

# Cognitive Development and Worry in Normal Children.

Citation for published version (APA):

Muris, P. E. H. M., Merckelbach, H. L. G. J., Meesters, C. M. G., & van de Brand, K. (2002). Cognitive Development and Worry in Normal Children. *Cognitive Therapy and Research*, 26(6)(6), 775-787. <https://doi.org/10.1023/A:1021241517274>

**Document status and date:**

Published: 01/01/2002

**DOI:**

[10.1023/A:1021241517274](https://doi.org/10.1023/A:1021241517274)

**Document Version:**

Publisher's PDF, also known as Version of record

**Please check the document version of this publication:**

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

**General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

[www.umlib.nl/taverne-license](http://www.umlib.nl/taverne-license)

**Take down policy**

If you believe that this document breaches copyright please contact us at:

[repository@maastrichtuniversity.nl](mailto:repository@maastrichtuniversity.nl)

providing details and we will investigate your claim.

## **Cognitive Development and Worry in Normal Children<sup>1</sup>**

**Peter Muris,<sup>2,3</sup> Harald Merckelbach,<sup>2</sup> Cor Meesters,<sup>2</sup> and Karlijn van den Brand<sup>2</sup>**

---

*The present study examined the connection between cognitive development and childhood worry. A sample of normal children aged 3–14 years ( $N = 248$ ) were interviewed about the presence and content of a personal worry. Furthermore, a worry elaboration score was obtained by encouraging children to think up potential negative outcomes associated with a series of worry topics. Finally, a number of Piagetian conservation tasks were administered in order to reliably assess the childrens' level of cognitive maturation. Results showed that there were positive associations among age and cognitive development, worry elaboration, and the presence of a personal worry. Correlational and regression analyses suggested a mediational model in which increased age and, in its wake, cognitive development lead to enhanced worry elaboration which, in turn, increases the possibility of a personal worry to emerge.*

---

**KEY WORDS:** worry; worry elaboration; cognitive development; children.

### **INTRODUCTION**

The phenomenon of worry, which can be defined as fearful thought processes which occur in the absence of actual danger (Borkovec, Robinson, Pruzinsky, & DePree, 1983), is quite common among normal children. For example, in their study of primary school children ( $N = 193$ ), Muris, Meesters, Merckelbach, Sermon, and Zwakhlen (1998) found that almost 70% of them worried every now and then (see for similar results: Henker, Whalen, & O'Neil, 1995; Muris, Merckelbach, Gadet, & Moulaert, 2000; Orton, 1982; Silverman, La Greca, & Wasserstein, 1995). Moreover, it appeared that about 5% of these children exhibited symptoms of worry in the pathological range. In the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (i.e., *DSM-IV-TR*; American Psychiatric Association, 2001), worry is described as the core feature of generalized anxiety disorder, but it should be kept in mind that worry plays a role in various other anxiety

<sup>1</sup>This article is dedicated to Karlijn van den Brand who suddenly deceased on 4 October 2001.

<sup>2</sup>Department of Medical, Clinical, and Experimental Psychology, Maastricht University, Maastricht, The Netherlands.

<sup>3</sup>Correspondence should be directed to Dr. Peter Muris, Department of Medical, Clinical, and Experimental Psychology, P.O. Box 616, 6200 MD Maastricht, The Netherlands; e-mail: p.muris@dep.unimaas.nl.

disorders (e.g., separation anxiety disorder and social phobia; see Perrin & Last, 1997).

There is evidence to suggest that worry is closely linked to children's level of development (Vasey & Daleiden, 1994). For instance, Vasey, Crnic, and Carter (1994) examined worries in children aged 5–6, 8–9, and 11–12 years. Results indicated that worrisome thoughts become prominent in older children (i.e., 8- to 9- and 11- to 12-year-olds; see also Muris et al., 2000). Furthermore, worries about physical well-being were relatively frequent among 5- to 6-year-olds but then decreased with age, whereas concerns about behavioral competence and social evaluation became more prevalent with increasing age. Finally, Vasey et al. observed that children in the two older age groups generated a significantly greater variety of worries than 5- to 6-year-olds.

Vasey et al. (1994, p. 531) hypothesize that “To worry, a child must be capable of anticipating future events. Such anticipation requires the ability to go beyond what is observable and consider what is merely possible. In essence, worry is a process characterized by the anticipation and elaboration of catastrophic possibilities. The ability to anticipate and reason about possibilities follow a predictable developmental course . . . Prior to 7 years of age, children are unlikely to consider more than a single solution to a problem. However, in middle childhood understanding of multiple possibilities increases and children can consider large numbers of possibilities via deductive reasoning.” Vasey et al. (1994; see also Vasey, 1993) link this developmental pattern to Piaget's (1970) theory of cognitive development. Briefly, prior to Age 7, children are still in the preoperational stage and hence their capacity to elaborate on potential negative outcomes is still limited. However, at Age 7, children enter the concrete operational stage. This implies that they are capable of decentration, that is, they can focus their attention on several attributes of an object or event simultaneously and understand the relationships among dimensions or attributes. As a result, children's worry may become increasingly complex because their ability to reason about future possibilities, to consider multiple outcomes, and to elaborate potential negative consequences dramatically increases.

Although it is generally assumed that level of cognitive development plays a significant role in childhood worry (e.g., Ollendick, Yule, & Ollier, 1991; Vasey, 1993; Vasey & Daleiden, 1994), few studies can be found that have actually tried to examine the connection between cognitive maturation and the emergence of worry in children. One exception is a recent study by Muris, Merckelbach, and Luijten (2002). In that study, the connection between level of cognitive development and the experience of fear and worry was examined. Normal children ( $N = 176$ ) were administered the Anxiety Interview (Muris et al., 2000), a brief instrument to assess the presence of anxiety phenomena, and a Piagetian conservation test as a proxy of children's concrete operational abilities. Results showed that fear and worry were more prevalent among those children who passed the Piagetian conservation task. In other words, level of cognitive development was indeed connected to the experience of childhood anxiety phenomena.

The current study further examined the relationship between cognitive development and worry in normal children. A large group of primary school children aged 3–14 years ( $N = 248$ ) were interviewed about the presence and content of a personal worry and their ability to elaborate on potential negative outcomes associated with

a series of worry topics. In addition, a series of Piagetian conservation tasks were administered to the children in order to assess their level of cognitive maturation. In line with Vasey's (1993) notions, a model was hypothesized in which worry elaboration mediated the connection between cognitive maturation and the emergence of a personal worry.

## METHOD

### Children

The sample consisted of 248 children (108 boys and 140 girls) who were recruited from two regular primary schools. Written informed consent was obtained from children's parents before participation in the study; more than 70% of those invited agreed to participate. Ages of the children ranged between 3 and 14 years (98.8% of the children ranged between 4 and 12 years); mean age of the total sample was 7.8 years ( $SD = 2.4$ ; percentages of children per age level were 9.7% 3- to 4-year-olds, 12.9% 5-year-olds, 11.7% 6-year-olds, 10.1% 7-year-olds, 13.3% 8-year-olds, 12.1% 9-year-olds, 14.1% 10-year-olds, 11.7% 11-year-olds, and 4.4% 12- to 14-year-olds). The large majority of the children (almost 95%) was Caucasian. Percentages of children with low, middle, or high socioeconomic background (classified by using the occupational levels of both parents, with the guidelines provided by the Dutch Central Bureau of Statistics) were 41.9%, 54.4%, and 3.7%, respectively.

### Assessment

#### *Personal worry*

Children's personal worry was assessed by means of a brief interview which lasted for about 5 min. The procedure started by showing the child a (gender-appropriate) picture of a worrying child (see Appendix) and describing it briefly: "This child worries about something. He/she is thinking about a bad thing that might happen." Then, children were asked whether they worried every now and then, and to provide details about content ("What do you worry about?").<sup>4</sup> Finally, when children did report a personal worry, they were asked to rate its severity ("How much do you fear [content of the worry]?") using a visual scale depicting Koala bears that expressed various degrees of fear (1 = *none*, 2 = *some*, 3 = *a lot*).<sup>5</sup> In addition, children were invited to elaborate on potential negative outcomes associated with the personal worry item. The question "What (other) unpleasant things might happen?" was repeated until children failed to think about a new negative outcome. The number of mentioned negative outcomes was the "personal worry" elaboration score.

<sup>4</sup>Muris et al. (2000) found evidence to suggest that anxiety phenomena such as fears, worry, and scary dreams of children aged 4–12 years can be reliably distinguished by means of this interview method.

<sup>5</sup>Previous research of our group (Muris, Meesters, Mayer, et al., in press) has demonstrated that this type of measurement is suitable for young children. That is, even in children aged 4–6 years, fear levels thus obtained appeared to be reliable and valid in that they correlated with other simple measures of negative affect.

### *Worry Elaboration*

To assess children's general capacity to elaborate on potential negative outcomes, they were shown various pictures of a worrying child with thought balloons containing black-and-white illustrations of 10 potential worry topics: witches, telling something in front of the class, being teased by other kids, being ill, getting lost in a strange place, being hit by a car, parents getting divorced, a scary man who wants to take you away (kidnapper), a burglar, and fire. Children were encouraged to elaborate on potential negative outcomes associated with each of the worry topics. Thus, again, the question "What (other) unpleasant things might happen?" was repeated until children could not think up anything new. The number of potential negative outcomes was summed across the 10 worry topics to yield a "worry elaboration" score.

### *Fear*

Although worry pertains to fearful thought processes, fear can be described as the unpleasant feeling that arises as a response to perceived danger (Marks, 1987). In the present study, general fear levels were assessed by showing children the 10 black-and-white illustrations for a second time and asking them to rate their fear level ("How much do you fear . . .?") to each of these items on a visual scale depicting Koala bears (1 = *none*, 2 = *some*, 3 = *a lot*; see *supra*). Scores on the items were summed to yield a total fear score, ranging between 10 (*not fearful at all*) and 30 (*extremely fearful*).

### *Cognitive Development*

As mentioned in the introduction, Vasey et al. (1994) assume that childhood worry is linked to children's cognitive development and in particular their level of concrete operational capacities. In the current study, five Piagetian conservation tasks were used as a proxy of children's level of concrete operations: (1) Conservation of substance: The experimenter presents two identical clay balls. One of the balls is deformed. The child is asked whether the two pieces still contain the same amount of clay or that one piece contains more than the other. (2) Conservation of length: Two sticks are aligned in front of the child. One of the sticks is moved to the right. The child is asked whether they are still the same length or that one stick is longer than the other. (3) Conservation of number: Two rows of chips are placed in one-to-one correspondence. One of the rows is elongated. The child is asked whether each row still has the same number or that one row has more chips than the other. (4) Conservation of liquids: Two glasses are filled to the same level with water. The water of one glass is poured into a small, tall glass. The child is asked whether the two glasses contain the same amount of water or that one glass contains more water than the other. (5) Conservation of area: The child and the experimenter each have an identical sheet. Wooden blocks are placed on these in identical positions. The child is asked whether each sheet has the same amount of space remaining. The experimenter then scatters the blocks on one of the sheets and asks the same question. The performance on these tasks is either scored as 0 = *failed*, that is, the child says

that substance/length/number/liquid/area differ or 1 = *passed*, that is, the child says that attributes of the pertinent objects remain the same. A “cognitive development” score was calculated by summing scores on the five tasks.

### Procedure

Children were interviewed individually in a separate room at school. All interviews were conducted by one and the same research assistant who was a graduate psychology student trained by the senior author and who was blind to the main hypothesis of the study. First, the worry interview was conducted, then “worry elaboration” and “general fear levels” were assessed,<sup>6</sup> and, finally, conservation tasks were presented to the children. At the end of the procedure, children received a small present in return for their participation.

## RESULTS

### General Results

#### *Reliability*

All answers of the children during the worry and worry elaboration interviews were recorded on-line and judged by an independent rater. Interrater reliabilities were Cohen’s kappa = .87 for the presence of a personal worry,  $r = .85$  for the “personal worry” elaboration score, and  $r$ s between .90 and .96 for the various worry topics of the worry elaboration interview. Internal consistency coefficients (Cronbach’s alphas) were computed for the other measures and appeared to be good with  $\alpha = .95$  for the total worry elaboration score,  $\alpha = .80$  for the total fear score, and  $\alpha = .89$  for the cognitive development score. In passing, it is important to note that reliability values of the main measures were also satisfactory among the younger children (aged 3–6 years) in our sample (see Table I).<sup>7</sup>

#### *Personal Worry*

The percentage of children who reported to worry every now and then was 60.1%. This percentage comes close to that found in previous studies (e.g., Muris et al., 2000) and indicates that worry is a relatively common anxiety phenomenon among normal children. Table II shows the rank order of worries reported by the children in the present study. As can be seen, the most frequent worries were about dying or death of others ( $n = 15$ , 6.0%), personal harm or harm to others ( $n = 14$ , 5.6%), and school performance ( $n = 14$ , 5.6%). The mean severity score was 2.1 ( $SD = 0.6$ ), indicating that children’s personal worry was accompanied by moderate levels of fear. The mean “personal worry” elaboration score of 1.8 ( $SD = 1.3$ , range 0–7)

<sup>6</sup>The worry interview was always administered first in order to prevent priming by the worry topics that were used during the “worry elaboration” and “fear” assessments.

<sup>7</sup>For the worry severity score, reliability could not be assessed as this was a 1-item measure with an absolute value.

**Table I.** Reliability Values for the Main Measures for the Total Sample and for Younger (Ages 3–7 Years) and Older Children (Ages 8–14 Years), Separately

	Total sample <sup>a</sup>	3- to 6-year-olds <sup>b</sup>	7- to 14-year-olds <sup>c</sup>
Cognitive development	0.89	0.85	0.72
Worry elaboration	0.95	0.77	0.87
Personal worry <sup>d</sup>	0.87	0.86	0.87
Fear	0.80	0.79	0.80

<sup>a</sup>*N* = 248.<sup>b</sup>*n* = 85.<sup>c</sup>*n* = 138.<sup>d</sup>For personal worry, reliability was calculated by means of kappa; for other measures, Cronbach's alpha was used.

meant that children reported on average almost two negative outcomes in relation to their worry.

### *Developmental Patterns*

To get an initial picture of the developmental patterns in our data, the sample was divided into three age groups: (a) children aged 3–6 years (*n* = 85; 34 boys and 51 girls), (b) children aged 7–9 years (*n* = 88; 45 boys and 43 girls), and (c) children aged 10–14 years (*n* = 75; 29 boys and 46 girls). A clear developmental pattern was found for the prevalence of worry,  $\chi^2(2, N = 248) = 11.9, p < .005$ . That is, worry was reported by almost half of the 3- to 6-year-olds (48.2%), and gradually became more prevalent in 7- to 9- and 10- to 14-year-olds (56.8% and

**Table II.** Rank Order of Personal Worries Reported by the Children

	Frequency	%
1. Dying or death of others	15	6.0
2. Personal harm or harm to others	14	5.6
School performance	14	5.6
3. Imaginary creatures	13	5.2
Social threats	13	5.2
4. Little things	12	4.8
5. Being teased	9	3.6
Disasters	9	3.6
6. Having an argument	8	3.2
7. Parents getting divorced	7	2.8
8. Falling ill	6	2.4
Pets	6	2.4
9. Separation from parents	5	2.0
10. Being kidnapped	4	1.6
Animals	4	1.6
11. Intruder	3	1.2
Environmental threats	3	1.2
12. Medical procedures	2	0.8
Frightening dreams or movies	2	0.8
No worry	99	39.9

*Note.* *N* = 248.

74.7%, respectively). Interestingly, the occurrence of a number of specific worries also varied as a function of age. For example, while imaginary creatures was the top intense worry in 3- to 6-year-old children (14.1%), this type of concern was almost absent in older children (1.1% in 7- to 9-year-olds and 0.0% in 10- to 14-year-olds),  $\chi^2(2, N = 248) = 20.6, p < .001$ . The opposite pattern emerged for worry about school performance: the prevalence of this type of concern steadily increased with age (i.e., 1.2% in 3- to 6-year-olds, 4.5% in 7- to 9-year-olds, and 12.0% in 10- to 14-year-olds),  $\chi^2(2, N = 248) = 9.1, p < .05$ .

Results showed that children's worry elaboration scores increased with age, with mean scores being 16.0 ( $SD = 6.9$ ) for the 3- to 6-year-olds, 28.0 ( $SD = 8.3$ ) for 7- to 9-year-olds, and 30.5 ( $SD = 9.7$ ) for 10- to 14-year-olds,  $F(2, 247) = 71.5, p < .001$ . A clear developmental pattern was also found with regard to children's performance on the conservation tasks. More specifically, older children passed a greater number of conservation tasks than younger children: the mean number of passed tasks was 0.8 ( $SD = 1.3$ ) in 3- to 6-year-olds, 3.8 ( $SD = 1.5$ ) in 7- to 9-year-olds, and 4.5 ( $SD = 0.7$ ) in 10- to 14-year-olds,  $F(2, 247) = 205.2, p < .001$ .

#### *Gender Differences*

No significant effects of gender were found for the presence of a personal worry,  $\chi^2(1) = 0.2, p = .62$ , worry elaboration,  $t(246) = 0.8, p = .44$ , and cognitive development,  $t(246) = 0.4, p = .67$ . However, girls displayed significantly higher general fear levels than boys, means being 21.6 ( $SD = 4.3$ ) versus 19.6 ( $SD = 4.8$ ), respectively,  $t(246) = 3.4, p < .005$ . Furthermore, girls reported somewhat higher levels of fear in relation to their personal worry than did boys, means being 2.2 ( $SD = 0.6$ ) versus 2.0 ( $SD = 0.6$ ), respectively,  $t(147) = 2.3, p < 0.05$ .

#### **Model Testing**

The hypothesized mediational model (i.e., cognitive development  $\rightarrow$  worry elaboration  $\rightarrow$  personal worry) was tested following the guidelines of Baron and Kenney (1986). These guidelines suggest that three conditions should be met to demonstrate a mediational relationship: (1) the correlation between the model predictor (i.e., cognitive development) and the mediator (i.e., worry elaboration) should be significant, (2) the correlation between the mediator (i.e., worry elaboration) and the model criterion (i.e., personal worry) should be significant, and (3) the correlation between the model predictor and the model criterion (i.e., cognitive development and personal worry) should be significantly reduced or eliminated when controlling for the mediator (i.e., worry elaboration). Before carrying out the correlational and regression analyses, scatterplots were examined and skewness and kurtosis of the main variables were inspected. No substantial departures from normality were found with values for skewness being below 1 and those for kurtosis below 2.

#### *Correlational Analysis*

Table III presents mean scores (standard deviations) for the total sample and correlations among various measures. Correlations generally displayed a pattern

**Table III.** Correlations (Corrected for Gender) Among Age, Cognitive Development, Worry Elaboration, Personal Worry, and Fear

	<i>M(SD)</i>	(1)	(2)	(3)	(4)
(1) Age	7.8 (2.4)				
(2) Cognitive development	3.0 (2.0)	.76***			
(3) Worry elaboration	24.7 (10.4)	.58***	.60***		
(4) Personal worry	0.6 (0.5)	.21**	.17*	.26***	
(5) Fear	20.7 (4.6)	-.41***	-.32***	-.16*	-.09

Note.  $N = 248$ . In cases where the variable “personal worry” was involved, point-biserial correlations were computed.

\* $p < .05$ . \*\* $p < .01$ , \*\*\* $p < .001$ .

that was in keeping with the basic requirements of the hypothesized mediational model. That is, positive and significant correlations were found between cognitive development and worry elaboration ( $r = .60, p < .001$ ), between worry elaboration and personal worry ( $r = .26, p < .001$ ), and between cognitive development and personal worry ( $r = .17, p < .05$ ). Note further that correlations between age and cognitive development, on the one hand, and general fear levels, on the other hand, were negative ( $r$ s being  $-.41$  and  $-.32$ , respectively, both  $ps < .001$ ) and that the connection between general fear levels and personal worry was non-significant ( $r = -.09, p = .18$ ).

### Regression Analyses<sup>8</sup>

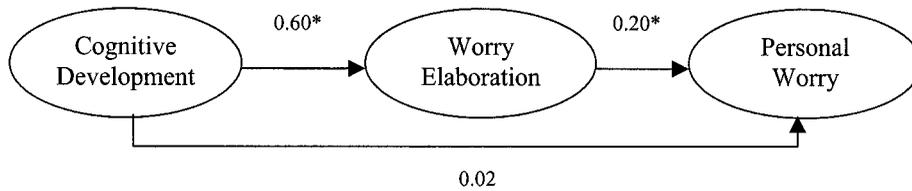
In order to test Baron and Kenney’s third condition for mediation, a logistic regression analysis was carried out predicting the presence of a personal worry. In this analysis, gender was entered as control variable on Step 1, worry elaboration (i.e., the mediator) was entered on Step 2, and cognitive development (i.e., the predictor) was entered on Step 3. Results indicated that while worry elaboration still predicted personal worry [partial  $r = .20$ , Wald  $\chi^2(1) = 9.7, p < .005$ ], cognitive development no longer accounted for a significant proportion of the variance [partial  $r = .02$ , Wald  $\chi^2(1) = 0.01, p = .93$ ]. Altogether, these results confirm that cognitive elaboration can be posited as a mediator between cognitive development and personal worry [see Fig. 1(A)].

An additional regression analysis was performed in which age was the predictor variable. The results were highly similar, that is, worry elaboration predicted personal worry [partial  $r = .18$ , Wald  $\chi^2(1) = 7.4, p < .01$ ], whereas the contribution of age to personal worry was no longer significant [partial  $r = .07$ , Wald  $\chi^2(1) = 0.9, p = .34$ ]. In other words, the data also support a mediational model “age  $\rightarrow$  worry elaboration  $\rightarrow$  personal worry” [see Fig. (1B)].

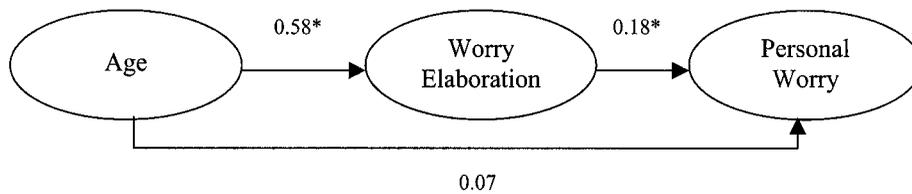
To test whether age and cognitive development each play a unique role in the model, two additional regression analyses were carried out. In a first (linear) regression analysis (in which we controlled for gender on Step 1), age (partial  $r = .23$ ,

<sup>8</sup>All regression models that are presented in this section were significant at  $p < .01$ . Furthermore, it should be mentioned that results were highly similar when carrying out these regression analyses while also controlling for general fear levels on Step 1.

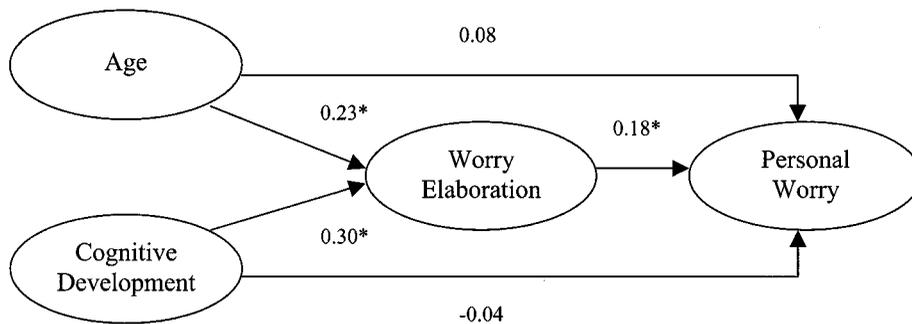
A



B



C



**Fig. 1.** Three models showing the mediational effects of worry elaboration on the relationship between cognitive development and age, on the one hand, and the emergence of a personal worry, on the other hand. (*Note.* The values in this figure are all partial correlations as obtained by means of stepwise hierarchical regression analyses in which gender was entered as control variable on Step 1. The numbers on the paths that go from the first to the last variable also control for the mediating variable in the middle. \*  $p < .05$ )

$t = 3.7, p < .001$ ) and cognitive development (partial  $r = .30, t = 5.0, p < .001$ ) both accounted for a unique and significant proportion of the variance of worry elaboration scores. In both cases, the positive partial correlations indicate that worry elaboration increased as children became older and their cognitive capacities further developed. In a second (logistic) regression analysis predicting personal worry, worry elaboration (i.e., the mediator) appeared to be the only significant predictor [partial

$r = .18$ , Wald  $\chi^2(1) = 7.7$ ,  $p < .01$ ]. Note that the connections between age [partial  $r = .08$ , Wald  $\chi^2(1) = 1.3$ ,  $p = .25$ ] and cognitive development [partial  $r = -.04$ , Wald  $\chi^2(1) = 0.4$ ,  $p = .50$ ], on the one hand, and personal worry, on the other hand, no longer attained significance, a finding which is in keeping with the hypothesized mediational model [see Fig. 1(C)].

### Predictors of Personal Worry Characteristics

In two further regression analyses, predictors of “personal worry” characteristics (i.e., worry severity and “personal worry” elaboration) were explored. The regression equation predicting worry severity only yielded marginally significant contributions of gender (partial  $r = .14$ ,  $t = 1.7$ ,  $p < .10$ ) and general fear (partial  $r = .16$ ,  $t = 1.9$ ,  $p < .10$ ). The positive partial correlations indicated that girls displayed somewhat higher worry severity scores than boys and that severity scores were slightly elevated in children with higher general fear levels. In the regression analysis predicting “personal worry” elaboration, only worry elaboration accounted for a significant proportion of the variance (partial  $r = .22$ ,  $t = 2.8$ ,  $p < .01$ ): children who displayed a general capacity to elaborate on potential negative outcomes, also generated more negative outcomes in relation to their personal worry.

## DISCUSSION

The present study examined connections between cognitive development, worry elaboration, and worry in a group of normal children aged 3–14 years. Results can be catalogued as follows. As hypothesized, positive connections were found among cognitive development, worry elaboration, and the presence of a personal worry. Furthermore, statistical analyses pointed in the direction of a model in which cognitive elaboration can be posited as a mediator between age/cognitive development and personal worry. Thus, although it should be born in mind that the present study was correlational in nature and that it is not possible to draw firm conclusions about causal relationships between variables, the data suggest a model in which increased age and, in its wake, cognitive development lead to an enhanced capacity to elaborate on potential negative outcomes which, in turn, increases the possibility of a personal worry to emerge.

The current data are in keeping with previous studies (e.g., Muris et al., 2000, 2002; Vasey et al., 1994) showing that worry becomes increasingly present as children become older. The finding that age and cognitive development, but not general fear levels, were predictive of its occurrence, indicates that worry in middle childhood should be considered as a developmental phenomenon which is principally nonpathological in nature. Putting it in other words, the current data at best demonstrate that cognitive development and worry elaboration seem to be prerequisites for the possibility of worry to emerge. Of course, this does not preclude that pathological manifestations of worry may occur in children of this age (see Muris et al., 1998). The present investigation is relatively silent about factors that contribute to

the emergence of pathological worry. Gender and general fear levels both appeared to account for marginally significant proportions of the variance of worry severity scores, but it is clear that genetic transmission, temperament, a low sense of control, parental rearing behaviors, conditioning experiences, and nonspecific environmental stressors are factors that play a more substantial role in the pathogenesis of abnormal worry as seen, for example, in generalized anxiety disorder (Rapee, 2001).

Interestingly, not only cognitive development but also age declared a unique part of the variance in worry elaboration scores. There are a number of plausible explanations for this finding. First, this result may indicate that with increasing age, children have obtained more direct or indirect information about potential negative outcomes associated with various threats. Second, cognitive development does not end with the achievement of the concrete-operational stage (as indexed by the successful solution of conservation tasks). Even according to Piaget's (1970) theory of cognitive development, older children still have to reach the formal-operational stage in which they are increasingly able to use flexible and abstract reasoning, to test mental hypotheses, and consider multiple outcomes for events. It seems plausible that children who reach this stage have an even greater capacity to elaborate on potential negative outcomes. Third, when children become older, their language further develops. It may well be the case that older children displayed higher elaboration scores because they were better in describing worrisome thoughts.

Whereas the prevalence of worry appeared to increase with age and cognitive development, the reversed pattern was found for fear. That is, general fear levels were found to decline with increasing age and cognitive development. This finding is in agreement with previous research showing that fearfulness decreases as children become older (see for a review, Craske, 1997), probably because they gradually habituate to and learn to deal with initially unknown stimuli and situations (Marks, 1987).

It should be acknowledged that the present study suffered from various shortcomings. A first limitation was already mentioned and pertains to the fact that our study was correlational in nature. Clearly, a longitudinal set-up in which children are followed for several years, would provide a more detailed picture of the developmental course of worry (see Ollendick & King, 1994). Most importantly, such an approach would make it possible to determine whether cognitive maturation indeed serves as an antecedent of elaboration and in its wake worry. A second limitation has to do with the current study's operationalization of children's cognitive capacity by means of Piagetian conservation tasks. More specifically, it should be born in mind that the conservation tasks were only a proxy index of children's concrete operational skills and that there are various other ways to index children's cognitive abilities related to this developmental stage (see Flavell, Miller, & Miller, 1993). Furthermore, it should be mentioned that several authors have criticized Piaget's view on cognitive development and noted that when Piagetian tasks are sufficiently well explained and simplified, even 4- to 5-year-old children are able to solve conservation problems (see Gelman, 1972). A third shortcoming pertains to the fact that children's tendency to generate negative outcomes in response to the 10 worry topics may not only be determined by age and cognitive developmental level, but also by a number of unmeasured variables. For example, individual differences in

extraversion/sociability or verbal expression in general may have influenced children's worry elaboration scores. A final limitation concerns the use of a 1-item measure for assessing the presence of a personal worry. Although there is some evidence for the validity of the worry interview even in young children (Muris, Meesters, Mayer, et al., in press), other techniques could have been employed (see Lentz, 1985; Stevenson-Hinde & Shouldice, 1995) in order to get a more precise picture of children's personal worries.

It is a widely accepted idea that childhood worries are mediated by level of cognitive development (see e.g., Ollendick et al., 1991; Vasey, 1993). However, few studies have actually examined this issue (see for an exception, Muris et al., 2002). The current study was a further attempt to investigate the relationship between cognitive development and worry in normal children. Results suggest that cognitive development, indeed, modulates childhood worry. More specifically, cognitive development seems to enhance children's capacity to elaborate on potential negative outcomes which, in turn, increases the possibility of worry to emerge.

### ACKNOWLEDGMENTS

Staff and children of primary schools "Koningin Juliana" en "Prins Willem Alexander" in Sprang-Capelle, The Netherlands, are thanked for their participation in this study.

### REFERENCES

- American Psychiatric Association. (2001). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev; DSM-IV-TR. Washington, DC: Author.
- Baron, R. M., & Kenney, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.
- Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary explanation of worry: Some characteristics and processes. *Behaviour Research and Therapy, 21*, 9–16.
- Craske, M. G. (1997). Fear and anxiety in children and adolescents. *Bulletin of the Menninger Clinic, 61*, (Suppl. A), A4–A36.
- Flavell, J. H., Miller, P. H., & Miller, S. (1993). *Cognitive development* (3d ed.) New Jersey: Prentice-Hall.
- Gelman, R. (1972). Logical capacity of very young children: Number invariance rules. *Child Development, 43*, 75–90.
- Henker, B., Whalen, C. K., & O'Neil, R. (1995). Wordly and workaday worries: Contemporary concerns of children and young adolescents. *Journal of Abnormal Child Psychology, 23*, 685–702.
- Lentz, K. (1985). Fears and worries of young children as expressed in a contextual play setting. *Journal of Child Psychology and Psychiatry, 26*, 981–987.
- Marks, I. M. (1987). Fear, phobias, and rituals. Panic, anxiety, and their disorders. New York: Oxford University Press.
- Muris, P., Meesters, C., Mayer, B., Bogie, N., Luijten, M., Geebelen, E., Bessems, J., & Smit, C. (in press). *The Koala Fear Questionnaire: A standardised self-report scale for assessing fears and fearfulness in pre-school and primary school children*. Behaviour Research and Therapy.
- Muris, P., Meesters, C., Merckelbach, H., Sermon, A., & Zwakhalen, S. (1998). Worry in normal children. *Journal of the American Academy of Child and Adolescent Psychiatry, 37*, 703–710.
- Muris, P., Merckelbach, H., Gadet, B., & Moulart, 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.
- Ollendick, T. H., & King, N. J. (1994). Diagnosis, assessment, and treatment of internalizing problems in children: The role of longitudinal data. *Journal of Consulting and Clinical Psychology*, *62*, 918–927.
- Ollendick, T. H., Yule, W., & Ollier, K. (1991). Fears in British children and their relationship to manifest anxiety and depression. *Journal of Child Psychology and Psychiatry*, *32*, 321–331.
- Orton, G. L. (1982). A comparative study of children's worries. *Journal of Psychology*, *110*, 153–162.
- Perrin, S., & Last, C. G. (1997). Worrisome thoughts in children referred for anxiety disorder. *Journal of Clinical Child Psychology*, *26*, 181–189.
- Piaget, J. (1970). Piaget's theory. In P.H. Mussen (Ed.), *Carmichaels's manual of child psychology* (Vol. 1, pp. 703–732). New York: Wiley.
- Rapee, R. (2001). The development of generalized anxiety. In M. W. Vasey & M. R. Dadds (Eds.), *The developmental psychopathology of anxiety* (pp. 481–503). New York: Oxford University Press.
- 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.
- Stevenson-Hinde, J., & Shouldice, A. (1995). 4.5 to 7 years: Fearful behaviour, fears and worries. *Journal of Child Psychology and Psychiatry*, *36*, 1027–1038.
- 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., Crnic, K. A., & Carter, W. G. (1994). Worry in childhood: A developmental perspective. *Cognitive Therapy and Research*, *18*, 529–549.
- Vasey, M. W., & Daleiden, E. L. (1994). Worry in children. In G. C. L. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment, and treatment* (pp. 185–207). Chichester, UK: Wiley.