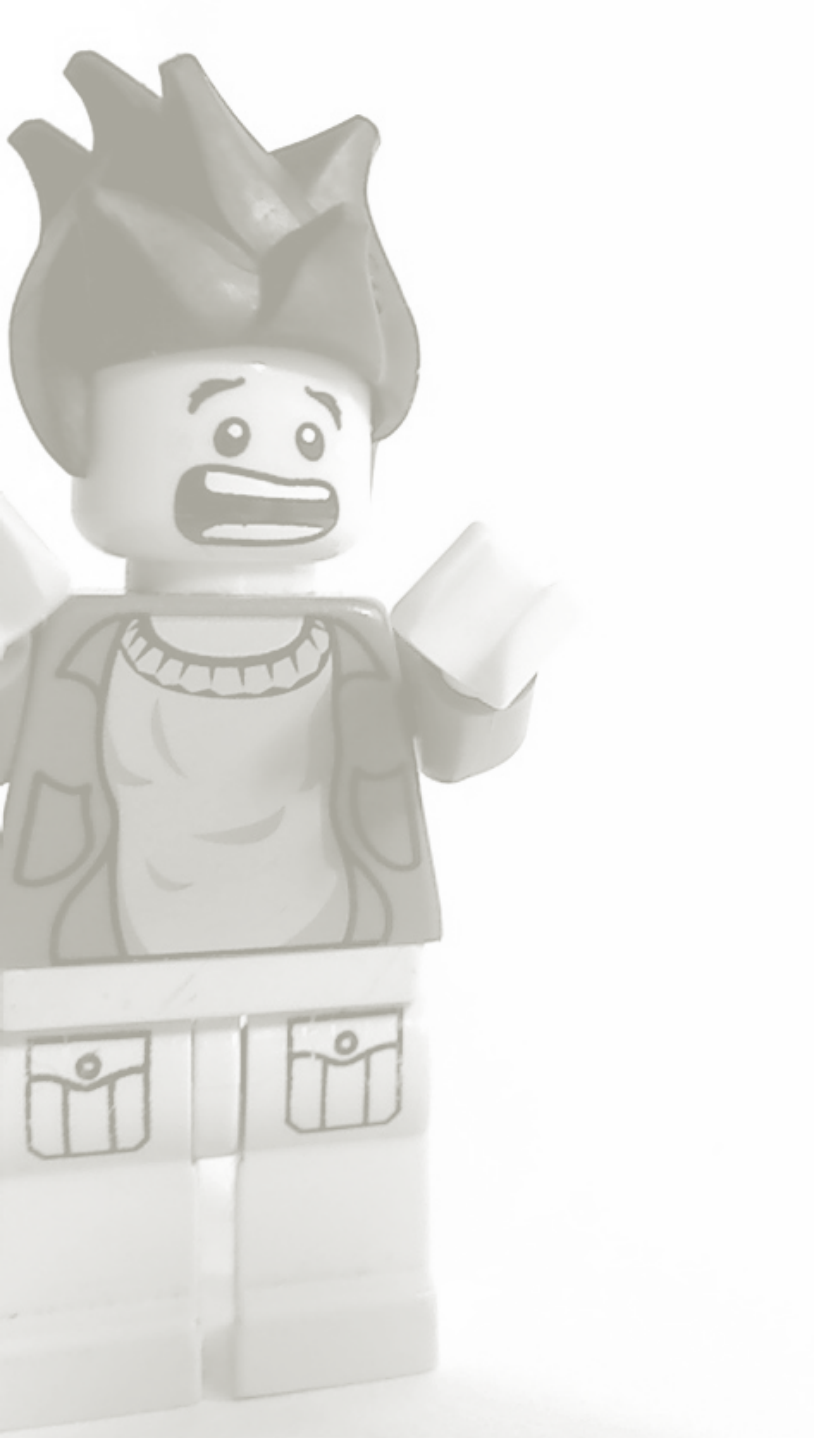
I also want to thank Andy Field and his CATT lab members (Kate, Zoe, Carina, and Saied). More specifically, Andy, thank you for letting me stay at Sussex, for making me feel welcome, and for your help with my research. I’ve learned a lot from you! Zoe, thank you for making me feel at home in Brighton and for all the fun trips and talks. You made my stay much more enjoyable. And last, but certainly not least, Kate. You made me feel so welcome and at home at Sussex. Thank you for all your help with my experiment, showing me Brighton and surroundings (Matt, thank you too!), all the nice (sporty and not so sporty) things we did, but also the inspiring talks about work and so much more. Thank you for everything!

Ten slotte wil ik mijn ouders, familie en vrienden bedanken voor hun liefde, gezelligheid, steun, jullie relativeringsvermogen, alle leuke afleiding…eigenlijk voor alles. Lieve vrienden en vriendinnen, ik ga jullie hier in dit “werk-stuk” niet allemaal noemen, maar bedankt voor alles! Lieve pap en mam: Ik ben zo dankbaar voor alles wat jullie mij geleerd en gegeven hebben, voor alle steun, warmte, de relativerende woorden (“Achteraf valt het altijd mee” toch?)…Ik had me geen betere ouders kunnen wensen! Lieve Steef, bedankt voor alle kletspraatjes, filosofische verhandelingen, gezelligheid en de mooie reis door Papua en Java. Nu begint ook jouw (werkende) leven pas echt: maak er iets moois van! Lieve pink, bedankt voor je hulp bij het ontwerpen van de kaft van mijn proefschrift. Ik ben zo blij om te zien dat het zo goed met je gaat. Je bent en blijft mijn lieve kleine zusje! En tot slot, lieve Jordi: Ik ben zo blij dat ik jou heb leren kennen! Bedankt dat we zoveel leuke dingen doen, dat ik zo met jou kan lachen, dat je er altijd voor me bent, dat je een lach op mijn gezicht weet te toveren zelfs als ik verdrietig bent, dat je dingen zo heerlijk nuchter kunt bekijken en me helpt te relativeren en voor zo veel meer…dank je wel voor alles! Zullen we samen nog heel veel avonturen gaan beleven?

En ten slotte wil ik iedereen bedanken die ik niet bij naam genoemd heb, maar die wel een plaatsje in dit dankwoord verdient.

Hartelijke bedankt allemaal!

Curriculum Vitae and publications



Curriculum Vitae

Suzanne Broeren was born in Rotterdam, The Netherlands, on December 17th, 1981. After completing athenaeum at the IJsselcollege in Capelle aan den IJssel and two years of nursing school at the Hogeschool Rotterdam, she studied psychology at the Erasmus University Rotterdam from 2002 until 2006. After receiving her bachelor degree (cum laude), she received a master degree in clinical and health psychology (cum laude). From 2006 to 2007, she worked as a "wetenschappelijk docent"/tutor at the Institute of Psychology, Erasmus University Rotterdam. In September 2007, she started her PhD research which formed the basis of this dissertation. The studies in this project focused on anxiety in children, and more specific, the developmental course and associated vulnerability factors of anxiety, and were supervised by Professor Peter Muris. During her PhD, she participated in the education program of the Dutch-Flemish post-graduate research school "Experimental Psychopathology" and spent three months as a visiting academic at Sussex University, Brighton, UK. Being a PhD-student she participated in several (clinical) psychology courses and practicals as a tutor or practical assistant, supervised research projects of master and bachelor students, and coordinated and taught a practical on diagnostic tools in neuropsychology. In September 2010, she started working as an assistant professor at the Department of Psychology, Erasmus University Rotterdam.

Publications

Journal articles and book chapters

Broeren, S., & Muris, P. (2010). A psychometric evaluation of the Behavioral Inhibition Questionnaire in a non-clinical sample of Dutch children and adolescents. *Child Psychiatry and Human Development, 41,* 214-229.

Broeren, S., & Muris, P. (2009). The relation between cognitive development and anxiety phenomena in children. *Journal of Child and Family Studies*, 18, 702-709.

Broeren, S. & Muris, P. (2008). Psychometric evaluation of two new parent-rating scales for measuring anxiety symptoms in Young Dutch children. *Journal of Anxiety Disorders, 22,* 949-958.

Broeren, S., Muris, P., Bouwmeester, S., Van der Heijden, K. B., & Abee, A. (in press). The role of repetitive negative thoughts in the vulnerability for emotional problems in non-clinical children. *Journal of Child and Family Studies.*

Muris, P., & Broeren, S. (2009). Twenty-five years of research on childhood anxiety disorders: Publication trends between 1982 and 2006 and a selective review of the literature. *Journal of Child and Family Studies, 18,* 388-395.

Muris, P., Broeren, S., & Mayer, B. (2009). Hoofdstuk 18: Angst- en stemmingsstoornissen bij kinderen en adolescenten. In G. Smeets, A.E.R. Bos, H. T. van der Molen, & P. Muris (Eds.), *Klinische psychologie: Diagnostiek en therapie* (pp 527-551). Groningen: Noordhoff Uitgevers.

Submitted manuscripts

Broeren, S., Lester, K., Muris, P., & Field, A. (2010-a). They are afraid of the animal, so therefore I am too: Influence of peer modeling on fear beliefs and approach-avoidance behaviors towards animals in typically developing children. Manuscript submitted for publication.

Broeren, S., Muris, P., & Diamantopoulou, S. (2010-b). The development of childhood anxiety disorder symptoms: Developmental trajectories and child-related variables in typically developing children. Manuscript submitted for publication.

Broeren, S., Muris, P., Bouwmeester, S., Field, A., & Voerman, J. S. (2010-c). Processing biases for emotional faces in 4- to 12-year-old non-clinical children: An exploratory study of developmental patterns and relationships with social anxiety and behavioral inhibition. Manuscript submitted for publication.

Presentations

Broeren, S. (2010, June 4). *Developmental patterns in information-processing biases in children.* Paper presented at the WCBCT 2010 conference, Boston, United States.

Broeren, S. (2010, June 3). *The effect of (non-verbal) modeling by peers on anxiety for animals in non-clinical children.* Paper presented at the WCBCT 2010 conference, Boston, United States.

Broeren, S. (2009, September 17). *Developmental patterns in information-processing biases in anxious and non-anxious children.* Paper presented at the EABCT 2009 conference, Dubrovnik, Croatia.

Broeren, S. (2009, March 11). *Anxiety and behavioral inhibition in young children.* Paper presented at the CDRIP meeting, University of Sussex, Brighton.

Broeren, S. (2007, October 29). *The relation between cognitive development and anxiety phenomena in children.* Poster presented at the EPP day, Dutch-Flemish post-graduate research school “Experimental Psychopathology”, Utrecht, The Netherlands.