

Predicting Growth Curves of Early Childhood Externalizing Problems: Differential Susceptibility of Children with Difficult Temperament

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Abstract Using an accelerated longitudinal design, the development of externalizing problems from age 2 to 5 years was investigated in relation to maternal psychopathology, maternal parenting, gender, child temperament, and the presence of siblings. The sample consisted of 150 children selected at age 2–3 years for having high levels of externalizing problems. Parenting was measured using observational methods, and maternal reports were used for the other variables. Overall, mean levels of externalizing problems decreased over time, and higher initial levels (intercept) were related to a stronger decrease (negative slope) in externalizing problems. Results showed that higher levels of maternal psychopathology were related to less decrease in early childhood externalizing problems. Parental sensitive behavior predicted a stronger decrease in externalizing problems, but only for children with difficult temperaments. A stronger decrease of externalizing problems in children with older siblings also pertained only to children with difficult temperaments. Thus, temperamentally difficult children appear to be more susceptible to

environmental influences on the development of externalizing behaviors. Our results indicate that the role of siblings in early childhood externalizing problems deserves more research attention, and that intervention efforts need to take into account temperamental differences in children's susceptibility to environmental influences.

Keywords Externalizing · Growth curves · Toddler · Preschool · Parenting · Temperament · Siblings

Introduction

Externalizing problems in toddlerhood are often transient and decline during the preschool years (Alink et al. 2006; Owens and Shaw 2003; Smith et al. 2004). Nevertheless, a substantial minority of toddlers continue to show high levels of externalizing problems throughout the preschool years (Kingston and Prior 1995; Shaw et al. 2003; Tremblay et al. 2004). Children with stable patterns of externalizing problems in early childhood have been found to show a variety of social and academic problems in later childhood (e.g., Kingston and Prior 1995). Identifying factors that can predict whether toddler externalizing problems will be stable or transient is essential to the development of prevention programs. In addition, specific target groups for such interventions can be identified by finding out whether certain children's trajectories are more susceptible to environmental influences than other children's pathways/trajectories (Belsky 1997a, b; Belsky et al. 2007). Using an accelerated longitudinal design, we examine the development of externalizing problems from age 2 to 5 years in relation to maternal mental health and

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parenting, child gender and temperament, and the presence of (younger and older) siblings. We also test the differential susceptibility hypothesis in terms of the moderating influence of temperament on the association between environmental influences (parenting and family factors) and the development of externalizing problems. The unique contribution of the current study lies in the combined investigation of predictors of *changes* in externalizing problems in *early childhood*, and taking into account the role of *child temperament* as a potential moderator.

The age at which children enter the school system varies for different countries, but in most cases children will receive some form of structured schooling from the age of about 4 years (e.g., preschool or kindergarten). Such a school setting will present children with increased social and self-regulatory demands that are inherent to adaptive school functioning (e.g., cooperating with other children, listening to the teacher, task orientation). Externalizing problems such as aggression, oppositional behavior, and attention problems are clear obstacles to the successful negotiation of these demands. Several studies have reported that early difficult temperament, parental psychopathology, and dysfunctional parenting predict externalizing problems at (pre)school age (e.g., Shaw et al. 1996; Smith et al. 2004). However, far fewer studies have examined whether such variables also predict *changes* in externalizing problems from toddlerhood into (pre)school age.

The study of change in behavior (or trajectories of behavior) during this particular developmental period is important for several reasons. First, from a normative developmental perspective, the period from toddlerhood to ages 4–5 years is characterized by many changes in behavior. Most externalizing behaviors (e.g., temper tantrums, stubborn) are to some extent age-appropriate in toddlerhood and the early preschool years, but generally decrease around age 4 years through socialization processes and advances in perspective-taking and frustration tolerance capacities (Campbell 2002). Deviations from this normative course are therefore particularly salient in this developmental period. Also, there is evidence that children showing early-onset externalizing problems are characterized by a more chronic course of antisocial behavior throughout later childhood and adolescence as well as more severe problems in several areas of socio-emotional functioning (Moffitt 2003). However, based on the course of externalizing problems alone, the accuracy of predicting persistent antisocial development is likely to be below 50% (Bennett et al. 1998; Bennett et al. 1999). This means that identifying factors that predict which children showing early externalizing problems will continue or be deflected from a chronic course of such problems is essential to the development of intervention programs. In a related vein, the study of predictors of change in problem behaviors is

particularly important for inferences about effective elements of intervention programs, as these are primarily concerned with changing the course of development.

Only a few studies have examined predictors of externalizing problems trajectories in early childhood. In a study examining predictors of externalizing growth curves in young boys, Gilliom and Shaw (2004) reported effects on the development of externalizing problems from 2 to 6 years for temperamental fearfulness (more fearfulness was related to a low, declining trajectory) and negative maternal control (more negative control was related to a high, nondecreasing trajectory). The combination of low temperamental fearfulness and negative control was particularly predictive of a high nondecreasing trajectory. In another study, Tremblay et al. (2004) found that a stable high physical aggression trajectory from age 17 to 42 months was predicted by having young siblings, mothers with a history of antisocial behavior, coercive parenting, and family dysfunction as measured in the first year of life. Kingston and Prior (1995) found that children showing a stable high aggressive trajectory from age 2 to 8 years were characterized by difficult temperament, problematic sibling interactions, and harsh parenting practices. However, the latter two variables were not examined in early childhood but at age 7–8 years, and may thus have been consequences rather than triggers or causes of aggressive behavior. Similarly, in a study by Spieker et al. (1999), stable high behavior problems from age 3.5 to 6 years were associated with maternal negative control at age 6 years. Other studies have also examined trajectories of externalizing problems, but these started after toddlerhood and continued into middle childhood or even adolescence, thus representing a different developmental period (e.g., Colder et al. 2002; Nagin and Tremblay 1999). Further, findings regarding child gender in relation to changes in early childhood externalizing problems are varied. Some found no gender effects (Spieker et al. 1999), while others reported more stable high trajectories in boys than in girls (Tremblay et al. 2004), and some studies only included boys so that gender could not be tested (Gilliom and Shaw 2004).

Several different levels of influences on children's problem behavior can be distinguished (cf. Belsky 1984; Bronfenbrenner 1979). With respect to the most proximal levels, parenting behavior, parental characteristics, family structure, and child characteristics are particularly salient.

On the level of parenting behavior, the literature points to negative discipline (also known as negative control, coercive parenting, or harsh parenting) and a lack of sensitivity as important factors in the development of child externalizing problems. According to social learning theory (Bandura 1973), a mechanism through which children learn aversive behaviors such as aggression is modeling. When

parents regularly use negative discipline, children may imitate these behaviors. In his coercion theory, Patterson (1976, 1982) hypothesized that negative or coercive disciplinary interchanges between parents and children are likely to continue and cumulate over time and set the stage for the development of externalizing problems. Parental negative behavior escalates the child's aversive behavior, and when the parent finally gives in, the child's behavior is rewarded and is more likely to occur again in the future (Snyder et al. 1994; Snyder and Patterson 1995). Negative discipline strategies such as physical interference and a predominance of simple prohibitions at the cost of positive alternatives are also related to child externalizing problems in early childhood, in particular in the context of child difficult temperament (Van Zeijl et al. 2007) or maternal insensitivity (Alink et al. (2009)). Maternal insensitivity in itself has also been found to predict early childhood externalizing problems (e.g., NICHD 2004; Shaw et al. 2000). According to Ainsworth and her colleagues (Ainsworth et al. 1974), children are naturally motivated to comply with their parents' rules when parents are sensitive and responsive. Children who have experienced insensitive early care are less motivated to behave according to parental rules or requests, and may therefore show more oppositional and aggressive behavior. Parental sensitivity may also serve as a model of empathic behavior (Van IJzendoorn 1997), which in turn may inhibit aggressive and oppositional behavior (Miller and Eisenberg 1988). Further, in the NICHD study (2004), lower levels of maternal sensitivity were associated with child affect dysregulation, which in turn constituted a significant risk for the children to show problem behaviors (NICHD 2004). Finally, when early parental care has been insensitive and unresponsive, children may develop negative working models of relationships, which may lead them to approach social situations with anger and mistrust (Weinfield et al. 2008).

On the level of parental characteristics, maternal psychopathology has been shown to be a strong predictor of child externalizing problems (e.g., Shaw et al. 2003; Spieker et al. 1999; Tremblay et al. 2004). These findings are generally thought to be due to a combination of genetic and environmental influences (Connell and Goodman 2002). Children of mothers with psychopathology are at genetic risk for the development of a wide range of emotional and behavior problems. In addition, symptoms associated with psychopathology in mothers may lead to less optimal parenting. The most common form of psychopathology in women is depression, which is related to uninvolved and negative parenting behaviors (Lovejoy et al. 2000). In general, the stress of coping with symptoms of psychopathology is also likely to lead to less optimal parenting, which in turn is related to externalizing problems in children.

On the level of family structure, siblings may be a factor of importance (Kingston and Prior 1995). On the one hand, the presence of younger siblings may represent an additional 'target' for externalizing behaviors such as aggression (e.g., Tremblay et al. 2004). On the other hand, the presence of older siblings may lead to less problem behaviors as the older sibling will not accept such behaviors from a younger child. Also, parents with older children are more experienced and may therefore be more effective in handling difficult behavior, which may predict lower levels of externalizing problems in their younger children.

In addition to the identification of parenting and other family predictors of (un)stable externalizing problems in early childhood, the search for subgroups of children particularly vulnerable to these processes is also important. According to Belsky's differential susceptibility hypothesis (1997a), environmental influences do not affect all children equally. In his differential susceptibility theory, Belsky (1997a, b) emphasizes the evolutionary rationale for a varying susceptibility to environmental influences in different children. The probabilities of passing on one's genes in a changing environment and an uncertain future will be greater with a diversification of investments, which includes bearing offspring with a differential susceptibility to that environment (Belsky et al. 2007). Similarly, Boyce and Ellis (2005a, b) and Ellis and Boyce (2008) posit an evolutionary-developmental theory of sensitivity to context related to variations in neurobiological stress reactivity. Others have focused on gene-environment interactions with respect to family violence (Caspi et al. 2002) and behavioral inhibition (Fox et al. 2005). In sum, these hypotheses all point to the possibility that not all children are affected equally by the family environment, and that these differences in susceptibility are likely to be due to differences in child temperament. Research that does not account for the moderating effects of child characteristics can both over- and underestimate environmental effects on the development of externalizing problems.

Consistent with Belsky's hypothesis (1997b), several studies have shown that young children with difficult temperaments are most susceptible to the effects of negative rearing practices. In a study by Belsky et al. (1998), negative parenting predicted externalizing problems most strongly in 3-year-old boys who were highly temperamentally negative as infants. Results reported by Paterson and Sanson (1999) indicated that in particular the combination of temperamental inflexibility and punitive parenting resulted in the development of externalizing behavior problems in 5- and 6-year-olds. A combination of high negative emotionality, low fearfulness, and high negative maternal control preceded stable high externalizing trajectories in disadvantaged boys followed from age 2 to 6 in the

study by Gilliom and Shaw (2004). In the report by Owens and Shaw (2003) on the same study, maternal depression predicted growth in externalizing problems, but primarily in the case of high infant emotionality. No interaction between infant emotionality and maternal acceptance was found in the prediction of externalizing problems growth.

According to the differential susceptibility hypothesis, children with a difficult temperament should not only be more negatively affected by adverse rearing circumstances, but should also be more positively influenced by optimal parenting practices. Indeed, Kochanska et al. (2007) showed that in highly fearless children, mother-child positive relationship predicted more successful socialization outcomes. Further, Klein Velderman et al. (2006) reported that highly reactive infants and their mothers benefited most from a parenting intervention aimed at enhancing maternal sensitivity. And in a previous report on the current study, Van Zeijl et al. (2007) found that in 1–3-year-olds the negative association between parental positive discipline and child externalizing problems was stronger for children with difficult temperaments than for those with easy temperaments.

Studies examining child temperament as a moderator of the association between parenting and early childhood externalizing problems generally do not examine differential susceptibility in relation to *changes* in externalizing problems. In the current study we will use an accelerated longitudinal design in a sample of boys and girls selected for having high levels externalizing problems at age 2–3 years. We will examine the development of externalizing problems from age 2 to 5 years in relation to gender, the presence of siblings, maternal psychopathology, maternal positive and negative parenting, and child temperament. The differential susceptibility hypothesis, i.e., the moderating influence of temperament on the association between environmental factors and the development of externalizing problems will also be tested. Based on the literature, the hypotheses to be tested are: (1) maternal negative discipline, maternal psychopathology, the presence of more siblings, and child difficult temperament are positively related to the child externalizing problems slope; (2) maternal sensitivity is negatively related to the child externalizing problems slope; (3) the effects of the family environment on changes in child externalizing problems are more pronounced for children with difficult (versus easy) temperaments; (4) gender is not related to changes in externalizing problems in this study. The literature on gender is equivocal, but as our sample is homogeneous in being selected for having high levels of externalizing problems regardless of gender, we do not expect that gender is a predictor of changes in externalizing problems.

Method

The SCRIPT Study

The SCRIPT study (Screening and Intervention of Problem behavior in Toddlerhood) investigates the effectiveness of an early intervention program aimed at reducing externalizing problems in 1- to 3-year-old children by enhancing parental sensitivity and discipline strategies. (Van Zeijl et al. 2006). Overall, this study showed that the intervention program was effective in increasing mothers' use of positive discipline strategies and positive attitudes towards sensitivity and sensitive discipline. Also, the intervention led to a decrease in overactive behavior for children of mothers who reported relatively high levels of daily hassles and marital discord. Child temperament did not moderate intervention effectiveness (Van Zeijl et al. 2006).

For the accelerated design in the current paper we used the data for 2- and 3-year-olds from the laboratory sessions that (after the screening phase at Time 0) were conducted for the pretest (Time 1), the first post-test one year later (Time 2), and the follow-up one year after the first (Time 3). The data for 1-year-olds was not included as the developmental trajectories of externalizing in this age group did not yield an adequate fit with the older children in the accelerated model.

Sample

Participants were recruited from community records of several cities and towns in the western region of the Netherlands. Children born in a specific time period were selected in order to obtain a group of 2-year-olds (ages 22 to 26 months), and 3-year-old children (ages 34 to 38 months). Children were not eligible to participate in the screening phase if they had non-Dutch first names as well as non-Dutch family names (implying a possible lack of familiarity with the Dutch language and meeting exclusion criteria for the intervention phase regarding ethnic background). In the screening phase, parents of 3,093 children were sent questionnaire booklets by mail. We obtained 1,584 questionnaires from primary caregivers (response rate 51%). Only children living with two parents (with the biological mother as the primary caregiver and a father figure — biological or stepfather — as the second caregiver) were eligible for the intervention. This was done to ensure a homogeneous sample and procedure for the intervention part of the study, as some of the intervention sessions were designed to include both parents. This selection and the application of several other exclusion criteria (e.g., twins, serious medical condition in child or mother) resulted in the exclusion of 306 cases, leaving a target selection sample of 1,278 children. For each age

group, children with scores above the 75th percentile on the Preschool Child Behavior Checklist (CBCL/1^{1/2}–5; Achenbach and Rescorla 2000) Externalizing Problems scale (age 2 years: scores ≥ 19; age 3 years: scores ≥ 20) were selected for the intervention study.

Of the 294 selected families, parents of 155 children (53%) agreed to participate in the intervention study. During the intervention phase, 5 families withdrew from the study, leaving 150 children and their mothers in the final sample (75 2-year-olds and 75 3-year-olds). Fifty-six percent of the children were boys, 69% of the children had siblings, and 53% were firstborns. Mean age of the mothers was 33.7 years (*SD*=4.1) and almost half of the mothers had a high educational level (46% Bachelor’s or Master’s degree). There were no significant differences between selected families who agreed to participate in the entire intervention phase and those who did not regarding level of child externalizing problems at Time 0 (*p*=0.24), child and maternal age (*p*=0.99 and *p*=0.07), child gender (*p*=0.78), and presence of siblings (*p*=0.59). The only statistically significant difference was that participating parents had a somewhat higher educational level than nonparticipating parents, *t*(1, 290)=−2.65, *p*<0.01.

For the 150 children in the final sample, data regarding externalizing problems was obtained at three time points (Time 1 to Time 3) to compute growth curves (see Analyses section). Time 0 was used for assessments of child temperament and initial number of siblings. Because half of the sample received an intervention between Time 1 and Time 2, all analyses included experimental group as a covariate. Table 1 shows the mean ages of the children in each age group for each time of assessment. Note that in the Netherlands, children start school at age 4 years. The first two grades (ages 4 and 5 years) were formerly known as kindergarten, but are now an integral part of the elementary school system.

Procedure

Participating families were invited for a pretest (Time 1) in the laboratory. During the 1.5 h laboratory session, mother and child completed several tasks. These sessions were videotaped with cameras that were fixed to the walls and

were operated from behind the one-way screen so that no third person was present in the room. During the lab session, mothers were asked to fill in some questionnaires. After the pretest, families were randomly assigned to either a control (*n*=73) or an intervention (*n*=77) group. There were no differences between the two groups regarding Time 1 level of child externalizing problems (*p*=0.23), maternal educational level (*p*=0.95), child and maternal age (*p*=0.69 and *p*=0.19), and presence of siblings (*p*=0.69). The only statistically significant difference was the percentage of girls, which was higher in the intervention group (52%) compared to the control group (36%), $\chi^2(1, N=150)=4.06$, *p*<0.05. Families in the intervention group received six home visits and, parallel in timing, families in the control group received six telephone calls. Approximately one year after the pretest, families from both the intervention and control group visited the laboratory for the post-test (Time 2) and again one year after that for the second post-test (Time 3), using the same procedures as in the pretest. The procedures were approved by the Leiden University Medical Center Medical Ethical Committee and all participating parents signed an informed consent form.

Measures

Child externalizing behaviors The Child Behavior Checklist for ages 1^{1/2} to 5 (CBCL/1^{1/2}–5; Achenbach and Rescorla 2000) was used to assess externalizing behaviors and was obtained from mothers during the screening phase (Time 0) to select children for the intervention study. Time 0 took place on average 3.85 months before Time 1 (*SD*=0.96). The CBCL was also obtained at Times 1 to 3 and these were used to compute growth curves (see Analyses section). Parents indicated whether their child displayed any of the 100 behavioral descriptions in the last 2 months on a 3-point scale (0 *not true*, 1 *somewhat or sometimes true*, and 2 *very true or often true*). The previous version of the CBCL/1^{1/2}–5 (the CBCL/2-3) was tested in a Dutch population of 2- to 3-year-olds by Koot et al. (1997) who identified a broadband Externalizing Problems syndrome (31 items) consisting of three narrowband syndromes: Oppositional (17 items), Aggressive (9 items), and Overactive (5 items). In addition, Koot et al. reported good reliability and validity. In the current study, internal consistencies for the Externalizing Problems syndrome were 0.73 at Time 0, 0.87 at Time 1, and 0.90 at Times 2 and 3.

Maternal sensitivity The sensitivity of mothers’ parenting behavior was observed in the laboratory sessions at Times 1 and 2 during a series of problem-solving tasks. In the pretest, dyads were given three tasks during a total time of 15 min; in the posttest they were given two tasks in 10 min.

Table 1 Mean Ages (in Months) of the Children at each Time of Assessment

	2-year-olds		3-year-olds	
	<i>M</i> (<i>SD</i>)	Range	<i>M</i> (<i>SD</i>)	Range
Time 1	27.6 (1.2)	25.9 – 30.3	39.6 (1.1)	37.1 – 41.9
Time 2	40.3 (1.7)	36.8 – 46.9	52.0 (1.3)	49.9 – 57.0
Time 3	52.6 (1.5)	50.3 – 56.2	64.3 (1.5)	61.9 – 68.7

Mother and child were asked to solve puzzles that were too difficult considering the age of the child (different puzzles were used in each age group) and mothers were instructed to help their child in the way they usually did. The mothers' sensitivity was measured using the 7-point Supportive Presence subscale from the Erickson scales (Egeland et al. 1990). The average intraclass correlation (single rater, absolute agreement) for intercoder reliability (for all separate pairs of three coders) was 0.78 (range 0.75 – 0.80; $n=30$). An average sensitivity score was computed across Time 1 and Time 2 ($r=0.29$, $p<0.01$). In one case only the Time 1 score was used as the Time 2 score was missing.

Maternal negative discipline Maternal negative discipline strategies were observed in the laboratory sessions at Times 1 and 2 during a 10-minute 'don't' task. The child was shown a treat, which was subsequently given to the mother with the (written) instruction to refrain from giving the treat to the child until the end of the session, 10 min later. During this task, the mother was asked to fill in a questionnaire as a competing demand, while the child had nothing to play with for the first 5 min and was offered toys to play with for the last 5 min. All maternal discipline strategies were coded, whether or not they concerned the forbidden treat (e.g., they could also concern the toys). Coding procedures were based on Kuczynski et al. (1987), and Van der Mark et al. (2002).

The following negative maternal discipline strategies were observed: prohibition, physical obstruction, and giving in. Factor analysis confirmed that these three strategies belong to one scale (see Van Zeijl et al. 2007). *Prohibition* concerned any prohibition, command, or disapproval with respect to the child's behavior. If a simple 'no' was immediately followed by a remark indicative of positive discipline such as understanding or induction (e.g., 'no, because we are having dinner soon'), prohibition was not coded. *Physical obstruction* was coded when mothers in any way physically obstructed the child from getting the treat. Finally, *giving in* was coded when mothers did not follow through on (part of) a prohibition, either by actively or passively giving in. Coding was ended before the intended 10-minute duration if mothers completely gave in by handing the child the treat. Therefore, all frequencies were recomputed to a standard 10-minute duration. An overall negative discipline score was computed by adding the frequencies of the three separate negative discipline strategies. The average intraclass correlation (single rater, absolute agreement) for intercoder reliability of the negative discipline scale (for all separate pairs of five coders) was 0.92 (range 0.87 – 0.96; $n=30$). An average negative discipline score was computed across Time 1 and Time 2 ($r=0.21$, $p<0.05$). In one case only the Time 1 score was

used as the Time 2 score was missing. The reverse was true for two cases.

Maternal psychopathology An abbreviated version of the Young Adult Self-Report (YASR; Achenbach 1997) was used to measure maternal psychopathology at Time 1 and Time 2. The questionnaire consists of 29 items, rated at a 3-point scale with 0 *not true*, 1 *somewhat or sometimes true*, or 2 *true or often true*. The selected items were those that were found to best discriminate between referred and non-referred adults (Wiznitzer 1993), and include items from both the internalizing and externalizing syndromes. Mothers completed this questionnaire at the end of the pretest (Time 1) and posttest (Time 2) laboratory sessions. Total scores for Time 1 and Time 2 were computed by summing item scores. Internal consistencies (Cronbach's alphas) for these scales were 0.88 and 0.86, respectively. Total scores for Time 1 and Time 2 ($r=0.58$, $p<0.01$) were then averaged into one maternal psychopathology score. In 9 cases only Time 1 scores were used as Time 2 scores were missing.

Child difficult temperament Child temperament (as perceived by the mother) was measured at Time 0 (screening phase) with the Infant Characteristics Questionnaire (ICQ; Bates et al. 1979). The ICQ was translated into Dutch and found reliable by Kohnstamm (1984). The Dutch ICQ contains 33 items, describing concrete behaviors in well defined situations. The items were rated on a 5-point scale, ranging from 0 *not true* to 4 *true*. Because the ICQ was used in combination with the aforementioned CBCL/1^{1/2}–5, five items in the ICQ were discarded due to content-overlap between items of both questionnaires. Next, a one-component analysis was carried out in the general population screening sample ($N=1,584$) for both age groups to derive a general difficulty factor. The difficulty factor consisted of 18 items in 2-year-olds, and 16 items in 3-year-old children. Cronbach's alphas were 0.76, and 0.75, respectively. Because the number of items differed between age groups, mean item scores were used to obtain scores that were comparable across age groups. There were nine missing values for temperament. As this variable was related to child age, but not to any of the other demographic variables, the missing values were substituted for the mean for the appropriate age group (2- or 3-year-olds).

Statistical Analyses

Latent growth curve (LGC) analysis was used to analyze the data. LGC analysis represents repeated measures of a given concept as a function of time and other measures (Meredith and Tisak 1990; McArdle 1986; Willet and Sayer 1994; Bollen and Curren 2006). A LGC analysis specifies an individual growth curve for each subject to represent the

development over time. All children in a given population are assumed to have developmental curves of the same functional form (e.g., all linear), but the parameters describing their curves may differ. With linear developmental curves, for example, individual differences may be due to heterogeneity in the intercept, as well as heterogeneity in the slope. In other words, the subjects may differ in their intercept at the first measurement occasion and grow subsequently with different slopes. Our design consists of three consecutive measurements of two groups of children (2 and 3 year old), and this allowed us to use estimate an accelerated, or cohort-sequential, latent growth curve model spanning a 4-year period using only three years of data. We refer to Bollen and Curran (2006) for a description of latent growth curve analysis in general and to Duncan et al. (2006) and Prinzie et al. (2006) for two recent applications of the cohort-sequential latent growth curve model.

The full information maximum likelihood (FIML) estimation method as implemented in the structural equation modelling software package Lisrel (Jöreskog and Sörbom 2006) was used to estimate the growth curve model. FIML allows for the inclusion of data of all children in the analyses under the assumption that data are Missing At Random (MAR; Little and Rubin 1987). MAR assumes that the missing values can be predicted from the available data. We had complete data for Time 1 and Time 2 externalizing problems, and there were 29 missing values for T3 externalizing problems. Overall goodness of fit of the model is judged by means of the standard chi-square statistic, and the RMSEA. We first estimated the unconditional cohort-sequential latent growth curve model, which is a model that does not include the predictor variables. This model was used to test the tenability of the constraints that allow us to estimate the growth curves. If the model provides a good fit to the data, the factor scores of intercept and slope are saved in a separate data file, and we proceed with a regression analysis using SPSS by regressing externalizing problem behavior slopes on the intercept as well as the predictors. We chose this two step procedure in the light of the relatively small sample size (twice $N=75$) and the number of parameters to be estimated.

Results

Preliminary Analyses

The unconditional cohort-sequential growth curve model did not provide a good fit to the data [$\chi^2 (df=9)=22.42, p=0.01$; RMSEA=0.14]. It appeared, however, that this was mainly due to the constraint that the intercept was equal for the two age groups,. The model without this constraint fitted significantly better and provided an excellent overall

goodness of fit [$\chi^2 (df=8)=6.16, p=0.63$; RMSEA=0.00]. The parameter estimates are reported below. A path diagram of the model is presented in Fig. 1. Mean intercepts for the two- and three-year-old children were 26.08 ($p<0.05$) and 31.36 ($p<0.05$), respectively. The mean slope was $-2.68 (p<0.05)$, representing a mean decrease in externalizing problems between ages 2 and 5 years. There was significant variance across children in both intercept and slope ($sd_{intercept}=7.52, p<0.01, sd_{slope}=2.69, p<0.05$). Proportions of variance explained in the observed scores on externalizing problem behavior ranged from 0.56 to 0.88. Furthermore, given the excellent fit of the model it may be concluded that the constraints implicit in the accelerated design hold (see Fig. 1), and that the predictor variables could be added to the model in the next step.

There were no significant differences between the experimental and the control group with respect to any of the variables used in the present study, nor any of the Time 1 or Time 2 variables that make up the composites used here ($ps=0.23$ to 0.95). In the main analyses, intervention was included as a covariate. Intercept and slope were not related to child gender (ps 0.81 and 0.78), maternal educational level (ps 0.41 and 0.70), or maternal age (ps 0.48 and 0.77). These variables were not included in the analyses. Descriptive statistics for all study variables are summarized in Table 2. Pearson correlations computed between the predictor variables showed that only the correlation between number of siblings and maternal sensitivity was significant, $r(150)=-0.20, p<0.05$.

Predicting Externalizing Problems Slope

Table 3 shows the univariate correlations of all independent variables with externalizing problems slope and shows that

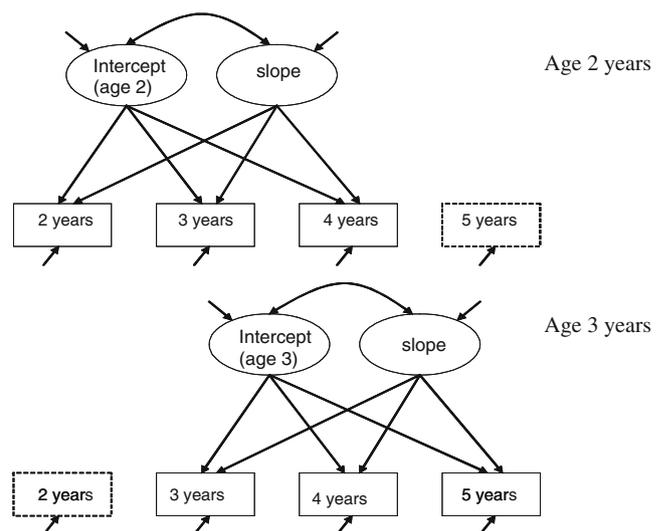


Fig. 1 Path diagram illustrating the accelerated model for ages 2 to 5 years, including slope and intercept

Table 2 Descriptive Statistics for all Study Variables (N = 150)

	M (SD)	Range
Externalizing problems - Intercept	28.7 (7.0)	9.1 – 45.6
Externalizing problems - Slope	-2.7 (1.8)	-9.2 – 2.5
Number of siblings (Time 0) ^a	0.9 (0.8)	0 – 3.0
Child difficult temperament (Time 0)	1.8 (0.5)	0.6 – 3.2
Maternal psychopathology (Times 1+2)	6.5 (5.7)	0 – 28.0
Maternal sensitivity (Times 1+2)	4.9 (0.8)	1.7 – 6.3
Maternal negative discipline (Times 1+2)	10.6 (7.0)	0.5 – 40.0

^a The maximum of this variable (score 3) was 'three or more siblings', with 31% with 0 siblings, 51% with 1 sibling, 15% with 2 siblings, and 3% with 3 siblings or more

a higher externalizing problems intercept (i.e., higher initial levels), having more siblings, and a more difficult temperament were inversely related to slope, i.e., a stronger decrease in externalizing problems. Maternal psychopathology, sensitivity, and negative discipline were not related to the externalizing problems slope. Next, a multiple regression analysis was conducted to identify unique predictors of the externalizing problems slope (Table 3). All interactions between difficult temperament and the other predictors were included to test for differential susceptibility. Temperament and the other predictor variables were centered to minimize collinearity between main and interaction effects. After correcting for intercept, 26% of the variance was explained by the other predictor variables and interaction terms. Betas in Table 3 represent the regression weights in the final model. Main effects showed that having more siblings predicted a stronger decrease in externalizing problems, and higher levels of maternal psychopathology predicted a weaker decrease in externalizing problems. The second step revealed that difficult temperament significantly moderated the effects of maternal sensitivity and number

of siblings. To examine the direction of the interaction effects, we applied a median split to the difficult temperament variable and ran the regression analyses again, separately for the low and high difficult temperament groups. For the low difficult temperament group, maternal sensitivity did not predict externalizing problems slope ($\beta=0.13$; $p=0.26$), whereas it did significantly predict slope in the high difficult temperament group ($\beta=-0.27$; $p<0.05$). In the group with difficult temperament, higher maternal sensitivity was related to a stronger decrease in externalizing problems. Similarly, for the low difficult temperament group, number of siblings did not predict externalizing problems slope ($\beta=-0.01$; $p=0.95$), whereas it was a significant negative predictor of slope in the high difficult temperament group ($\beta=-0.36$; $p<0.01$). Thus, for children with difficult temperaments, having more siblings was related to a stronger decrease in externalizing problem behavior. Within the difficult temperament group ($n=77$), we also examined whether the effect of number of siblings was specific to firstborn or later-born children. No significant interaction effect between number of siblings and birth order was found in predicting the development of externalizing behavior ($p=0.72$). We performed extra regression analyses with two dummy variables: 'absence/presence of younger siblings' and 'absence/presence of older siblings'(and their interactions with difficult temperament) instead of the 'number of siblings' main and interaction variables. In addition to the significant effects of the other variables reported in Table 3, this analysis showed that the interaction between 'absence/presence of older siblings' and difficult temperament was significant ($\beta=-0.29$; $p<0.05$). For children with difficult temperaments, having older siblings was related to a stronger decrease in externalizing problem behavior.

We also conducted a multiple regression analysis examining the interaction effects between gender and all the other predictors on externalizing slope. None of the

Table 3 Univariate Correlations and Final Unique Regression Weights for Predictors of Externalizing Slope (N=150)

(Final $R^2=.26^{**}$)	Univariate r	Unique β
<i>Step 1 = Main effects</i>		
Experimental group	0.05	0.02
Externalizing Problems intercept	-0.33**	-0.33**
Number of siblings (Time 0)	-0.22**	-0.22**
Child difficult temperament (Time 0)	-0.19*	0.01
Maternal psychopathology (Times 1+2)	0.13	0.17*
Maternal sensitivity (Times 1+2)	-0.03	-0.15
Maternal negative discipline (Times 1+2)	0.07	-0.02
<i>Step 2 = Interaction effects ($\Delta R^2=0.07^*$)</i>		
Difficult Temperament*Number of siblings	-	-0.17*
Difficult Temperament*Maternal psychopathology	-	0.11
Difficult Temperament*Maternal sensitivity	-	-0.20*
Difficult Temperament*Maternal negative discipline	-	-0.07

interaction effects were significant (all $ps > 0.07$). Finally we looked at the interaction between experimental group and temperament. Consistent with previous findings from this study reported by Van Zeijl et al. (2006), this interaction was not significant ($p = 0.35$).

Discussion

Overall, our results revealed a mean decrease in externalizing problems from age 2 to 5 years, as evidenced by a negative mean slope. This is not surprising considering that our sample consisted of children selected for having high levels of externalizing problems at ages 2 or 3 years. Consistent with the ‘law of initial values’, high initial scores are more likely to decrease over time than low scores. In toddlers with relatively high levels of externalizing problems, a weaker decrease in these problems until school entry is related to maternal psychopathology and for children with difficult temperaments also to low maternal sensitivity and having fewer siblings. We did not find any effects of maternal negative discipline on externalizing problems development. All results regarding predictors of externalizing problems development were corrected for the influence of the intercept, i.e., the initial level of externalizing problems.

The main effect we found showed that higher levels of maternal psychopathology (consisting of internalizing and externalizing problems) predicted a weaker decrease in externalizing problems from age 2 to 5 years. This is consistent with findings that maternal depression and antisocial behavior are related to (growth in) externalizing problems in young children (e.g., Shaw et al. 2003; Spieker et al. 1999; Tremblay et al. 2004). As this effect was found independent of observed parenting, this result may partly reflect the child’s genetic vulnerability to the development of persistent problem behavior. Indeed, early-onset persistent externalizing problems have been found to have higher heritability estimates than late-onset transient problems (Moffitt 2003). Further, it is likely that maternal psychopathology does affect child externalizing problems development through parenting practices as well, but that not all relevant elements of dysfunctional parenting were captured in our model. For instance, harsh discipline such as physical punishment has previously been found to predict externalizing problems (e.g., Kingston and Prior 1995; Weiss et al. 1992), but this aspect of parenting was rarely seen in the relatively short observation periods in a standardized laboratory setting in the current study. Longer observation periods in a naturalistic setting would be needed to capture more extreme and less frequent parenting practices.

No main effects of parenting were found, but the interaction between maternal sensitivity and child difficult temperament was a significant predictor of externalizing

problems growth. Closer examination of the data revealed that higher maternal sensitivity was related to stronger decrease of externalizing problems, but only for children with difficult temperaments. This finding is consistent with Belsky’s (1997a) differential susceptibility hypothesis that children with difficult temperaments are more susceptible to environmental influences, for better and for worse. In other words, a toddler’s experience with sensitive parenting is more likely to lead to a decrease in externalizing problems across early childhood when the toddler has a difficult rather than a less difficult temperament. These findings confirm previous findings from the current study reported by Van Zeijl et al. (2007) that the negative association between parental positive discipline and child externalizing problems in 1-3-year-olds was stronger for children with difficult temperaments than for those with easier temperaments. The current study adds to these findings because it demonstrates the moderating influence of temperament on the effects of parenting on *change* in child externalizing problems. This means that parenting intervention efforts (that are inherently concerned with behavioral change) may be especially beneficial to children with difficult temperaments, as they stand to gain most from improved parenting skills, a finding also reported by Klein Velderman et al. (2006).

Having more siblings, in particular older siblings predicted a stronger decrease in externalizing problems. However, examination of the interaction effect with child temperament showed that this was only true for children with difficult temperaments. This suggests that differential susceptibility may also apply to the effects of environmental variables other than direct parenting influences. For difficult children in particular, the presence of older siblings may provide a potentially positive example or even a distraction from externalizing behaviors. It is also possible that in families with older children, parents are less likely to tolerate externalizing behaviors as they are more experienced as parents as well as busier with managing multiple children. Tremblay et al. (2004) found that having younger siblings predicted stable high aggression trajectories from age 17 to 42 months. This finding is different from our results but it is important to note that their results pertain specifically to physical aggression, whereas our results are about the broader scope of externalizing problems. In the case of physical aggression, having ‘an easy target’ (i.e., a younger sibling) increases the odds of showing this behavior. More broadly defined externalizing problems also include behaviors that do not require the presence of a ‘target’, such as having angry moods, being stubborn, not being able to sit still, etc. It is noteworthy that our own findings are unlikely to be due to parents simply not noticing or mitigating externalizing problems when they have more children, because our findings represent an

interaction effect with difficult temperament and not a simple main effect of number of siblings on *change* in externalizing problems. Whether the presence of siblings can indeed be seen as a form of environmental influence to which the concept of differential susceptibility can be applied needs to be explored in future work.

The current study is one of the few that examined predictors of change in externalizing problems in early childhood for both boys and girls. We did not find any significant main or interaction effects of gender on externalizing problems slope or intercept. The lack of gender effects on the intercept is likely to be due to the fact that toddlers were selected for having relatively high levels of externalizing problems. Thus, all participating toddlers, boys and girls, scored above a certain threshold on parent-reported externalizing problems at study onset. The lack of significant main or interaction effects for gender on externalizing slope also shows that within a group of toddlers with high initial levels of externalizing problems, subsequent trajectories across early childhood and the predictors of these trajectories are the same for boys and girls. Spieker et al. (1999) did not find a significant effect of child gender on trajectories of externalizing problems in early childhood either. Tremblay et al. (2004) reported that a stable high aggression trajectory (versus stable low and increasing trajectories) was more common for boys than for girls. However, those findings refer specifically to overt physical aggression, which is the component of externalizing problems that may be most influenced by gender compared to other components such as oppositional and overactive behavior, or more covert externalizing behaviors, such as lying and stealing (e.g., Willoughby et al. 2001; Zoccolillo 1993). Further, the findings are based on a general population sample, whereas our sample was selected for having high levels of externalizing problems in toddlerhood, suggesting that once that selection has been made, being a boy or a girl does not make much of a difference to the developmental course of these problems.

This study had some limitations. First, we focused only on mothers, with maternal reports of externalizing problems, temperament and maternal psychopathology, as well as observations of her parenting behaviors. Although in all cases the mothers were the primary caregivers, the inclusion of fathers' views on child behavior problems as well as their parenting styles would have provided a more comprehensive picture. Second, the parents had a rather high educational level. This may have affected the severity of the externalizing pathways and may have led to fewer stable high or increasing pathways. However, the results regarding predictors of the pathways are consistent with previous studies and may have been less affected by the sample's educational level. Third, not all relevant aspects of parenting were included. Harsh/hostile parenting and

inconsistent/permissive discipline in particular are known predictors of (persistent) early childhood externalizing problems (Granic and Patterson 2006; Snyder et al. 2005), and may therefore have provided additional evidence for the direct influence of parenting on externalizing problems pathways. Further, the sample was relatively small for growth curve analysis. Nevertheless, the findings are consistent with the literature. Finally it is important to note that half of our sample received a parenting intervention between Time 1 and Time 2. However, this did not affect the variables used in the present paper. This was evidenced by a lack of association between the experimental group variable and any of the Time 1, Time 2, and composite variables. The intervention did impact other aspects of parenting and child functioning (see Van Zeijl et al. 2006), but not negative discipline and sensitivity.

In conclusion, higher levels of maternal psychopathology were related to less decrease in early childhood externalizing problems in early childhood, illustrating the importance of maternal characteristics in the development of persistent behavior problems in young children (see also Belsky 1984). Parenting behavior in the form of higher maternal sensitivity predicted a stronger decrease in externalizing problems, but only for children with difficult temperaments, suggesting that this group should be of particular interest to parenting intervention efforts. We also found that having more siblings led to a stronger decrease in externalizing problems but again only in children with difficult temperaments. In future studies, the inclusion of information from and about fathers, a focus also on other aspects of dysfunctional parenting, and more information on sibling relationships may yield a more comprehensive view on the processes underlying the development of early childhood externalizing problems. We conclude that our findings are compatible with the differential susceptibility model suggesting greater plasticity for environmental influences of children with a difficult temperament.

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