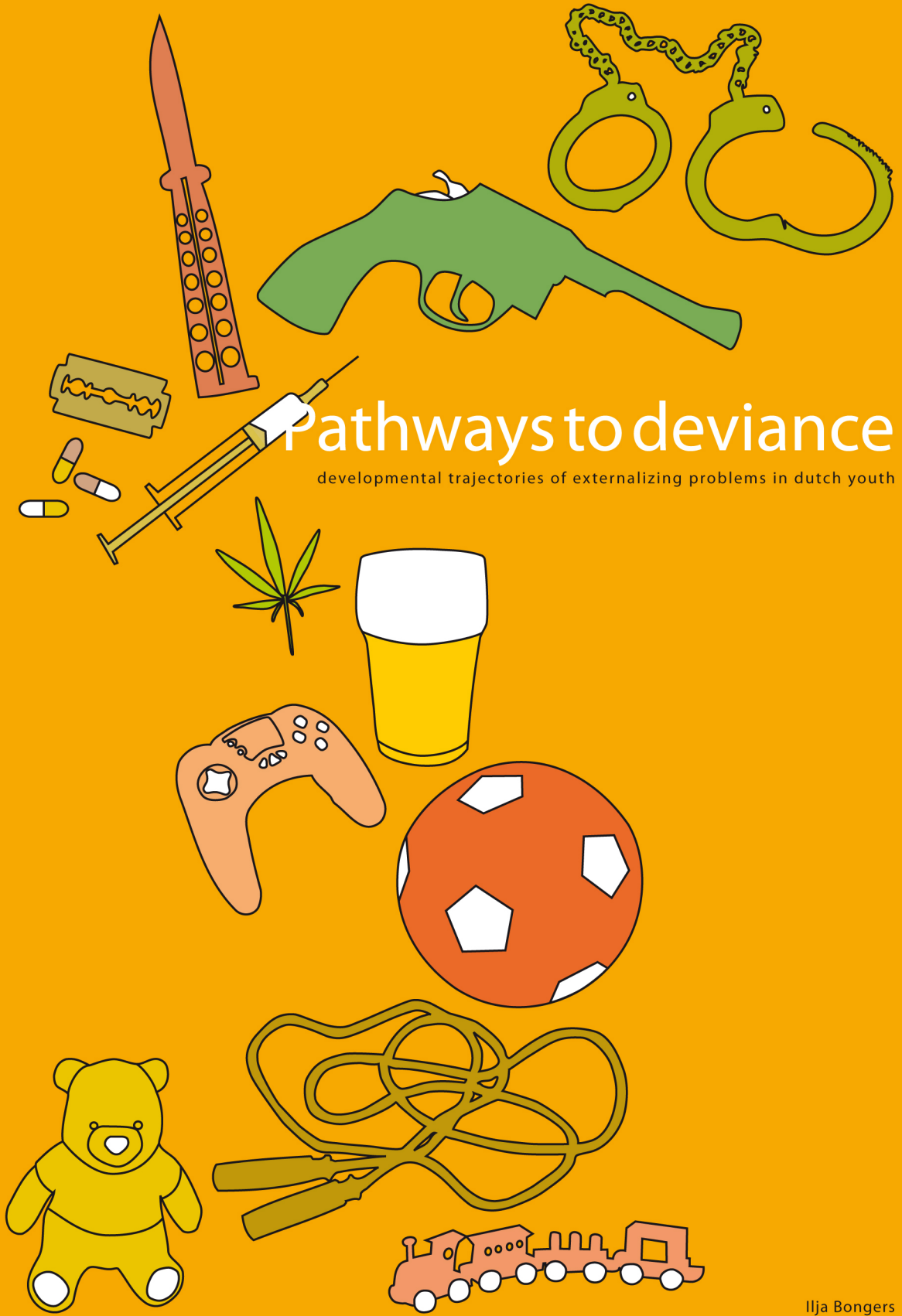# Pathways to deviance

developmental trajectories of externalizing problems in dutch youth

Ilja Bongers

Pathways to deviance:

Developmental trajectories of externalizing problems in Dutch youth

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Pathways to deviance:

Developmental trajectories of externalizing problems in Dutch youth

Ontwikkelingspaden van antisociaal gedrag en hun uitkomsten bij Nederlandse jongeren

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INTRODUCTION

Chapter 1
Introduction

Externalizing behaviors are the most common and persistent forms of childhood problem behaviors (Campbell, 1995) and are both concurrently and prospectively related to impaired functioning in many domains (Rutter, Giller, & Hagell, 1998). Studies indicated that children and adolescents with conduct problems are at increased risk for various types of psychopathology in adulthood (Bardone, Moffitt, Caspi, Dickson, & Silva, 1996; Farrington, 1999; Fergusson, Lynskey, & Horwood, 1996; Keenan, Loeber, & Green, 1999; Moffitt, Caspi, Harrington, & Milne, 2002; Zoccolillo, 1993), delinquency (Broidy et al., 2003; Fergusson & Horwood, 2002), and impaired social functioning (Achenbach, Howell, McConaughy, & Stanger, 1998; Chassin, Pitts, & DeLucia, 1999). At the same time externalizing behaviors change so much in expression and frequency over the course of development that studies at any single time-point in development will provide only limited information or misrepresent the phenomenon (Kraemer, Yesavage, Taylor, & Kupfer, 2000). Therefore there is a growing consensus that externalizing behavior must be studied from a developmental perspective (Costello & Angold, 2000).

Types of Externalizing Behavior
Several studies investigated the development of externalizing behaviors in the general population (Hofstra, Van der Ende, & Verhulst, 2000; Loeber, Green, Lahey, Frick, & McBurnett, 2000; Moffitt et al., 2002). According to these studies childhood aggressive behavior has been identified as the most significant antecedent of externalizing behavior in adolescence and young adulthood. However, a substantial proportion of those children who display high levels of aggressive behavior in childhood do not manifest externalizing behavior later on (e.g., Hofstra, 2000). Groups of individuals following different pathways including 'persisters', as well as 'desisters' and 'late starters' have been identified, and each group may have different outcomes. Each of these studies used different approaches to define externalizing behaviors, including those guided by principal component analyses, consensus based diagnostic classifications, or developmental theory. A limitation of most of these approaches is that dimensions of externalizing behavior that may be sensitive to development are no longer distinguished. For example, the Externalizing syndrome in the empirically derived taxonomy proposed by Achenbach (1991) includes the syndromes Delinquent Behavior and Aggressive Behavior. The latter one includes items on physically aggressive as well as on oppositional behaviors. Using this syndrome in developmental research may conceal any differences in the development of aggressive versus oppositional behaviors. Moreover, based on one broad aggression construct, it is only possible to conclude that disruptive or troublesome behavior during childhood predicts later violent behavior, not that

aggression or another specific behavior during childhood per se is a distinct risk factor for violence in adolescence or young adulthood. Differentiation of externalizing behaviors into distinct and specific clusters allows the investigation of different developmental links and patterns for these specific manifestations of externalizing behavior.

The present thesis uses an empirically derived scheme for grouping externalizing behaviors. This scheme, developed by Frick and colleagues (Frick et al., 1993) distinguishes four types of externalizing behaviors based on a meta-analysis of 44 factor analytic studies including more than 28,000 youths. The four behavioral clusters that emerged, may be ordered along two dimensions (overt versus covert; destructive versus nondestructive) and were labeled Opposition, Aggression, Property Violations, and Status Violations. The same behavior clusters were confirmed in an independent studies of adolescents (e.g., Rey & Morris-Yates, 1993). Opposition includes behaviors such as disobedient, stubborn, and temper tantrums (overt and nondestructive); Aggression includes behaviors such as physically attacking people, and destroying belonging of others (overt and destructive); Property Violations includes delinquent acts such as vandalism and stealing (covert and destructive), while finally, Status Violations includes behaviors that are characterized by efforts to escape from the demands imposed on the subject such as truancy or running away (covert and nondestructive).

Development of Externalizing Behavior

The developmental course of externalizing behavior and its evolution into adult psychiatric disorders and delinquent behavior, has long been a source of concern for researchers. Since the early 1990s several child and adolescent developmental theories have been proposed to describe the development of antisocial behavior (Gottfredson & Hirschi, 1990; Loeber et al., 1993; Moffitt, 1993; Patterson & Yoerger, 1993).

Cicchetti and Schneider-Rosen (1986) argued that successful development regards a series of interlocking social, emotional, and cognitive competencies. Childhood externalizing behaviors may interfere with the development of these competencies, while they may stem from (often genetically based) limitations in competence and adverse environmental (family and peer) influences themselves. In the course of development, this combination of lack of competence and negative reactions from others to behavioral deviance may result in pervasive failures in adjustment. Person-environment effects, when stemming from externalizing behavior, tend to lead to further adverse experiences that are likely to foster the continuation of the externalizing behavior. This is particularly the case since adverse experiences tend to have their greatest effect on those who are most vulnerable (Rutter et al., 1998) owing to their genetic background (Simonoff et al., 2004), previous adverse experiences (Fergusson, Lynskey, & Horwood, 1997), or previously established deviant developmental trajectories (Moffitt et al., 2002). The overall failure in adjustment for individuals with deviant

externalizing behaviors might be expected to continue into young adulthood due to continuities associated with patterns of interactions between the adolescent and his/her environment. The accumulation of adverse experiences resulting from the factors indicated above needs not to be restricted to childhood but may still be present and lead to impaired social functioning, psychiatric disorders and delinquent behavior in adult life as well. In this way, externalizing behavior, on the whole, provides an accentuating effect that further reinforces and perpetuates pre-existing behavioral deviance, leading to cumulative continuity (Caspi & Moffit, 1995) of the behavior and its associated adverse outcomes even in adulthood.

Models of Externalizing Development

Several models of externalizing behavior (Loeber et al., 1993; Moffitt, 1993; Patterson & Yoerger, 1993) have proposed distinct developmental trajectories toward later deviant outcomes. According to these models different developmental trajectories originate from childhood onward. A developmental trajectory describes the behaviors displayed by an individual as defined by the age of onset of the behavior, the level of the behavior, and the change of the behavior across time.

Loeber et al. (1993) outlined three pathways of externalizing behaviors leading to different types of delinquency and criminal involvement. These are the *overt* (i.e., high levels of aggression in childhood and violence in adolescence and adulthood), the *covert* (i.e., covert antisocial acts in childhood and nonviolent, property crimes in later development), and the *authority conflict* pathway (i.e., a progression of stubbon behavior, deviance, and authority avoidance to later status offending).

In their model Patterson and Yoerger (1993) argue for two distinct pathways toward adult deviancy: one followed by *early starters* involving coercive parenting, school failure, and antisocial problems starting in childhood, and another followed by *late starters* involving poor parental monitoring, oppositionality, and deviant peer involvement starting in early adolescence.

The model developed by Moffitt (1993) also proposes two mutually exclusive subgroups of antisocial youth: *life-course persisters*, who show high levels of aggression throughout development and continue to be violent as adults, and *adolescence- limited* individuals, who engage in nonviolent forms of antisocial behavior only during the teen years.

There is good evidence from several independent studies that individuals following a life-course persistent or early starting pathway can be reliably distinguished from a subgroup defined by adolescent onset (e.g., Broidy et al., 2003; Fergusson & Horwood, 2002; Maughan, Pickles, Rowe, Costello, & Angold, 2000; Nagin & Tremblay, 1999; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Most studies clearly show the presence of a relatively small group of boys (mostly less than 10%) whose externalizing behavior was consistently

high throughout childhood and adolescence and extended into young adulthood. Also, most studies show the existence of a late starter or an adolescence onset group that is mostly somewhat larger than the group with chronic externalizing behaviors (about 20% of the individuals). However, as yet there is no conclusive evidence for the limitation of problem behaviors to adolescence in the adolescent onset group. Some studies indicate that late starters stop exhibiting externalizing behaviors in young adulthood (e.g., Fergusson & Horwood, 2002; White, Bates, & Buyske, 2001) whereas others show that the problems in these individuals in the late starter group persist far beyond this point (e.g., Brame, Nagin, & Tremblay, 2001; Lacrouse et al., 2002; Nagin & Tremblay, 1999). In addition, the overt and covert trajectories as proposed by Loeber are still in need of empirical support. New methodologies for analyzing individual level development in longitudinal data sets enable us to determine, distinctive groups of individuals who are more likely to follow one developmental track than another (Muthén, 2001; Muthén & Shedden, 1999; Nagin, 1999).

Developmental Trajectories

Although considerable evidence has been found to support the life-course persistent and some for the adolescence-limited developmental trajectories, these trajectories were not empirically derived from methodologies that determined similarities in pathways that existed in the scores from samples of children and adolescents. Instead categorization procedures were based on factors such as age of onset and the seeming chronicity of behavior (Loeber et al., 1993; Moffitt, 1993). Although the assignment rules used in these studies are generally reasonable, there are limitations and pitfalls involved in their use. One is that the existence of the various developmental trajectories that underlie the taxonomic theory cannot be tested; they must be assumed a priori. A related pitfall of constructing groups using a priori subjective classification procedures regard the "overfitting" and "underfitting" of data, i.e., the creation of trajectory groups that reflect only random variation while at the same time failing to identify groups with actually distinct trajectories. Second, a priori specified rules provide no basis for calibrating the precision of individual classifications to the various groups that compose the taxonomy. The semiparametric, group-based method (Nagin, 1999) used in this thesis for the analysis of the developmental trajectories avoids each of these limitations. It provides a formal basis for determining the number of groups that best fit the data and also provides an explicit metric, the posterior probability of group membership, for evaluating the precision of group assignment. Important capabilities of the method are: the capability to identify rather than assume distinctive developmental trajectories; the capability to estimate the proportion of the population best approximated by the various trajectories so identified; the capability to relate the probability of membership in the various trajectory groups to characteristics of the individual and his or her circumstances; and the capability to use the

posterior probabilities of group membership for various other purposes such as creating profiles of group membership.

Gender Differences

It is widely understood that males are generally much more antisocial than females (e.g., Giordano & Cernkovich, 1997; Rutter et al., 1998). Gender differences in psychopathology fall into two main groups. First, there are early onset neuropsychiatric disorders, such as ADHD (Gaub & Carlson, 1997), with marked male preponderance. Second, there are adolescent onset emotional disorders, such as depression (Allgood-Merten, Lewinsohn, & Hops, 1990), with marked female preponderance. Antisocial disorders appear to be an anomaly in that they are substantially more common in males than females despite the fact that their onset peaks in adolescence (Rutter et al., 1998). However, the early onset variety of antisocial behavior associated with neurodevelopmental impairment shows a male preponderance, whereas females commonly show adolescent onset antisocial behavior (Moffitt & Caspi, 2001). In view of this paucity of data, in the present thesis we investigated gender differences in the developmental trajectories of externalizing behaviors and the different predictive links between externalizing developmental trajectories and adverse outcomes.

Adult Adverse Outcomes

In addition to information about the developmental course of externalizing behavior from childhood to adolescence, it is also important to determine the broader consequences of externalizing behavior for psychopathology, delinquent behavior, and adult social functioning. Therefore, in the present thesis we investigated the predictive link between externalizing developmental pathways and psychopathology, delinquent behavior, and social functioning. Within a developmental psychopathologic perspective, early patterns of adaptation are viewed as related to later adaptation – whether deviant or nondeviant – in a complex, interactive, and transformational manner (Sroufe, 1989). Substantial evidence exists that link aspects of early development to the development of antisocial behavior patterns and adverse outcomes (Cicchetti & Rogosch, 2002; Fergusson & Horwood, 1998; Shaw, Owens, Vondra, Keenan, & Winslow, 1996). This explains why childhood externalizing behaviors are among the best predictors of psychopathology, delinquency, and impaired social functioning. Several theories suggest that the risk depends on the developmental course of these behaviors (Loeber et al., 1993; Patterson & Yoerger, 1993). According to these theories individuals with life-course persistent or early onset pathway of externalizing behaviors are most at risk for developing adverse outcomes.

Finally, different types of externalizing behaviors may be differentially related to psychopathological, delinquent, and social outcomes. Since no study consistently

distinguished between physical aggression, opposition, property violations, and status violations to young adult outcomes, this is the first study to give evidence on this issue.

Aims of the Thesis

With this thesis we aimed to extend and test the existing knowledge on the developmental pathways of externalizing behavior from childhood and adolescence, into young adulthood. Because studies on the development of externalizing behavior have involved samples that were confined to males, or have presented analyses based on males only (because there were too few females with deviant levels of externalizing behavior to warrant separate attention), the theories of antisocial behavior development are either very male-oriented or are gender-blind in the sense that there is no consideration whether or not antisocial behavior in females might be different in origin. Therefore, we aimed in the present study to investigate gender differences in externalizing developmental patterns and in the predictive relation between developmental pathways and outcomes.

The main aims of the present study were:

1. to determine the average or normative developmental trajectories of emotional and behavior problems, and to account for gender differences in the normative developmental trajectories from ages 4 to 18 years.

2. to determine the presence of different developmental trajectories for individuals in different clusters of externalizing behavior from ages 4 to 18 years.

3. to determine the predictive link between these externalizing group-based developmental trajectories and psychopathological, delinquent, and social outcome, thereby testing existing theories on the development of externalizing behavior.

Zuid-Holland Study

The Zuid-Holland prospective longitudinal study which started in 1983 as a study on the developmental course of behavioral and emotional problems. After initial assessment (time 1, 1983), the population sample has been approached with time intervals of two years, until measurement 5 (time 5, 1991), and again in 1997 (time 6) when the child participants were 18 to 30 years of age. The sample was selected from the Dutch province of Zuid-Holland using municipal registers that list all residents in the province of Zuid-Holland, a province that has 3,2 million inhabitants living in highly urbanized as well as rural areas. High response rates were maintained through the years.

At initial assessment in 1983 information was gathered on 2,076 children, aged 4 through 16 years, via home interviews with parents (Verhulst, Akkerhuis, & Althaus, 1985).

Parents completed the Child Behavior Checklist (CBCL; Achenbach, 1991; Verhulst, van der Ende, & Koot, 1996) at time 1 through time 5. At time 6 (1997) the young adults were assessed using a number of standardized instruments , including a structured diagnostic psychiatric interview for obtaining DSM-IV diagnoses, a standardized delinquency interview, a questionnaire on social functioning, and a questionnaire on outcomes in young adulthood (for more information, see Hofstra, 2000 and Donker, 2004).

Structure of this Thesis

In chapter 2, information is provided on the average or normative development of parent reported problem behavior from ages 4 to 18 years. The normative developmental patterns of the scales of the CBCL were estimated taking into account the gender and the age of the individuals. In chapter 3, we assessed the average and group-based developmental trajectories for the four behavioral clusters aggression, opposition, property violations, and status violations (c.f., Frick et al., 1993) for males and females aged 4- to 18- years. We first estimated the average developmental trajectories using a multilevel modeling procedure, and subsequently estimated group-based developmental trajectories using a semiparametric modeling procedure (c.f., Nagin, 1999). Individuals were assigned to the group-based developmental trajectories that best described the pattern of the parent reported externalizing behavior of each individual. The results were discussed with respect to the developmental theories described above. In chapter 4 we used survival analysis to investigate the predictive value of the group-based developmental trajectories regarding DSM-IV diagnoses, as assessed with the Composite Diagnostic Interview (World Health Organization, 1992) and three sections of the Diagnostic Interview Schedule (Robins, Helzer, Croughan, & Compton, 1997) completed in young adulthood. In chapter 5, we used multinomial regression analysis to investigate the predictive link between the externalizing group-based developmental trajectories and self-reported delinquent behavior in young adulthood. In chapter 6, we conducted multiple linear regression analyses to investigate the association between externalizing group-based developmental trajectories in childhood and adolescence and social impairment in young adulthood. Finally, in chapter 7 the main findings and conclusions of the studies reported in the foregoing chapters are presented and discussed. Moreover, research implications and theoretical implications, as well as recommendations for future research are proposed.
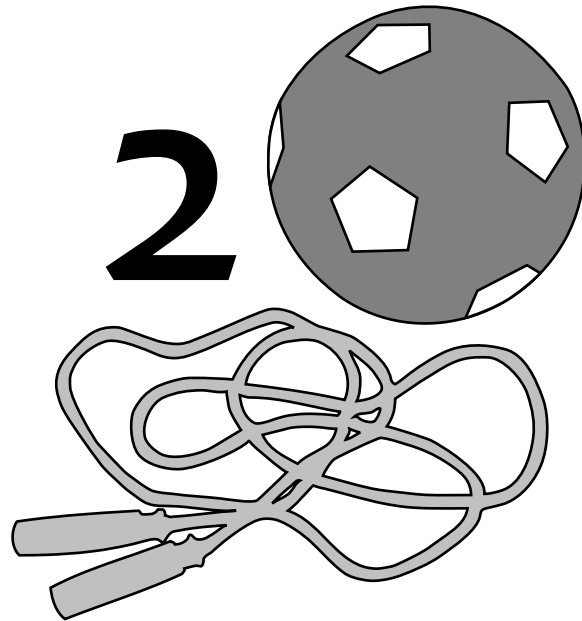
The Normative Development of Child and Adolescent Problem Behavior

Ilja L. Bongers, Hans M. Koot, Jan van der Ende, Frank C. Verhulst

Chapter 2
The Normative Development of Child and Adolescent Problem Behavior

Abstract

The aim of this study was to identify normative developmental trajectories of parent-reported problems assessed with the Child Behavior Checklist (CBCL; T. M. Achenbach, 1991) in a representative sample of 2,076 children aged 4 to 18 years from the general population. The trajectories were determined by multilevel growth curve analyses on the CBCL syndromes in a longitudinal multiple birth-cohort sample that was assessed five times with 2-year intervals. Nearly 7,000 CBCLs were collected on 1,016 boys and 1,060 girls. Most syndromes showed a linear increase or decrease with age or a curvilinear trajectory, except for thought problems. Trajectories for most syndromes differed for boys versus girls, except those for withdrawn, social problems and thought problems. These normative developmental trajectories provide information against which developmental deviance in childhood and adolescence can be detected.

Introduction

Little is known about the normative development of behavioral and emotional problems of children and adolescents in the general population. Although several studies and review articles provide suggestive evidence of age-related changes in problem behavior, this evidence is mainly derived from cross-sectional studies or single birth-cohort longitudinal studies (Birmaher, Ryan, Williamson, Brent, Kaufman et al., 1996; Campbell, 1995; Cicchetti & Toth, 1998; Fergusson, 1998). However, for the determination of developmental trajectories, multicohort longitudinal studies are necessary, because they enable the researcher to disentangle age, cohort and period effects by showing whether the same changes with age are observed in different cohorts studied in different time periods (Farrington, 1991; Kraemer, Yesavage, Taylor, & Kupfer, 2000; Loeber & Farrington, 1995; Willett, Singer, & Martin, 1998).

Only two studies have investigated the normative development of psychopathology in the general population (Keiley, Bates, Dodge, & Pettit, 2000; Stanger, Achenbach & Verhulst, 1997). The study by Stanger et al. (1997) is the only study using a multicohort longitudinal sample, including 1,139 children ages 4-18 years. The authors studied the normative developmental trajectories of delinquent and aggressive behavior using an accelerated longitudinal design with five repeated measurements at 2-year intervals with data that partially overlapped data used in the present study. This design matches two cohorts with at least two overlaps in measurement moments. The overlapping cohorts were matched by level of problem behavior, gender, socioeconomic status (SES), and age. According to this study the scores for both Aggressive and Delinquent Behavior measures declined from ages 4 to 10

years. After about the age of 10 years, scores for Aggressive Behavior continued to decline, but scores for the Delinquent Behavior increased until age 17. On both aggressive and delinquent behaviors, boys were scored higher than girls. A disadvantage was that Stangers et al.'s design did not control for the effects of an interaction between age and cohort. This effect can only be controlled in a nonmatched multicohort longitudinal study (Raudenbush & Chan, 1992).

The study by Keiley et al. (2000) used a single birth-cohort longitudinal design. More than 400 children aged 5-12 years from the general population were followed from kindergarten through seventh grade and were assessed every year (eight measurements). Using multilevel data analytic techniques, the study determined the developmental trajectories of internalizing and externalizing problems of these children reported by the mother and the teacher. For internalizing behaviors reported by both mothers and teachers, no effect of gender and time was found, which suggests a stable trajectory for internalizing behavior throughout the measurement period. However, mothers and teachers differed in their reports of externalizing behavior. Teachers reported significantly more externalizing behaviors in boys than in girls and a decline over time that was faster for boys than for girls. A similar declining trajectory was found for mother-reported externalizing behavior, but it is surprising that no effect of gender was found. However, the use of a single cohort implies that period and cohort effects could not be controlled for in this study.

Neither study accounted for age, period, and cohort effects in the way a multi-cohort longitudinal study can. The present study addresses the normative development of psychopathology using multiple cohorts and taking advantage of multilevel growth curve analysis, a data-analytic method that was specifically developed to describe time-related changes while accounting for cohort and period effects.

This study used parent reports of children's problems on the Child Behavior Checklist (CBCL; Achenbach, 1991; Verhulst, van der Ende, & Koot, 1996) obtained at five time-points with 2-year intervals. The analysis aimed to estimate the normative developmental trajectories for all CBCL scores, including Total Problems, Internalizing, Externalizing, and eight small-band scale scores (i.e., Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior, and Aggressive Behavior). The normative developmental trajectories represent the changes in levels of problem behavior from age 4 to 18 years. We examined the initial status and age-related change of the behavior as well as gender differences in these parameters.

On the basis of the limited evidence available, a number of hypotheses on age- and gender-related changes in problem behavior may be proposed. Because we aimed to describe the normative development of problem behavior we reviewed only studies including samples drawn from the general population. We organized our hypotheses according to the problem

scales identifiable in the CBCL (Achenbach, 1991; Verhulst et al., 1996), because the data in this study were obtained with this instrument.

Internalizing Problems

Internalizing problems include anxiety, depression (Bernstein, Borchardt, & Perwien, 1996; Birmaher et al., 1996), somatic complaints (Egger, Costello, Erkanli, & Angold, 1999; Taylor, Szatmari, Boyle, & Offord, 1996) and withdrawn behavior.

Symptoms of anxiety are quite common in childhood and adolescence but, their type and content vary with age (Craske, 1997). Anxiety problems change from separation anxiety in early childhood to social phobia or generalized anxiety in adolescence. Specific phobia has been described in children of all ages. However, for the total number of anxiety symptoms, no consistent gender or age differences have emerged (Bell-Dolan, Last, & Strauss, 1990; Bernstein et al., 1996).

For symptoms of depression, consistent age and gender differences have been found (e.g., Angold & Rutter, 1992). Prepubertal boys and girls show equal levels of depressive problems, but around mid-puberty (Tanner stage III) girls begin to exhibit more depressive problems, a trend that continues into adulthood (Angold, Costello, & Worthman, 1998; Birmaher et al., 1996; Cohen, Cohen, Kasen, Velez, Hartmark et al., 1993; Fleming & Offord, 1990; Laitinen-Krispijn, van der Ende & Verhulst, 1999).

In the CBCL, the anxious and depressed behaviors are subsumed under one construct (i.e., the Anxious/Depressed scale). Whereas findings suggest an increase of symptoms of depression over age, especially in girls, anxiety is expected to be stable over ages. Because anxiety is more normative than depression, the normative developmental trajectory of the anxious/depressed syndrome is expected to be similar to the trajectory of anxiety. Thus, we expected a small increase in scores on the Anxious/Depressed scale over age for girls and a stable (i.e., neither increasing nor decreasing) normative developmental trajectory for boys.

Another syndrome included in the CBCL Internalizing scale is the somatic complaints syndrome. Children and adolescents do not differ in the level of self-reported somatic complaints (Taylor et al., 1996). Girls report more somatic complaints than do boys, and this difference continues into adulthood (Egger et al., 1999; Taylor et al., 1996). Thus, the developmental trajectory of the somatic complaints syndrome is expected to stay at the same level across childhood and adolescence and is expected to have higher levels for girls than for boys.

Finally, the CBCL Internalizing scale includes the withdrawn syndrome. Scores on this syndrome are expected to show an increase from childhood to adolescence. Young adolescents usually acquire more independence from their parents, and peers become more important as a reference group (Alsaker, 1996). This increases the emotional distance between adolescents and their parents. Pubertal maturation is related to greater emotional autonomy

and less closeness to parents (Alsaker, 1996). From cross-sectional studies (Achenbach, 1991; Verhulst et al., 1996) it is known that parents of older children report more withdrawn behavior than do parents of younger children and that parents report more withdrawn behaviors for girls than for boys (Achenbach, 1991). These findings suggest a normative developmental trajectory for the Withdrawn scale with scores that are increasing with age for both girls and boys, with higher overall levels for girls than for boys.

Externalizing Problems

The CBCL broadband Externalizing scale encompasses the syndromes aggressive behavior and delinquent behavior. The aggressive behavior syndrome includes behaviors such as bragging, teasing, fighting, and attacking, which may indicate both aggression and opposition (Frick, Lahey, Loeber, Tannenbaum, Van Horn et al., 1993). Young children are still developing their communication skills and often rely on aggressive and oppositional behavior to control their environment (Tremblay, 2000). The type of aggressive behavior that both boys and girls show transforms during development, with decreasing levels of physical aggression (Cairns, Cairns, Neckerman, Ferguson, & Gariépy, 1989). Most studies indicate that boys show more physical and verbal aggression than girls do (Cairns & Cairns, 1984; Silverthorn & Frick, 1999). For both boys and girls, we expected a declining normative developmental trajectory of scores on the Aggressive Behavior scale, with higher levels for boys versus girls.

The delinquent behavior syndrome includes behaviors such as stealing and firesetting but also lying and cheating. These acts are covert and may be both destructive and nondestructive (Frick et al., 1993). Recent studies (Loeber, Wung, Keenan, Giroux, Stouthamer-Loeber et al., 1993; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996; Nagin & Tremblay, 1999) show that the majority (60-70%) of boys do not commit any delinquent or antisocial acts during childhood and adolescence. For girls this group is larger (i.e., nearly 90% of girls never commit any delinquent or antisocial act; Moffitt & Caspi, 2001). It has been suggested that there is a small group of boys (10%) and girls (1%) who show persistent delinquent and antisocial behaviors throughout childhood and adolescence. They follow a so-called life-course-persistent trajectory (Moffitt, 1993). A larger group of boys (26%) and girls (18%) only commit antisocial or delinquent behaviors during adolescence. They follow the so-called adolescence-limited trajectory (Moffitt, 1993). These findings suggest a normative developmental trajectory of increasing delinquent behavior starting in adolescence, with boys showing more delinquent behavior problems than girls across the whole period of childhood and adolescence.

Attention Problems

Attention problems are supposed to emerge when children are starting to attend school, because there children are faced with more complex and structured tasks. A few recent studies provide evidence for the expected normative development of attention problems. A study on a general population sample in Australia indicated minimal age differences in the number of attention deficit hyperactivity disorder symptoms in the age-range from 5 to 11 years (Gomez, Harvey, Quick, Scharer, & Harris, 1999). Results from a study in a clinically referred male sample indicated that hyperactivity-impulsivity declines with increasing age, especially during late childhood and early adolescence, whereas inattention remained relatively stable over ages (Hart, Lahey, Loeber, Applegate, Green et al., 1995). Other studies indicated that boys show more symptoms of inattentive and overactive behaviors than do girls (Cantwell, 1996; Gaub & Carlson, 1997; Gomez et al., 1999). These findings suggest a normative trajectory with first an increase when children start attending school and thereafter a decreasing frequency of attention problems over age, with higher levels for boys than for girls.

Other Problems

Two other CBCL syndromes not included in the Internalizing and Externalizing scales are the social problems and thought problems syndromes. Because these syndromes have no direct counterparts in the general psychopathology literature that does not use the CBCL, our hypotheses have to be based on cross-sectional findings reported for these syndromes.

The social problems syndrome includes behaviors such as acting too young, getting teased, or not being liked by peers. Results from cross-sectional studies indicate that younger children show more social problems than older ones and that boys show more problems than do girls (Achenbach, 1991; Verhulst et al., 1996). These cross-sectional findings suggest a normative developmental trajectory that decreases with age and has a higher level for boys than for girls.

The thought problems syndrome includes items referring to obsessive-compulsive behavior, seeing or hearing things that are not there, and strange behaviors. Results from cross-sectional studies indicate no age effects or gender effects on the thought problems syndrome (Achenbach, 1991; Verhulst et al., 1996), which suggest that the normative developmental trajectory for thought problems is stable during childhood and adolescence and similar for boys and girls.

Table 2.1.
Number of Subjects by Time of Measurement

Cohort	Time 1 1983 4-16 yrs			Time 2 1985 6-18 yrs			Time 3 1987 8-20 yrs			Time 4 1989 10-22 yrs			Time 5 1991 12-24 yrs		
	Age	B	G	Age	B	G	Age	B	G	Age	B	G	Age	B	G
1	4	81	84	6	69	64	8	69	71	10	72	76	12	71	75
2	5	78	90	7	65	73	9	65	75	11	70	73	13	69	73
3	6	78	83	8	63	71	10	65	70	12	65	71	14	68	74
4	7	78	85	9	67	72	11	65	71	13	67	74	15	66	71
5	8	89	83	10	66	62	12	77	64	14	72	69	16	67	65
6	9	81	78	11	66	72	13	60	71	15	67	73	17	62	67
7	10	78	83	12	59	63	14	59	67	16	64	69	18	60	66
8	11	78	83	13	65	66	15	66	69	17	62	72	19		
9	12	77	76	14	63	61	16	55	63	18			20		
10	13	78	83	15	52	65	17	43	51	19			21		
11	14	69	82	16	50	57	18	37	41	20			22		
12	15	75	70	17	1		19			21			23		
13	16	76	80	18			20			22			24		
Total		1,016	1,060		686	726		661	713		539	577		463	491

Note. yrs = years; B = boys; G = girls.

Method

Sample

The data used in this study were derived from a six-wave longitudinal study of behavioral and emotional problems that began in 1983. Respondents were interviewed at 2-year intervals until 1991 and again in 1997. This study uses data from the first five waves. The original sample of 2,600 children from 13 birthcohorts aged 4 to 16 years was drawn from municipal registers that list all residents in the Dutch province of Zuid-Holland. A random sample was drawn of 100 children of each gender and age with the Dutch nationality. Two small municipalities out of a total of 86 refused to cooperate, and 75 children were untraceable. Of the 2,447 parents who could be reached, 2,076 responded and provided usable CBCL data (84.8%). For details of the initial data collection see Verhulst, Akkerhuis and Althaus (1985). After the first measurement (1983), the sample was approached again in 1985, 1987, 1989, and 1991. The sample at Time 1 included 1,016 boys and 1,060 girls (see Table 2.1).

Because of the age-range of the CBCL not all subjects could participate in each wave of the study. The age-range was 4 to 16 years at Time 1 and Time 2 for the earlier version of the CBCL, and 4 to 18 years at Time 3 through Time 5 for the 1991 version of the CBCL. Of the 2,076 subjects who participated at Time 1 only 1,149 (Cohorts 1 to 7) were able to participate at all five waves, of these subjects, 68.8% completed the CBCL at all five time points (see Table 2.1). Of the 2,076 who participated at Time 1, data were available for 38.1% from five measurements, for 12.2% from four measurements, for 18.0% from three measurements, for 8.8% from two measurements, and for 22.9% from only one measurement.

We kept all subjects in the sample who were between 4 to 18 years of age at any timepoint even if data were available from only one measurement.

To investigate selective attrition, we compared dropouts and remainders with respect to their Time 1 CBCL Total Problems score and SES. We divided the sample in three groups, one group with subjects who participated in 5 waves (remainders), one group with one or more missing waves scattered throughout the study (random dropouts), and those who participated only once, at the first wave, and never participated again (dropouts). SES of the parents at Time 1 was scored on a six-step scale of parental occupation (van Westerlaak, Kropman, & Collaris, 1975) with 1 indicating the lowest SES, and 6 indicating the highest SES. We examined the differences in the mean SES and the CBCL Total Problems score between the dropout groups using analyses of covariance (ANCOVAs) with age as covariate and dropout as fixed factor, so that the effect of the dropout groups on the SES and the Total Problems score was corrected for the age of the individual. The ANCOVAs resulted in a significant effect of dropout in the mean SES $F(2, 2064) = 10.314$, $p < .01$, and no effect of dropout in the mean Total Problems score $F(2, 2071) = 0.065$, $p = .937$. Mean SES (adjusted) was 3.77 for the remainders, 3.53 for the random dropouts, and 3.19 for the dropouts.

Measurements

At Time 1 to Time 5, the CBCL (Achenbach, 1991) was used to obtain standardized parent reports of children's problem behaviors. Of the collected CBCLs, 87% were filled out by the mother. The CBCL is a questionnaire to be completed by parents of 4- to 18- year olds and contains 120 items covering behavioral or emotional problems that occurred during the past 6 months. The response format is 0 (not true) through 2 (very true or often true). The CBCL can be scored on the syndrome scales: Anxious/Depressed, Withdrawn, Somatic Complaints, (these three scales form the Internalizing scale), Aggressive Behavior, Delinquent Behavior, (these two scales form the Externalizing scale), Attention Problems, Social Problems, and Thought Problems. One can derive a Total Problems score is derived by summing the individual item scores. The same items and syndromes are scored for boys and girls aged 4 to 18 years. The good reliability and validity of the CBCL (Achenbach, 1991) were confirmed for the Dutch version of the measure (Verhulst et al., 1985; 1996). Cronbach's alpha ranged from .92 for Total Problems score to .40 for Delinquent Behavior (average = .70). The test-retest reliability over a period of 2 weeks ranged from .91 for Total Problems score to .74 for Thought Problems (Verhulst et al., 1996). Confirmatory factor analysis of the American syndromes in a sample of 2,335 clinically referred Dutch children, aged 4 to 18 years, supported the cross-cultural generalizability of the CBCL (De Groot, Koot, & Verhulst, 1994). The 4-year stability ranged from .65 for Aggressive Behavior to .24 for Thought Problems (Verhulst, Koot, & Berden, 1990).

Table 2.2.
Means and Standard Deviations of the Raw CBCL Syndrome Scores by Age Category

	Boys				Girls			
	Age-range				Age-range			
Syndrome	4-7 yrs	8-11 yrs	12-14 yrs	15-18 yrs	4-7 yrs	8-11 yrs	12-14 yrs	15-18 yrs
Anxious/Depressed 14 items								
M	1.81	2.63	2.17	1.97	1.93	2.47	2.50	2.72
SD	2.48	3.18	2.84	2.84	2.45	2.99	3.19	3.57
Somatic Complaints 9 items								
M	0.61	0.71	0.75	0.76	0.67	0.81	1.00	1.28
SD	1.14	1.38	1.33	1.36	1.13	1.27	1.59	1.93
Withdrawn 9 items								
M	1.58	1.81	1.93	2.12	1.78	1.94	2.04	2.27
SD	1.81	1.99	2.10	2.29	1.83	2.11	2.08	2.35
Internalizing 32 items								
M	3.96	5.09	4.78	4.78	4.35	5.15	5.45	6.11
SD	4.13	5.09	4.88	5.15	4.16	4.98	5.40	6.19
Aggressive Behavior 20 items								
M	8.50	7.12	5.76	4.52	6.28	5.05	4.47	3.81
SD	6.28	6.08	5.42	4.98	5.24	5.04	4.70	4.41
Delinquent Behavior 13 items								
M	1.47	1.28	1.25	1.34	1.03	0.84	0.91	1.01
SD	1.69	1.68	1.94	2.10	1.24	1.31	1.58	1.72
Externalizing 33 items								
M	9.97	8.40	7.01	5.86	7.30	5.90	5.38	4.82
SD	7.41	7.21	6.86	6.52	6.08	5.89	5.85	5.64
Attention Problems 11 items								
M	3.16	3.78	3.57	3.12	2.35	2.74	2.72	2.59
SD	2.70	3.37	3.20	3.18	2.47	2.88	2.80	2.91
Social Problems 8 items								
M	1.30	1.51	1.40	1.04	1.15	1.44	1.25	0.99
SD	1.75	2.06	2.00	1.72	1.59	1.98	1.80	1.67
Thought Problems 7 items								
M	0.36	0.29	0.23	0.25	0.26	0.24	0.25	0.28
SD	0.83	0.73	0.66	0.73	0.64	0.63	0.77	0.79
Total Problems 118 items								
M	22.84	21.90	18.99	16.52	19.58	18.60	17.21	16.54
SD	15.08	16.52	15.47	15.14	13.96	14.60	14.69	15.31

Note. yrs = years.

Statistical Analyses

The normative course of the CBCL syndromes, the two broadband groupings, and Total Problems scores were described with multilevel growth curve analysis (Bryk & Raudenbush, 1992). Multilevel models deal with the analysis of nested data. In a multiwave longitudinal

sample, the repeated observations are nested within the individuals. Each wave contributes to a naturally formed subset of observations that are nested within individuals. The multilevel model has two levels: one level for the repeated measures (level 1 or between subjects), and one level for the individuals (level 2 or within subject). Level 1, the level for the repeated measures, describes the between-subjects variation with the use of the following parameters: intercept, gender, and age. The values obtained for the parameters included in level 1 describe the normative developmental trajectories. Level 2, the level for the individuals, describes the characteristics of the individuals who participate in the study (i.e., the within-subject variation). In multilevel models, each individual is allowed his or her own growth curve or growth trajectory - that is, the individual growth parameters (intercept and slope) may vary across individuals - and these parameters are modeled in the level 2 part of the multilevel growth curve model.

In this study the within-subject variation is described by the intercept of the scale, the gender, and age of the subject. An overall growth curve is estimated for the total sample that is the average of all individual growth curves. The parameters that describe the overall growth curve are estimated in the level 1 part of the multilevel growth curve model. In that way, the multilevel model allows for estimation of the mean growth trajectory (for the total sample) as well as the estimation of individual variation around this mean. The multilevel growth trajectory at each level consists of the growth parameters' intercept and slope. The intercept represents the initial status of the problem behavior at age 4 on both the between-subjects and the within-subject level. The slope describes the average rate of change in problem behavior across ages for each individual on both levels (Boyle & Willms, 2001; Bryk & Raudenbush, 1992).

The multilevel growth curve models were estimated using (restricted) maximum likelihood estimation and an unstructured (co)variance matrix according to the SAS PROC MIXED procedure (Littell, Milliken, Stroup, & Wolfinger, 1996). The unstructured (co)variance matrix gave a better fit for the (co)variance structure than the compound symmetry model, and the first-order autoregressive model. In the unstructured (co)variance matrix the (co)variances are independent of each other and uncorrelated. We used the raw scale scores to estimate the multilevel growth curves following the same procedure for each syndrome. First we fitted the baseline models, which consist of only the intercept at level 1 and level 2. After estimating the baseline model, we tested which of the nested level 1 models gave the best fit using the maximum likelihood chi-square difference test. We created 7 different nested models with the following parameters: gender, age, age squared, and Gender x Age. All nested models had an intercept. After deciding which model described the (level 1) mean growth curve best, we built the level 2 of the multilevel growth curve model in the same way. We used the restricted maximum likelihood chi-square instead of the normal maximum likelihood chi-square because the former is an unbiased estimator of the covariance matrix

(Longford, 1993). In both levels we tested the significance of the nested models instead of the significance of the parameters. Therefore, it is possible that parameters included in the final models are not significant. However, the model with nonsignificant parameters showed a better model fit than models without these parameters.

The multilevel analysis deals with the missing data by the expectation-maximization (EM) algorithm. The EM algorithm is an iterative procedure with each iteration consisting of two parts: the E-step (expectation), in which the conditional expectations of the functions of the sufficient statistics for the missing data are calculated, and the M-step (maximization), in which the complete likelihood, with the functions of the missing data replaced by their conditional expectations, is maximized. The conditioning in the E-step is on the incomplete (available) data and the current estimates of the parameters. The estimates are updated in the subsequent M-step. This process of E-steps and M-steps continues until the estimates of the parameters stop changing to a meaningful extent.

The age parameter was centered at age 4 before being entered into the model. This causes the estimates of the parameters in the model to be tested for significance at age 4. Gender was coded as a dummy variable, with boys = 1 and girls = 0. Because of this dummy variable, the value for the intercept is the average initial status of the growth trajectory composed of the intercept plus the gender effect, resulting in an intercept that corresponds to the raw score on age 4 for girls. A significant gender effect indicates that there is a significant difference between boys and girls in the level of problem behavior at age 4. The following equation represents a full model with all the possible parameters on both levels (γ-parameters represent the between-subjects level parameters, and μ-parameters the within-subject level parameters):

$$\text{CBCL scale score} = \gamma_{00} + \gamma_{10}*\text{Gender} + \gamma_{20}*\text{Age} + \gamma_{30}*\text{Gender x Age} + \gamma_{40}*\text{Age2} + \mu_{0j} + \mu_{1j}*\text{Gender} + \mu_{2j}*\text{Age} + \mu_{3j}*\text{Gender x Age} + \mu_{4j}*\text{Age2} + \varepsilon_{ij} \quad (1)$$

To test the model fit of the models, the root-mean-square error of approximation (RMSEA) was calculated (Steiger, 1998). An RMSEA value of .05 or smaller suggests that the absolute magnitude of the discrepancies between the models and the data is small (Hu & Bentler, 1999). Values in the range of .05 to .08 indicate a fair fit, and values above 0.10 indicate a poor fit. We consider values in the range of 0.09 to 0.10 to indicate mediocre fit (MacCallum, Browne, & Sugawara, 1996).

Results

We first calculated the means and standard deviations of all CBCL syndromes and the Total Problems score, separately for boys and girls, and for four age groups. As shown in Table 2.2, the means vary by the number of items in each scale and show increases and decreases by age. Next, we tested multilevel growth curve models for all syndromes and for the Total Problems score. Table 2.3 shows for each syndrome the estimated parameters of the between-subjects level (level 1) and the estimated parameter variances and covariances of the within-subject level (level 2), as well as the values for the fit of the tested models. Except for thought problems, all normative developmental trajectories show changes across age, (see Figures 1, 2, and 3), and all final models showed a significantly better fit to the data than the baseline model with only an intercept on the between-subjects and the within-subject level. The RMSEA indicates for most models an average fit, but it indicates a mediocre to poor fit for the models for Total Problems score and externalizing problems. Below, we describe the trajectories that were estimated for internalizing syndromes, externalizing syndromes, and other syndromes, respectively.

Internalizing Problems

The first entry in Table 2.3 describes the model for the normative developmental trajectory for the anxious/depressed syndrome. The final model, $\chi^2(2065, N = 2,076) = 32,604.3$, is significantly better than the baseline model, $\chi^2 (2074, N = 2,076) = 32,875.3$, as is shown by the chi-square difference test, $\Delta\chi^2 (9, N = 2,076) = 271.0$, $p < .0001$. The RMSEA (0.08) of the model indicates that the model fit is fair. The between-subjects level of the anxious/depressed syndrome is dependent on an intercept, gender, age, gender x age, and age squared effect. Figure 2.1 shows the normative developmental trajectory of the anxious/depressed syndrome. The initial value at age 4 is significantly different from zero (intercept = 1.73, p < .0001). This normative trajectory has no significant gender effect (0.26, ns) on the intercept. However, there is a significant gender effect on the slope (gender x age = -0.076, p < .0001), which indicates that the normative developmental trajectory is different for boys and girls. The significant linear (age) and quadratic (age squared) slope effect indicate that the normative developmental trajectory first shows an increase and thereafter shows a decrease with age (age = 0.19, p < .0001; age squared = -0.0093, p < .0001). The within-subject level is dependent on intercept, age and age squared. These parameters account for the simple variation in the growth parameters for different individuals across the total group. The estimated (co)variances of the individual growth parameters provide us with information about the deviations of individuals' scores from the normative developmental trajectory. Of the variances of the within-subject level, only the variance of the intercept (2.16, p < .0001) is significant indicating that there is variation among the individuals in the initial level of anxious and depressive problems. The significant covariances between intercept and age

Table 2.3.
Model Fit and Parameter Estimates for the Final Models at the Between-Subjects and Within-Subject Level

Syndrome	Final χ2 (df)	Baseline χ2 (df)	Δ χ2	Δ Df	RMSEA (CI)	Parameter	Estimates (SE)	Parameter ((co)variances)	Estimates (SE)
			Model fit			*Between-subjects level*		*Within-subject level*	
Anxious/ Depressed	32604.3 (2065)	32875.3 (2074)	271.0***	9	0.08 (0.07-0.09)	Intercept	1.73*** (0.14)	Intercept	2.16*** (0.51)
						Gender	0.26 (0.18)	Age	0.022 (0.018)
						Age	0.19*** (0.031)	Age2	0
						Gender x Age	-0.076*** (0.019)	Intercept x Age	0.51*** (0.096)
						Age2	-0.0093*** (0.0019)	Intercept x Age2	-0.055*** (0.0065)
								Age x Age2	0.0016 (0.00062)
Somatic Complaints	23498.4 (2066)	23806.9 (2074)	308.5***	8	0.07 (0.06-0.08)	Intercept	0.57*** (0.054)	Intercept	0
						Gender	0.054 (0.078)	Age	0.030** (0.011)
						Age	0.054*** (0.0064)	Age2	0.00024*** (0.000059)
						Gender x Age	-0.042*** (0.0092)	Intercept x Age	0.057** (0.021)
								Intercept x Age2	-0.0026 (0.0020)
								Age x Age2	-0.0025** (0.00080)
Withdrawn	27541.4 (2068)	27754.6 (2074)	213.2***	6	0.08 (0.07-0.08)	Intercept	1.70*** (0.063)	Intercept	1.38*** (0.25)
						Age	0.037*** (0.0066)	Age	0.015 (0.0093)
								Age2	0
								Intercept x Age	0.19*** (0.047)
								Intercept x Age2	-0.023*** (0.0031)
								Age x Age2	0.00051 (0.00031)
Internalizing	39576.8 (2065)	39876.2 (2074)	299.4***	9	0.09 (0.08-0.10)	Intercept	4.10*** (0.23)	Intercept	5.17*** (1.22)
						Gender	0.0056 (0.29)	Age	0
						Age	0.27*** (0.049)	Age2	0
						Gender x Age	-0.099** (0.031)	Intercept x Age	1.71*** (0.19)
						Age2	-0.0098** (0.0031)	Intercept x Age2	-0.16*** (0.016)
								Age x Age2	0.0064*** (0.00061)
Aggressive Behavior	38955.9 (2065)	39856.0 (2074)	900.1***	9	0.09 (0.08-0.10)	Intercept	6.86*** (0.31)	Intercept	33.13*** (2.95)
						Gender	2.98*** (0.37)	Age	0.47** (0.13)
						Age	-0.31*** (0.055)	Age2	0.000029 (0.00053)
						Gender x Age	-0.19*** (0.032)	Intercept x Age	-1.72** (0.54)
						Age2	0.0059 (0.0031)	Intercept x Age2	-0.040 (0.033)
								Age x Age2	-0.0097 (0.0084)

Table 2.3. (continued)

Syndrome	Final χ2 (df)	Baseline χ2 (df)	Δ χ2	Δ Df	RMSEA (CI)	Parameter	Estimates (SE)	Parameter ((co)variances)	Estimates (SE)
			Model fit			*Between-subjects level*		*Within-subject level*	
Delinquent Behavior	25073.8 (2066)	25341.1 (2074)	267.3***	8	0.07 (0.07-0.08)	Intercept	1.17*** (0.072)	Intercept	0.69*** (0.15)
						Gender	0.37*** (0.061)	Age	0.020** (0.0071)
						Age	-0.073*** (0.018)	Age2	0
						Age2	0.0050*** (0.0011)	Intercept x Age	0.040 (0.031)
								Intercept x Age2	-0.0076*** (0.0019)
								Age x Age2	0
Externalizing	41901.5 (2065)	42560.3 (2074)	658.8***	9	0.10 (0.09-0.10)	Intercept	8.07*** (0.36)	Intercept	40.43*** (3.72)
						Gender	3.29*** (0.44)	Age	0.63*** (0.081)
						Age	-0.39*** (0.067)	Age2	0
						Gender x Age	-0.19*** (0.039)	Intercept x Age	-1.63** (0.57)
						Age2	0.011** (0.0038)	Intercept x Age2	-0.083** (0.030)
								Age x Age2	-0.012*** (0.0024)
Attention Problems	31953.3 (2066)	32301.3 (2074)	348.0***	8	0.08 (0.08-0.09)	Intercept	2.36*** (0.12)	Intercept	2.15*** (0.46)
						Gender	0.67*** (0.11)	Age	0.050** (0.016)
						Age	0.18*** (0.028)	Age2	0
						Age2	-0.014*** (0.0018)	Intercept x Age	0.57*** (0.087)
								Intercept x Age2	-0.062*** (0.0060)
								Age x Age2	0.00028 (0.00052)
Social Problems	25843.9 (2065)	26200.5 (2074)	356.6***	7	0.07 (0.07-0.08)	Intercept	1.23*** (0.075)	Intercept	1.26*** (0.25)
						Age	0.094*** (0.019)	Age	0.058** (0.020)
						Age2	-0.0088*** (0.0012)	Age2	0.000075 (0.000083)
								Intercept x Age	0.087 (0.060)
								Intercept x Age2	-0.017*** (0.0041)
								Age x Age2	-0.0019 (0.0013)
Thought Problems	14535.5 (2074)			2	0.05 (0.05-0.06)	Intercept	0.26*** (0.012)	Intercept	0.15*** (0.0086)
Total Problems	53741.1 (2065)	54142.4 (2074)	401.3***	8	0.11 (0.10-0.12)	Intercept	21.35*** (0.68)	Intercept	164.96*** (17.49)
						Gender	4.27*** (0.98)	Age	1.66*** (0.39)
						Age	-0.38*** (0.06)	Age2	0
						Gender x Age	-0.34** (0.09)	Intercept x Age	1.91 (2.71)
								Intercept x Age2	-0.86*** (0.16)
								Age x Age2	-0.010 (0.012)

Note. For al chi-squares, N = 2,076. RMSEA = root-mean-square error of approximation; CI = confidence interval. ** p < .01. *** p < .0001

(intercept x age = 0.51, p < .0001) and intercept and age squared (intercept x age squared = -0.055, p < .0001) indicate that children who start at a higher level tend to change faster than those who start at a lower level, but that those with a higher initial level have a more linear decrease than those with a lower initial level.

For somatic complaints, the normative developmental trajectory is dependent on intercept, gender, age and the interaction between gender and age. This model is significantly better than the baseline model, $\Delta\chi2$ (8, N = 2,076) = 308.5, p < .0001. The normative developmental trajectory shown in Figure 2.1 is significantly different from zero (intercept = 0.57, p < .0001), is different for boys and girls (gender = 0.054 ns; gender x age = -0.042, p < .0001) and both boys and girls show an increasing trajectory over time (age = 0.054, p < .0001). The within-subject level is again dependent on intercept, age, and age squared. Only the variances of age (0.030, p < .0001) and age squared (0.00024, p < .0001) and the covariances between intercept and age (0.057, p < .0001) and between age and age squared (-0.0025, p < .0001) are significant. This indicates that there is no significant variation in the amount of somatic complaints at age 4 years. However, there is significant variation within individuals in the change of somatic complaints over age.

The final model for the withdrawn syndrome fits significantly better than does the baseline model, $\Delta\chi2$ (6, N = 2,076) = 213.2, p < .05, and is dependent on intercept and age at the between-subjects level. The normative developmental trajectory in Figure 2.1 shows an increase (age = 0.04, p < .0001) of withdrawn behavior over age that differs significantly from zero (intercept = 1.70, p < .0001). There is no significant gender difference in the development of withdrawn behavior. The within-subject level is again dependent on intercept, age, and age squared. The variance of the intercept (1.38, p < .0001) and the covariances between intercept and age (0.19, p < .0001) and between intercept and age squared (-0.023, p < .0001) are significant. This indicates that there is significant variation in the amount of problem behavior at age four. The within-subject-level model also indicates that children who start at a higher level tend to change faster and decrease at a later measurement moment than children who start at a lower level.

The final model for internalizing problems shows a significantly better fit than the baseline model, $\Delta\chi2$ (9, N = 2,076) = 299.4, p < .0001. The normative developmental trajectory of internalizing behavior problems is dependent on intercept, gender, age, gender x age, and age squared. The normative developmental trajectory (Figure 2.1) has no gender difference at age 4 (intercept = 4.10, p < .0001; gender = 0.0056, ns), but shows a significant effect of gender on the slope (gender x age = -0.099, p < .0001). The slope has a linear and a quadratic effect shown in Figure 2.1 as a steeper increase at younger than at older ages (age = 0.27, p < .0001; age squared = -0.0098, p < .01). The within-subject level is dependent on intercept, age, and age squared. There is significant variation in the initial value of the internalizing problems (intercept = 5.17, p < .0001) and all the covariances are significant
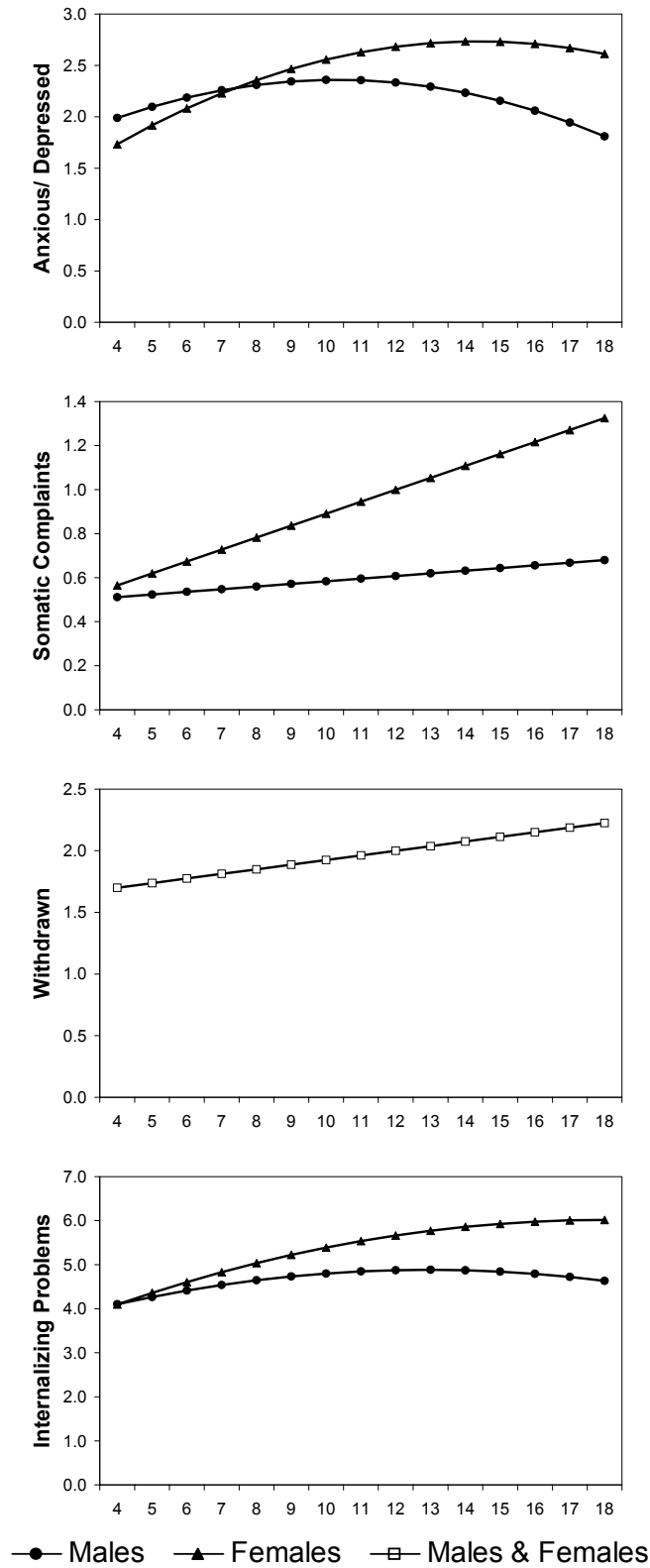
Figure 2.1. Normative developmental trajectories of internalizing Child Behavior Checklist syndromes and internalizing problems. Ages are shown on the x axis. The y axis represents the raw syndrome scores.

(intercept x age = 1.71, p < .0001; intercept x age squared = -0.16, p < .0001; age x age squared = 0,0064, p < .0001), indicating that children with higher initial values tend to change at a faster rate and that both children with a higher initial value and older children show a stronger decline at the end of the measurement period.

Externalizing Problems

Figure 2.2 shows the normative developmental trajectories of externalizing behavior problems. The normative developmental trajectory of aggressive behavior (Figure 2.2, Panel 1) is dependent on intercept, gender, age, gender x age, and age squared. The final model, $\chi 2$ (2065, N = 2,076) = 38,955.9, has a significantly better fit than the baseline model, $\chi 2$ (2074, N = 2,076) = 39,856.0; $\Delta\chi 2$ (8, N = 2,076) = 900.1, p < .0001. Gender (2.98, p < .0001) has a significant effect on the intercept (6.86, p < .0001), which results in a different initial value for boys (initial value =9.84) versus girls (initial value = 6.86). There is also a gender effect on the slope, which results in a difference in the development of aggressive behavior for boys and girls, with boys decreasing at a faster rate than girls (age = -0.31, p < .0001; gender x age = -0.19, p < .0001; age squared = 0.0059, ns). The within-subject level is again influenced by intercept, age, and age squared. The variances of intercept (33.13, p < .0001) and age (0.47, p < .01) are significant, which suggests that there is individual variation in the number of aggressive problems at age 4 and there is variation in the development of the problems over age. The covariance between intercept and age (-1.72, p < .01) is the only covariance that is significant, which indicates that children with a lower initial value change at a faster rate than do children with a higher initial value.

The second panel of Figure 2.2 shows the normative developmental trajectories for delinquent behavior. These are significantly different from the baseline model, $\Delta\chi 2$ (8, N = 2,076) = 267.3, p < .0001, and are dependent on intercept, gender, age, and age squared on the between-subjects level. There is a significant gender effect (0.37, p < .0001) on the initial value (intercept = 1.17, p < .0001) at age 4, resulting in a different initial value for boys (initial value = 1.54) versus girls (initial value = 1.17). There is no gender effect on the slope of the normative trajectory. Instead, the developmental trajectory of boys and girls shows the same quadratic change over time (age = -0.0073, p < .0001; age squared = 0.0050, p < .0001), resulting in a curvilinear growth for both boys and girls. The individual difference (within-subject level) is dependent on intercept, age, and age squared. The variances of the intercept (0.69, p < .0001) and age (0.020, p < .01) are significant indicating that there are differences between individuals in the initial value and in change of delinquent behavior over time. Also, the covariance between the intercept and age squared (-0.0076, p < .0001) is significant, indicating that children with a lower initial score on delinquent behavior have a greater quadratic change than do children with a higher initial value on delinquent behavior.
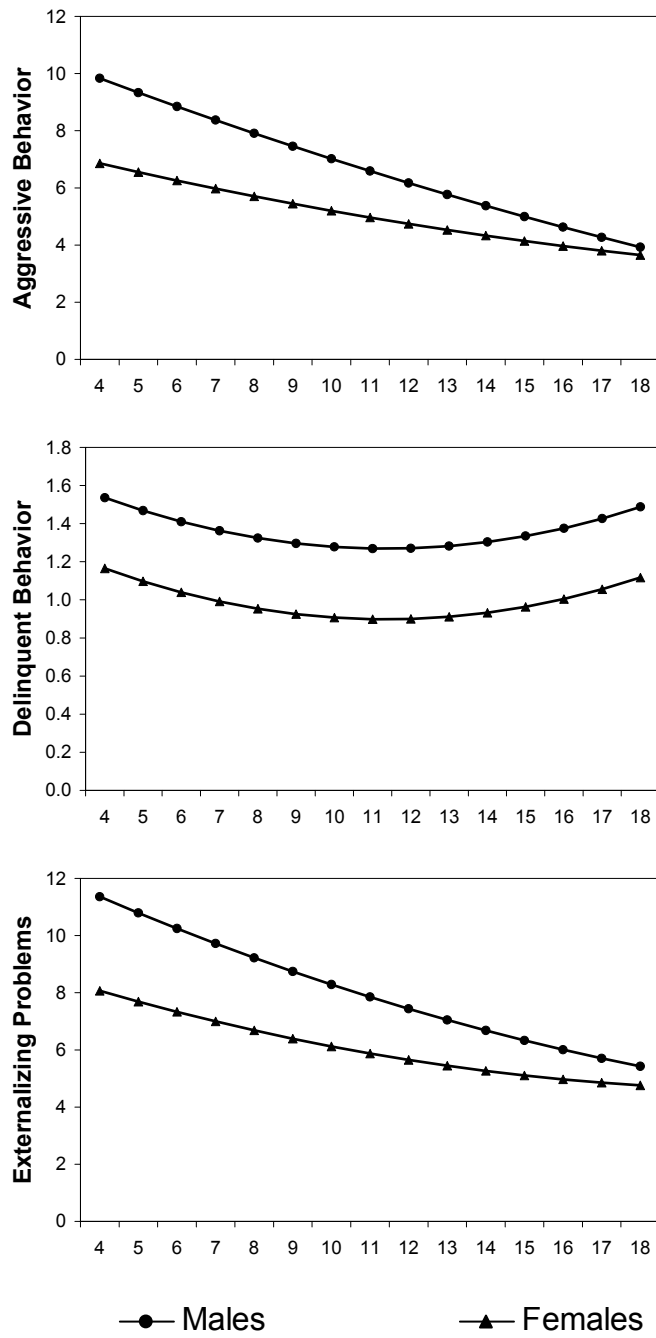
Figure 2.2. Normative developmental trajectories of externalizing Child Behavior Checklist syndromes and externalizing problems. Ages are shown on the x axis. The y axis represents the raw syndrome scores.

The last panel of Figure 2.2 depicts the normative developmental trajectories of externalizing problems. The final model is significantly different from the baseline model, $\Delta\chi2$ (9, N = 2,076) = 658.8, p < .0001. The normative developmental trajectory is dependent on intercept, gender, age, gender x age, and age squared. As for all externalizing behavior problems the initial value is significantly different for boys and girls (intercept = 8.07, p < .0001; gender = 3.29, p < .0001), which results in a different initial value of the normative developmental trajectory for boys (initial value = 11.36) versus girls (initial value = 8.07). Also, there is a significant gender effect on the slope (gender x age = -0.19, p < .0001) as well as a significant linear and quadratic effect on the slope (age = -0.39, p < .0001; age squared = 0.011, p < .01). The within-subject level indicates that individuals differ in the initial number of externalizing problems (intercept = 40.43, p < .0001) and that there is variation in the development of externalizing behaviors within individuals (age = 0.63, p < .0001). All covariances are significant (intercept x age = -1.63, p < .01; intercept x age squared = -0.083, p < .01; age x age squared = -0.012, p < .01), which indicates that children with lower initial value tend to change at a faster rate and also children with lower initial levels and younger children show a stronger decrease at the end of the measurement period.

Other Problems

Figure 2.3 shows the normative developmental trajectories of the other syndromes (attention problems, social problems, thought problems, and Total Problems score) included in the CBCL. The first panel shows the normative developmental trajectories of attention problems. The final model of attention problems is dependent on intercept, gender, age, and age squared at the between-subjects level and has a significantly better fit than the baseline model, $\Delta\chi2$ (8, N = 2,076) = 348.0, p < .0001. The initial value of the normative developmental trajectory is different for boys (initial value = 3.03) and girls (initial value = 2.36; intercept = 2.36, p < .0001; gender = 0.67, p < .0001). There is no gender effect on the slope, which indicates that the linear and quadratic change over time is the same for boys and girls (age = 0.18, p < .0001; age squared = -0.014, p < .0001). The within-subject level is dependent on intercept, age, and age squared, which indicates that individuals differ in the initial level of the problem behavior and in the change over time. The variances of the intercept (2.15, p < .0001) and age (0.050, p < .01) are significant. The covariances between intercept and age (0.57, p < .0001) and between intercept and age squared (-0.062, p < .0001) are also significant and indicate that children with a higher initial level change at a faster rate and that children with lower initial levels tend to show a stronger decrease at later age.

The second panel of Figure 2.3 shows the normative developmental trajectory of social problems, which is dependent on intercept, age, and age squared. The final model is significantly better than the baseline model, $\Delta\chi2$ (7, N = 2,076) = 356.6, p < .0001. There is no gender difference in the intercept nor in the slope. The initial value of social problems is

1.23 (p < .0001). After age 4 there is first a slight increase and thereafter a slight decrease (age = 0.094, p < .0001; age squared = -0.0088, p < .0001). The within-subject level of social problems is dependent on intercept, age, and age squared. The variance of intercept (1.26, p < .0001) and age (0.058, p < .01) and the covariance between intercept and age squared (-0.0117, p < .0001) are significant, which indicates that the subjects differ in the initial value and in the development over time.

The normative developmental model of thought problems is identical to the baseline model, χ^2 (2074, N = 2,076) = 14,535.5. There is no significant change in the number of thought problems over time. The only significant parameter in the between-subjects model is the intercept (0.26, p < .0001), which indicates that the normative developmental trajectory is significantly different from zero. Also, in the within-subject level only the variance of the intercept (0.15, p < .0001) is significant, indicating that subjects only differ in the initial value of the thought problems, which remains stable over time.

The last panel of Figure 2.3 shows the normative developmental trajectories for the Total Problems score. The final model of the Total Problems score is dependent on the intercept, gender, age, and gender x age on the between-subjects level and on intercept, age, and age squared on the within-subject level. This final model has a significantly better fit than the baseline mode, $\Delta\chi^2$ (8, N = 2,076) = 401.3, p < .0001, and is significantly different for boys and girls. There is a significant gender effect (4.27, p < .0001) on the intercept (21.35, p < .0001) and on the slope (age = -0.38, p < .0001; gender x age = -0.34, p < .0001). The within-subject level variances and covariances indicate that individuals differ in the initial value and in the amount of change over time; the variances of the intercept (164.94, p < .0001) and age (1.66, p < .0001) as well as the covariance between intercept and age squared (-0.86, p < .0001) are significant.

Discussion

The aim of this study was to describe the normative developmental trajectories of behavioral and emotional problems during childhood and adolescence. This study accounts for most of the problems typically associated with this type of research. The trajectories were described in a large longitudinal sample including multiple cohorts of boys and girls aged 4 to 18 years. Using Time 1 SES and CBCL Total Problems scores, we found significant differences in SES between the dropout groups but no indication for selective attrition for the Total Problems score. These findings suggest that children and youth with lower SES are somewhat underrepresented in the longitudinal sample but that these children do not show more problem behavior. To further analyze possible dropout effects, we also tested whether the normative developmental trajectories of the remainders and the random dropouts differed from the normative developmental trajectories of the total sample. This test indicated that the parameters of the developmental trajectories of the different dropout groups were in each
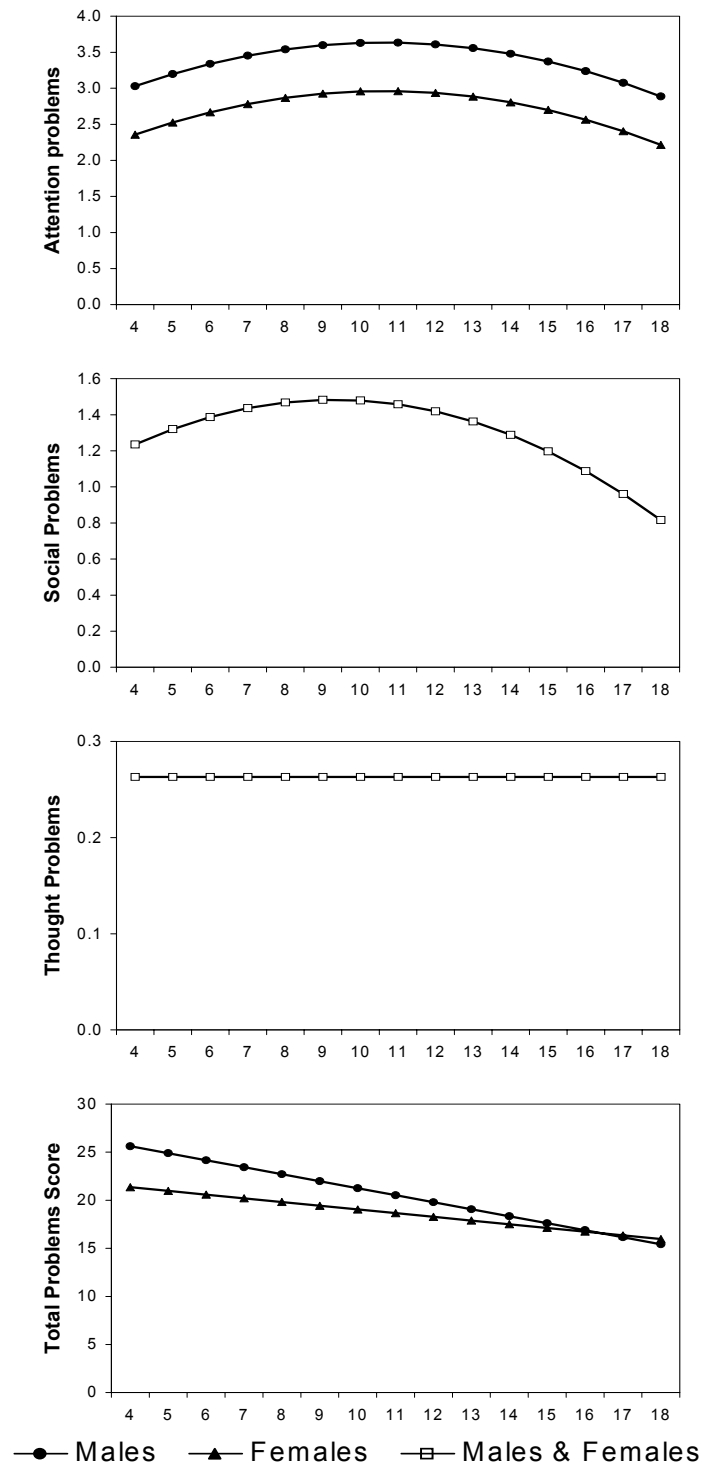
Figure 2.3. Normative developmental trajectories of attention problems, social problems, thought problems and the Total Problems score. Ages are shown on the x axis. The y axis represents the raw syndrome scores.

other's range of confidence interval, suggesting that the deviation from the normative development is not significant for different dropout groups in the sample. Finally, we added a variable to the multilevel growth curve model that represented the subjects' dropout group. This variable was not significant in any of the normative developmental trajectories. In sum, the net effect of the selective dropout of a group with lower SES is visible neither in initial problem scores nor in the normative developmental trajectories. The design of the study corrected for possible cohort and period effects, because all ages, except ages 4 and 5 were measured multiple times in different cohorts and at different time points. The analytic method used also corrects for the dependencies among observations created by repeated measurements.

This study gives new insights in the development of behavioral and emotional problems of children and adolescents in the general population. Some of our findings are in stark contrast to our expectations, whereas other expectations were confirmed.

Internalizing Problems

The normative developmental trajectory for the CBCL Internalizing scale showed a curvilinear increase for both girls and boys over time. In childhood, the number of internalizing problems did not differ between boys and girls, whereas in adolescence the developmental trajectory for girls showed a higher average level than that for boys. The same trajectories for the CBCL Internalizing scale were found in other longitudinal studies (Keiley et al., 2000; Stanger & Verhulst, 1995). These findings reflect that internalizing problems are the same for boys and girls in childhood but have a different developmental trajectory thereafter. The different developmental trajectories for boys and girls are likely to be explained by differences in pubertal development, or different coping styles for boys versus girls (e.g., Zahn-Waxler, Klimes-Dougan & Slattery, 2000).

Confirming our expectations, we found a developmental trajectory for the Withdrawn scale reflecting increasing withdrawal with increasing age. On the basis of small differences between boys and girls found in cross-sectional studies (Achenbach, 1991; Verhulst et al., 1996), we also expected a gender difference, with girls showing more withdrawn behavior than boys. However, this could not be confirmed in the present study. The trajectory found for the Withdrawn scale confirms earlier observations that during the transition into adolescence children spend increasing amounts of time alone or with friends, show a dramatic drop in time they spend with their parents (Alsaker, 1996), and that they disclose less of their inner world to their parents.

As expected, we found different trajectories for boys and girls for the Somatic Complaints scale. Contrary to our expectation, we found that Somatic Complaints scores increased with increasing age for girls, whereas the trajectory for boys was less influenced by age. Scores on the Somatic Complaints scale for girls were twice as high in adolescence than

in childhood. In a cross-sectional study, Eminson, Benjamin, Shortall and Woods (1996) also found significantly more physical symptoms in girls versus boys, and more symptoms in older versus younger girls, but Egger et al. (1999) and Taylor et al. (1996) did not. An increase such as found in the present study and in the study by Eminson et al. (1996), may have been missed in the Egger et al. (1999) and Taylor et al. (1996) studies due to the limited age-ranges covered by these studies (ages 9-16 years and 12-16 years in the Egger et al. (1999) and Taylor et al. (1996) study, respectively) as well as the fact that these studies looked at single items instead of scales composed of multiple items as the present study did. The increase of somatic complaints with age for girls may be a precursor of the often reported gender differences in somatic complaints between males and females in adulthood (e.g., Rief, Hessel, & Braehler, 2001). The present study's results suggest that the gender difference in somatic complaints in adulthood may have originated in childhood.

For the Anxious/Depressed scale, we found a normative developmental trajectory for boys that showed first a slight increase and thereafter a decrease. The trajectory for boys showed in childhood and in adolescence nearly the same level of problems which confirmed our expectation indicated that anxious-depressive problems are fairly stable for boys. For girls, the normative developmental trajectory showed a higher level of problems than for boys and the expected increase with increasing age (Angold et al., 1998). However, after an initial increase, the trajectory slightly decreased. Informant effects may explain the discrepancies between our expectations and our findings. Many symptoms of adolescent anxiety and depression are covert, and parents may be less accurate informants of these problems than adolescents themselves (Compas, Oppedisano, Connor, Gerhardt, Hinden et al., 1997; Mesman & Koot, 2000a, b; Verhulst & van der Ende, 1992). For example, in a large national sample of referred and nonreferred youths, Compas et al. (1997) found that parents reported for the nonreferred youths fewer problems on the anxious/depressed syndrome with increasing age. The nonreferred youths' self-reported scores on the Anxious/Depressed scale showed a gradual increase with increasing age, and girls reported more problems than boys. This suggests that the normative developmental trajectory of anxiety and depression reported by parents may be different from the normative developmental trajectory reported by youths.

Externalizing Problems

As expected, boys and girls differed in their trajectories for Externalizing scores. Boys and girls both showed normative developmental trajectories of scores that decreased with age, with boys showing more problems than girls, throughout the whole measurement period. Similar declining trajectories were found by Stanger and Verhulst (1995), Keenan and Shaw (1997), and Silverthorn and Frick (1999), but not by Keiley et al. (2000) who found no gender differences in the declining externalizing trajectory.

As expected, the normative developmental trajectory for the Aggressive Behavior scale decreases with age for both boys and girls. In childhood, boys had higher levels of parent-reported aggressive behaviors than girls. However, aggressive behaviors decreased at a much faster rate with age in boys than in girls, with nearly no gender difference left at 18 years. This finding corresponds with findings of many earlier studies that reported higher levels of aggression in boys versus girls in childhood (Crick & Dodge, 1996; Keenan & Shaw, 1997). Contradicting the popular belief that as boys become older they increase the frequency of their oppositional and physically aggressive behavior, the present study shows a decline in aggressive behavior over time even more so in boys than in girls. According to our study, aggressive behaviors shown by children and adolescents are relatively transitory in nature and are resolved by the beginning of adulthood.

We found a normative developmental trajectory with a curvilinear increase for the Delinquent Behavior scale for both boys and girls, with boys showing more rule breaking behaviors than girls. On the basis of a study by Moffitt et al. (1996) on antisocial and delinquent acts, we expected an increase in the developmental trajectory for delinquent behavior for boys in adolescence. According to Moffitt et al. (1996) almost 30% of the boys commit antisocial or delinquent acts only in adolescence, whereas 5% of the boys commit antisocial or delinquent acts throughout life. The present study's results confirm the presence of a relatively large group of boys as well as girls committing delinquent acts in adolescence. However, the normative developmental trajectory of delinquent behaviors cannot give conclusive evidence for the existence or nonexistence of a life-course-persistent group that commits antisocial or delinquent acts starting at a young age and lasting throughout life.

For attention problems, we found a trajectory for both boys and girls that increased untill age 11 years and declined thereafter. Although boys and girls followed the same trajectory, boys showed more attention problems than girls. Our findings may well be explained by current theory on the development of attention problems and overactivity, with increases in these problems as the demands on impulse control and response inhibition increase during childhood, and with a decrease in these problems with the growing development of self-regulation in adolescence (Barkley, 1997; Hart et al., 1995).

Implications and Limitations
The trajectories as described in this study reflect the normative development expected if child and adolescent problems are repeatedly assessed using parent reports. The trajectories found in this study provide a basis against which deviations from the expected developmental course can be identified.

Some of the trajectories found in the present study throw a new light on the development of problem behaviors across childhood and adolescence, as illustrated by the decrease in scores of the Aggressive Behavior scale, and the increase in scores of the

Withdrawn and Somatic Complaints scales. We know of no other studies demonstrating the curvilinear course of attention problems.

The present study is not without limitations. A main limitation is the generalizability of findings. The longitudinal design resulted in some selective dropout of study participants. The SES of the dropouts was slightly, though significantly, lower than the SES of the remainders, indicating that the remainders had slightly better socioeconomic background than the dropouts. However, post-hoc analyses indicated that it is unlikely that this dropout affected the estimated developmental trajectories to any significant extent.

The study population was a random sample of mainly Caucasean children and adolescents living in The Netherlands. Crijnen, Achenbach and Verhulst (1999) compared CBCL scores for 11 different cultures and concluded that cultural effects were minimal and that the CBCL can be used to obtain reports of problem behaviors that can be compared across countries.

The design of the study created the opportunity to correct for cohort and period effects. A disadvantage of this design is that fewer measurement points were available for the individuals in the older birthcohorts and at the younger age (4-5 years). Notwithstanding these limitations in the design the analyses have a considerable power (Hedeker, Gibbons, & Waternaux, 1999).

Another limitation of this study is the reliance on only parental reports to assess psychopathology. Parents may be unaware of their child's rule breaking behavior, especially as their child becomes an adolescent. The same may be true for internalizing problems. Parents are not the most reliable source to report anxious and depressed feelings of their children (Mesman & Koot, 2000a, b; Verhulst & van der Ende, 1992). Therefore, replications are essential to assess the generalizability of the present findings to other informants such as teachers and youths themselves.

The developmental trajectories of problem behavior obtained in this study may constitute the background for additional and smaller range studies. The development of problem behavior in specific clinical or risk groups may be contrasted with the present normative data, enabling the detection of groups of deviating individuals. In addition, it will be interesting to identify children within the present sample who follow individual developmental trajectories that deviate from the normative trajectories found in this study (e.g., Nagin & Tremblay, 1999).

Developmental Trajectories of Externalizing Behaviors in Childhood and Adolescence

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Chapter 3
Developmental Trajectories of Externalizing Behaviors in Childhood and Adolescence

Abstract
This study describes the average and group-based developmental trajectories of Aggression, Opposition, Property Violations, and Status Violations using parent reports of externalizing behaviors on a longitudinal multiple birthcohort study of 2,076 children aged 4 to 18 years. Trajectories were estimated from multilevel growth curve analyses and semiparametric mixture models. Overall, males showed higher levels of externalizing behavior than did females. Aggression, opposition, and property violations decreased on average, whereas status violations increased over time. Group-based trajectories followed the shape of the average curves at different levels, and were similar for males and females. The trajectories found in this study provide a basis against which deviations from the expected developmental course can be identified and classified as deviant or nondeviant.

Introduction
Externalizing problem behaviors are the most common and persistent forms of childhood maladjustment (Campbell, 1995). At the same time externalizing behaviors change so much in expression and frequency over the course of development that studies at any single time-point in development will provide only limited information or misrepresent the phenomenon (Kraemer, Yesavage, Taylor, & Kupfer, 2000). Therefore, there is a growing agreement that externalizing behavior must be studied from a developmental perspective (Costello & Angold, 2000). The present study aims to describe the development of various types of externalizing behaviors over age and identify groups of children and adolescents whose externalizing behaviors follow similar developmental trajectories.

Classification Schemes of Externalizing Behavior
Several studies investigated the development of externalizing behavior in the general population (e.g., Hofstra, Van der Ende, & Verhulst, 2000; Loeber, Green, Lahey, Frick, & McBurnett, 2000; Moffitt, Caspi, Harrington, & Milne, 2002). However, each of these used different diagnostic approaches to describe externalizing problems, including those guided by principal component analyses, consensus based classification, or developmental theory. The present study uses an empirically derived scheme for grouping externalizing behavior problems that is interpretable from major taxonomic perspectives (e.g., *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) [DSM-IV], American Psychiatric Association, 1994; Child Behavior Checklist [CBCL], Achenbach, 1991). This scheme, developed by Frick et al. (1993), distinguishes four types of externalizing behavior problems

based on a meta-analysis of 44 factor analytic studies of more than 28,000 youths. The four behavioral clusters that emerged, may be ordered along two dimensions (overt vs. covert; destructive vs. nondestructive) and were labeled opposition, aggression, property violations, and status violations. The same behavior clusters were confirmed in independent studies of adolescents (e.g., Rey & Morris-Yates, 1993).

The current work represents the first longitudinal-developmental study of the Frick clusters in childhood and adolescence. We confirmed the Frick clusters in longitudinally collected parent ratings of externalizing problems in children and adolescents. As such, it provides a replication of previous cross-sectional work but also facilitates a major step forward. First, other major classifications can be conceptually covered by the Frick clusters, which therefore may constitute an integrative framework for externalizing behavior problems. For instance, researchers who work in the CBCL tradition could profit from the clusters because the opposition and aggression clusters cover the aggressive behavior syndrome, wheras the property violations and status violations clusters cover the delinquent behavior syndrome. The Antisocial Behavior scale used in the studies by Moffitt and colleageus (e.g., Moffitt, 1993; Moffitt et al., 2002) is covered by opposition and property violations, whereas symptoms constituting *DSM-IV* conduct disorder (CD) and oppositional defiant disorder (ODD) are subsumed under the combined aggression, property violations, and status violations clusters, and the oppositional cluster, respectively.

Second, the differentiation of externalizing behavior into these four clusters allows the investigation of different developmental patterns for different manifestations of externalizing behavior. For example, Tremblay (2000) concluded in his overview that physically aggressive behavior decreases with increasing age while other externalizing behaviors such as truancy and alcohol or drug use increase with increasing age. If different developmental patterns for the four behavioral clusters can indeed be identified, this would suggest that they are distinct from each other. Lumping externalizing problem behaviors in longitudinal studies may hamper the study of the developmental meaning of distinguishable types of behavior within the externalizing domain.

Third, distinguishing different clusters of externalizing behaviors enables the study of comorbidity of clusters and developmental pathways both within and across clusters. Several different patterns of comorbidity or developmental pathways, or both, may be distinguished, so that each may predict different outcomes. For example, studies by Loeber and colleagues (e.g., Loeber et al., 1993, 1994) suggest three different pathways of externalizing behavior in males that predict different delinquent outcomes. Each of these hypothesized pathways can be studied using the four behavioral clusters proposed by Frick et al. (1993).

Average Development of Externalizing Behavior
As indicated earlier, externalizing behaviors are expected to change in frequency across age.

From both theoretical and clinical perspectives it is important to know when children and adolescents engage in certain externalizing behaviors and which behaviors at what frequency may be considered normative for children of a certain age. Understanding the normal development of externalizing behaviors provides an essential baseline for defining abnormality at any given age point. Using the behavioral clusters defined by Frick (1993), a recent cross-sectional study by Lahey et al. (2000) determined age and gender differences in parent reports of externalizing behavior problems in nearly 1,300 youths aged 9 to 17 years. They found no gender differences in opposition and status violations. However, aggression and property violations were more common among boys. The study also indicated that the levels of opposition were higher at younger ages, aggression peaked around 13 years, property violations showed no age effect, and status violations were more prevalent at older ages. The results on gender and age differences in this cross-sectional study are suggestive of actual developmental changes within individuals. In an earlier, longitudinal study on the same sample, Bongers, Koot, van der Ende, Verhulst (2003) showed a declining trajectory of parent-reported externalizing problems (including the CBCL Aggressive Behavior and Delinquent Behavior scales) over time for both boys and girls. The aggressive behavior syndrome showed a decreasing developmental trajectory for both boys and girls. In childhood, males showed nearly twice as many aggressive behaviors as females, whereas in adolescence this difference nearly vanished. Delinquent behavior showed a curvilinear developmental trajectory peaking at age 11 years, with higher problem levels among boys than girls.

Average developmental trajectories describe the expected development of externalizing behavior for most children. However, average developmental trajectories may show considerable variation around the mean. Although some children who show high levels of externalizing problem behaviors in childhood may outgrow their problems during adolescence, other children's problems may remain at consistently high or even increasing levels during development. Therefore, it is of interest to identify groups of participants who show developmental trajectories of externalizing problems that vary in level and shape.

Group-based Developmental Trajectories

Different developmental trajectories can be characterized by different ages of onset. For instance, the developmental taxonomy described by Moffitt (1993) distinguishes two developmental pathways of antisocial behavior. One pathway is followed by children who commit antisocial behaviors throughout their lives, the so-called life-course persisters. The other pathway is followed by children who commit these behaviors only in adolescence, the so-called adolescence-limited. Patterson and Yoerger (1993) defined these different groups of children as early starters and late starters, respectively. Loeber et al. (1993) proposed different developmental pathways that are characterized by the age of onset of overt and covert

antisocial behaviors. The overt pathway is characterized by an escalation from minor aggression, followed by physical fighting, and eventually to violence. The covert pathway consists first of minor covert acts, followed by property damage, and finally more serious forms of theft.

Although evidence has been found to support each of these developmental trajectories, they were not empirically derived from methodologies that determined similarities in pathways that existed in the scores from samples of children and adolescents. Instead, these categorization procedures were based on factors such as age of onset and the apparent chronicity of behavior (Loeber et al., 1993; Moffitt, 1993; Patterson & Yoerger, 1993).

New methodologies for analyzing individual level development enable us to determine, in longitudinal data sets, distinctive groups of individuals who are more likely to follow one developmental track than another (Nagin, 1999). Several studies used these new methodologies to investigate the developmental trajectories of externalizing behaviors in boys (Brame, Nagin, & Tremblay, 2001; Broidy et al., 2003; Nagin & Tremblay, 1999). For example, four groups of boys were identified following different developmental trajectories of aggressive behavior as rated by teachers and boys themselves: a chronic group comprised of 3% to 4% of the males in the sample, who exhibited stable high levels of physical aggression from age 6 to 13, with a slight decrease until age 17; a group of nearly 30% who displayed a high level of physical aggression in childhood declining in adolescence; a large group (50%) showing modest aggressive behaviors in childhood and none in adolescence; and a group composed 17% of the population, who almost never committed any physically aggressive act (Brame et al., 2001; Nagin & Tremblay, 1999). Nagin and Tremblay (1999) found similar trajectories for oppositional behavior. Developmental trajectories were also investigated in a female sample (Côté, Zoccolillo, Tremblay, Nagin, & Vitaro, 2001) using a combined cluster of teacher-rated physical aggression and oppositional behavior. Again, four different developmental trajectories were identified, all showing decreasing numbers of problem behaviors over time. The problematic group included nearly 1.5% and the low group 57% of the girls in the sample. Finally, Broidy et al. (2003), using four female samples, found for teacher-rated physical aggression three different groups with mostly stable physical aggression in childhood, the most deviant group constituting 10% of the population.

Research Questions

The present study addressed three primary research aims, which are answered in a sample that has several features to enhance the generalizability of the results to other studies and populations. In contrast to other studies that used enriched or clinical samples, we used a large representative general population sample with both males and females in a wide age-range. Our sample included both males and females to compare the developmental trajectories of both sexes, instead of analyzing them separately. Also, we addressed a wide age-range, i.e., 4-

18 years, covering the developmental transition from childhood to adolescence.

First, we tested to what extent the classifications of externalizing behavior as first suggested by Frick et al. (1993) fit the data from the present sample. To address this question we conducted a confirmative factor analysis (CFA) and assessed the fit of the Frick clusters to the data obtained from parent reports in a longitudinal multiple birthcohort sample. We expected an acceptable fit for both males and females.

Second, we aimed to describe the shape of the average developmental trajectories of the Frick clusters across childhood and adolescence. Based on the combined results from the Lahey et al. (2000) and Bongers et al. (2003) studies, we hypothesized that there are different average developmental trajectories for males and females for aggression, property violations, and status violations but not for opposition. Further, based on the cross-sectional findings from Lahey et al. alone, we expected an average decrease in opposition, for aggression first an increase and thereafter a decrease, stable trajectories for property violations, and increases in status violations, with higher levels of problems for boys on the latter three clusters.

Our third research goal was to investigate whether groups of individuals can be distinguished who follow different developmental trajectories within each cluster of externalizing behavior. To address this question we tested semiparametric mixture models that describe different developmental trajectories within clusters. Based on the findings from earlier studies we expected to be able to distinguish reliably at least three different groups within each externalizing behavior cluster. We expected that most developmental trajectories of aggression would show a decline over age (c.f., Brame et al., 2001; Broidy et al., 2003; Nagin & Tremblay, 2001b; Tremblay, 2000). Similarly, for opposition we expected mostly declining trajectories (Côté et al., 2001, Nagin & Tremblay, 1999). However, for property violations and status violations we expected an increase for all identifiable groups (Loeber & Hay, 1997; Tremblay, 2000). Given the ubiquitous finding (e.g., Bongers et al., 2003; Lahey et al., 2000) that males exhibit more externalizing behaviors than do females, we expected more males to follow high developmental trajectories of externalizing behaviors than females, except for oppositional behavior on which we expected an equal distribution of persistently high developmental trajectories across gender (Lahey et al., 2000). Because earlier studies indicated that the average developmental trajectories differ between males and females (Bongers et al., 2003; Lahey et al., 2000) we expected a different distribution of patterns of developmental trajectories across males and females, besides the differences in overall level.

Method
Sample
The original sample of 2,600 children from 13 birthcohorts aged 4 to 16 years was drawn from the Dutch province of Zuid-Holland in 1983, using municipal registers that list all residents. The province of Zuid-Holland encompasses more than 3,2 million inhabitants (20%

Table 3.1.
Number of waves per participant

Cohort	Age-range in the study	Maximum number of waves per cohort	Numbers of waves									
			1		2		3		4		5	
			M	F	M	F	M	F	M	F	M	F
1	4-12	5	5	1	2	5	5	9	7	13	62	56
2	5-13	5	2	6	5	4	4	8	12	14	55	58
3	6-14	5	6	3	4	7	5	3	5	7	58	63
4	7-15	5	2	2	6	8	8	5	5	10	57	60
5	8-16	5	7	9	7	5	7	5	11	11	57	53
6	9-17	5	5	1	9	4	4	3	14	7	49	63
7	10-18	5	10	5	2	6	5	10	14	9	47	53
8	11-17	4	7	6	4	7	12	10	55	60		
9	12-16	3	10	10	16	8	51	58				
10	13-17	3	21	16	19	18	38	49				
11	14-18	3	17	24	18	18	35	40				
12	15	1	74	70								
13	16	1	76	80								

Note. M = males; F = females.

of the Dutch population) in environments ranging from rural to highly urbanized. A random sample was drawn of 100 children of each gender and age with the Dutch nationality. Of the 2,447 parents reached, 2,076 responded and provided usable data (84.8%). For details of the initial data collection see Verhulst, Akkerhuis, and Althaus (1985). The sample in 1983 included 1,016 males and 1,060 females. Respondents were interviewed at two-year intervals until 1991 and again in 1997. This study uses data from the first five waves (1983-1991), during which a total of 6,932 observations were collected that are used in the present study.

Because of the age-range of the CBCL, not all respondents could participate in each wave of the study. The age-range was 4 to 16 years in 1983 and 1985 for the earlier version of the CBCL, and 4 to 18 years from 1987 to 1991 for the 1991 version of the CBCL. Of the 2,076 individuals who participated in 1983, only 1,149 (Cohorts 1 to 7) could participate in all five waves. For 68.8% of these 1,149 participants the CBCL was completed at all five waves (see Table 3.1). We kept all participants in the sample who were between 4 and 18 years of age at any time point even if data from only one wave were available. However, because of the multiple birthcohort design of the study no single person was assessed at age 4 and age 18 (see Table 3.1). To investigate selective attrition, we compared dropouts and remainders with respect to their 1983 CBCL scale scores, using analysis of variance (ANOVA) and correcting for 1983 age and gender. Participants with missing assessments did not differ significantly from participants with assessments available at all five waves on any of the CBCL scales.

The present sample is representative of the Caucasian population in the Netherlands. The distribution of occupational levels of the parents in 1983 was 34%, 32%, and 34% for low, middle, and high occupational level, respectively, which is comparable with the

distribution in the Netherlands. Half of the sample lived in a city, nearly 30% in a suburban area, and 20% in a rural area, which is comparable with the total population of Zuid-Holland in 1981.

Measurements

The CBCL (Achenbach, 1991) was used to obtain standardized parent reports of children's problem behaviors. The CBCL is a questionnaire completed by parents of 4- to 18- year olds and contains 120 items covering behavioral or emotional problems that occurred during the past 6 months, in the present study, items were mainly reported by mothers of the participants. The response format is 0 = not true, 1 = somewhat or sometimes true, and 2 = very true or often true. The good reliability and validity of the CBCL have been replicated for the Dutch translation (e.g., De Groot, Koot, & Verhulst, 1994; Verhulst et al., 1985; Verhulst, Van der Ende, & Koot, 1996).

Table 3.2.
Item description of the externalizing behaviors and item loadings from the confirmative factor analysis

Frick Clusters	CBCL items	Item loadings*
Aggression	Cruelty, bullying, or meanness to others	0.614
	Gets in many fights	0.684
	Physically attacks people	0.695
	Threatens people	0.732
Opposition	Argues a lot	0.724
	Disobedient at home	0.572
	Disobedient at school	0.812
	Stubborn, sullen, or irritable	0.778
	Sulks a lot	0.701
	Teases a lot	0.682
	Temper tantrums or hot temper	0.677
Property Violations	Cruel to animals	0.636
	Lying or cheating	0.725
	Sets fires	0.631
	Steals at home	0.605
	Steals outside the home	0.543
	Vandalism	0.703
Status Violations	Runs away from home	0.796
	Swearing or obscene language	0.573
	Truancy, skips school	0.497
	Uses alcohol or drugs for not medical purposes	0.907

Note. CBCL = Child Behavior Checklist
* Average item loadings derived from the confirmative factor analysis of males and females on Time 1 (1983).

To organize the CBCL externalizing items, we used the clustering of behaviors proposed by Frick et al. (1993). For this clustering CBCL items were selected of which the content showed a good match to the description provided by the authors of the clusters (Frick

et al., 1993; see Table 3.2). Four behaviors in the clusters defined by Frick et al. (1993) had no counterpart in the CBCL, i.e., 'spiteful' and 'blames others' from the aggression clusters, and 'angry' and 'breaks rules' from the opposition cluster and status violations cluster, respectively. We assumed that the small number of behaviors per cluster that were not covered by the CBCL were no real threat to the content validity of these clusters. Moreover the items 'spiteful' and 'breaks rules' are the items least discriminating between the destructive and nondestructive dimensions (Frick et al., 1993). The 2-week test-retest reliabilities (N = 91) of the clusters are comparable with the reliabilities found for the original CBCL scales (i.e., aggression $r = .75$, opposition $r = .75$, property violations $r = .83$, and status violations $r = .62$, all $ps < .01$).

Statistical Analyses

Analyses proceeded in three stages. First, to test the applicability of the Frick clustering of externalizing problems to the data, the CBCL items included in the proposed cluster were submitted to CFAs using M-plus 2.0 (Muthén & Muthén, 1998). The CFAs were conducted for each measurement moment and males and females separately. Model fit was determined using the goodness-of-fit index (GFI) and the percentage of explained variance. A model shows a good fit to the data if the GFI is larger than .90 (Hu & Bentler, 1999).

Second, the average course of the clusters was described using multilevel growth curve analyses (Longford, 1993). Multilevel models deal with the analysis of nested data. In a multiwave longitudinal sample, the repeated observations are nested within individuals. The multilevel model has two levels, one level for the repeated measures (between-subjects level), and one level for the individuals (within-subject level). The between-subjects level describes the between-subjects variation with the use of the following parameters: intercept, gender, and age. The values of these parameters describe the average developmental trajectories for the total sample. The level for the individuals describes the unique characteristics of each individual participant in the study (i.e., the within-subject variation). In the multilevel models each individual was allowed to have his or her own developmental trajectory; that is, the individual growth parameters (intercept and slope) were allowed to vary across individuals. In that way the multilevel model allowed for estimation of the mean developmental trajectory (for the total sample) as well as the estimation of individual variation around this mean. For the estimation of the multilevel model, raw scores of the behavior scales were used.

The multilevel developmental trajectory models were estimated using (restricted) maximum likelihood estimation and an unstructured (co)variance matrix using the SAS PROC MIXED procedure (Littell, Milliken, Stroup, & Wolfinger, 1996). We followed the same procedure for each cluster. First, the baseline models were fitted, which consist of the intercept at the between-subjects and within-subject level. After estimating the baseline model, the successive models were built in a stepwise way. We built nested models at the

between-subjects level with the parameters gender, age, age^2, and the interaction term gender x age. After deciding which model could be regarded the best description of the data at the between-subjects level (the average developmental trajectory), we built the within-subject level (the variation around the average developmental trajectory) of the multilevel growth curve model in the same way. The significance of the improvement in fit of the nested models was tested with the chi-square difference test.

Third, the Frick clusters were submitted to a semiparametric mixture model-fitting procedure to identify groups of individuals who follow distinctive developmental trajectories within each externalizing behavior cluster. This model was proposed by Nagin and colleagues (e.g., Nagin, 1999) and is well suited for analyzing within-subject-level developmental trends. In the multilevel model the individual variation around the developmental trends is modeled at the within-subject level, assuming that with significant within-subject levels there are distinctive developmental trajectories within the population. Mixture models assume that the population is comprised of a finite number of unobserved groups of individuals. The groups were defined by an expected developmental trajectory that relates the expected level of the behavior of interest with age. We assume that trajectories are different from each other when there is significant variation in the intercept or slope or in a combination of variation in intercept and slope. Technically, we modeled this linkage between expected behavior and age up to a second-order polynomial equation. The parameters of this equation could vary freely across groups. We restricted the possible test per model to 6 different parametric representations of shapes of the group's trajectories (i.e., combinations of zero slope, linear slope, and quadratic slope). Model estimation was achieved by maximization of the likelihood that was derived in Roeder, Lynch, and Nagin (1999). This mixture model is based on the zero-inflated Poisson distribution, which intends to estimate trajectory models in which the response variable is an integer-value index or count. The response variables were the raw scores (which are categorical scores ranging from 0 to 14) of the externalizing behavior clusters. Because externalizing behavior is typically concentrated in a small fraction of the population, the distribution of the scores contained more zeros than acceptable under the Poisson assumption. Therefore we used the zero-inflated Poisson distribution.

In addition to a depiction of the shapes of the group-based behavioral trajectories, another important output was an estimate of the probability that each individual belongs to each of the groups. Using this probability, individuals could be assigned to the group to which they have the highest probability of belonging. These analyses were conducted using the SAS PROC TRAJ procedure (Jones, Nagin, & Roeder, 2001). Final model selection required a determination of the number of groups that best describe the data. We used the Bayesian Information Criterion (BIC) as a basis for selecting the optimal number of groups for any given model. The model with the maximum BIC identifies the best explanatory model. The BIC criterion rewards parsimony and so tends to favor fewer groups, but it is known to be

consistent (Keribin, 2000). The difference in BIC value between the models can give evidence of how well the model with the highest BIC fits the data compared with the other models. After we decided which model had the highest BIC value we observed whether the model was better than the model above and below. A difference of more than 10 in the BICs obtained for two different models is considered very strong evidence against models with a higher BIC, a BIC difference between 6 and 10 indicates strong evidence against models with a higher BIC, and a BIC difference between 2 and 6 indicates positive evidence for the model with the highest BIC (Raftery, 1995). To find the model with the maximum BIC we tested for each externalizing cluster models with two to five groups.

Table 3.3.
Model fit of average developmental trajectories of externalizing behaviors

	Between-subjects level	Within-subject level	Final χ^2	Baseline χ^2	$\Delta \chi^2$	Δ df
Baseline	Intercept	Intercept				
Aggression	Intercept, Gender, Age, Gender x Age	Intercept, Gender, Age, Gender x Age	11206.9	12116.3	909.4*	6
Opposition	Intercept, Gender, Age, Age^2, Gender x Age	Intercept, Age, Age^2	29649.6	29934.9	285.3*	6
Property Violations	Intercept, Gender, Age	Intercept, Gender, Age, Age^2	12858.5	13302.7	444.2*	5
Status Violations	Intercept, Gender, Age Age^2	Intercept, Age, Age^2	11136.5	12002.3	865.8*	5

Note. * $p < .001$

Results

Factor Analysis

The CFA indicated that the structure of the Frick clusters fit well to the data at each time of measurement. The average GFI was 0.92 for the males and 0.96 for the females. The average proportion of variance explained in the Frick clusters (52% explained variance for males and 55% explained variance for females) was also considerable. All item loadings on the Frick clusters were significant and ranged from 0.497 to 0.907 (see Table 3.2 for loadings in 1983).

Average Developmental Trajectories of Externalizing Behaviors

Table 3.3 shows for each of the four behavior clusters the chi-square values for the fit of the tested models and for the baseline model of the multilevel model. All average developmental trajectories showed changes across age, and all final models showed a significantly better fit to the data than the baseline model, which included only an intercept at the between-subjects and the within-subject level. Later, we describe the trajectories that were estimated for aggression, opposition, property violations, and status violations, respectively, and that are depicted in Figure 3.1.
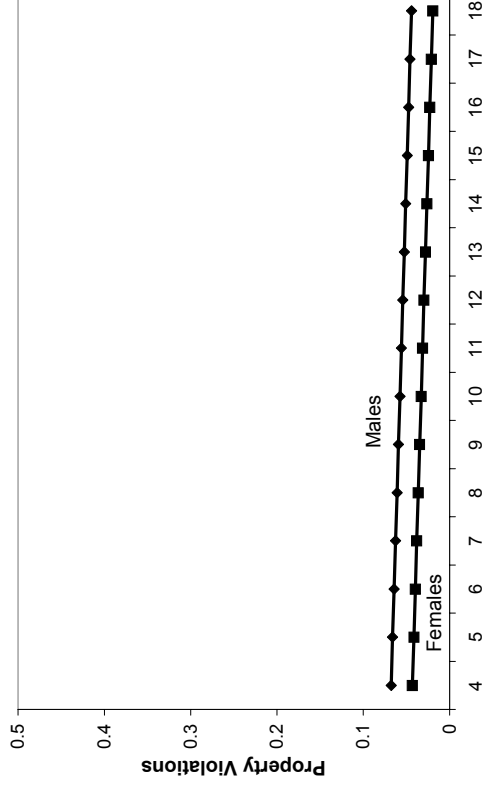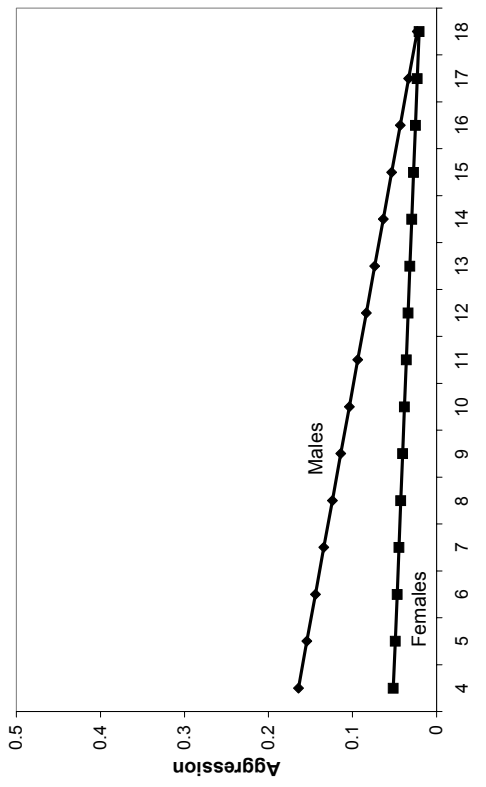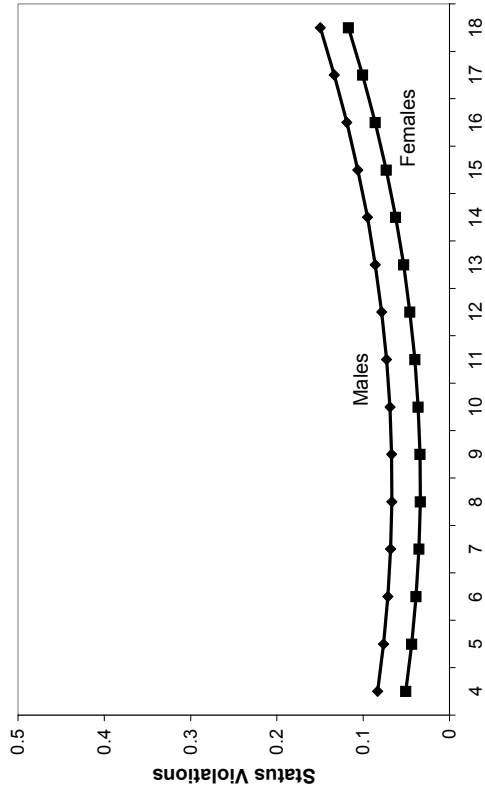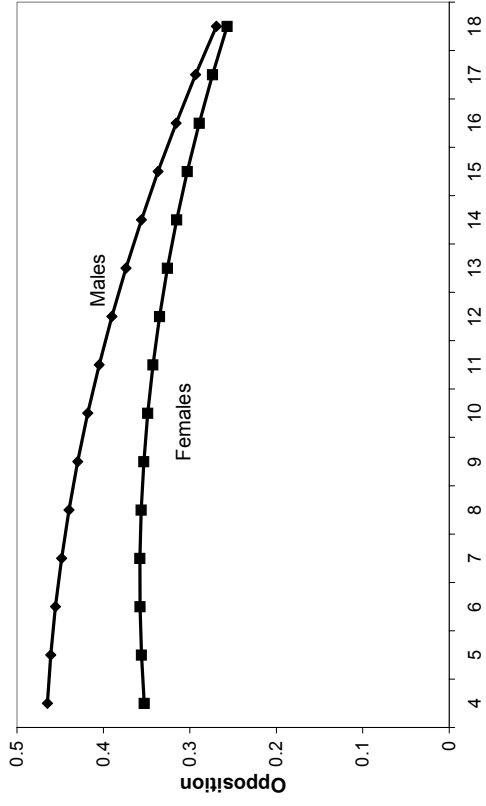
Figure 3.1 Average developmental trajectories of aggression, opposition, property violations, and status violations. Ages are shown on the x axis. The y axis represents the raw syndrome scores divided by the number of items in the scale.

The final model ($\chi2$ = 11,206.9, df = 2,068) for aggression showed a significantly better fit than the baseline model ($\chi2$ = 12,116.3, df = 2,074; $\Delta\chi2$ = 909.4, Δdf = 6, $p < .001$). The between-subjects level of aggression was dependent on intercept, gender, age, and gender x age effect. Aggression followed an average developmental trajectory that differed between males and females (gender effect), decreased linearly with increasing age (age effect), and decreased at a faster rate for males than for females (gender x age effect).

The average development of opposition also showed a decreasing trajectory that was different for males and females (gender effect) and that was significantly different from the baseline model ($\Delta\chi2$ = 285.3, Δdf = 6, $p < .001$). Males showed more oppositional behaviors than females in childhood and a larger decrease for males resulted in the same level of oppositional behaviors for males and females in adolescence (age and gender x age effect). The age^2 effect for opposition influenced the steepness of the decrease of the average trajectory over time, with a faster average decrease in adolescence than in childhood.

The final model for property violations had a significantly better fit than the baseline model ($\Delta\chi2$ = 444.2, Δdf = 5, $p < .001$). Property violations showed for both males and females the same linearly decreasing average development over age (age effect), but the level of reported property violations was higher for males than for females (gender effect).

The final model for status violations described the average developmental trajectories better than the baseline model ($\Delta\chi2$ = 865.8, Δdf = 5, $p < .001$). Status violations was the only behavioral cluster that showed an average developmental trajectory with increasing problem behaviors over time. After an initial, slight decrease of status violations during early childhood, there was a steep increase after age 9 (age and age^2 effect). The decreasing trajectory in the earliest years of the study reflects mainly swearing and using obscene language. Across the age-range of 4 to 18 years males showed at average more status violations than did females (gender effect).

A multilevel growth curve model also incorporates the individual deviations from the average developmental trajectory at the within-subject level. All within-subject models appeared to be dependent on age indicating that there were differences between individuals in the development of these behaviors over time (see Table 3.3). Therefore, the next analysis incorporated the individual differences in the development of behaviors over time and identified different groups of children following a similar developmental pathway.

Group-based Developmental Trajectories of Externalizing Behaviors

The results of the semiparametric mixed modeling approach to identify group-based developmental trajectories of externalizing behaviors are shown in Table 3.4. We present the BIC values of models for different numbers of groups using the same variation of trajectory shapes (zero slope, linear slope, quadratic slope). The model with the largest BIC value is the best model, printed in bold face. For aggression (BIC –3,551.17) the BIC suggested that there

was positive evidence (a BIC difference of 34.9 points with the 2-group solution and a BIC difference of 3.9 points with the 4-group solution) that the three-group solution with all linear trajectories was the best model. For both property violations and status violations there was

Table 3.4.
Bayesian Information Criterion of the group-based developmental trajectories

No. of groups	Aggression	Opposition	Property Violations	Status Violations
2	-3,586.08	n.t.	n.t.	-4,401.39
3	**-3,551.17**	-13,277.65	-3,901.07	-4,388.23
4	-3,555.05	-13,154.14	**-3,896.98**	**-4,384.48**
5	-3,566.10	-13,128.41	-3,906.33	-4,395.58
6		**-13,116.00**		
7		n.e.		

Note. The boldface values indicate the selected models.
n.t. = not testable; n.e. = not estimable.

positive evidence for a four-group solution. For property violations the best model had a combination of linear and zero slope trajectories, and the best model of status violations had all linear slope trajectories. In the opposition cluster we also fitted a model with six and seven groups because no single best BIC value could be demonstrated in the models with two to five groups. The seven-groups solution did not reach convergence, which leads to the conclusion that the model with six groups and a combination of zero slope and quadratic slope trajectories is the optimal model for opposition.

We tested gender differences in the group-based developmental trajectories, by adding a gender effect on the intercept and on the slope of all four best models. The effects of gender on the intercept were comparable to the effects of gender on the average developmental trajectories, with males showing higher levels of problem behavior than females. However, the shapes of the trajectories were similar across males and females. In only 4 of 17 cases we found gender differences in the slope of the trajectories. Given these minimal differences, we present the same models across gender.

As depicted in Figure 3.2, all trajectories in the optimal solutions for aggression showed a linear decrease, and for status violations a linear increase over time. The optimal solutions for both opposition and property violations showed a combination of stable and linear decreasing or increasing trajectories. The proportions of children and adolescents in each trajectory group are reported in Table 3.5.

All three identified trajectories for aggression (first panel of Figure 3.2) showed decreasing levels of reported physically aggressive behaviors, indicating that the developmental trajectories were dependent on intercept and age. The largest number of children, an estimated 71% of the sample, is represented in the *near zero* group for whom
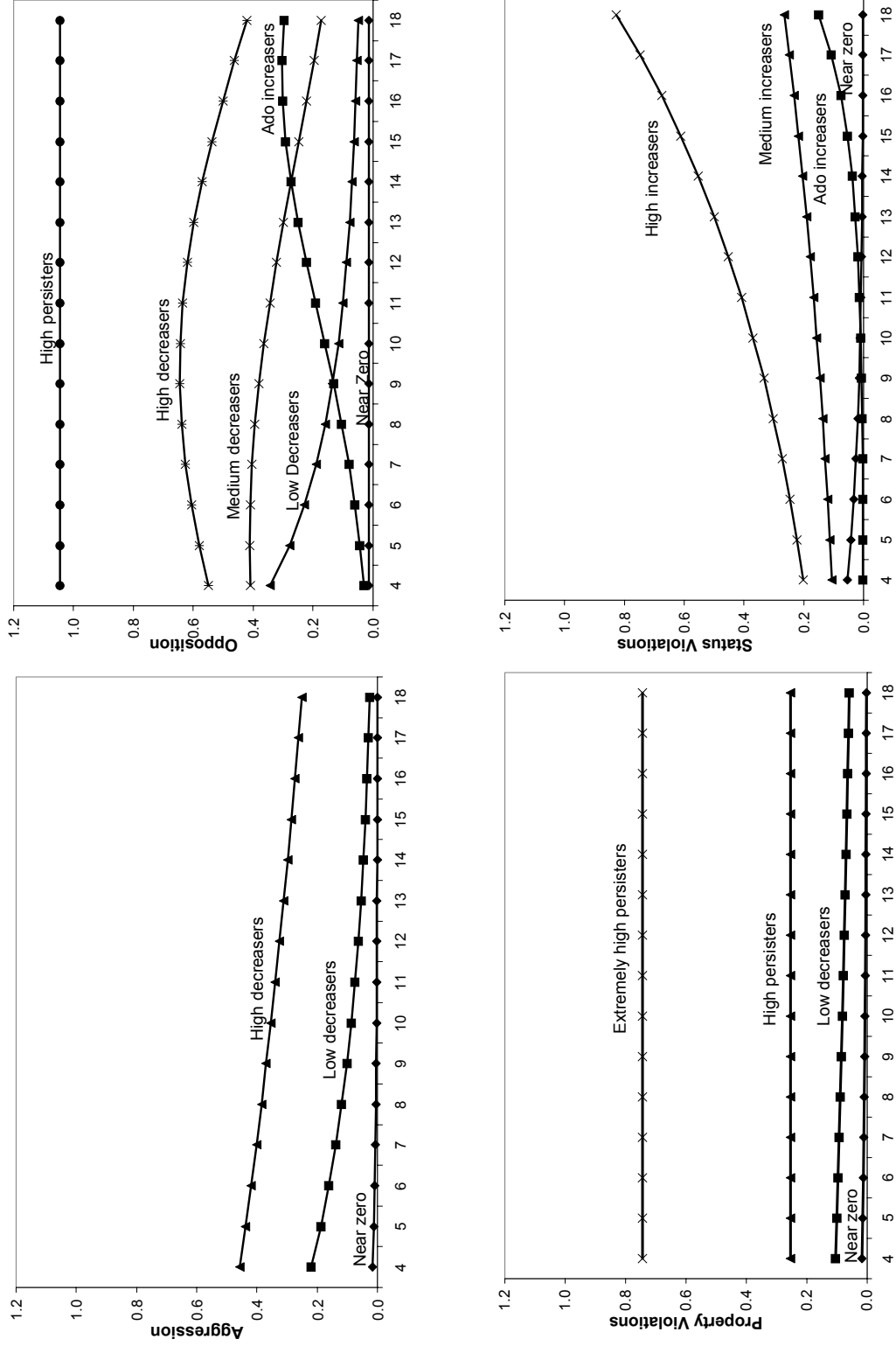
Figure 3.2. Group-based developmental trajectories of aggression, opposition, property violations, and status violations. Ages are shown on the x axis. The y axis represents the raw syndrome scores divided by the number of items in the scale.

hardly any aggressive behavior is reported across the age period. The *low decreasers* group (21%) included children who engage in medium-level aggressive behaviors during childhood and almost none in late adolescence. The smallest and most problematic *high decreasers* group (8%) is described by a declining but high level trajectory of aggressive behavior, indicating persistent aggressive behavior even in late adolescence.

The second panel of Figure 3.2 presents the developmental trajectories for opposition. Two groups showed nearly no oppositional behavior in adolescence and were designated the *near zero* and *low decreasers* group, including approximately 7% and 24% of the sample, respectively. The reverse pathway was shown by the *adolescence increasers* (6%) who showed very little opposition during childhood but increasing levels during adolescence. Two other groups, the *medium decreasers* (33%) and the *high decreasers* (24%), also showed a decreasing trajectory from childhood to adolescence. The problematic opposition group, the *high persisters* (7%) showed nearly twice as much oppositional behavior throughout the measurement period as the next highest, the *high decreasers* group. The *near zero* group and the *high persisters* group both followed stable trajectories and thus are only dependent on the intercept. All other trajectories within opposition were dependent on intercept and age.

The third panel of Figure 3.2 shows the four developmental trajectories found for property violations. There was a large *near zero* group (75%) of males and females who showed nearly no property violations throughout the measurement period. The *low decreasers* (20%) showed declining property violations on a low level. The *near zero* group and the *low decreasers* group within property violations were both dependent on intercept and age. The two highest groups, the *high persisters* (5%) and the *extremely high persisters* (0.3%) both showed persistent property violations on a high level, and were thus dependent on intercept only, the 6 males and females in the *extremely high persisters* group being very deviant from all other individuals. Because the *extremely high persisters* group included less then 1% we combined these two groups into one *high persisters* (5.2%) group for further analyses.

The last panel of Figure 3.2 depicts the four developmental trajectories found for status violations, which were all dependent on intercept and age. The *near zero* offenders were the largest group (51%) showing little status violations in childhood and none during adolescence. The other half of the sample showed increasing status violations over time, but at different levels. The *adolescence increasers* (28%) started status violations by age 10, whereas they showed none before that age. The *medium increasers* (25%) showed an increasing amount of status violations throughout the measurement period. A small group, the *high increasers* (1%), showed highly deviant levels of status violations in adolescence.

To test our hypotheses on gender distribution across the group-based developmental trajectories, we computed odds ratios for each trajectory group using females and the near zero trajectory within each behavior cluster as reference group. The proportions of the total sample, males and females across the developmental trajectories and the odds ratios for the

Table 3.5.
Proportion of the total sample, males, and females in each developmental trajectory (in percentages)
and odds ratios for gender and behavior clusters

Developmental trajectories	Total sample (N=2,076)	Males (N=1,016)	Females (N=1,060)	Odds Ratio
Aggression				
Near zero	71.0	60.4	81.0	-
Low decreasers	21.4	28.5	14.5	2.6 [2.1-3.3]
High decreasers	7.7	11.0	4.4	3.3 [2.3-4.8]
Opposition				
Near zero	7.1	6.4	7.8	-
Low decreasers	23.7	21.6	25.7	ns
Adolescence increasers	6.0	5.1	6.9	ns
Medium decreasers	32.5	33.4	31.6	ns
High decreasers	24.2	26.5	22.1	1.5 [1.0-2.1]
High persisters	6.5	7.1	5.9	ns
Property Violations				
Near zero	74.6	69.2	79.7	-
Low decreasers	20.3	23.3	17.4	1.5 [1.2-1.9]
High persisters	5.2	7.5	3.1	2.9 [1.9-4.5]
Status Violations				
Near zero	50.7	45.3	55.8	-
Adolescence increasers	23.4	22.3	24.3	ns
Medium increasers	24.8	30.6	19.2	2.0 [1.6-2.4]
High increasers	1.2	1.8	0.7	3.3 [1.4-8.0]

Note. Odds Ratios [95% confidence interval] are given as significant ($p < .05$). Females and the near zero trajectory within each behavior cluster are the reference category for each reported odds ratio.

effect of gender are shown in Table 3.5. This table shows that males were overrepresented in the problematic developmental trajectories of aggression, property violations, and status violations while females were overrepresented in the low developmental trajectories. The problematic trajectories were between 2.9 and 3.3 times more common among males than among females except for opposition. For opposition, the gender difference was less obvious than for the other behavior clusters, with only an overrepresentation of males among the *high decreasers*.

In the total sample 175 males and 100 females were assigned to one or more problematic trajectories (i.e., a trajectory of continuously high scores comprising the smallest proportion of individuals within each cluster). Of these 64% were assigned to only one problematic trajectory, 22% to two problematic trajectories, 11% to three problematic trajectories, and 4% to four problematic trajectories. Although more males than females were classified as having a problematic trajectory for aggression, property violations and status violations (see Table 3.5), the distribution of individuals assigned to one, two, three, or four problematic trajectories was the same across gender, $\chi2(3) = 3.7$, $p = .297$.

Discussion

The objectives of this study were to test the applicability of the Frick clustering of externalizing behavior to children and adolescents from a broad age-range and to describe the average and group-based developmental trajectories of four externalizing behaviors: aggression, opposition, property violations, and status violations. The study was conducted in a large longitudinal representative general population sample including multiple birthcohorts of males and females aged 4 to 18 years using assessments of externalizing behaviors by mainly the mothers of the participants, in contrast to studies that used at risk samples (e.g., Loeber et al., 2000), measured males and females seperately (e.g., Broidy et al., 2003), or addressed only childhood (e.g., Côté et al., 2001). The results from this study should be interpreted in light of the fact that only parent reports were used in the analyses.

First, we investigated whether the Frick clustering represents an acceptable description of externalizing behavior. The results confirmed its conceptual strength for both males and females and across a wide age-range. The use of longitudinal data in this study not only allowed us to show the good validity of the Frick clusters, but also to show that these clusters follow different average and group-based developmental trajectories over time, supporting their distinctness. The main asset of this clustering lays in the further differentiation of externalizing problems, avoiding the lumping of behaviors that potentially show different developmental changes.

Using multilevel growth curve analyses we demonstrated that the average development is different for these four types of externalizing behavior with higher levels for males than for females. We found decreasing average developmental trajectories for aggression, opposition, and property violations, and increasing trajectories for status violations.

Contrary to our expectation, that aggression would peak at age 13 (c.f., Lahey et al., 2000), we found that physically aggressive behavior was most prevalent in younger children. Aggression showed a decreasing trajectory over time, with nearly twice as much aggressive behavior reported for males than for females in childhood, but hardly a difference in late adolescence (c.f., Crick & Dodge, 1996; Keenan & Shaw, 1997). This study also demonstrated that the difference in aggressive behavior between girls and boys is very likely to have risen even before age 4, which runs counter to the assumption of no difference before elementary school (Keenan & Shaw, 1997). Our results also suggest that physically aggressive behaviors in childhood and adolescence tend to be transitory and, for most individuals, largely resolved by the beginning of adulthood.

Similarly, and confirming our expectations, we found decreasing average developmental trajectories for opposition. In childhood, males showed more oppositional behavior than females, but this gender difference evaporated in adolescence. Lahey et al.

(2000) did not detect gender differences in oppositional behavior, but assumed that this was caused by a lack of statistical power, which was no problem in the present study.

Contrary to our expectation, we found a decreasing trajectory for property violations with higher levels for males than for females. Although this average decrease may be real, it is possible that parents are well aware of their child's minor rule breaking behavior, such as lying, but less aware of more serious forms, such as stealing and vandalism, especially as their child enters adolescence.

As expected, we found an increasing average developmental trajectory for status violations, with males showing higher levels than females. This pattern is similar to the one found by Lahey et al. (2000) in a cross-sectional design. However, we did not expect that all children follow the average trajectories we found for the externalizing behaviors. Numerous studies already indicated that there are children and adolescents who follow different developmental patterns, for instance, the two developmental patterns that are proposed by Moffitt (1993). Therefore, we also identified group-based developmental trajectories.

Within each behavior cluster there were three to six different group-based developmental pathways, most of which followed the shape of the average trajectories at various levels. Within each behavior cluster, a large group of individuals was identified who followed a developmental trajectory at a low level, indicating that most individuals exhibit very little externalizing problem behavior as reported by the parents. All trajectories for the aggression cluster decreased with age. Half of the trajectories for opposition and property violations decreased with age as well, as did one for status violations. We found two stable trajectories for property violations and two for opposition. Three of the four trajectories for status violations and one for opposition increased with age. Although the shape of the trajectories did not differ for males and females across the age period more males than females followed high level trajectories of aggression, property violations and status violations. By contrast, for opposition we only found a gender difference for the *high decreasers* trajectory that included somewhat more males.

As expected, we found declining trajectories for aggression, indicating that both males and females show most aggressive behavior in childhood which is congruent with many other studies (e.g., Broidy et al., 2003; Campbell, 1995; Tremblay, 2000). For most children, aggressive behaviors disappear in adolescence as shown by near-zero amount of aggressive behavior in adolescence for the *low decreasers,* confirming findings from a study by Brame et al. (2001). The children who deviated most from average development, the *high decreasers* group, showed serious aggressive behavior throughout the measurement period; moreover the level of aggressive behaviors at age 18 was higher than the level of the *low decreasers* group at age 4.

Unexpectedly, not all trajectories for opposition decreased with age. The lowest and the highest trajectories showed a stable course, and we found one small group (6%) with

increasing opposition in adolescence. These youngsters seem to follow trajectories comparable with the adolescence onset or escalating ones described in other studies (e.g., Moffitt, 1993; Patterson & Yoerger, 1993; Gorman-Smith, Tolan, Loeber, & Henry, 1998). Because the largest trajectory group for opposition is not the group of children who show no oppositional behavior at all, we can assume that it is normative for parents to observe some oppositional behavior during both childhood and adolescence. Other studies reported similar findings for males (Nagin & Tremblay, 1999, 2001a). This is the first study to confirm this phenomenon for females.

Contrary to our expectations of an increase of property violations during adolescence (c.f., Moffitt, 1993), we found stable or decreasing trajectories with an early onset. Several studies (e.g., Loeber et al., 1993; Moffitt et al., 2002; Nagin & Tremblay, 2001a; Tremblay, 2000) showed that property violations reported by other informants than parents increase with age, especially in the most problematic group. Our findings should be interpreted in the light of the fact that only parent reports were used, potentially missing behaviors that may be better reported by, for instance, youngsters themselves or peers.

As expected, we found increasing trajectories of status violations for about half of the participants. Earlier studies indicated that alcohol and drug use and truancy tend to start in early adolescence (Tremblay, 2000). However, our results show that an increase in status violations is not as normative as sometimes suggested (e.g., Moffitt, 1993), considering that the other half showed decreasing trajectories.

Of those whose development followed a problematic trajectory, 64% were deviant on only one of the behavioral clusters. The other 36% (or 99 individuals in the present sample) were likely to follow two, three or even four problematic trajectories. It might well be that, for example, the *high persisters* within opposition were also the *high increasers* within status violations, lending support to Loeber's (Loeber et al., 1993) and Tremblay's (2000) perspectives on the development of delinquent careers. The analyses reported in this article may be used as a starting point to identify classes of developmental trajectories that may converge with these perspectives.

Gender Differences

The present study indicated that the shape of the developmental trajectories hardly differs between males and females. Several studies found comparable results for childhood and adolescence onset antisocial behavior (Fergusson & Horwood, 2002; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996), suggesting that despite differences in overall levels of externalizing behavior, the developmental pathways are the same for males and females, at least in the Netherlands and New Zealand. Apparently, females showing deviant levels of externalizing behavior follow developmental pathways similar to deviant males.

Despite the lack of differences in the group-based developmental curves for males and

females there are gender differences in mean numbers of reported problem behaviors. Studies indicated that males are more prone to receive a CD diagnosis than females in a ratio of 4:1, although the gender difference in frequency of ODD diagnosis is not that obvious (McDermott, 1996). Similarly, in the present study the chance of following high-level trajectories was higher for males than for females, especially for CD-like behavioral clusters (aggression, property violations, and status violations). Research also suggested that the most obvious gender difference can be found for physically aggressive behaviors (e.g., Crick et al., 1999). In the present study, all CD-like behavioral clusters showed nearly the same gender difference (Table 3.5). This indicates that the gender difference in CD is probably not caused by a single behavioral cluster, but by all relevant behaviors together.

Theoretical Implications

This study has possible implications for Moffitt's theory of the development of antisocial behavior (Moffitt, 1993; Moffitt et al., 1996). Similar to other studies (e.g., Fergusson & Horwood, 2002; Lacrouse et al., 2002; Brame et al., 2001; Nagin & Tremblay, 1999) we could not identify the so-called adolescence-limited group. The limited number of individuals who showed increasing trajectories of opposition and status violations did not reach the level of the identified problematic trajectory (that showing the highest level of problem behavior throughout).

In addition, our study results seem to contrast with some of the assumptions forwarded in the theory of antisocial development proposed by Loeber et al. (1993). According to Loeber's model of antisocial development, high levels of opposition in childhood would be expected to be followed by increasing levels of aggression, property violations, and status violations later on. Although we did not model sequential patterns of behaviors, the identification of early childhood high levels of aggression and property violations in the present study does not fit Loeber's perspective of behavioral sequences.

Several reviews of the development of externalizing behaviors suggest that behaviors related to the diagnosis ODD become less common after the transition from childhood to adolescence (e.g., Campbell, 1995), whereas studies suggest behaviors related to the diagnosis CD increase (especially covert behaviors; e.g., Tremblay, 2000). Although oppositional behavior indeed showed a slight developmental decrease, behaviors represented by the opposition cluster remained more common then those represented by the aggression, property violations and status violations clusters (these three clusters combined reflecting behaviors tapped by the diagnosis CD). In this sample, opposition also remained more common in adolescence than covert externalizing behaviors, represented by the clusters property violations and status violations. Again, it is possible that parents were unaware of their children's covert antisocial activities.

Study Limitations and Further Research

The present study is not without limitations. A main limitation is that the study population was a random sample of mainly Caucasian children and adolescents living in The Netherlands. It is uncertain to what extent cultural differences may be responsible for differences in the course of problem behavior. Crijnen, Achenbach and Verhulst (1997) compared CBCL scores for 12 different cultures and concluded that cultural effects on average levels of parent-reported problem behavior were minimal. However, this conclusion may not translate to the developmental course of problem behavior. Another limitation of this study is the reliance on only parental reports to assess psychopathology. Parents may be unaware of their child's rule breaking behavior and offenses, especially as their child becomes adolescent (Moffitt et al., 1996). Therefore, replications are essential to assess the generalizability of the present findings to other informants such as teachers and youths themselves.

Because of the use of the CBCL, we could not describe externalizing behavior that is more relevant for females, such as relational aggression. However, our results indicate that the externalizing behavior that is assumed to be more often exhibited by males also has considerable levels in subgroups of females. It might well be that gender differences would had been absent or reversed, had relational aggression been included in this study.

Although the study results were obtained from a fairly large sample of about 2,000 children and adolescents, some of the identified trajectory groups were very small. However, the descriptive value of the study is not affected by the finding of small groups, which may be regarded to represent validly the distribution of longitudinal trajectories in the population. Also the longitudinal trajectories that are described cover an age-range from 4 to 18 years, while the maximum age-range covered by any participant was only 8 years.

This study's results also suggest a number of potential directions for future research. First, the cross-setting generalizability of the trajectories found in this study needs to be investigated. Teachers and youth themselves may have a view of children's problem behaviors that is different from parents' views, because of both situational and informant factors. In addition, it is important to identify cross-situational replicable trajectories because children who show cross-situational behavior problems often have more severe and stable behavioral difficulties than do children who show problems in one setting only.

Second, in further research the predictive power of the present method of creating subgroups of individuals based on a statistical criterion instead of arbitrary cutoff points for being deviant versus nondeviant could be tested. Using the developmental trajectories instead of cutoff points can give new impulse to the research of the predictive relations between child and adolescent externalizing behavior and psychopathology or other outcomes. For instance, it is interesting whether children who develop a problematic developmental trajectory have an increased risk for developing psychiatric disorders. In addition, the presence of trajectory

classes might be addressed (e.g., through latent class analysis) to get a view of the co-occurrence of high-level externalizing trajectories. These classes can indicate whether there are clusters of high level externalizing behavior that have a stronger predictive relation with psychopathology than other clusters of externalizing behaviors.

Third, it is highly important to learn more about potential causes of and causal mechanisms affecting the developmental trajectories identified in this study. We showed that children with externalizing problems are most likely to be adolescents with problem behaviors. The long-term consequences of externalizing problem behavior in childhood and adolescence support the importance of early intervention and prevention. Revealing mechanisms that account for the persistence of externalizing problems from childhood to adolescence contributes to the development of effective interventions and preventions. New studies may profit from the approach taken in this study to find trajectories in the development of psychopathology.

Predicting Psychopathology in Young Adults from Child/Adolescent Pathways of Externalizing Behavior

Ilja L. Bongers, Hans M. Koot, Jan van der Ende, Frank C. Verhulst

Chapter 4
Predicting Psychopathology in Young Adults from Child/Adolescent Pathways of Externalizing Behavior

Abstract

This study investigated the predictive association between developmental trajectories of child/adolescent externalizing behaviors and psychiatric disorders. Developmental trajectories of parent reported aggression, opposition, property violations, and status violations were defined in a longitudinal multiple birthcohort study of 2,076 males and females aged 4-18 years. At young adulthood, lifetime psychiatric diagnoses were obtained by a standardized DSM-IV interview. Cox proportional hazards models were used to test the likelihood of developing psychiatric disorders within each developmental trajectory. Individuals with deviant, i.e., persistently high developmental trajectories of parent-reported externalizing behaviors showed the most increased risk to report psychiatric disorders. Individuals with deviant status violations predicted oppositional defiant disorder, antisocial personality disorder, and substance abuse disorder, while individuals with a deviant opposition trajectory were more likely to report mood disorder and individuals with a deviant property violations trajectory were at risk for developing anxiety disorder. A cross-time link between trajectories of aggression and psychiatric disorders was only found when aggression was associated with one or more other deviant externalizing trajectories. The study indicates that developmental trajectories of distinguishable types of problem behaviors are related to different psychiatric disorders and that this pattern varies for males and females.

Introduction

Externalizing behaviors like opposition and conduct problems are among the most vexing problems of childhood and adolescence. Externalizing behaviors of various types are both concurrently and prospectively related to psychopathology and impaired functioning in many domains (Rutter, Giller, & Hagell, 1998), and tend to go together with both disruptive problems like ADHD as well as with internalizing problems (Zoccolillo, Pickles, Quinton, & Rutter, 1992). Several studies indicated that children and adolescents with conduct problems are at risk for various types of psychopathology in adulthood (Bardone, Moffitt, Caspi, Dickson, & Silva, 1996; Farrington, 1999; Fergusson, Lynskey, & Horwood, 1996; Hofstra, Van der Ende, & Verhulst, 2002; Keenan, Loeber, & Green, 1999; Moffitt, Caspi, Harrington, & Milne, 2002; Zoccolillo, 1993).

Little is known on why some children showing externalizing behaviors develop psychiatric disorders when they reach young adulthood, while others do not. This is mainly due to a lack of truly developmental data. Most prospective studies on this issue were limited due to analyzing the association between the presence of externalizing psychopathology at

one point in time and psychopathological outcomes assessed at one later point in time (e.g., Hofstra, Van der Ende, & Verhulst, 2001). Longitudinal prediction is better suited by developmental studies that are able to detect both persistence and change by using multiple data points. In addition, most studies did not differentiate between different types of child/adolescent externalizing behaviors, while it may be important to distinguish between different types which, for example, have different ages of onset. Finally, to test developmental theories of psychopathology, it is crucial to identify different developmental patterns of persistence and change.

The present paper reports on child and adolescent developmental trajectories of externalizing behaviors predicting the onset of psychopathology into young adulthood in a 14-year multiple birthcohort longitudinal study of males and females from the Dutch general population. We addressed the predictive value of child and adolescent trajectories of four types of externalizing behaviors regarding psychopathological outcome. Trajectories of aggression, opposition, property violations, and status violations (c.f., Frick et al., 1993), were related to disruptive disorders (Oppositional Defiant Disorder (ODD), Antisocial Personality Disorder (ASPD), and Attention Deficit Hyperactivity Disorder (ADHD)), substance use disorder (SUD), mood disorder, and anxiety disorder. This enabled us to study the predictive link between externalizing behaviors and the development of different types of psychopathology into young adulthood and the dependence of this link on the type, severity, and developmental course of the externalizing behaviors.

The most obvious ground for the association between child/adolescent problem behavior and young adult psychopathology lays in developmental continuity of early problems. Several studies (Loeber et al., 1993; Moffitt, 1993; Patterson & Yoerger, 1993) distinguished between groups of individuals following different patterns, that were named life-course persisters, adolescence-limited, recoveries, and abstainers (Moffitt, Dickson, Silva, & Stanton, 1996). Earlier studies indicated that children with an early onset and persistent high levels of externalizing behavior are more severely afflicted with psychopathological symptoms in young adulthood than children with later onset or lower levels of externalizing behaviors (e.g., Fergusson et al., 1996; Moffitt, 2002; Patterson & Yoerger, 1997; Loeber et al., 1993). Several authors (e.g., Moffitt, 1993; Patterson & Yoerger, 1993) theorized that individuals who follow a life-course persistent pattern of externalizing behaviors are more at risk for mental health problems than the three other groups due to inherent defects. It was suggested that the risk emerges from inherited or acquired neuropsychological variation, resulting in malfunctioning in multiple life domains and social interactions. Over time the interaction between individual and environment gradually constructs psychopathologic disorders that, according to the theory persist into midlife. Therefore, at the most general level we expected that the so-called life-course persisters, i.e., individuals with early onset,

persistently high levels of externalizing behaviors during both childhood and adolescence would be most at risk for developing young adult psychopathology.

In contrast, the theory suggests that for the so-called adolescence-limited group it is normative to copy some of the negative behaviors from the life-course persisters (Moffitt, 1993), and that they have a healthy development before adolescence that enables them to desist from deviant behaviors in late adolescence or adulthood. This recovery may be delayed for those who experience so-called snares, such as a criminal record or an addiction (Moffitt et al., 2002). Such snares can compromise the ability to make a successful transition to adulthood, impair mental health, and lead to social disadvantage. Therefore, the theory expects that most individuals with problem behavior that is limited to adolescence be at lower risk for developing psychopathology than persisters, but still more than recoveries or abstainers.

Apart from the persisters and the adolescence-limited group, Moffitt's study on the Dunedin sample suggested the existence of two other groups, the recoveries and the abstainers. The recoveries, which were also found in a Canadian study (Nagin, Farrington, & Moffitt, 1995), show only high levels of externalizing behaviors in childhood. The study by Moffitt et al. (2002) indicated that several so-called recoveries suffered from internalizing forms of psychopathology in adulthood, suggesting that complete recovery from high levels of childhood externalizing behaviors is not the rule. They also suggest that males in the abstainer group, those who abstain form all antisocial behaviors in childhood and adolescence, may be peculiar because some experimentation with societal rules may be normative and indicate a healthy development. This group might be at risk for developing psychopathology because these adolescents may be excluded from social relationships in adolescence due to their personal characteristics. Nonetheless, most of these individuals develop in well functioning adults with virtually no diagnosable disorders according to Moffitt et al. (2002).

Little work has been done on the types of psychopathological outcomes that may rise from externalizing behaviors. The prospective relation between child/adolescent externalizing behaviors and young adult psychopathology may both be homotypic and heterotypic. Evidence of homotypic continuity, i.e., externalizing behaviors predicting externalizing psychopathology is abundant. For example, Zoccolillo et al. (1992) found that two-fifth of children with conduct disorder went on to show a DSM-III antisocial personality disorder at age 26. There is also some evidence of heterotypic continuity of child and adolescent externalizing behaviors, i.e., the development of antisocial behavior into phenotypically different types of psychopathology. First, there is strong evidence that emotional disorders, and especially depression occur much more often than expected in children and adolescents with deviant externalizing behaviors (Bardone et al., 1996; Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). Second, it seems that the more severe the antisocial behavior was, the greater

the likelihood of the development of a nonantisocial disorder would be (Robins & Price, 1991). An earlier longitudinal study indicated that 22% of the children with multiple antisocial problems had a mood disorder versus only 6% of children without multiple antisocial problems (Fergusson, Horwood, & Lynskey, 1994).

It is obvious that child/adolescent externalizing behaviors are predictive of a variety of psychopathological outcomes. However, little work has been done to distinguish between outcomes of different types of externalizing behaviors such as aggressive and nonaggressive subtypes. Studies that did investigate these links found, for instance, that aggressive child behaviors were related to later substance abuse or dependence (Offord & Bennett, 1996), conduct disorder (Loeber, Green, Lahey, & Kalb, 2000), and anxiety and mood disorders (Zoccolillo, 1992). Deviant oppositional behavior appeared to be associated with later conduct disorder (Loeber, Green, Lahey, & Kalb, 2000), substance abuse or dependence (Loeber, Burke, Lahey, Winters, & Zera, 2000), and mood disorder (Angold & Costello, 1996). Child/adolescent status violations, which incorporate alcohol abuse, were found to be related to adult substance abuse but probably not to depression, while other conduct problems (aggression and property violations) were related to mood disorders and substance abuse or dependence (Duncan, Alpert, Duncan, & Hops, 1997). However, we are not aware of studies that simultaneously addressed the links between the developmental trajectories of different types of externalizing behaviors and a broad range of psychopathology with an onset in adolescence or young adulthood. In the present study we will investigate specific links between the four different types of child and adolescent externalizing behaviors and the development of ODD, ADHD, ASPD, SUD, mood disorder, and anxiety disorders from childhood into young adulthood.

This study intended to answer three research questions. First, we investigated the dependency of the predictive link between child and adolescent of externalizing behaviors and young adult DSM disorders on the course and level of these behaviors. We hypothesized that the risk would be highest for individuals in the persisters group, and would diminish successively for the adolescence-limited, the recoveries, and abstainers group. Second, we addressed the dependency of the predictive link between the different developmental trajectories and DSM disorders on the type of externalizing behavior. We hypothesized that high level trajectories of child/adolescent externalizing behaviors would be associated with both homotypic and heterotypic types of psychopathology. Since internalizing psychopathology from adolescence onwards is much more prevalent in females than in males (Allgood-Merten, Lewinsohn, & Hops, 1990; Bongers, Koot, Van der Ende, & Verhulst, 2003), we may expect that homotypic relations are more typical for males, and that heterotypic relations are more typical for females. In addition we expected aggressive behavior to be associated with all types of psychopathology (Loeber, Green, Lahey, & Kalb, 2000; Offord & Bennett, 1996; Zoccolillo, 1992), oppositional behavior and property

violations more specifically with substance use and mood disorders (Angold & Costello, 1996; Loeber, Burke et al., 2000; Loeber, Green, Lahey, & Kalb, 2000), and status violations only with SUDs (Duncan et al., 1997).

Few studies have tested the prospective association between child/adolescent externalizing behaviors and young adult psychopathology, and most that did, included only males (Moffitt et al., 2002; Vitaro, Tremblay, Kerr, & Bukowski, 1997). Having equal numbers of males and females in the study allowed us to test the hypothesis that developmental outcomes of externalizing trajectories would reflect more homotypic continuity of psychopathology for males and more heterotypic continuity for females.

Method

Sample

Parent respondents were interviewed at two-year intervals from 1983 until 1991 (Time 1-5), and young adults themselves in 1997 (Time 6) in a six-wave longitudinal study of behavioral/emotional problems. The original sample of 2,600 children in 13 birthcohorts aged 4 to 16 years, was drawn from the Dutch province of Zuid-Holland, using municipal registers that list all residents. A random sample was drawn of 100 children of each gender and age with the Dutch nationality. Two small municipalities out of a total of 86 refused to cooperate and 75 children were untraceable. Of the 2,447 parents who could be reached, 2,076 responded and provided usable CBCL data (84.8%) (for details on the initial data collection, see Verhulst, Akkerhuis and Althaus (1985)). The sample at Time 1 included 1,016 boys and 1,060 girls (see Table 4.1).

All subjects who participated at Time 1 were approached again at Time 6. Of all subjects in the original sample who could be reached, 1,580 provided complete information. This comprised 77.5% of the Time 1 sample (response rate corrected for deceased subjects, mentally retarded individuals, and subjects who had emigrated). For details on the Time 6 data collection see Hofstra, Van der Ende, and Verhulst (2000).

To investigate selective attrition, we compared dropouts and remainders with respect to their Time 1 CBCL total problem scores and the broadband scale internalizing and externalizing scores using ANOVA and correcting for Time 1 age and gender. The participants who could be interviewed at Time 6 did not significantly differ from the ones who could not be interviewed at Time 6 on the CBCL total problem score and the two broadband CBCL scales at Time 1.

Table 4.1.
Number of waves per subject

Cohort	Age-range in the study	Maximum number of waves per cohort	Numbers of waves within Time 1 to Time 5										Time 6	
			1		2		3		4		5			
			M	F	M	F	M	F	M	F	M	F	M	F
1	4-18	6	5	1	2	5	5	9	7	13	62	56	63	67
2	5-19	6	2	6	5	4	4	8	12	14	55	58	62	79
3	6-20	6	6	3	4	7	5	3	5	7	58	63	55	69
4	7-21	6	2	2	6	8	8	5	5	10	57	60	55	72
5	8-22	6	7	9	7	5	7	5	11	11	57	53	65	65
6	9-23	6	5	1	9	4	4	3	14	7	49	63	58	60
7	10-24	6	10	5	2	6	5	10	14	9	47	53	62	68
8	11-25	5	7	6	4	7	12	10	55	60			52	66
9	12-26	4	10	10	16	8	51	58					49	54
10	13-27	4	21	16	19	18	38	49					54	67
11	14-28	4	17	24	18	18	35	40					51	72
12	15-29	2	74	70									47	53
13	16-30	2	76	80									59	57

Note. M=males, F=females

Measurements

Trajectories of externalizing behaviors At Time 1 to Time 5 the Child Behavior Checklist (CBCL; Achenbach, 1991) was used to obtain standardized parent reports of children's problem behaviors. The CBCL is a questionnaire to be completed by parents of 4- to 18- year olds and contains 120 items covering behavioral or emotional problems that occurred during the past 6 months. The response format is 0=not true, 1=somewhat or sometimes true, and 2=very true or often true. Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst, Van der Ende, & Koot, 1996).

The items of the CBCL were used to create four distinct clusters of externalizing behavior, which were first specified by Frick et al. (1993). These clusters are Aggression (attacks, mean, fights, threatens), Opposition (temper, disobedient at home, disobedient at school, teases, argues, stubborn, sulks), Property Violations (cruel to animals, steals from home and outside home, vandalism, sets fires, lies), and Status Violations (runs away, truancy, alcohol and drugs use, swears) (Frick et al., 1993). The four behavior clusters were created with items of the CBCL whose content showed a good match to the description provided by the author of the scale (Bongers, Koot, Van der Ende, & Verhulst, 2004). The 2-week test-retest reliabilities (N=91) of the clusters are comparable with the reliabilities found for the original CBCL scales, i.e., Aggression r = 0.75, Opposition r = 0.75, Property Violations r = 0.83, and Status Violations r = 0.62 (all p < 0.01).

Group-based developmental trajectories were created for these four clusters (Bongers et al., 2004). We were able to identify at least three specific subgroups of individuals within each problem type who followed different developmental trajectories during childhood and

adolescence (see Figure 3.2). The aggression trajectory included three distinct subgroups: a *near zero* group (71%), for whom hardly any aggressive behavior was reported across this age period; a *low decreasers* group (21%) consisting of children who engaged in medium level aggressive behaviors during childhood and almost none in late adolescence; and a small but most problematic *high decreasers* group (8%) that is described by a declining but high level trajectory, indicating persistent aggressive behavior even at late adolescence. Within the oppositional behavior cluster six different developmental trajectories were identified. These included a *near zero* group (7%), for whom no oppositional behavior was reported; the *low decreasers* group (24%) consisting of children who only showed oppositional behavior in childhood; the *adolescence increasers* (6%), who showed very little opposition during childhood but increasing levels during adolescence; the *medium decreasers* (33%) and the *high decreasers* (24%), who both showed a decreasing trajectory from childhood to adolescence on a medium level and high level, respectively; and finally a small group of children who show high levels of oppositional behavior throughout the measurement period, the *high persisters* group (7%).

For the behavior cluster property violations we found three different developmental trajectories. The *near zero* group (75%) of males and females who show nearly no property violations throughout the measurement period; the *low decreasers* group (20%), that shows declining property violations on a low level; and the highest group, the *high persisters* (5%), that shows persistent property violations on a high level.

Finally, for status violations four different groups were found who show mainly increasing developmental trajectories. The *near zero* offenders (51%) showing little status violations in childhood and none during adolescence; the *adolescence increasers* (28%), who start showing status violations by age 10, after showing none up to middle childhood; the *medium increasers* (25%), who show an increasing amount of status violations; and finally the *high increasers* (1%), who show highly deviant levels of status violations in childhood and in adolescence.

Table 4.2.
Percentage of subjects with self-reported psychopathology.

	Total (N=1,580)	Males (N=732)	Females (N=848)
Oppositional Defiant Disorder	8.2	7.7	8.6
Attention Deficit Hyperactivity Disorder	3.0	4.0	2.2
Antisocial Personality Disorder	3.9	7.4	0.9
Any substance use disorder	14.4	23.0	7.1
Any mood disorder	14.7	6.7	21.6
Any anxiety disorder	12.9	6.3	18.6

Note. All distributions are significantly different for males and females at p<.001 except for Oppositional Defiant Disorder (p=0.49) and Attention Deficit Hyperactivity Disorders (p=0.05).

For each individual in the sample the model produces parameters (the posterior probabilities of group membership) that indicate the likelihood of each individual's membership of each of the trajectory groups. Using these parameters each child is designated to the trajectory within each cluster that best describes its individual developmental trajectory. Therefore, children can at the same time be classified in, for example, a high level trajectory for aggression and a low level trajectory for opposition. The child's classifications in each of the four different clusters were used in the further analyses.

Young adult psychopathology Psychopathology at young adult age was assessed using the computerized version of the Composite International Diagnostic Interview (CIDI; World Health Organization, 1992), and three sections of the Diagnostic Interview Schedule (DIS; Robins, Helzer, Croughan, & Compton, 1997). The CIDI and the DIS were used to obtain lifetime diagnoses of mental disorders. The CIDI and the DIS are fully structured interviews to allow administration by lay interviewers and scoring of diagnoses by computer. The CIDI has some 300 questions chosen to cover the criteria for the DSM-IV (American Psychiatric Association, 1994) diagnoses. Good reliability and validity have been reported for the CIDI (Andrews & Peters, 1998). Because the CIDI contains no questions concerning disruptive disorders in adulthood (oppositional defiant disorders, antisocial personality disorder, and attention deficit hyperactivity disorder), sections of the DIS covering these disorders were used.

Because we aimed to investigate the predictive link between externalizing behaviors and psychopathology we used specific disruptive disorders, i.e., Oppositional Defiant Disorder (ODD), Antisocial Personality Disorder (ASPD), Attention Deficit Hyperactivity Disorder (ADHD) as outcome variables. In addition, for all other diagnoses we constructed groupings of DSM-IV categories. We constructed the following categories: (1) ODD, (2) ASPD, (3) ADHD, (4) *SUDs*, consisting of alcohol abuse/dependence, drug abuse/dependence, or both; (5) *mood disorders*, including major depressive episode, bipolar disorder, dysthymia, or any combination of these disorders; (6) *anxiety disorders*, including generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, agoraphobia, social phobia, specific phobia, or any combination of these disorders.

Analysis

The analyses were designed to assess the predictive power of the developmental trajectories regarding psychopathology reported in young adulthood. First, we computed for each developmental trajectory the proportions of males and females reporting psychopathology at Time 6. Second, using survival analysis with Cox Regression we computed the cumulative incidence of the different disorder categories in relation to the externalizing behaviors. The reported hazard ratios (HR) describe the association between externalizing developmental

Table 4.3.
Distribution (%) of self-reported psychopathology (N=1580) across group-based externalizing developmental trajectories.

Developmental trajectories	Males							Females						
	N	ODD	ASPD	ADHD	SUD	Mood disorders	Anxiety disorders	N	ODD	ASPD	ADHD	SUD	Mood disorders	Anxiety disorders
Aggression														
Near zero	450	4.2	5.8	3.8	21.8	6.7	5.8	693	6.6	0.4	1.7	6.5	19.9	16.2
Low decreasers	207	9.7	8.7	4.3	23.2	5.8	6.8	121	16.5	1.7	2.5	7.4	27.3	28.9
High decreasers	75	22.7	13.3	4.0	29.3	9.3	8.0	34	20.6	8.8	11.8	17.6	35.3	32.4
Opposition														
Near zero	48	2.1	2.1	2.1	8.3	2.1	4.2	68	2.9	0.0	0.0	2.9	8.8	8.8
Low decreasers	161	1.9	3.1	2.5	19.3	3.7	5.0	225	4.4	0.4	1.8	5.8	20.4	15.1
Medium decreasers	243	5.3	8.6	4.5	25.5	8.2	7.4	264	6.8	0.0	2.7	5.3	18.9	18.2
Adolescence increasers	38	10.5	2.6	10.5	28.9	5.3	2.6	62	8.1	1.6	0.0	14.5	21.0	17.7
High decreasers	196	13.8	9.2	4.1	23.5	6.6	6.6	182	13.7	2.2	2.7	7.1	28.0	25.8
High persisters	46	17.4	17.4	2.2	30.4	15.2	8.7	47	27.7	4.3	6.4	19.0	36.2	25.5
Property violations														
Near zero	509	4.9	5.9	3.5	22.2	6.5	5.9	678	6.9	0.1	1.6	6.2	20.5	17.7
Low decreasers	174	11.5	7.5	4.0	22.4	5.7	5.2	142	14.8	4.2	4.2	9.2	21.8	19.7
High persisters	49	22.4	22.4	8.2	32.7	12.2	14.3	28	17.9	3.6	7.1	17.9	46.4	35.7
Status violations														
Near zero	322	2.8	5.0	3.4	17.7	5.6	5.9	476	5.0	0.2	1.1	3.8	18.7	15.8
Adolescence increasers	163	8.0	6.7	3.1	20.2	6.7	4.3	211	9.5	0.5	2.8	11.4	20.9	19.0
Medium increasers	233	12.8	9.8	5.1	30.8	8.1	8.5	154	16.9	3.2	4.5	10.4	29.9	26.0
High increasers	13	30.8	30.8	7.7	46.2	7.7	0.0	7	42.9	14.3	14.3	28.6	57.1	42.9

Note. ODD = Oppositional defiant disorder, ASPD = Antisocial personality disorder, ADHD = Attention deficit hyperactivity disorder,
SUD = Substance use disorder.

trajectories and the psychiatric disorders, and were computed by using Cox continuous-time proportional hazard models. For each covariate, we tested the proportional hazard assumption by two different methods as suggested by (Kleinbaum, 1996). We used the goodness of fit approach for each variable in the model adjusted for the other variables in the model and we compared the estimated *ln minus ln* survivor curves over different (combinations of) categories of variables being investigated. Both methods indicated that we could accept the proportional hazard assumption. Survival time was defined as years after age four (the start of the developmental trajectories) till age of the first complaints of psychiatric disorder. We first analyzed in a univariate survival analysis, the hazard ratios of the externalizing behaviors for the DSM disorders separately for each of the four externalizing clusters and adjusted for gender. This analysis was conducted to investigate if there is a relationship between externalizing behaviors and a specific DSM disorder.

Third, we investigated which externalizing behavioral trajectory had a unique risk for developing a DSM disorder using a multiple survival analysis. We included in each model the trajectories of the four externalizing behavior clusters and gender to predict the DSM disorder. The externalizing behavior clusters were categorized with the group with the lowest level trajectory as reference category, and gender dichotomized (females = 0 and males = 1) for both survival analyses. All computations were performed using SPSS 10.1.

Results

The results of the cross-tabulation of DSM disorders by gender are shown in Table 4.2. Mood disorders were the most prevalent disorder category for the total sample (14.7%) and females (21.6%) while SUDs were most prevalent for males (23.0%). There was no significant difference between the distribution males and females who reported ODD or ADHD. The gender ratio was for both mood disorders and anxiety disorders nearly the same (1:3 for M:F), while for any SUDs and for ASPD the gender ratio was 3.2:1 (M:F) and 8.2:1 (M:F), respectively.

Univariate Survival Analyses

The analyses showed a clear dose-response relationship between the level of problem behaviors in the trajectory and the presence of DSM disorder. Overall, the risk of having a DSM disorder increased linearly with increasing levels of problem behaviors (see Table 4.3 and 4.4), except within the trajectories for opposition, and all high level trajectories were associated with an increased risk for developing a DSM disorder. The hazard ratios for gender indicated that the association between trajectories and DSM disorders was different for males versus females. The associations with ASPD and SUD were clearly stronger for males, while for females the associations were stronger for ODD, mood disorder, and anxiety disorder.

Table 4.4.
Univariate gender-adjusted hazard ratios [95% CI] of psychopathology related to group-based externalizing developmental trajectories

Developmental trajectories	ODD	ASPD	ADHD	SUD	Mood disorders	Anxiety disorders
Aggression						
Low decreasers	2.40 [1.60-3.59]	-	-	-	1.56 [1.11-2.18]	1.78 [1.28-2.49]
High decreasers	4.37 [2.71-7.05]	3.00 [1.55-5.81]	-	1.67 [1.11-2.52]	1.88 [1.67-3.04]	1.83 [1.10-3.05]
Gender	0.64 [0.45-0.92]	6.20 [2.92-13.17]	-	3.20 [2.37-4.33]	0.26 [0.19-0.35]	0.26 [0.18-0.36]
Opposition						
Low decreasers	-	-	-	-	-	-
Adolescence increasers	-	-	-	2.85 [1.24-6.55]	2.18 [1.00-4.75]	-
Medium decreasers	-	-	-	4.77 [1.92-11.89]	3.22 [1.31-7.90]	-
High decreasers	5.37 [1.77-17.20]	-	-	2.84 [1.23-6.58]	3.02 [1.38-6.60]	2.58 [1.23-5.40]
High persisters	8.84 [2.64-29.65]	10.42 [1.33-81.41]	-	4.52 [1.84-11.11]	4.49 [1.93-10.42]	2.49 [1.06-5.81]
Gender	-	6.89 [3.28-14.49]	-	3.37 [2.51-4.53]	0.27 [0.20-0.37]	0.28 [0.20-0.39]
Property Violations						
Low decreasers	2.26 [1.54-3.33]	1.96 [1.11-3.48]	-	-	-	-
High persisters	4.00 [2.31-6.93]	4.39 [2.24-8.57]	2.76 [1.13-6.72]	1.76 [1.11-2.79]	2.69 [1.66-4.34]	2.51 [1.52-4.18]
Gender	-	6.39 [3.03-13.49]	1.46 [0.81-2.62]	3.27 [2.43-4.40]	0.26 [0.19-0.36]	0.28 [0.20-0.39]
Status Violations						
Adolescence increasers	2.40 [1.48-3.88]	-	-	1.95 [1.38-2.76]	1.85 [1.33-2.57]	-
Medium increasers	4.02 [2.61-6.21]	2.76 [1.51-5.06]	2.32 [1.19-4.54]	2.39 [1.75-3.26]	1.92 [1.41-2.62]	1.77 [1.28-2.46]
High increasers	11.79 [5.17-26.87]	9.31 [3.42-25.32]	4.90 [1.12-21.48]	3.73 [1.79-7.76]	3.60 [1.46-8.88]	-
Gender	0.67 [0.47-0.95]	6.24 [2.95-13.18]	-	3.03 [2.25-4.08]	0.25 [0.18-0.35]	0.27 [0.19-0.38]

Note. The near zero developmental trajectories and females are the reference category within each cluster. ODD = Oppositional defiant disorder; ASPD = Antisocial personality disorder; ADHD = Attention deficit hyperactivity disorder; SUD = Substance use disorder.

The hazard ratios for the externalizing disorders were higher than the hazard ratios for the internalizing disorders. For instance, for the *high persisters* within opposition HR = 8.84 [95% CI= 2.64-29.65] for ODD, HR = 10.42 [95% CI= 1.33-81.41] for ASPD, HR = 4.52 [95% CI= 1.84-11.11] for SUD, HR = 4.49 [95% CI= 1.93-10.42] for mood disorders, and HR = 2.49 [95% CI= 1.06-5.81] for anxiety disorders. A similar pattern appeared for the deviant trajectories within aggression, property violations, and status violations. Also, HRs were different for different cluster by externalizing DSM disorder combinations. The highest HRs for ODD were related to deviant trajectories in aggression and status violations (HR = 4.37 [95% CI= 2.71-7.05] and HR = 11.79 [95% CI= 5.17-26.87] respectively), while the highest HRs for ASPD were related to opposition and property violations (HR = 10.42 [95% CI= 1.33-81.41], and HR = 4.39 [95% CI= 2.24-8.57], respectively). Within the internalizing DSM disorders the HRs for mood disorders were higher than the HRs for anxiety disorders for all deviant developmental trajectories.

Multivariate Survival Analyses

The multivariate analyses show which of all externalizing developmental trajectories are associated with the largest unique risk for developing a DSM disorder, i.e., after accounting for the influence of all other trajectories. The developmental trajectories within status violations appear to have the largest unique association with the DSM diagnoses ODD (see Table 4.5), hazard ratios being HR = 2.05 [95% CI= 1.26-3.34] for the *adolescence increasers*, HR = 2.37 [95% CI= 1.46-3.84] for the *medium increasers*, and HR = 4.52 [95% CI=1.73-11.85] for the *high increasers* (HR = 0.62 [95% CI= 0.43-0.90] for gender). This indicates that subjects with non-zero trajectories within status violations are more likely to develop ODD than subjects with any of the other developmental trajectories, and females are more likely to develop ODD than males are.

For ASPD we found only a significant hazard ratio for the *high increasers* within status violations (HR = 4.43 [95% CI= 1.27-15.49]) and gender (HR = 5.87 [95% CI= 2.76-12.51]). This indicates that males with a deviant developmental trajectory within status violations are most likely to develop ASPD. The multivariate survival analysis showed no significant predictor within the externalizing developmental trajectories for ADHD. Non zero trajectories within status violations (*adolescence increasers* HR = 1.98 [95% CI= 1.39-2.81], *medium increasers* HR = 2.28 [95% CI= 1.61-3.24], *high increasers* HR = 3.53 [95% CI=1.51-8.29]) and the *low decreasers* (HR = 2.40 [95% CI= 1.02-5.65]), *adolescence increasers* (HR = 2.69 [95% CI= 1.16-6.23]) and *medium decreasers* (HR = 4.13 [95% CI=1.65-10.37]) within opposition and gender (HR = 3.09 [95% CI= 2.28-4.18]) had a significantly increased hazard ratio for developing a SUD.

Table 4.5.

Multivariate gender-adjusted hazard ratios [95% CI] of psychopathology related to group-based externalizing developmental trajectories

Developmental trajectories	ODD	ASPD	ADHD	SUD	Mood disorders	Anxiety disorders
Aggression						
Low decreasers	-	-	-	-	-	1.47 (1.02 - 2.12)
High decreasers	-	-	-	-	-	-
Opposition						
Low decreasers	-	-	-	2.40 (1.02 - 5.65)	-	-
Adolescence increasers	-	-	-	2.69 (1.16 - 6.23)	-	-
Medium decreasers	-	-	-	4.13 (1.65 - 10.37)	2.88 (1.17 - 7.08)	-
High decreasers	-	-	-	-	2.47 (1.10 - 5.53)	-
High persisters	-	-	-	-	2.89 (1.13 - 7.42)	-
Property Violations						
Low decreasers	-	-	-	-	-	-
High persisters	-	-	-	-	-	1.87 (1.03 - 3.39)
Status Violations						
Adolescence increasers	2.05 (1.26 - 3.34)	-	-	1.98 (1.39 - 2.81)	1.77 (1.26 - 2.48)	-
Medium increasers	2.37 (1.46 - 3.84)	-	-	2.28 (1.61 - 3.24)	1.56 (1.09 - 2.23)	1.45 (1.00 - 2.11)
High increasers	4.52 (1.73 - 11.85)	4.43 (1.27 - 15.49)	-	3.53 (1.51 - 8.29)	-	-
Gender	0.62 (0.43 - 0.90)	5.87 (2.76 - 12.51)	-	3.09 (2.28 - 4.18)	0.25 (0.18 - 0.34)	0.24 (0.17 - 0.34)

Note. The near zero developmental trajectories and females are the reference category within each cluster. ODD = Oppositional defiant disorder; ASPD = Antisocial personality disorder; ADHD = Attention deficit hyperactivity disorder; SUD = Substance use disorder.

For mood disorders again developmental trajectories within opposition and status violations were associated with the highest hazard ratios. The hazard ratios were 2.88 [95% CI= 1.17-7.08] for *medium decreasers*, 2.47 [95% CI= 1.10-5.53] for *high decreasers*, and 2.89 [95% CI= 1.13-7.42] for *high persisters* within opposition, and 1.77 [95% CI= 1.26-2.48] and 1.56 [95% CI= 1.09-2.23] for *adolescence increasers* and *medium increasers* within status violations (HR = 0.25 [95% CI= 0.18-0.34] for gender).

The *low decreasers* pathway within aggression (HR = 1.47 [95% CI= 1.02-2.12]), the *high persisters* pathway within property violations (HR = 1.87 [95% CI= 1.03-3.39]) and gender (HR = 0.24 [95% CI= 0.17-0.34]) were associated with a significant hazard ratio for developing an anxiety disorder.

Discussion

The objectives of this study were to test the predictive link between child/adolescent developmental trajectories of several types of externalizing behavior and a range of psychiatric disorders. The study was conducted in a large longitudinal representative general population sample including multiple cohorts of males and females aged 4 to 30 years using self-report assessments of psychiatric disorders. This design countered the limitations inherent to studies that used at risk samples (e.g., Loeber, Green, Lahey, Frick, & McBurnett, 2000), only addressed childhood (e.g., Côté, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002), analyzed males and females separately (e.g., Broidy et al., 2003), or even restricted analyses to males only (e.g., Moffitt et al., 2002).

The main finding from this study is that males and females who follow high level developmental trajectories of parent-reported externalizing behaviors are at increased risk of reporting psychiatric disorders in young adulthood, especially when parents reported deviant levels of status violations.

As we expected there were differential risk patterns for individuals who followed different developmental trajectories. This was the second study comparing adult psychiatric outcomes of individuals following different trajectories of antisocial development, i.e., abstainers, recoveries, adolescence-limited, and life-course persisters. Our study confirmed some of the findings found for males in the earlier study (Moffitt et al., 2002). Individuals in the near zero trajectories, a trajectory that is comparable to Moffitt's abstainers group, were least likely to develop psychiatric disorder during adolescence and young adulthood. Given the proportion of individuals assigned to the near zero groups (50% to 75%) within aggression, property violations and status violations these findings suggest that more than half of the children and adolescents from the general population develop into adults without serious psychopathology.

In the present study we could not find a group that is comparable to the recoveries as found in the study by Moffitt et al. (1996), this group is characterized as children with stable,

pervasive, and extreme antisocial problems in childhood, but whose participation in delinquency during adolescence is only moderate and not extreme enough to meet criteria for membership in the life-course persisters group. However, we found that both individuals with an adolescence increase of oppositional behavior and status violations were at risk for developing substance dependence disorder, whereas only individuals with an increasing trajectory of status violations were also at risk for developing ODD and mood disorders. In contrast with our expectation, individuals with adolescence onset problems more often developed psychiatric problems in adolescence or young adulthood than individuals within the near zero developmental trajectories, suggesting that outcome for so-called adolescence increasers might be less benign than was previously thought. However, they fared better than individuals in the deviant developmental trajectories. These findings are congruent with the findings of Moffitt (2002), but in contrast with her previously held expectation that individuals in the adolescence-limited category are protected from problems in adulthood (c.f., Moffitt, 1993).

In the present study, individuals with chronic and persistent externalizing developmental trajectories appeared to be most at risk for developing psychiatric disorders, which confirms the findings of several other studies (e.g., Broidy et al., 2003; Moffitt et al., 2002). However, our findings also clearly show the importance of the differentiation between different types of externalizing problems, given the variety of associations with psychiatric disorders. This differentiation is in contrast with the broad antisocial construct adopted by Moffitt and colleagues (Moffitt & Caspi, 2001; Moffitt, Caspi, Rutter, & Silva, 2001). They suggest that the heterogeneity within developmental continuity is only dependent on the course of the antisocial behaviors (Moffitt, 1993). However, the present study indicates that the developmental continuity is dependent on both the course of the developmental trajectories and the types of externalizing problems.

Individuals who followed a deviant developmental trajectory within the aggression cluster were not at increased risk of developing psychiatric disorders in adulthood after accounting for the presence of deviancy of other types of problem behavior. Apparently and in contrast to our expectations, parent reports of aggressive behavior in childhood and adolescence are not uniquely linked to self-reporting psychiatric disorders in adulthood. The cross-time link between aggression and psychiatric disorders is only found when the individual concurrently follows one or more other deviant externalizing trajectories. Remarkably, other analyses on the same sample yielded similar results in the prediction of delinquency from trajectories of aggression (Bongers, Koot, Van der Ende, Donker, & Verhulst, submitted). Deviant trajectories of aggression were not strongly related to young adult delinquency after controlling for the influence of other types of externalizing problems. Although aggression might be thought to be the behavioral feature most likely to be predictive of antisocial outcomes, surprisingly little is still known regarding its role in the developmental

processes leading to such outcomes. Magnusson and Bergman (1990) found that aggressiveness was associated with crime only when part of a constellation of problem behaviors, suggesting that it is necessary to consider behavior in terms of overall patterns and not only of supposedly separate traits. However, most studies investigated the developmental continuity of aggressive behavior (e.g., Loeber, Green, Lahey, & Kalb, 2000; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003) without correcting for the influence of other externalizing behaviors.

Following a deviant developmental trajectory within property violations only had a unique predictive relation with the development of anxiety disorders. It is not clear to what extent this association is indicative of young adult dysfunction in individuals showing relatively high and persistent levels of property violations. Studies showed that the combination of conduct disorder and anxiety disorder is associated with relatively little impairment (Walker et al., 1991) and lower rates of aggression and violent crime (Hinshaw, Lahey, & Hart, 1993). Other analyses showed that individuals in the present sample who follow a deviant developmental trajectory within property violations indeed showed few impairments in social functioning in adulthood (Bongers, Koot, Van der Ende, & Verhulst, submitted). Individuals with deviant levels of opposition appeared to be more likely to develop mood disorders than individuals with other deviant developmental trajectories. According to Zoccolillo (1992) the more severe the externalizing behaviors, the greater the likelihood of comorbidity with non-antisocial disorders like mood or anxiety disorder. In addition, the increased likelihood for the development of internalizing disorders in individuals with deviant externalizing developmental trajectories could be caused by problems of all sorts that occur to them, including deteriorated social relationships, serious trouble with authorities, and often being told to be bad. These problems are all related to negative life events, chronic difficulties and hassles, and cognitive styles that are both correlates of depression and deviant externalizing behavior (Capaldi, 1992; Capaldi & Stoolmiller, 1999). According to this line of reasoning, individuals with deviant externalizing developmental trajectories who encounter fewer difficulties arising from their externalizing behavior would manifest less depression. Thus, given their strong association with depression deviant developmental trajectories opposition and property violations may be regarded the most disturbing for the individuals themselves.

Deviant developmental trajectories of status violations appeared most likely to show unique predictions to externalizing psychiatric disorders including ODD, ASPD, and SUD. Status violations were the only type of child/adolescent externalizing problems with a unique predictive value for externalizing psychiatric disorders. It is not clear why this type of externalizing problem was the only one to show a unique relationship. One reason might be that status violations is the only type for which all trajectories showed an increasing linear curve (Bongers et al., 2004) suggesting that children might grow into psychiatric deviancy in

adolescence and young adulthood through this type of behaviors. Alternatively, the seeming developmental continuity might simply reflect the similarity of symptoms between status violations on the one hand and ASPD and SUD on the other, although ODD is an exception. The predictive link between status violations and SUD is an ubiquitous finding providing support for earlier studies indicating that the level of adolescent use of alcohol (an important part of status violations) and other substances predict alcohol use and other substance use in young adulthood (e.g., Duncan et al., 1997). The continuity of status violations from adolescence to ODD and ASPD in adulthood can be explained by the notion of a syndrome of interrelated problem behaviors during adolescence (Duncan et al., 1997) or cumulative continuity (Caspi & Moffit, 1995), where higher levels of adolescent alcohol use are channeled into environments that sustain and encourage not only the alcohol use itself but also engagement in other types of behaviors, such as aggression and theft. Moreover, according to Jessor, Donovan, and Costa (1991) adolescent substance use was unrelated to adult outcome unless the use persisted into adulthood. The very high hazard ratios of the deviant developmental trajectory of status violations, the highest of all, also indicate that for individuals in this trajectory the onset of psychiatric disorder occurred at earlier ages than for individuals in any other trajectory.

This study showed both remarkable similarities and dissimilarities in findings for males and females. The hazard of developing a psychiatric disorder occurred for both males and females in deviant developmental trajectories. However, females are clearly more likely to show heterotypic continuity whereas males are more likely to show homotypic continuity. This finding confirmed a widely held belief about a sex-specific comorbid relations that suggests that although females' underlying psychopathology may sometimes be expressed as externalizing behavior in childhood and adolescence, psychopathology among females is primarily channeled into internalizing problems such as depression, whether by gender-role socialization or as a natural consequence of sex differences in cognitive and emotional development (Zoccolillo, 1993).

Besides the differences in continuity for males and females the present findings suggest that a gender paradox may operate in the domain of deviant externalizing developmental trajectories. While females in general are found to have fewer externalizing problems than males, females with deviant externalizing developmental trajectories were more pervasively at risk for adult psychiatric disorders than males. The cumulative hazard ratios indicate that females in deviant developmental trajectories are more seriously afflicted than males in the same developmental trajectory. Several earlier studies have found a gender paradox in regard to conduct problems (e.g., Loeber & Keenan, 1994; Robins, 1986) and several hypotheses have been proposed to explain this. Nevertheless these explanations are still puzzling. For instance, one hypothesis assumes a greater genetic variability in males with more males showing milder forms of disorders as a result of this variation (Eme, 1992).

Another explanation assumes that the underlying vulnerability for males and females is congruent, but the threshold that needs to be exceeded before an individual is affected differs for males and females (Eme, 1992). However, to better understand the causes of this gender paradox researchers should expand prospective studies of externalizing behaviors and outcomes to studies that incorporate both males and females and investigate the differential patterns for males and females more thoroughly.

Limitations and Further Research

The strengths of this study are the well defined developmental trajectories of externalizing behavior that cover the transition from childhood to young adulthood and the description of predictive links within externalizing behavior. Also the sample was large enough to investigate differences between males and females and to examine relatively common psychiatric disorders. However, some potential limitations need to be considered. As in other longitudinal studies, the generalizability is questionable because of sample attrition, despite the fact that we traced 78% of the time 1 sample and that our data did not suggest selective attrition. Second, the retrospective psychiatric diagnoses based on the subjects' reports of when they first experienced complaints of the disorders could have introduced recall error. People tend to underestimate past morbidity, which may lead to significant underestimation of the lifetime prevalences reported (Simon & VonKorff, 1995). Furthermore, respondents may "telescope" time and shift the age at first onset toward recent years, which could lead to overestimation of disease incidence during the period immediately before assessment of the psychiatric interview. This could explain why we found low rates of ADHD.

This study's results also suggest a number of potential directions for future research. First, the cross-setting generalizibility of the found predictive links in the present study needs to be investigated. Teachers and youths themselves may have a view of children's problems that is different from the parents' views, due to both situational and informant factors, and the link between the externalizing behaviors and psychiatric disorders as described by other informants than parents may elucidate unknown patterns.

Second, the present study indicates that children with deviant developmental trajectories are most likely to develop a psychiatric disorder, also studies indicate that multi-problem children are more likely to show poor outcomes in their mid twenties in contrast to children with problems in only one domain of externalizing behavior. Therefore it will be interesting to investigate in further research whether a variety of externalizing behaviors have more pervasive outcomes than showing dysfunctioning in only one domain of externalizing behavior.

Third, it is highly important to learn more about potential causes and causal mechanisms affecting the predictive links between developmental trajectories and psychiatric disorders. We showed that children and adolescents with externalizing problems are most

likely to turn into young adults with a psychiatric disorder. The long-term consequences of externalizing behaviors in childhood and adolescence support the importance of early intervention and prevention. Revealing the underlying mechanisms may yield theoretical insights into behavior-cognition links in both normal an atypical development, an important tenet of the field of developmental psychopathology.

Implications

The account of the externalizing developmental trajectories linking to later psychiatric disorder that emerges from the present study has implications for both the planning of interventions to address childhood externalizing behaviors and the prevention of risk for developing psychiatric disorders in adolescence and adulthood.

The need for interventions for deviant developmental externalizing behaviors showing chronic or persistent patterns across childhood is clearly indicated by the finding that children with persistent externalizing behaviors are at increased risk for developing a wide range of psychiatric disorders. Given this, it would seem important to intervene timely and effectively with the behavioral development of these children. However, the findings of this study suggest also that it may beneficial to include children and adolescence with mild or minor externalizing behaviors in such interventions. In particular, the results suggest the presence of a continuous dose-response function between the extent of externalizing behaviors and risk for psychiatric disorders. This implies that those with intermediate levels of externalizing developmental trajectories are at increased risk for psychiatric disorders when compared with those who follow a near zero developmental trajectory.

In sum, this study was the first to show that different developmental trajectories of distinguishable types of child/adolescent problem behaviors are related to different patterns of adolescent/young adult psychiatric disorders and that this pattern varies for males and females. The mechanisms behind these developmental continuities now need our continued attention.

Children and Adolescent Developmental Pathways of Externalizing Behavior Predict Delinquency

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Chapter 5
Children and Adolescent Developmental Pathways of Externalizing Behavior Predict Delinquency

Abstract

Objective: The majority of children and adolescents with externalizing problems abstain from serious or violent delinquency in young adulthood. This study addressed the issue of which developmental trajectories of child/adolescent externalizing behaviors predict delinquency in young adulthood. **Method:** *Delinquency was predicted from developmental trajectories of parent reported Aggression, Opposition, Property Violations, and Status Violations, which were defined in a longitudinal multiple birthcohort study of 2,076 males and females aged 4-18 years. Delinquency was assessed using life-time reports of young adults aged 18 - 30 years, categorized in non-serious, serious, and violent delinquency. Multinomial logistic regression analyses were used to describe which of the four developmental trajectories are prospectively related to any of the self-reported delinquency.* **Results:** *Individuals who follow deviant externalizing developmental trajectories, especially during childhood, were at increased risk of reporting delinquency in young adulthood. Youngsters with deviant trajectories of property and status violations report more delinquent acts as young adults than youngsters with deviant trajectories within aggression and opposition. Of two increasing externalizing trajectories in adolescence, one characterized by an increase in truancy and alcohol and drug use (status violations) did not increase the risk of young adult delinquency while another, characterized by an increase in oppositional behavior was associated with an increased risk of both serious and violent delinquency.* **Conclusions:** *The results from this study have implications for theories on development of delinquency, and provides leads for longitudinal monitoring of youth at risk.*

Introduction

Adult problem behavior may have its roots in childhood difficulties; nowhere is that tendency more apparent than in the externalizing domain. Childhood externalizing problems are among the best predictors of adolescent and adult delinquency. Several theories suggest that the risk depends on the developmental course of these behaviors (Loeber et al., 1993; Patterson & Yoerger, 1993). According to these theories the life-course persisters group described by Moffitt (1993) and the children with an early onset pathway of externalizing behaviors as proposed by Loeber et al. (1993) and Patterson and Yoerger (1993) are most at risk. These children show deviant levels of externalizing problem behavior throughout their lives, including delinquency during adolescence and young adulthood. Besides those with early onset and persistent externalizing problems a group which first starts to show antisocial behaviors in adolescence seems to be particularly at risk. According to Moffitt (1993), an

increase in antisocial behavior during adolescence is normative, and mainly due to factors arising from the peer social context and limited to adolescence (Moffitt, 1993). If an increase of problem behaviors in adolescence is indeed normative, they may be expected to be related to a relatively mild outcome. If, in contrast they are the signs of a late onset pathway of delinquency (Loeber et al., 1993), they may be expected to result in high levels of young adult delinquency. As yet it is unknown what the young adult outcomes are of high level externalizing problems in childhood showing decreasing trajectories.

Besides the developmental course, the type of externalizing problems may also determine their outcome. However, little work has been done on this issue. An exception is Loeber's model (1993) of the development of overt and covert delinquency, in which aggression as part of an overt pathway is more likely to predict violent delinquency than property violations and status violations, which are part of a covert pathway. Besides the overt and covert pathway Loeber distinguishes an authority conflict pathway that is characterized by oppositional and stubborn behavior in childhood followed by authority avoidance in young adolescence (status violations). Children in this pathway are expected to be at an increased risk of developing nonviolent delinquent behavior.

The present study addressed the long-term prediction of different types of delinquent outcome reported by young adults from developmental trajectories of various types of child/adolescent externalizing behavior, using a 14-year multiple birthcohort longitudinal follow-up of 2,076 males and females from the Dutch general population who were 4 to 16 years at initial assessment. Developmental trajectories were identified in four clusters of externalizing behavior, including aggression (e.g., attacks, fights), opposition (e.g., temper tantrums, disobedient), property violations (e.g., steals, vandalism), and status violations (e.g., truancy, substance use) (c.f., Frick et al., 1993). In addition, we distinguished three categories of young adult delinquent behavior that increase in seriousness of the reported offenses: non-serious delinquency (e.g., vandalism, shoplifting), serious delinquency (e.g., selling drugs, arson), and violent delinquency (e.g., assault, threatening) (Loeber, Farrington, & Waschbusch, 1998).

In earlier longitudinal analyses (Bongers, Koot, Van der Ende, & Verhulst, 2004) on the same sample, we identified developmental trajectories for the four clusters of externalizing behavior covering the age-range of 4 to 18 years. The average development of aggression and opposition largely showed a course with decreasing scores while property violations showed a stable developmental course and status violations a course with increasing scores, especially during adolescence. In addition, we were able to identify at least three specific subgroups of individuals within each cluster who followed different developmental trajectories during childhood and adolescence. Each cluster contained at least one low, one middle, and one high level trajectory which followed a stable, decreasing or increasing pattern (see Figure 3.2).

Few studies have tested the developmental continuity of antisocial behavior to delinquent behavior in young adulthood, and most studies included only males (Moffitt, Caspi, Harrington, & Milne, 2002; Vitaro, Tremblay, Kerr, & Biukowski, 1997). The present study is the first to investigate the developmental continuity of different developmental pathways of different externalizing behaviors to delinquent behavior in young adulthood for both males and females. More specifically, we aimed to investigate the predictive association between child and adolescent trajectories of parent-reported aggression, opposition, property violations, and status violations and specific young adult self-reported delinquent outcome (non-serious, serious, and violent delinquency) in both males and females.

Method

Sample

Participants were included in a six-wave longitudinal study of behavioral/emotional problems started in 1983. Parents of children originally aged 4-16 years were interviewed at two-year intervals until 1991 and the children themselves were interviewed in 1997 when they were 18-30 years old. The original sample of 2,600 children from 13 birthcohorts aged 4 to 16 years, was drawn from the Dutch province of Zuid-Holland. Of the 2,447 parents who could be reached, 2,076 (84.8%) responded and provided usable Child Behavior Checklists (CBCL; Achenbach & Rescorla, 2001; see Verhulst, Akkerhuis and Althaus, 1985). At the start of the study in 1983 the sample included 1,016 boys and 1,060 girls. Of all participants in the original sample who could be reached in 1997, 1,547 provided complete information (77.5% of the 1983 sample; response rate corrected for deceased subjects, mentally retarded individuals, and subjects who had emigrated).

To investigate selective attrition, we compared dropouts and remainders with respect to their 1983 CBCL total problems scores and internalizing and externalizing scale scores. An ANOVA with age and gender as covariates showed that the participants in 1997 did not differ significantly from the nonparticipants on the CBCL scales at 1983 (total problems, $F = 1.765$, $p = 0.184$; externalizing, $F = 3.231$, $p = 0.072$; internalizing, $F = 0.351$, $p = 0.554$). Also, dropout was not dependent on the developmental trajectory (see Table 5.1).

Each assessment phase of this study was approved by the Committee for Medical Ethics, Erasmus MC Rotterdam. Informed consent was obtained from all subjects who cooperated, after the procedure had been fully explained.

Table 5.1.
Number of subjects in the externalizing developmental trajectories

Developmental trajectories	Percentage total sample	Percentage males	N	Present delinquency interview males (%)	Present delinquency interview females (%)
Aggression					
Near zero	71.0	41.7	1473	71.8	79.0
Low decreasers	21.4	65.3	444	69.3	78.6
High decreasers	7.7	70.4	159	66.1	66.0
Opposition					
Near zero	7.1	43.9	148	72.3	79.5
Low decreasers	23.7	44.6	491	73.1	81.6
Medium decreasers	32.5	50.3	674	69.6	77.9
Adolescence increasers	6.0	41.6	125	73.1	83.6
High decreasers	24.2	53.5	503	71.0	75.2
High persisters	6.5	53.3	135	61.6	71.4
Property Violations					
Near zero	74.6	45.4	1548	70.6	78.9
Low decreasers	20.3	56.3	421	73.0	75.0
High persisters	5.2	71.0	107	61.8	83.9
Status Violations					
Near zero	50.7	43.7	1052	68.7	79.2
Adolescence increasers	23.4	46.8	485	70.5	80.2
Medium increasers	24.8	60.5	514	73.3	72.9
High increasers	1.2	72.0	25	66.7	100.0

Note. There were no difference in participation between the developmental trajectories within each externalizing behavior clusters, p-values of the χ^2-test range from 0.098 to 0.567.

Measurements

Developmental Trajectories

From 1983 to 1991 the CBCL (Achenbach & Rescorla, 2001; Verhulst, Van der Ende, & Koot, 1996) was used to obtain standardized parent reports of children's problem behaviors. CBCL items were used to score four clusters of externalizing behavior (i.e., aggression, opposition, property violations, and status violations) specified by Frick et al. (1993).

In a previous study (Bongers et al., 2004) we identified for each of the clusters distinct developmental trajectories for ages 4 through 18 years using a semiparametric mixture model. This model was proposed by Nagin and colleagues (Nagin, 1999) and is well suited for analyzing within-subject-level developmental trends. The model allows for cross-group differences in the shape of the developmental trajectories (Nagin & Tremblay, 1999). The approach is based on the assumption that the population is composed of a mixture of distinct groups defined by their developmental trajectories. Within each behavior cluster the optimal number of groups with different developmental trajectories are estimated and selected using the Bayes information criterion (D'Unger, McCall, & Nagin, 1998). Model estimation produces two key outputs: parameter estimates that demarcate the shape of the trajectories (see Figure 3.2; Bongers et al., 2004) and posterior probabilities of group membership for each individual in the sample for each of the trajectory groups. Using these probabilities each child was designated to the trajectory within each cluster that best described its individual

developmental trajectory, i.e., the largest probability for each individual indicated the trajectory that best conformed to that individual's behavior over time. There were no age effects in the assignment of the individuals to the developmental trajectories. The child's classifications of the four different externalizing behaviors were used in the further analyses.

We found three trajectories for aggression: a *near zero* group (71%), a *low decreasers* group (21%), and a *high decreasers* group (8%). Within the oppositional cluster, six different developmental trajectories were identified: a *near zero* group (7%); a *low decreasers* group (24%); an *adolescence increasers* group (6%); a *medium decreasers* (33%) and a *high decreasers* (24%) group; and a *high persisters* group (7%) of children with high level oppositional behavior throughout the measurement period. For property violations we found three different developmental trajectories: a *near zero* group (75%); a *low decreasers* group (20%); and a *high persisters* (5%) group, who showed persistent property violations on a high level. Finally, for status violations we found four different groups who showed mainly increasing developmental trajectories: a *near zero* group (51%); an *adolescence increasers* group (28%), who started showing status violations by age 10; a *medium increasers* group (25%); and a very small *high increasers* group (1%) (see Figure 3.2).

The number of males and females in each trajectory group are given in Table 5.1. In the total sample 275 males and females were assigned to one or more problematic trajectories (i.e., a trajectory of continuously high scores): 64% of them to only one problematic trajectory, 22% to two problematic trajectories, 11% to three problematic trajectories, and 4% to four problematic trajectories. Although there are more males than females in problematic trajectories the distribution of individuals assigned to one, two, three, or four problematic trajectories was the same across gender ($\chi2$ (3) = 3.7, *p* = .297).

Young Adult Delinquency

Lifetime delinquent behavior was assessed in 1997, using a modified version of a standardized interview developed for juveniles in the International Self-Report Delinquency Study (Junger-Tas, Terlouw, & Klein, 1994), and scored in three categories: non-serious, serious, and violent delinquency. Non-serious delinquency included: painting graffiti, vandalism, shoplifting, stealing a bike, scooter, or motor, and buying stolen goods. Serious delinquency included: selling drugs, dealing in stolen property, car theft, arson, burglary, break and entry, hit and run, and carrying a gun. Violent delinquency included: joining a group fight in a public place, assault outside the family, assault inside the family, wounding with a weapon, and threat. The definitions of violent and serious delinquency are in accordance with the classification proposed by Loeber et al. (1998). We created four categories of delinquent behavior: (1) no delinquent behavior, (2) only non-serious delinquency (age of onset: 21% before age 12, 27% between 12 and 15), (3) serious delinquency and possibly non-serious delinquency (age of onset: 14% before age 12, 24%

between 12 and 15), (4) violent delinquency and possibly non-serious and/or serious delinquency (age of onset: 7% before age 12, 29% between 12 and 15). With this categorization we aimed to model the severity of delinquency, assuming that violent delinquency represents the most serious form of delinquency.

Analysis

Using multinomial logistic regression analyses we computed odds ratios for the association between the likelihood of 1997 delinquency and the likelihood of belonging to a specific developmental trajectory, adjusted for the effect of gender (females = 0 and males = 1) and age. In all cases the trajectory group with the lowest level of externalizing behavior was used as a contrast group. To detect gender differences, females were used as a contrast group. Finally, we conducted a multiple multinomial logistic regression in which we computed odds ratio for the unique association between the likelihood of 1997 delinquency and all developmental trajectories within each externalizing behavior cluster, adjusted for the effect of gender and age. Again the low level trajectories and females were used as contrast groups. For tests of significance of association, alpha level was set at 0.05. The analyses were performed using SPSS 10.1.

Results

More than half of the subjects reported one or more delinquent acts throughout their lives. Non-serious delinquent acts only were committed by 32% of the sample, while about 10% of the subjects committed a serious offense and possibly a non-serious offense but no violent offense, and also 10% committed a violent and possibly a serious and/or non-serious offense.

The distribution of reported delinquency was significantly different across gender ($\chi2=189.91$, df=3, p<.001), with males reporting more delinquency than females. About 65% of the males and 43% of the females reported at least one delinquent act.

All high level trajectories within each behavior cluster indicated an increased risk for reporting delinquent outcomes (see Table 5.2). Individuals in the problematic trajectory for aggression (*high decreasers*) had an increased risk for serious delinquency (OR = 2.5 [95% CI = 1.3-4.8]), and violent delinquency (OR = 5.3 [95% CI = 2.9-9.7]). For the problematic trajectory of opposition the ORs were 2.9 [95% CI = 1.5-5.9], 8.0 [95% CI = 2.6-25.2], and 21.0 [95% CI = 5.6-79.1] for only non-serious delinquency, serious delinquency and violent delinquency, respectively. For property violations the ORs were 4.0 [95% CI = 1.9-8.4], and 6.7 [95% CI = 3.3-13.6] for serious delinquency and violent delinquency, respectively, and for status violations the ORs were 6.8 [95% CI = 1.8-25.7], and 9.8 [95% CI = 2.6-37.0] for serious delinquency and violent delinquency, respectively. For the *high decreasers* within aggression, *high persisters* within property violations and for the *high increasers* trajectory within status violations the odds ratios were not significant for only non-serious delinquency.

Membership of the *adolescence increasers* trajectories appeared to mark an increased risk for reporting delinquent outcomes (see Table 5.2) within opposition but not within status violations. *Adolescence increasers* within opposition showed an increased risk for serious and violent delinquency, with ORs of 6.8 [95% CI = 2.3-20.3] and 6.8 [95% CI = 1.7-27.1], respectively (see Table 5.2).

Table 5.2.
Associations between group-based developmental trajectories and delinquency.

Developmental trajectories	Only non-serious delinquency	Serious delinquency	Violent delinquency
Aggression			
Low decreasers	1.6 [1.2-2.2]	1.8 [1.2-2.8]	3.2 [2.1-5.0]
High decreasers	-	2.5 [1.3-4.8]	5.3 [2.9-9.7]
Males	1.3 [1.0-1.7]	5.0 [3.4-7.3]	8.3 [5.2-13.1]
Age	1.0 [1.0-1.1]	-	1.1 [1.0-1.1]
Opposition			
Low decreasers	1.7 [1.0-2.8]	-	-
Medium decreasers	2.5 [1.5-4.1]	3.9 [1.5-10.0]	4.6 [1.3-15.5]
	2.2 [1.3-3.6]	*3.0 [1.1-8.1]*	
Adolescence increasers	2.0 [1.1-3.9]	7.0 [2.4-21.1]	7.2 [1.8-28.9]
		6.2 [2.0-18.8]	*5.0 [1.2-20.6]*
High decreasers	3.1 [1.9-5.1]	6.4 [2.4-17.1]	14.2 [4.2-47.7]
	2.2 [1.3-3.6]	*3.6 [1.3-10.2]*	*5.5 [1.6-19.3]*
High persisters	2.9 [1.5-5.9]	8.0 [2.6-25.2]	21.0 [5.6-79.1]
Males	1.4 [1.1-1.8]	5.7 [3.9-8.4]	10.6 [6.7-16.9]
Age	1.0 [1.0-1.1]	-	-
Property Violations			
Low decreasers	1.5 [1.1-2.0]	2.4 [1.6-3.7]	3.2 [2.1-4.9]
		1.8 [1.1-2.8]	*1.7 [1.0-2.7]*
High persisters	-	4.0 [1.9-8.4]	6.7 [3.3-13.6]
Males	1.4 [1.1-1.7]	5.2 [3.6-7.7]	9.5 [6.0-15.1]
Age	1.0 [1.1-1.7]	-	-
Status Violations			
Adolescence increasers	1.6 [1.2-2.1]	-	-
	1.5 [1.1-2.1]		
Medium increasers	2.1 [1.6-3.0]	3.6 [2.3-5.5]	5.6 [3.6-8.8]
	1.8 [1.3-2.5]	*2.5 [1.5-4.0]*	*3.0 [1.9-5.0]*
High increasers	-	6.8 [1.8-25.7]	9.8 [2.6-37.0]
		4.4 [1.0-18.9]	
Males	1.3 [1.0-1.7]	5.0 [3.4-7.4]	8.9 [5.6-14.1]
Age	1.1 [1.0-1.7]	-	-

Note. Table entries are univariate odds ratios [95% confidence interval] between each of the four externalizing behavior clusters and delinquency derived from nominal regression analyses. Contrast category are for each univariate analysis the no delinquency category, the lowest trajectory of each behavior clusters for the group-based externalizing trajectories, and females for gender. Figures printed in *italic* are odds ratios [95% confidence interval] derived from multiple multinominal regressions, with developmental trajectories within each of the four externalizing behavior clusters, gender, and age as predictor to delinquent behavior. The odds ratios for gender were *1.3 [1.0-1.7]*, *5.1 [3.4-7.5]*, and *8.7 [5.4-14.1]* respectively for only non-serious delinquency, serious delinquency and violent delinquency. The odds ratio for age was for all delinquent behavior categories the same OR = *1.1 [1.0-1.1]*.
- no significant odds ratio.

Multiple multinomial logistic regressions indicated that there is a unique prediction from the developmental trajectories within status violations (*adolescence increasers* and *medium increasers)* and opposition (*medium decreasers* and *high decreasers*) to nonserious delinquency. Serious delinquency is uniquely predicted by developmental trajectories within opposition (*medium decreasers, adolescence increasers,* and *high decreasers*), property violations (*low decreasers*), and status violations (*medium increasers* and *high increasers*). Violent delinquency was uniquely predicted by developmental trajectories within opposition (*adolescence increasers* and *high decreasers*), property violations (*low decreasers*), and status violations (*medium increasers*). The multiple nominal regressions indicated no unique predictions from developmental trajectories within aggression.

Discussion

The main finding of this study is that males and females who follow high level developmental trajectories of parent-reported externalizing problems are at increased risk of reporting delinquent behavior in young adulthood, especially when parents reported deviant levels of externalizing problems already in childhood. Also, children who show increasing instead of decreasing levels of oppositional behavior during adolescence are clearly running an increased risk for committing delinquent acts in young adulthood. In addition the results from the multiple nominal regression indicate that opposition, property violations, and status violations have a unique prediction to all categories of delinquent behaviors while developmental trajectories within aggression had no unique predictions to delinquent behavior above and beyond other externalizing developmental trajectories.

This study showed that among both males and females, a small group of children stand out as exhibiting developmental trajectories involving notably more aggression, oppositional behavior, property violations, and status violations than their peers throughout childhood and adolescence, and reporting more delinquent behaviors in young adulthood than children who did not follow deviant trajectories. Furthermore, we found that the higher the level of the developmental trajectory was, irrespective of the type of problems, the more severe the delinquent acts reported in young adulthood. This finding appeared to be true for all externalizing behavior trajectories, and for both males and females. Moreover, the four behavior clusters appear to reflect different risk patterns. Individuals exhibiting problematic trajectories of aggression and opposition have an increased risk for all types of delinquent behaviors, while individuals with problematic trajectories involving property violations and status violations, have an increased risk specifically for serious and violent delinquency.

Broidy et al. (2003) also found that different teacher reported externalizing behaviors are associated with different forms of delinquency. For boys, chronic physical aggression had an independent influence on both violent and nonviolent delinquency, while early non-aggressive conduct problems increased the risk of later violent delinquency in adolescence.

Early oppositional behaviors independently increased the risk of nonviolent delinquency in adolescence. In the present study that extended into young adulthood we made an in-depth analysis of the influence of different types of externalizing behavior and found that the trajectories of non-aggressive conduct problems (property violations and status violations) had a stronger association with violent delinquency than trajectories of aggressive behaviors. Problematic trajectories within property violations and status violations seem to divide between serious and non-serious delinquent outcomes while problematic trajectories within aggression and opposition also included children who as young adults tend to report only non-serious delinquency. This indicates that individuals with deviant trajectories of property violations and status violations, which are typical adolescent behaviors, are more seriously afflicted with delinquent outcome than individuals with deviant trajectories of aggression and opposition, which are typical childhood externalizing behaviors, provided that violent delinquency may be considered more serious than any other outcome.

Besides individuals whose development followed persistently deviant trajectories throughout childhood and adolescence, we also identified children who showed increasing levels of problems in adolescence. The developmental course followed by these adolescence increasers within the opposition and status violations clusters is similar to the course followed by adolescence-limited offenders described by Moffitt (1993) and the late onset group described by Loeber and by Patterson (Loeber et al., 1998; Patterson & Yoerger, 1997) However, the adolescence increasers trajectory within opposition showed a different prediction to delinquency than the adolescence increasers trajectory within status violations. According to Moffitt (1993) subjects following the adolescence-limited trajectory limit their antisocial and offending behavior to adolescence. In other words they stop displaying antisocial behavior when they become adults. In the present study the adolescence increasers within the status violations cluster did not show an increased risk for delinquent acts, suggesting that their behavior is indeed more normative, as is suggested by Moffitt (1993). In contrast, subjects with increasing levels of oppositional behavior in adolescence were clearly at increased risk for young adult delinquency. This suggests that there are two different increasing pathways of externalizing problems in adolescence, one that is normative and is characterized by truancy and alcohol and drug use that does not increase the risk of young adult delinquent outcome and another that is characterized by an increase in oppositional behavior that increases the risk of both serious and violent delinquency. For now, it is unclear why the developmental outcomes of these two increasing trajectories are different.

In the present study, the prediction from the aggressive developmental trajectories to violent delinquency was stronger than the prediction to serious or non-serious delinquency. This finding supports the theory of Loeber that highly aggressive males are more inclined to commit violent delinquent acts (Loeber et al., 1993). A new finding is that the same holds for

females. However, this was not specific for aggression, since the same pattern recurred for all four types of externalizing behavior.

The high level trajectory of property violations was associated with a more increased risk for serious delinquency relative to the high level trajectory within aggression, thus confirming the importance of the covert pathway proposed by Loeber (1993). However, the problematic trajectories of property violations and status violations were also associated with an increased risk for violent delinquency, being even higher than the risk for serious delinquency. This finding is in contrast with the outcome of the covert pathway proposed by Loeber (1993), which would be characterized by covert outcomes but not by violent delinquency. However, Loeber (1993) also indicated that almost 80% of the males with a full overt pathway also had a full covert pathway, and 30% of the males with a full covert pathway had a full overt pathway. Thus, the distinction between overt and covert pathways may become blurred when adolescents reach adulthood. Our findings seem to confirm this suggestion.

Limitations

The present study is not without limitations. A limitation is the reliance on only parental reports to assess psychopathology. Parents may be unaware of their child's rule breaking behavior, especially as their child becomes an adolescent (Moffitt, Caspi, Dickson, Silva, & Stanton, 1996). Therefore, replications are essential to assess the generalizability of the present findings to other informants like teachers and youths themselves. On the other hand, these parent reports of problem behavior did predict young adults' reports of delinquency which attests to their validity.

Another limitation is the reliance on retrospective self-reported lifetime delinquent behavior as an outcome measure. All measures of delinquent behavior have some shortcomings, a major problem of self-reports is the willingness of subjects to report, and their ability to remember their delinquent behaviors. However, self-reports seem to be a better index of delinquent outcomes than proxy reports or official records of registered criminality (Loeber et al., 1998). In addition these reports were obtained independently of parents' reports of psychopathology, assuring that the associations found in this study are unlikely to reflect common method variance. Although we used lifetime reports of delinquent acts, most of the delinquent acts are committed in young adulthood or later, while most males and females start committing delinquent acts in late adolescence.

Implications

Recently, much emphasis has been put on the developmental importance of pathways of physically aggressive behavior. The present study indicates that there are interesting patterns of risk involved in pathways of nonaggressive externalizing behaviors as well. For instance,

children following deviant trajectories of aggression and opposition (overt externalizing behaviors) seem to be mainly at risk for non-serious delinquency and serious forms of delinquency, while children with deviant trajectories of property violations and status violations (covert externalizing behaviors) are clearly at risk for both serious and violent delinquency. This suggests that in the long run children displaying externalizing problems of a covert nature are following pathways that involve even more risk than those displaying overt aggression.

Some of the findings in the present study throw a new light on adolescent increases of externalizing behavior problems. Earlier studies defined the problems of adolescents with increasing behavior problems as adolescence-limited (Moffitt, 1993) or late onset children (Loeber et al., 1998; Patterson & Yoerger, 1997). The present study indicates that the limitation of the behavior to adolescence depends on the type of behavior. Oppositional behavior that increases in adolescence seems to indicate an increased risk of developing delinquency. Status violations like truancy and alcohol and drugs abuse that increase in adolescence seem indeed to be mainly limited to adolescence without increasing the risk of delinquent outcomes. This indicates that some types of problem behavior, such as alcohol and drug use that increase during adolescence may indeed be normative, i.e., displayed by a large proportion of adolescents without indicating increased risk of deviant outcomes, while others should be regarded nonnormative and indicative of an unwanted development. Apparently, although most individuals may show at least some opposition during (early) adolescence, this is likely to disappear in time. However, adolescents with continuously increasing oppositionality are clearly on a deviant track.

Our findings make for three suggestions for intervention. First, children with persistent behavior problems, violating the rights of others need early intervention to prevent the development of delinquent behavior. Second, the situation of children with deviant oppositional problems should not be regarded lightly, these behavior problems deserve close attention because children with deviant trajectories of oppositional behavior are clearly at risk for developing severe forms of delinquency in adulthood. Third, children giving evidence of early property and status violations are clearly candidates for early interventions while this is less evident for adolescents who become involved in status violations. However, they may deserve extra attention and or early intervention for potential alcohol and drug abuse.

Finally, the results from this study suggest that longitudinal screening of children's and adolescents' externalizing problems may be a valuable tool in the early identification of those who are at increased risk of growing into delinquency once they have reached young adulthood.

6

Predicting Young Adult Social Functioning from Developmental Trajectories of Externalizing Behavior

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Chapter 6
Predicting Young Adult Social Functioning from Developmental Trajectories of Externalizing Behavior

Abstract

This study investigated the predictive link between developmental trajectories and social functioning in adulthood. Developmental trajectories of parent reported Aggression, Opposition, Property Violations, and Status Violations were defined in a longitudinal multiple birthcohort study of 2,076 males and females aged 4-18 years. Social functioning was assessed using self-reports by young adults aged 18 - 30 years. Linear regression analyses were used to test the association between the four developmental trajectories and self-reported social functioning. There is a dose-reponse relationship between the level of externalizing problems and later social outcome risks, with later risks tending to increase with increasing severity of externalizing behaviors. Females with persistent externalizing behavior problems reported more impairment in relationships than males in the same persistent trajectory.

Introduction

Children and adolescents with persistent externalizing problems are at risk for deviant outcomes when they reach adulthood, including delinquency and psychopathology. This risk may rise from the sheer persistence of these problems evolving into problems of conduct and personality typical for older ages like delinquent acts, antisocial personality disorder, or substance use. However, the long-term consequences of child and adolescent externalizing problems often involve a much wider spectrum of social maladaptation in adult life (e.g., Capaldi & Stoolmiller, 1999; Moffitt, Caspi, Harrington, & Milne, 2002; Sroufe, 1989). Cicchetti and Schneider-Rosen (1986) argued that successful development regards a series of interlocking social, emotional, and cognitive competencies. Childhood externalizing behaviors interfere with the development of these competencies, thus causing a chain reaction of failures in adjustment that may continue into adulthood (Patterson & Yoerger, 1993). Lack of opportunity to acquire prosocial skills may be especially prominent in those children and adolescents who show persistent externalizing behaviors. Chronic externalizing behaviors may thus provide an accentuating effect that further reinforces and perpetuates pre-existing behavioral deviance leading to an increased risk of impaired social functioning in adulthood (Caspi & Moffit, 1995).

Longitudinal studies have emphasized the heterogeneity in the developmental course of externalizing behaviors and of individuals who engage in it. Apart from forms of externalizing behavior that persist through childhood and adolescence into adulthood, individuals may start to display problem behaviors from puberty onwards that are limited in

time to adolescence (Frick et al., 1993; Moffitt, 1993; Patterson & Yoerger, 1993). Individuals with this so-called adolescence-limited behavior pattern are probably exempted from cumulative continuity or accentuating effects because they generally have good prosocial skills, show better academic achievements, and keep the capacity to engage in close relationships (Moffitt, 1993). Therefore, individuals with externalizing behaviors that are limited to adolescence may be less seriously afflicted with social impairment in adulthood than individuals with externalizing behaviors persisting throughout childhood and adolescence.

Several studies provide evidence for negative social outcomes in adulthood for children and adolescents with externalizing behavior. For instance, one study showed that high levels of externalizing problems in adolescence are associated with less involvement in daily activities like sports, volunteer work, and social life in young adulthood (Chassin, Pitts, & DeLucia, 1999). Also, high levels of the CBCL Delinquent Behavior syndrome in adolescence appeared to be associated with school dropout, unwed pregnancy, alcohol use, and drug use in both young adult males and females, while high levels of the CBCL Aggressive Behavior syndrome in adolescence predicted school dropout only for young adult males (Achenbach, Howell, McConaughy, & Stanger, 1998). Capaldi reported that conduct problems in boys predicted a number of failures in the two years following senior high school year, including failure to graduate from high school, enter higher education, attain and keep employment, and to keep a driver's license, along with early fatherhood. This study showed that young men with conduct problems entered adulthood with substantial disadvantages (Capaldi & Stoolmiller, 1999).

Social outcomes of child/adolescent problems may be quite different for males versus females. For example, males seem to be more vulnerable to work-related social outcomes, while females may more often be sensitive to problems of interpersonal relations. Indeed a few studies reported different outcomes of similar behaviors in boys and girls. A study by Caspi (Caspi, Elder, & Bem, 1987) showed that boys showing temper tantrums from ages 8 to 10 years, experienced downward occupational mobility, erratic work lives, and greater likelihood to divorce in the subsequent 30 years, while girls with temper tantrums during the same age period married men with lower occupational status, were likely to divorce, and became ill-tempered mothers later in their lives (Caspi et al., 1987). In the Dunedin study conduct-disordered males had significantly worse outcomes than conduct-disordered females in the domains of work, criminal justice, and substance abuse. In contrast, conduct-disordered females had worse outcomes than conduct-disordered males in the domains of relationship with a partner, and in depression and physical health (Moffitt, Caspi, Rutter, & Silva, 2001).

These studies provide evidence of long-term negative consequences in social functioning for children and adolescents with externalizing behavior as well as possible gender effects on these consequences. However, most studies predicted from externalizing

behavior at one point in time to indices of social impairment as outcome many years later, indicating that the level of externalizing problems is related to adverse social outcomes. These studies did not investigate the impact of various developmental trajectories of externalizing behavior on later social functioning. To relate social outcomes to developmental continuity and change of problem behaviors, multiple assessments across the interval are needed. Based on the ideas of developmental chaining and accentuation we might expect stronger negative effects of trajectories of chronic, persistent problems starting in childhood versus trajectories involving adolescent onset of or even desistance from deviancy. In addition, it might well be that different types of externalizing problems may lead to different social outcomes. For instance, while aggressive behavior may be most persistent in children with neurologic abnormalities (c.f., Quay, 1993) and therefore more related to poor job-performance, oppositionality may constitute much more of a problem in the establishment of sound family of partner relationships.

Therefore, in the present study we determined the associations between child and adolescent developmental trajectories of externalizing behaviors and social functioning in adulthood in a 14-year multiple birthcohort longitudinal study of males and females from the Dutch general population. We addressed the predictive value of child and adolescent developmental trajectories of four types of externalizing behaviors (aggression, opposition, property violations, and status violations (c.f., Frick et al., 1993) regarding young adult educational and occupational outcome, social relationship, and substance use. We tested three hypotheses based on existing literature of developmental continuity and gender differences. First, we expected the highest risk of social impairment in individuals whose externalizing behaviors show persistent or chronic trajectories during both childhood and adolescence. Second, increasing levels of externalizing problems in adolescence were expected to be related to later social impairment though to a lesser degree than in individuals with chronic externalizing problems. Third, males with deviant trajectories were expected to be especially at risk for social impairment related to work, while the risk for females was expected to be related to personal and family relationships.

Method
Sample
This study is a six-wave longitudinal study of behavioral/emotional problems that began in 1983. Parents of child subjects were interviewed at two-year intervals until 1991 and the subjects themselves were interviewed in 1997 when they were 18-30 years old. The original sample involved 2,600 children from 13 birthcohorts aged 4 to 16 years, that was drawn from the Dutch province of Zuid-Holland. Of the 2,447 parents who could be reached, 2,076 (84.8%) responded and provided usable Child Behavior Checklists (CBCL; Achenbach &

Rescorla, 2001). The original 1983 sample of participants included 1,016 boys and 1,060 girls (see Verhulst, Akkerhuis and Althaus (1985).

Of all participants in the original sample who could be reached in the 1997 data wave, 1,615 provided complete information (77.8% of the 1983 sample; response rate corrected for deceased subjects, mentally retarded individuals, and subjects who had emigrated).

To investigate selective attrition, we compared dropouts and remainders with respect to their 1983 CBCL total problems scores and the broadband internalizing and externalizing scale scores. An ANOVA with age and gender as covariates showed that the participants for whom no outcome questionnaire was available in 1997 did not differ significantly from the ones with an outcome questionnaire available on the CBCL total problems score and the two broadband CBCL scales at 1983. Also dropout was not dependent on the developmental trajectory of externalizing problems (see Table 6.1).

Measurements

From 1983 to 1991 the CBCL (Achenbach & Rescorla, 2001) was used to obtain standardized parent reports of children's problem behaviors. The CBCL is a questionnaire to be completed by parents of 4- to 18- year olds and contains 120 items covering behavioral or emotional problems that occurred during the past 6 months. The response format is 0 (not true) through 2 (very true or often true). Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst, Van der Ende, & Koot, 1996).

The items of the CBCL were used to score four distinct clusters of externalizing behavior that were first specified by Frick et al. (1993), i.e., aggression, opposition, property violations, and status violations. Confirmative factor analyses showed a good fit of these behavior clusters to the longitudinal data set (average GFI across 1983 – 1991 was 0.92 for males and 0.96 for females (Bongers, Koot, Van der Ende, & Verhulst, 2004)).

Trajectories of Externalizing Problems

In a previous study (Bongers et al., 2004; Nagin, 1999) we identified for all four clusters of externalizing behavior distinct developmental trajectories for ages 4 through 18 years using a semiparametric mixture model (Nagin, 1999). This model was proposed by Nagin and colleagues (Nagin, 1999) and is well suited for analyzing within-subject-level developmental trends. This semiparametric mixture model allows for cross group differences in the shape of the developmental trajectories (Nagin, 1999). The approach is based on the assumption that the population is composed of a mixture of distinct groups defined by their developmental trajectories. The developmental trajectories can be stable, decreasing, or increasing (see Figure 3.2). Within each behavior cluster the optimal number of groups with different developmental trajectories are estimated and selected using the Bayes information

Table 6.1.
Number of subjects per developmental trajectory

Developmental trajectories	Percentage of total sample	Percentage males	N	Percentage of present questionnaires males	Percentage of present questionnaires females
Aggression					
Near zero	71.0	41.7	1,473	74.9	82.2
Medium decreasers	21.4	65.3	444	73.8	79.9
High decreasers	7.7	70.4	159	68.8	74.5
Opposition					
Near zero	7.1	43.9	148	75.4	83.1
Low decreasers	23.7	44.6	491	75.8	84.6
Medium decreasers	32.5	50.3	674	72.9	80.0
Adolescence increasers	6.0	41.6	125	73.1	86.3
High decreasers	24.2	53.5	503	75.5	79.5
High persisters	6.5	53.3	135	66.7	76.2
Property Violations					
Near zero	74.6	45.4	1,548	74.4	81.8
Low decreasers	20.3	56.3	421	74.3	78.8
High persisters	5.2	71.0	107	68.4	90.3
Status Violations					
Near zero	50.7	43.7	1,052	72.0	82.1
Adolescence increasers	23.4	46.8	485	73.6	82.9
Medium increasers	24.8	60.5	514	76.5	77.3
High increasers	1.2	72.0	25	83.3	100.0

criterion (D'Unger, McCall, & Nagin, 1998). Model estimation produces two key outputs: parameter estimates that demarcate the shape of the trajectories (see Bongers et al., 2004) and posterior probabilities of group membership for each individual in the sample for each of the trajectory groups. Using these probabilities each child was designated the trajectory within each cluster that best describes its individual developmental trajectory, i.e, the largest probability for each individual indicates the trajectory that best conforms to that individual's behavior over time. There were no age effects in the assignment of the individuals to the developmental trajectories. The child's classifications to the four different externalizing behaviors were used in the further analyses.

We found three trajectories for aggression: a near zero group (71%), a medium decreasers group (21%), and a high decreasers group (8%) (both decreasing trajectories, with only aggression at different levels). Within the oppositional cluster, six different developmental trajectories were identified: a near zero group (7%); a low decreasers group (24%); an adolescence increasers group (6%); a medium decreasers (33%) and a high decreasers (24%) group; and high persisters group (7%) of children with high level oppositional behavior throughout the measurement period.

For property violations we found three different developmental trajectories: a near zero group (75%); a low decreasers group (20%); and a high persisters (5%) group, who showed persistent property violations on a high level.

Finally, for status violations four different groups were found which showed mainly increasing developmental trajectories: a near zero group (51%); an adolescence increasers group (28%), who started showing status violations by age 10; a medium increasers group (25%); and a small high increasers group (1%) (see Figure 3.2).

Social Outcomes

To obtain information on social outcomes in young adulthood we used a questionnaire including the following social outcomes: (a) educational level, ranging from only primary school = 1 to post-graduate education = 7; (b) currently employed or following a study (not working or studying = 0; working or studying = 1); (c) job level, ranging from professions with no education necessary = 1 to profession with post-graduate educations necessary = 5; (d) number of job changes; (e) expulsion from school or job (not expelled = 0, expelled = 1) ; (f) number of different romantic partners; (g) number of days drunk in the past 6 months; (h) number of times using drugs in the past 6 months.

Social Functioning

Current social functioning was assessed with the Groningen Questionnaire on Social Behavior (GQSB; De Jong & Van der Lubbe, 1994; Van der Lubbe, 1995). The GQSB contains 115 items that are organized in 10 subscales covering different areas of social functioning: self-care (i.e., bodily care and hygiene, management of personal possessions, including direct living surroundings); civic sense (i.e., role as citizen, interest and participation in society); family functioning (for subjects who do not live alone); family functioning, living alone (for subjects who live alone); intimate relationship with parents; intimate relationship with siblings; intimate relationship with partner; social activities with friends; study functioning; job functioning; household functioning; and spare time activities. Subjects were asked to indicate whether items were applicable to their situation within the past four weeks. Each item has four reponse options, ranging from never to always. By summing the item scores, a total score for each subscale was derived, as well a Total Social Functioning score based on all items of the subscales intimate relationship with parents, intimate relationship with partner, social activities with friends, study functioning, job functioning, and household functioning. Higher scores represent problems in social functioning. Not all scales apply to all subjects. For instance, intimate relationships with siblings does not apply to subjects who do not have siblings. Good reliability and validity of the GQSB have been reported for ages 18 through 65 years (De Jong & Van der Lubbe, 1994; Van der Lubbe, 1995). The GSBQ has been shown to assess problems in social functioning in a valid way independent of potential

psychopathology in the respondent. Test-retest correlations and internal consistency measures indicated adequate reliability (test-retest correlations ranged from 0.65 to 0.97; Cronbachs alpha from 0.62 to 0.89) (De Jong & Van der Lubbe, 1994).

Table 6.2.
Means [SE] of social outcome and social functioning measures for males and females

	N	Mean [SE]		
	(M-F)	Males	Females	p-value*
Social outcomes				
Education level	751-856	3.9 [0.9]	3.9 [0.9]	0.470
Currently employed or studying	744-854	92.7%	83.3%	<0.000 (χ^2-test)
Job level	498-532	2.9 [0.8]	2.9 [0.9]	0.753
Number of job changes	675-714	0.7 [0.9]	0.6 [0.9]	0.277
Expulsion from school/job	738-854	16.9%	5.6%	<0.000 (χ^2-test)
Number of different partners	311-512	0.3 [0.6]	0.3 [0.5]	0.292
Days drunk in the past 6 months	746-859	4.3 [9.1]	1.1 [3.6]	<0.000
Times using drugs in the past 6 months	747-861	6.8 [29.8]	1.8 [14.5]	<0.000
Social functioning				
Total social functioning score	749-863	56.6 [10.2]	56.0 [10.3]	0.262
Self care	752-864	4.5 [1.4]	3.9 [1.1]	<0.000
Civic sense	752-864	7.8 [1.7]	7.9 [1.6]	0.167
Family functioning	613-733	16.8 [3.6]	15.1 [3.0]	<0.000
Family functioning, living alone	128-125	14.3 [3.6]	12.8 [3.2]	<0.000
Intimate relationship with parents	735-840	10.6 [3.3]	10.3 [3.3]	0.046
Intimate relationship with siblings	680-721	11.8 [3.6]	11.5 [3.6]	0.174
Intimate relationship with partner	460-661	15.1 [3.8]	15.3 [4.2]	0.398
Relation with friends	735-845	10.7 [2.8]	10.8 [2.8]	0.618
Study functioning	272-246	12.8 [2.0]	12.5 [1.7]	0.098
Job functioning	638-643	11.6 [2.5]	11.7 [2.4]	0.602
Household functioning	473-706	8.3 [2.4]	8.1 [2.3]	0.201
Spare time activities	741-858	9.6 [2.6]	9.9 [2.9]	0.011

Note. * p-value t-test for gender differences.

Statistical Analysis

The analysis was designed to assess the predictive power of the developmental trajectories of parent-reported externalizing problems regarding self-reported social functioning in young adulthood.

Using multiple regression analyses we computed betas for the association between each measure of social outcome and social functioning in adulthood and each of the developmental trajectories of externalizing behavior. The association was adjusted for the effect of gender (males = 1, females = 0) and age. In all cases the near zero trajectories of externalizing behavior were used as a contrast group. For tests of significance of association, alpha level was set at 0.05. The analyses were performed using SPSS 10.1.

We conducted the analyses in a stepwise manner. In the first step we examined for each social outcome and social functioning measure the relation with all developmental

trajectories simultaneously. In the second step we added the main effect for gender and age, and in the third step we added the interaction between gender and each developmental trajectory. For each step we determined whether adding parameters to the models implied a significant change in explained variance.

Results

Table 6.2 presents the mean scores of the social outcome and social functioning variables. For most variables there were no gender differences in social outcome, except for the number of days drunk in the past 6 months, the number of times using drugs in the past 6 months, and being expelled from school or job for which males scored higher than females. Females scored lower than males on currently being employed or studying. Males scored higher on 3 out of 12 social functioning subscales indicating that they had more problems with family functioning, living alone, and self care. Females reported more problems with their spare time activities than males.

The linear regressions indicated that deviant externalizing behavior trajectories (i.e., the developmental trajectory within each externalizing behavior cluster involving the highest level of problem behavior) were significantly related to many of the social outcome and social functioning measures (see Table 6.3 and 6.4). This was particularly the case with deviant trajectories of opposition and status violations. None of the outcome or functioning measures was related to all deviant trajectories, indicating that different types of externalizing problems do indeed incur different risks for young adult social outcome and functioning.

Remarkably, not only the highest level developmental trajectories but also most trajectories involving more than zero oppositional problem behaviors in childhood or adolescence were significantly related to young adult social outcome and social functioning measures. Several of the associations with social outcome were influenced by age, mostly indicating natural developmental opportunities (e.g., job level).
Confirming our hypothesis, the two increasing developmental trajectories (adolescence increasers within the opposition and status violations clusters) were less likely to be associated with negative social outcomes and young adult impairment in social functioning than the deviant developmental trajectories within the same clusters (high persisters within opposition and high increasers within status violations). Individuals who followed an adolescence increasers developmental trajectory within opposition had lower betas or no significant beta in all 10 cases indicating significant betas for the high persisters trajectory within opposition. The adolescence increasers within status violations had lower or non significant betas in 8 out of the 13 cases with significant betas for the high increasers trajectory within status violations. For opposition 8 to 13 out of the 21 predictions were significant for the trajectories involving childhood behavior problems (i.e., low decreasers, medium decreasers, high decreasers, and high persisters), while for the adolescence increasers

Table 6.3. *Associations between developmental trajectories of child/adolescent externalizing problems and social outcomes in young adulthood*

Social outcomes	R^2	Aggression		Opposition					Property Violations		Status Violations			Age	Sex
		Med decr	High decr	Low decr	Med decr	Ado incr	High decr	High pers	Low decr	High pers	Ado incr	Med incr	High incr		
Education level	0.09	-	-	-0.14[b]	-0.12[c]	-0.07[c]	-0.20[a]	-0.12[b]	-	-0.06[c]	-	-0.12[a]	-	0.13[a]	-
Currently employed or studying	0.06	-	0.08[c]	-	-	-	-	-	-	-	-	-	-	0.19[a]	-0.17[a]
Job level	0.16	-	-	-0.17[b]	-0.18[a]	-0.09[c]	-0.27[a]	-0.19[a]	-	-0.07[c]	-	-0.08[c]	-	0.30[a]	-
Number of job changes	0.07	-	-0.11[b]	-	-	-	0.16[b]	-	-	0.07[c]	0.06[c]	-	0.16[a]	-0.23[a]	-
Expulsion from school/job	0.08	-	-	-	-	-	-	-	0.09[c]	-	0.10[c]	0.09[b]	0.19[a]	-	0.15[a]
Number of different partners	0.08	0.12[b]	-	-	-	-	-	-0.11[c]	-	-	-	0.13[b]	0.06[c]	0.11[a]	-
Days drunk in the past 6 months	0.07	-	-	-	-	-	-	-	-	-	-	0.10[a]	-	-0.09[b]	0.22[a]
Times using drugs in the past 6 months	0.02	-	-	-	-	-	-	-	-	-	-	-	0.08[b]	-	0.09[a]

Table 6.4. *Associations between developmental trajectories of child/adolescent externalizing problems and social functioning in young adulthood.*

Social functioning	R^2	Aggression		Opposition					Property Violations		Status Violations			Age	Sex
		Med decr	High decr	Low decr	Med decr	Ado incr	High decr	High pers	Low decr	High pers	Ado incr	Med incr	High incr		
Total social functioning score	0.57	-	-	-	0.24[a]	-	0.23[a]	0.27[a]	-	-	0.12[bf]	0.11[c]	-0.01[f]	-	0.08
Self care	0.06	-	-	-	0.10[c]	-	-	-	-	-	-	0.06[c]	0.05[c]	-	0.22[a]
Civic sense	0.05	-	-	0.15[b]	0.24[c]	0.11[a]	0.24[a]	0.18[a]	-	-	0.09[b]	0.07[b]	0.05[c]	-0.26[a]	-0.07[b]
Family functioning	0.20	-	-	0.15[b]	0.31[a]	0.13[a]	0.27[a]	0.17[a]	-	-	-	0.12[a]	0.07[b]	-	0.23[a]
Family functioning, living alone	0.04	-	-	-	-	-	-	-	-	0.15[b]	-	-	-	-	0.19[b]
Intimate relationship with parents	0.04	-	-	0.12[b]	0.26[a]	0.09[b]	0.23[a]	0.21[a]	-	-	-	-	0.07[c]	-	-
Intimate relationship with siblings	0.03	-	-	0.16[b]	0.25[a]	0.10[b]	0.25[a]	0.18[a]	-	-	0.11[cf]	-	-	-	-
Intimate relationship with partner	0.06	-	-	-	-	-	0.17[c]	0.29[af]	-	0.12[cf]	0.08[cf]	0.13[c]	-	-	0.11
Relation with friends	0.03	-	-	-	0.14[c]	-	0.13[c]	-	-	-	-	-	-0.10[f]	0.10[b]	0.05
Study functioning		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Job functioning	0.01	-	-	0.12[c]	-	-	0.11[c]	-	-	-	-	0.09[b]	0.07[c]	-	-
Household functioning	0.01	-	-	0.16[c]	0.15[c]	-	0.15[b]	-	-	-	-	0.11[b]	-	-	-
Spare time activities	0.04	-0.10[c]	-	-	0.19[b]	-	0.27[a]	0.20[af]	-	0.12[cf]	0.11[bf]	-	-	-	0.11

Note. Significant standardized betas are reported. Med: medium, Decr: decreasing; Ado: Adolescence; Incr: increasers; Pers: persisters.

a: $p<0.001$; b: $p<0.01$; c: $p<0.05$; f: females score significantly higher.

only 6 out of the 21 predictions were significant. The same pattern of results was found for developmental trajectories involving childhood problems within status violations. Twelve or 13 out of the 21 predictions were significant for trajectories involving childhood problems (i.e., medium increasers and high increasers), while this was true for only 7 of the 21 predictions for the adolescence increase trajectory. This indicates that especially individuals following trajectories involving childhood onset behavior problems are at increased risk for reporting negative social outcome and impaired social functioning in young adulthood.

There were a number of significant gender differences, indicating that overall, males were more likely to report problems with social functioning and social outcomes (sex main effect in Table 6.3 and 6.4). There were two domains in which females were overall more likely to report negative social outcome or impaired social functioning than males: being employed or studying (sex: $\beta = -0.17$, $p<0.001$) and civic sense (sex: $\beta = -0.07$, $p<0.01$). Besides the overall effects we also investigated whether there were different effects for males and females in the developmental trajectories with an interaction between gender and the developmental trajectory. The interaction effects indicated that females who followed high level developmental trajectories were more likely to report problems with social functioning than males. This was particularly the case in relations with friends and partners and in the spare time domain for females in the high persisters trajectory within opposition and property violations and for females in the adolescence increasers and high increasers trajectory within status violations.

Discussion

The central goal of the current study was to examine the relation between child and adolescent externalizing behaviors and young adult social functioning. Earlier studies looked at this relationship by predicting adult functioning from childhood functioning measured at one point in time. Using a representative general population sample including multiple cohorts of males and females aged 4 to 18 the present study extended existing knowledge by determining the developmental relationships between trajectories of externalizing behavior based on multiple measurements in time and social functioning in adulthood. Because it is known that development may be different for different types of externalizing behavior we distinguished four separate types of externalizing behavior instead of one broad measure. Also, while existing studies predominantly looked at the development of externalizing behaviors in males, the present study investigated gender differences in the developmental continuity of externalizing behaviors to social functioning in adulthood. We used parent reported externalizing behaviors to predict young adults' self-reported social outcomes and social functioning in young adulthood.

In agreement with the findings of previous studies (Caspi et al., 1987; Zoccolillo, Pickles, Quinton, & Rutter, 1992), this study showed that individuals with marked

externalizing behaviors in childhood and adolescence were at increased risk of social problems in young adulthood. Moreover, we found different predictive links for different types of externalizing behavior. Individuals who followed developmental trajectories with high levels of parent-reported opposition and status violations in childhood were most likely to report impairment on various indices of social functioning as adults. By contrast, the linear regressions showed nearly no unique predictions from developmental trajectories within aggression and property violations to adult social functioning. This suggests that individuals who only followed a non zero developmental trajectory of aggression or property violations are not at particularly increased risk for negative social outcomes and impaired social functioning once they have reached young adulthood. This is in agreement with the finding from an earlier study on this sample that these individuals also have a relatively low risk for developing a psychiatric disorder in adulthood (Bongers, Koot, Van der Ende, & Verhulst, submitted).

The results from this study also suggest that deviant developmental trajectories within opposition versus status violations are related to different forms of social impairment in adulthood. While individuals following deviant trajectories of oppositional behavior seem at risk for low achievement, problematic social interactions, and personal relations, individuals with deviant developmental trajectories within status violations were most likely to show deteriorated functioning in society at large. More specifically, individuals in the high persisters trajectory of opposition reported lower educational and job levels, they had more different partners, were more impaired in family functioning and in relationships with parents, siblings, and partners, and they reported impaired functioning in their spare time activities. On the other hand, individuals in the high increasers trajectory of status violations reported that they had been more often expelled from school or job, had more different partners, were more days drunk, used more drugs, reported more problems with self care, civic sense, family functioning, relationships with parents, relations with friends, as well as impaired functioning in their job.

Thus, although both deviant trajectories of opposition and status violations were related to impaired functioning in multiple domains of adult life the types of functional impairment seem to differ somewhat, possibly reflecting the typical behaviors included in these behavioral clusters. Anyway, both types of externalizing behaviors represent maladapative ways of coping with social and environmental challenges which short-circuits the development of more mature and adaptive social functioning. This confirms the finding from Moffitt that life-course persisters have more more durable than changeable problems in their behavior and their reaction to their environment (Moffitt et al., 2002).

We expected that individuals with adolescent increasing externallizing problem behaviors would have better outcomes in all domains of social functioning than individuals with chronic or persistent problems. Overall young adults who passed through adolescent

increasing trajectories reported lower levels of impaired social outcomes and social functioning than individuals with chronic or persistent externalizing problems. This fits well in the theoretical frameworks of Moffitt, Loeber and Patterson who hypothesized that the more persistent or early starting a pathways is the more deviant, and the more difficult it is to reclaim a normal developmental pathway (Moffitt, 1993; Sroufe, 1989). It also partially answers repeated questions on the relevance of adolescent onset problem behavior. Our data show that chances of impaired social outcome and functioning increase most notably when problem behavior started early, much more so than for adolescence-onset cases. All developmental trajectories with childhood problems (low, medium, and high decreasers within opposition and medium increasers within status violations) showed a deteriorating effect on several of the outcome measures. This suggests that the most important factors in increasing the risk of impaired social functioning is the occurrence of problem behavior in childhood and the type of externalizing behavior, instead of the chronicity of externalizing problems.

Although we expected the opposite, males with externalizing behavior problems were not more likely than females with externalizing problem behaviors to report problems in the domains of work and substance abuse. The similarity of the ill effects of externalizing trajectories for both males and females were striking. Only 4% of the interaction between trajectory and gender were significant, which indicated that females with high level externalizing behavior trajectories were more impaired in relationship with partners and friends, and in spare time activities than males in the same developmental trajectory. Thus, if any social outcomes differentiate between deviant males and females, they were somewhat gender-stereotyped for females, as indicated by their higher risk of problems in personal relationships.

Limitations

The present study is not without limitations. A main limitation is that the study population was a random sample of mainly Caucasian children and adolescents living in The Netherlands. It is uncertain to what extent cultural differences may be responsible for differences in the course of problem behavior and their predictive link to adult behavior. Crijnen, Achenbach and Verhulst (1999) compared CBCL scores for 12 different cultures and concluded that cultural effects on average levels of parent-reported problem behavior were minimal. However, this conclusion may not translate to the developmental course of problem behavior or its social outcome.

Another limitation of this study is the reliance on only parental reports to assess child/adolescent problem behavior. Parents may be unaware of their child's rule breaking behavior and offenses, especially as their child becomes an adolescent (Moffitt et al., 1996). Therefore, replications are essential to assess the generalizability of the present findings to

other informants like teachers and youths themselves. On the other hand, these parent reports of problem behavior did predict independent young adults' reports of social functioning which attests to their validity.

Our study was not intended to elucidate the underlying etiological mechanisms of the continuities and discontinuities of externalizing behaviors. Therefore, we do not know to what extent genetic or environmental factors are responsible for the cumulative continuity of externalizing developmental trajectories and for their negative effects on so many domains of social functioning. Elucidation of the underlying mechanisms may yield theoretical insights into behavior-cognition links in both normal an atypical development, an important tenet of the field of developmental psychopathology.

Implications and Further Research

In general, the results of this study tend to suggest the presence of a dose-reponse relationship between the extent of males' and females' childhood and adolescent externalizing problems and later outcome risk, with later risks tending to increase with increasing severity of earlier behavior problems. These findings clearly suggest the importance of addressing mild to moderate levels of conduct problems in males and females. There is clearly a need for greater recognition of the fact that females are also at risk for antisocial behavior problems, and that these difficulties are likely to have a pervasive impact on their adult life.

Recently, much emphasis has been put on the developmental importance of pathways of physically aggressive behavior. The present study indicates that there are interesting patterns of risk involved in pathways of nonaggressive externalizing behaviors as well. For instance, children following deviant trajectories of opposition and status violations seem to be mainly at risk for social impairment, while deviant trajectories of property violations and aggression showed no independent contribution to the prediction of adult social functioning. This suggests that in the long run children displaying externalizing problems of opposition and status violations are following pathways that involve even more risk for social impairment than those displaying overt aggression.

Individuals with childhood oppositional behavior and status violations are at a substantial risk for serious social problems during the transition to adulthood that may persist into their future. This study should not taken to imply that childhood externalizing problems are causes of social impairment in young adulthood. Rather, the value of these findings is that they show that early oppositional problem behaviors and status violations are observable markers that signal risk for a unfavorable transition to adulthood. The issue of causes for the development of externalizing behaviors and the evolution into social impairment is not answered in the present study. However, this study's results clearly suggest the relevance of the prevention of childhood externalizing problems as a means of preventing undesirable social outcomes in adulthood. Therefore, longitudinal screening of children's and adolescents'

externalizing problems may be a valuable tool in the early identification of those who are at increased risk of social impairment once they have reached young adulthood.

7

General Discussion

Chapter 7
General Discussion

The main aim of this study was to investigate key issues regarding the development of externalizing behavior across childhood and adolescence and predictive relations between developmental trajectories of externalizing behavior and young adult delinquency, psychopathology, and social impairment. More specifically, we investigated: (1) the normative development of a broad array of child emotional/behavioral problems across childhood and adolescence; (2) individual differences in developmental trajectories of different types of externalizing behavior, including aggression, opposition, property violations, and status violations; (3) the predictive value of different developmental trajectories of externalizing behaviors regarding major indices of impairment in young adulthood; and (4) gender differences in levels and developmental course of these externalizing behaviors and their outcomes.

For the determination of developmental trajectories, multicohort longitudinal studies are necessary because they enable us to disentangle age, cohort, and period effects by showing whether the same changes with age are observed in different cohorts studied in different time periods (Farrington, 1991; Kraemer, Yesavage, Taylor, & Kupfer, 2000; Loeber & Farrington, 1995; Stanger, Achenbach, & Verhulst, 1997; Willett, Singer, & Martin, 1998). This study described developmental trajectories of parent reported emotional/behavioral problems and the predictive value of these developmental pathways from childhood into adulthood using a sample of males and females from a multiple birthcohort that was followed across 14 years.

Externalizing Behaviors

The study of externalizing behavior in childhood and adolescence is important because of the direct costs of such behavior to society, not only in terms of damaged property and disruption of normal patterns of living, but also because of the difficulty of treating antisocial youth, and the potential emergence of later adult criminality and other serious disorders such as substance abuse (Loeber & Stouthamer-Loeber, 1998). Externalizing behavior problems are the most common child and adolescent problem behaviors (Robins & Price, 1991; Zoccolillo, 1992). However, not all children who show externalizing behaviors develop into adolescents or adults with externalizing behaviors or other deviant outcomes.

To identify patterns of risk we have to investigate how childhood externalizing behaviors develop into maladaptive patterns of externalizing behavior resulting in undesirable outcome and how they may change and develop into adaptive adult outcomes. Specifically, one cannot explain the origins of externalizing behaviors in adolescence or young adulthood without understanding age differences in their course. By consequence, studies on the long-

term meaning of childhood externalizing problems need to address average or normative changes in these behaviors, as well as individual differences in these changes. There is also growing agreement that one cannot fully understand the development of externalizing behaviors without understanding differences in types of externalizing behavior. Several studies indicated that there are differential developmental patterns for different externalizing behaviors (Stanger et al., 1997; Tremblay, 2000). Given the wide range and differing developmental manifestation of defiant, aggressive, and antisocial behaviors exhibited by children and adolescents, we distinguished between different types of externalizing behavior comprised in four behavioral clusters first described by Frick et al. after performing a meta-analysis of 44 factor analytic studies of antisocial behavior (Frick et al., 1993). Four behavior clusters resulted from this meta-analysis, i.e., aggression, opposition, property violations, and status violations representing two dimensions, i.e., the overt - covert dimension and the destructive - nondestructive dimension. The classification of externalizing behaviors into four clusters received strong empirical support from Bongers, Koot, van der Ende, and Verhulst (2004) and Rey and Morris-Yates (1993).

We first addressed developmental changes in syndromes of externalizing behavior included in the empirically based system of psychopathology developed by Achenbach (Achenbach, 1991). In the study reported in Chapter 2 we found differences in the average development of Achenbach's Aggressive Behavior and Delinquent Behavior syndromes across the age period of 4 to 18 years. The Aggressive Behavior syndrome showed a decreasing average pattern across age while the Delinquent Behavior syndrome showed first a decreasing and thereafter an increasing pattern. The broadband Externalizing grouping of syndromes in which the Aggressive Behavior and Delinquent Behavior syndromes are included showed an average decrease with age. These findings strongly indicated the need to differentiate between different types of externalizing behaviors in order to provide a valid description of the developmental patterns of externalizing behavior. Moreover, the differentiation of externalizing behaviors in the four Frick clusters refined the description of the development of externalizing behaviors even more. The average developmental curves found for the four clusters indicated that aggressive and oppositional behavior decreases with age, property violations shows a nearly stable pattern across age, and status violations increases with age. The average developmental curves of all types of behavior were higher for males than for females. The average developmental curves reflect a normal reference for the developmental change of emotional/behavioral problems in the general population, against which individual or group wise deviations can be identified. Based on the deviation from the average developmental trajectories interventions and preventions can be designed specifically for the problems of an individual.

Externalizing Group-based Developmental Trajectories

The identification of average developmental curves assumes that all children are part of a single homogeneous population and subgroup differences in the average trajectories are related to conditional means. However, we reasoned that it is more likely that development of behavior is specific and unique to the individual (c.f., Willett et al., 1998). If the developmental pattern of behavior is unique to an individual, then this individuality explains the heterogeneity in developmental patterns within emotional/behavioral problems. Therefore, theories forwarded in the developmental and life-course study of externalizing problems (Loeber et al., 1993; Moffitt, 1993; Patterson & Yoerger, 1993) suggest the importance of distinguishing the developmental course of externalizing behavior between individuals. Specifically, life-course theories predict that within the population there are distinctive groups with distinctive etiologies that follow distinctive trajectories of externalizing behavior.

Following this lead, we found different developmental patterns for the four externalizing behavior clusters, suggesting that these indeed have different developmental origins. Taking the notion of individual differences a step further, we tried to identify groups of individuals following similar developmental pathways across childhood and adolescence. The availability of a large longitudinal sample allowed us to employ the innovative semi-parametric approach developed by Nagin (1999) to this end. Within each behavior cluster we found three to six different group-based developmental pathways. For each externalizing behavior cluster we identified a large group (50%) of individuals who followed a developmental trajectory at a low level, indicating that most individuals exhibit very little externalizing problem behavior as reported by the parents, and a small group (less than 8%) of individuals who exhibited more externalizing behavior than their peers throughout the measurement period, which we called the deviant developmental trajectories. The deviant developmental trajectory within aggression showed a decreasing course, for opposition and property violations a chronic course, and for status violations an increasing course. We found for both opposition (6%) and status violations (23%) a small group of individuals who showed an adolescent onset of problem behaviors.

Most individuals in deviant developmental trajectories (two-third) followed a problematic trajectory in only one of the behavioral clusters indicating that having problems in one domain of externalizing behavior does not necessarily imply having problems in other domains. The different developmental course for the four clusters of externalizing behavior and the limited overlap of only one third of the group membership of the deviant developmental trajectories indicate that individuals show heterogeneity of development across these externalizing behaviors.

Deviant Developmental Trajectories

One of the main findings from the present thesis is that individuals with deviant

developmental trajectories across childhood and adolescence, based on parents reports of externalizing behavior were most likely to develop psychiatric disorders (Chapter 4), commit various forms of delinquent behavior (Chapter 5), and to develop into socially impaired adults (Chapter 6). The developmental continuities we found for individuals following a deviant developmental trajectory are comparable with the continuity Moffitt et al. reported for the males who followed a life-course persistent trajectory in the Dunedin study (Moffitt, Caspi, Harrington, & Milne, 2002).

Moreover, we found that the higher the level of the developmental trajectory was, irrespective of the type of externalizing behaviors, the more severe the delinquent behavior, psychopathology, or social impairment in young adulthood. Although different deviant externalizing developmental trajectories reflect different predictive patterns to adult outcome, we can conclude that individuals who, irrespective of the type of externalizing behavior are classified in one or more deviant developmental trajectories from childhood to adolescence have less favorable life circumstances in adulthood than individuals who are not classified in a deviant developmental trajectory. This indicates that individuals who follow a deviant developmental trajectory have a more durable than changeable pattern of behavioral, emotional, and social problems. In other words, deviant developmental trajectories of externalizing problems are indicative of a multifaceted pattern of persistent maladjustment.

Children and adolescents who follow a deviant status violation trajectory, are in contrast to individuals in other deviant developmental trajectories, the ones with the most problematic development and are most likely to develop psychiatric disorders of an externalizing nature such as oppositional defiant disorder, antisocial personality disorder, and substance abuse disorder (Chapter 4). In addition, independent of other deviant trajectories this trajectory is associated with the most serious and violent delinquent acts (Chapter 5). The continuity of status violations to delinquency and psychiatric disorders in adulthood can be explained by the notion of a syndrome of interrelated problem behaviors during adolescence (Duncan, Alpert, Duncan, & Hops, 1997) or cumulative continuity (Caspi & Moffit, 1995), where higher levels of adolescent alcohol use (an important part of status violations) are channeled into environments that sustain and encourage not only the alcohol use itself but also engagement in other types of behaviors, such as aggression and theft. Moreover, in adulthood, individuals who follow a deviant developmental trajectory within status violations continue to use more alcohol and drugs than other individuals and show problems with the society at large (Chapter 6). According to Jessor et al. (Jessor, Donovan, & Costa, 1991) adolescent substance use is unrelated to adult outcome unless the alcohol use persisted into adulthood. This suggests that prevention of status violations becoming persistent may prohibit adult deviancy in the same domain.

Individuals who follow a deviant developmental trajectory within opposition are also severely affected in their psychosocial functioning in adulthood, but in other domains than

individuals with a deviant trajectory of status violations. Individuals with deviant oppositional behavior are more likely than individuals with other types of deviant developmental trajectories to develop a mood disorder, and social impairments in relationships. The problems related with deviant oppositional behavior can arise from the fact that individuals with deviant oppositional behavior have problems in all sorts of social relationships, do poorly at school, and get into serious trouble with the authorities (Chapter 5 and 6). Because depression and oppositional behavior have common correlates including life events, chronic difficulties and hassles, and cognitive styles. Capaldi et al. suggested that externalizing behavior, and more specifically oppositional behavior can cause depression (Capaldi, 1992; Capaldi & Stoolmiller, 1999).

Comparable with individuals who follow deviant developmental trajectories within status violations, individuals with deviant trajectories of property violations are most likely to report serious and violent delinquency. Deviant trajectories within property violations and status violations seem to divide between serious and non-serious delinquent outcomes while problematic trajectories within aggression and opposition also included children who as young adults tend to report only non-serious delinquency. This indicates that individuals with deviant trajectories of property violations and status violations, which are typical adolescent behaviors, are more seriously afflicted with delinquent outcome than individuals with deviant trajectories of aggression and opposition, which are typical childhood externalizing behaviors.

On the other hand individuals with deviant property violations are independently from other externalizing behaviors more likely to develop an anxiety disorder. This is in contrast with earlier studies, which suggest that, individuals with CD and comorbid anxiety were less likely than youths with CD alone to have been arrested for a violent offense (Hinshaw, Lahey, & Hart, 1993). In addition, studies indicated that individuals with comorbid CD and anxiety were less impaired in adulthood (Walker et al., 1991). In the current study we found that individuals with deviant property violations were less likely to show impaired social functioning in adulthood (Chapter 6).

Unexpectedly, individuals who follow only a deviant developmental trajectory within aggression appeared to be most likely to develop into mature and adaptive adults when compared with individuals who follow other deviant externalizing developmental trajectories. Once membership of other trajectories was accounted for individuals who followed a deviant developmental trajectory within aggression had no increased chance of developing psychiatric disorders in adulthood, to report delinquency, or to be socially impaired in adulthood.

Although we expected a link between aggression and psychiatric disorders or delinquency we only found a link between aggression and adverse outcomes in cases when the individual concurrently followed other deviant externalizing developmental trajectories. Aggressiveness might be thought to be the behavioral feature most likely to predict antisocial behavior, if only because much delinquent activity and antisocial personality disorder have an

aggressive component. Nevertheless, although aggression is undoubtledy associated with antisocial behavior, surprisingly little is known regarding its role in the developmental processes leading to such behavior. Magnusson and Bergman (1990) found that aggressiveness was associated with crime only when part of a constellation of problem behaviors, suggesting that it is necessary to consider behavior in terms of overall patterns and not only of supposedly separate traits.

In conclusion, all types of deviant externalizing behaviors represent maladaptive ways of coping with social and environmental challenges, which short-circuits the development of more mature and adaptive social functioning resulting in adverse psychiatric and delinquent outcomes in adulthood.

Other Developmental Trajectories

Besides individuals whose development followed deviant trajectories across childhood and adolescence, we also identified children who showed increasing levels of problems in adolescence only. The developmental course followed by the adolescence increasers within the opposition and status violations clusters is similar to the course followed by adolescence-limited offenders described by Moffitt (1993). According to Moffitt (1993) subjects following the adolescence-limited trajectory limit their antisocial and externalizing behavior to adolescence and are less pathological than individuals with a life-course persistent trajectory. In other words they stop displaying antisocial behavior when they become adults. However, despite the expectation, in our study young adults who passed through adolescent increasing trajectories reported more adult delinquent behaviors and psychiatric disorders than individuals within the near zero developmental trajectories, suggesting that outcome for these adolescence increasers groups might be less benign than previously thought, although they fared better that individuals in the deviant developmental trajectories. Both individuals with adolescence increases within opposition and status violations appeared to develop in young adults with few social problems, and appeared well-situated to establish bonds to a partner and commitment to a career path. Such ties have been found to facilitate the desistance from delinquent conduct (Quinton, Pickles, Maughan, & Rutter, 1993) and can cause the recovery in well functioning adults as suggested by the theory (Moffitt, 1993). This suggests that eventually most adolescence increasers probably develop into healthy adults.

Although both trajectories showed increasing problems in adolescence the developmental continuity for the trajectories was different. This suggests that there are two different increasing pathways of externalizing problems in adolescence, one that is characterized by truancy and alcohol and drug use that does increases the risk for developing psychiatric disorders and another that is characterized by an increase in oppositional behavior that heightens the risk of both serious and violent delinquency. For now, it is unclear why the developmental outcomes of these two increasing trajectories are different.

In the present study we could identify groups of individuals who showed no externalizing behaviors throughout childhood and adolescence. Males and females in this trajectory committed the least delinquent acts, were less likely to develop a psychiatric disorder, and were socially well-adapted adults. The large group of individuals who showed no externalizing behavior throughout childhood and adolescence found in the present study suggests that it is not normative to exhibit externalizing behavior. Although, Moffitt's (1993) theory assumed that it is normative for any adolescent to exhibit at least some externalizing behavior. Perhaps the seeming desistance from externalizing behavior found for a large group of individuals in this study may have been caused by the use of parent reports for the description of externalizing behavior. Studies indicate that parents are well aware of the externalizing behavior of children and adolescents who are deviant but seem to be less aware of less problematic externalizing behaviors (Achenbach, McConaughy, & Howell, 1987).

Gender Differences

The present study indicated that the shape of the studied developmental trajectories did not differ between males and females, although we did find clear gender differences in mean numbers of reported externalizing behaviors. Apparently, females showing deviant levels of externalizing behavior follow similar developmental pathways as deviant males. In addition, the chance of following high-level trajectories was higher for males than for females, especially for CD-like behavioral clusters (Aggression, Property Violations, and Status Violations). Importantly, in the present study all CD-like behavioral clusters showed nearly the same gender difference. This indicates that the gender difference in CD is probably not caused by a single behavioral cluster, but by all relevant behaviors taken together. Although several researchers suggested that there is a different underlying construct for males and females (e.g., Crick et al., 1999), the present results suggest that there are no different symptom constellations of conduct disorder for males and females.

Both males and females in deviant developmental disorders have an increased risk for developing delinquent behavior and psychiatric disorders. The overall gender differences in base rate of reported delinquent acts and psychiatric disorders are also present in males and females in deviant developmental trajectories. A strong finding in our study is that females with deviant externalizing problems are more likely to show heterotypic continuity (internalizing psychiatric disorders) than homotypic continuity (delinquent behavior and externalizing psychiatric disorders). These findings confirmed a widely held belief about a sex-specific comorbid relation. The reasoning is that although females' underlying psychopathology may sometimes be expressed as externalizing behavior in childhood and adolescence, psychopathology in females is primarily channeled into internalizing problems such as depression in adulthood. This expression may be the result of gender-role

socialization or natural consequence of sex differences in cognitive and emotional development (Zoccolillo, 1993).

Besides the differences and similarities in continuity for males and females the present findings suggest that a gender paradox may operate in the domain of deviant externalizing developmental trajectories. Although females in general are found to have fewer externalizing problems than males, females with deviant externalizing developmental trajectories were even more at risk for psychiatric disorders (Chapter 4) and impairment in social relationships (Chapter 6) in young adulthood than males. Earlier studies have found a gender paradox with regard to conduct problems (e.g., Loeber & Keenan, 1994; Robins, 1986) and several hypotheses have been proposed to explain this, although the explanation is still puzzling. For instance, one hypothesis assumes a greater genetic variability in males; therefore, males might show milder forms of disorders as result of this variation (Eme, 1992). Another explanation assumes that underlying vulnerability for males and females is congruent, but the threshold that needs to be exceeded before an individual is affected differs for males and females (Eme, 1992). However, to better understand causes of the gender paradox researchers should expand their prospective studies of externalizing behaviors and outcomes to studies that incorporate both males and females and investigate the differential patterns for males and females more thoroughly.

Strengths and Limitations of the Study

It must be noted that this study was originally not designed to be a longitudinal project to investigate developmental processes regarding psychopathology, but to validate the CBCL/4-18 for Dutch children (Verhulst et al., 1985). Therefore, the range of variables studied during childhood and adolescence was somewhat limited, and potentially important factors in the development of externalizing behaviors such as temperament, problematic attachment, parenting factors, and neuropsychological variables were not included. Therefore, we could not elucidate the underlying etiological mechanisms of the continuities and discontinuities of externalizing behaviors found in this study. As a consequence, we do not know to what extent genetic or environmental factors are responsible for the cumulative continuity of externalizing developmental trajectories and for their negative effects on so many domains in adult functioning. Elucidation of the underlying mechanisms may yield theoretical insights into behavior-cognition links in both normal an atypical development, an important tenet of the field of developmental psychopathology.

On the other hand, the multiple birthcohort design of our study created the opportunity to describe developmental patterns while accounting for cohort and period effects. Advantages of the use of a multiple birthcohort design are shortening of the follow-up time and simultaneous coverage of a wide age-range. Despite these strengths a disadvantage of this design is that fewer measurement points were available for the individuals in the older

birthcohorts and at the younger age (4-5 years), and that developmental trajectories, which were based on the first five waves of the study, covered only 8 years. Because none of the subjects in the sample was assessed at age 4 as well as age 18, the developmental curves obtained in this study were based on estamations. However, in this thesis, we used a powerful and innovative new methodology –the semiparametric mixed model– that eliminates many of the problems that arise from the multiple birthcohort design.

Another strong feature of our approach is that the semiparametric modeling process does not focus on the relationship among variables like factor analysis, and regression analysis (variable-centered approaches), but on relationships among individuals (a person-centered approach). Developmental patterns of externalizing behavior deserve a person-centered focus because the cross-time variance in these behaviors reflects the presence of heterogeneous groups of individuals who follow different developmental trajectories. If there was not such heterogeneity between the individuals we also could have done with an easier approach such as repeated measures ANOVA, or growth curve analysis. However these methods do not account for the heterogeneous variability within and between subjects. The semiparametric model used in the present study accounts in an optimal way for the assumed heterogeneity within the population.

The developmental trajectories in the present study are based on parent reports of externalizing behaviors. Because the developmental trajectories cover an age-range from 4 to 18 years, and self-reports of psychopathology are deemed reliable only from age 10 it was impossible to use self-reports of the children. Therefore, the level of externalizing problems in the trajectories reported in this study is potentially influenced by parental reporting bias. In general, in contrast to self-reports, parent reports tend to underestimate the actual frequency of several externalizing behaviors, as parents cannot be aware of all behaviors displayed by their children (Youngstrom, Loeber, & Stouthamer Loeber, 2000). Low agreement between different informants regarding overt and covert behaviors in children and adolescents is the rule rather than the exception. Nowhere are questions of situational specificity more crucial than in children's behavioral and emotional problems, because assessment of such problems must span diverse situations, such as home, school, and neighborhood. Most likely parents are less aware of their children's covert externalizing behaviors than of their overt externalizing behaviors. It is difficult to predict the consequences of a bias, because it may have its effects through other unknown variables (for instance intelligence), although studies indicate that for very deviant children the agreement between informants may be less affected by situational and informant variables (Achenbach et al., 1987). Therefore, parent reports might be more indicative of the deviant developmental trajectories than of the lower level developmental trajectories.

Besides parent reports for the developmental trajectories we used self-reports to assess the adverse outcome variables in adulthood. Despite the fact that agreement between different

informants is considered to be low (Achenbach et al., 1987), we found considerable predictive links between externalizing behavior reported by parents and adverse outcomes in adulthood reported by the subjects themselves. The use of different informants for predictors and outcomes provide confidence in the significant results obtained. However, the use of different informants may lead to an underestimation of the effects. We might have obtained different results had the same informant been used for the measurement of the developmental trajectories and the outcomes. In addition, important informants like teachers and peers were completely absent in this study. Therefore findings from the present study should be replicated in other samples using different informants.

Theoretical Implications

This study yielded results that confirmed theoretical assumptions as well as others discarding them. The assumed heterogeneity within antisocial behaviors could be confirmed in the present study. We found groups that are comparable to the early onset or life-course persistent groups and the late starter or the adolescence-limited groups proposed in the current literature. Moreover, the persistent externalizing developmental trajectories appeared to be most at risk for developing psychiatric disorders, delinquent behavior, and impaired social functioning in adulthood which confirms the findings of several other studies (e.g., Broidy et al., 2003; Moffitt et al., 2002) and characteristics of the deviant trajectories were as expected by the theories of the development of antisocial behavior (Moffitt, 1993; Loeber et al., 1993; Patterson & Yoerger, 1993).

Although we found strong evidence for the existence of a life-course persistent or early starter groups, we could not identify the so-called adolescence-limited group, which is in convergence with other studies that tried to identify this group (e.g., Fergusson & Horwood, 2002; Lacrouse et al., 2002; Brame et al., 2001; Nagin & Tremblay, 1999). Thus, confirmation of Moffitt's assumption (1993) is still wanting. The limited number of individuals who showed increasing trajectories of opposition and status violations also did not reach the level of problem behavior of the identified deviant trajectory (that showing the highest level of problem behavior throughout). However, individuals with adolescent onset problems showed more adverse outcome in adolescence or young adulthood than individuals within the near zero developmental trajectories, suggesting that the increasing developmental trajectory was more harmful than the near zero developmental trajectories. Also, they developed into healthier adults than individuals in the deviant developmental trajectories. These latter findings are congruent with the findings of Moffitt (2002), but in contrast with her previously held expectation that individuals in the adolescence-limited category are protected from problems in adulthood (c.f., Moffitt, 1993). Although, the adolescence increasers reported delinquent behavior, and psychiatric problems, they were socially well-adapted individuals. This indicates that the transition from adolescence to mature adults for

individuals in the adolescence increasers trajectories was more difficult than for individuals within the near zero trajectory.

Our findings also clearly show the importance of the differentiation between different types of externalizing problems, given the variety in association with adverse outcomes like psychiatric disorders, and delinquent behavior. This differentiation is in contrast with the broad antisocial construct adopted by Moffitt and colleagues (Moffitt & Caspi, 2001; Moffitt, Caspi, Rutter, & Silva, 2001). They suggest that the heterogeneity within developmental continuity is only dependent on the course of the antisocial behaviors (Moffitt, 1993). However, the present study indicates that the developmental continuity is dependent on both the course of the developmental trajectories and the types of externalizing problems.

The investigation of the developmental continuity within externalizing behaviors revealed unexpected relations between externalizing developmental trajectories and adverse outcomes. Recently, much emphasis has been put on the developmental importance of pathways of physically aggressive behavior for the development of violent delinquency and cost of the aggressive behavior for the society (e.g., Nagin & Tremblay, 1999). However, our study showed that the long-term consequence of the deviant trajectory of physical aggression for the individual is the least problematic of all deviant trajectories. These individuals are most likely to develop in healthy and well-adapted adults. However, when individuals show deviant aggressive behavior in combination with deviant developmental trajectories of opposition or status violations they show much more adverse outcomes. It seems that externalizing behaviors that are harmful for the individual themselves, such as alcohol and drug abuse, have more severe long-term consequences than externalizing behaviors that have direct consequences for the society or environment of the individual. Because of these unexpected patterns within externalizing behaviors, further studies must emphasize the developmental continuities within externalizing behavior and the links between different types of externalizing behaviors and adverse outcomes.

Clinical Implications

It is highly important to learn more about potential causal factors and causal mechanisms affecting the developmental trajectories identified in this study. We showed that children with following deviant trajectories of externalizing problems are most likely to become adolescents with problem behaviors and young adults with a diversity of undesirable outcomes. The long-term consequences of child/adolescent externalizing problem behavior support the importance of early intervention and prevention. Revealing factors and mechanisms that account for the persistence of externalizing problems from childhood into young adulthood may contribute to the development of effective interventions and preventions.

With respect to primary prevention, our findings on males and females with a deviant developmental trajectory suggest that primary prevention efforts must begin very early in life.

Those males and females were distinguished by difficult externalizing behavior as early as age 4 years. Previous reports have suggested that individuals with deviant developmental trajectories encounter multiple problems at the level of the individual, family, school, and justice system. It has been demonstrated that problem areas interact to exacerbate antisocial outcomes (Bongers, Koot, Van der Ende, Hofstra, & Verhulst, submitted; Raine, 2002). Such results suggest that effective prevention effects must encompass multiple modalities: family, child, and school (Yoshikawa, 1994).

However, the findings of this study suggest also that it may be beneficial to include children and adolescents with mild or moderate externalizing behaviors in such interventions. In particular, the results suggest a continuous dose-response function between the extent of externalizing behaviors and risk for adverse outcomes in young adulthood. These findings clearly suggest the importance of also addressing mild to moderate levels of conduct problems in males and females. There is clearly need for greater recognition of the fact that females are also at risk for antisocial behavior problems, and that these difficulties are likely to have a pervasive impact on their adult life.

Recently, much emphasis has been put on the developmental importance of pathways of physically aggressive behavior. The present study indicates that there are interesting patterns of risk involved in pathways of nonaggressive externalizing behaviors, as well. For instance, children following deviant trajectories of opposition and status violations mainly seem to be at risk for delinquency, social impairment and psychiatric disorders, while deviant trajectories of property violations and aggression showed no independent contribution to the prediction of adult social functioning and psychiatric disorders. This suggests that in the long run children displaying externalizing problems of opposition and status violations are following pathways that involve even more risk for social impairment than those displaying overt aggression.

Individuals with childhood oppositional behavior and status violations are at a substantial risk for serious adverse outcomes during the transition to adulthood and these adverse outcomes may persist into their future. This study should not be taken as to imply that childhood externalizing problems are causes of adverse outcomes in young adulthood. Rather, the value of these findings is that they show that early oppositional problem behavior and status violations are observable markers that signal risk for an unfavorable transition into adulthood. The issue of causes for the development of externalizing behaviors and the evolution into adverse outcomes is not addressed in the present study.

Conclusions

This study is one of the first to systematically investigate key issues regarding the developmental continuity of developmental trajectories within externalizing behaviors for both males and females from childhood into young adulthood in a general population sample.

Besides that we found different developmental trajectories within externalizing behaviors, although the same for males and females, five findings from this study stand out. First, we found a dose-response relation between the level of the developmental trajectory and the level of adverse outcome in young adulthood. Second, there were no unique predictive links between deviant aggressive behavior in childhood and adolescence and adverse outcome in young adulthood. Third, individuals following a deviant developmental trajectory of opposition or status violations were most likely to show adverse outcomes in young adulthood. Fourth, we found two different trajectories with an increase in adolescence, one within opposition and one within status violations that showed different predictive links to adverse outcomes in young adulthood. Individuals who showed an adolescence increasers trajectory within opposition were more likely to report delinquent behaviors and individuals who followed a developmental trajectory within status violations were more likely to develop psychiatric disorders. Finally, females in problematic developmental trajectories were more severely afflicted with adverse outcomes in young adulthood than males in the same trajectories.

Considering our results, it seems very important to provide early prevention and adequate early intervention for both boys and girls before their externalizing behaviors develop into problematic patterns and accordingly will be less susceptible for improvement. Future research should focus on the mechanisms leading to the differences in the externalizing developmental trajectories and differences in the developmental continuity from childhood into adulthood. To achieve this, emphasis should be placed on the identification of genetic and biological markers and the unique contribution of genetic and biological and family/environmental factors on the development of externalizing behaviors in males and females.

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Summary

Summary

The objective of the present study was to examine the development of externalizing behavior across childhood and adolescence and the predictive relations between developmental trajectories of externalizing behavior and young adult delinquency, psychopathology, and social impairment.

The background and the rationale of the present study are described in chapter 1. We used an empirically derived scheme for the grouping of externalizing behaviors. This grouping, first described by Frick et al. (1993) distinguishes four behavior clusters of externalizing behavior, i.e., aggression, opposition, property violations, and status violations. Several theoretical models of externalizing behavior have proposed distinct developmental trajectories. The developmental course of externalizing behavior and its evolution into adult psychiatric disorders and delinquent behavior, has long been a source of concern for researchers. Unfortunately, theoretical proposals of the shape of developmental trajectories still need confirmation because previous research defined trajectories only on an a priori basis. Recently a so-called semiparametric model was developed that enables the empirical identification of developmental trajectories in longitudinal datasets. For the determination of developmental trajectories, multicohort longitudinal studies are necessary because they enable us to disentangle age, cohort, and period effects by showing whether the same changes with age are observed in different cohorts studied in different time periods (e.g., Farrington, 1991).

Using this method we aimed to extent the existing knowledge on the developmental pathways from childhood and adolescence, into young adulthood. More specifically, we investigated: (1) the normative development of a broad array of child emotional/behavioral problems across childhood and adolescence; (2) individual differences in developmental trajectories of different types of externalizing behavior, including aggression, opposition, property violations, and status violations; (3) the predictive value of different developmental trajectories of externalizing behaviors regarding major indices of impairment in young adulthood; and (4) gender differences in levels and developmental course of these externalizing behaviors and their outcomes.

This study described developmental trajectories from age 4 to 18 of parent reported emotional/behavioral problems and the predictive value of these developmental pathways from childhood into adulthood from age 18 to 30 using a general population sample 2,076 of males and females from a multiple birth cohort that was followed across 14 years.

In chapter 2, normative developmental trajectories of parent-reported behavioral and emotional problems assessed with the CBCL (Achenbach, 1991) were identified in children aged 4 to 18 years from the general population. These trajectories describe the course of average CBCL syndrome scores across the 4-18-years age period. The CBCL assesses withdrawn behavior, somatic complaints and anxious-depressed behavior, together constituting internalizing problems; delinquent behavior and aggressive behavior constituting externalizing problems, and social problems, thought problems, and attention problems. Most syndromes showed a linear increase or decrease with age or a curvilinear trajectory, except for thought problems. Somatic complaints, withdrawn behavior, and overall internalizing problems showed an increasing average trajectory from ages 4 to 18. Aggressive behavior, overall externalizing problems, and total problem scores showed a decreasing average trajectory, while anxious/depressed behavior, delinquent behavior, social problems, and attention problems showed a curvilinear average trajectory. Trajectories for most syndromes differed for boys versus girls, except those for withdrawn behavior, social problems and thought problems. Internalizing problems were similar in girls and boys in childhood, but more girls than boys were affected in adolescence. Externalizing problems were more common in boys than in girls. The results reflect a normal reference trajectory for behavior problems in the general population and provide information against which developmental deviance in childhood and adolescence can be detected.

In chapter 3, the average and group-based developmental trajectories within externalizing behavior were investigated. Externalizing behaviors were defined using the clustering first suggested by Frick et al. (1993). The main asset of the clustering of externalizing behavior in four behavior clusters (i.e., aggression, opposition, property violations, and status violations) lays in the further differentiation of externalizing problems, avoiding the lumping of behaviors that potentially show different developmental changes. The average developmental trajectories found for the four behavior clusters showed on average higher levels of externalizing behavior for males than for females. On average, aggression, opposition, and property violations decreased, whereas status violations increased over time. However, theories forwarded in the developmental and life-course studies of externalizing problems suggest the importance of distinguishing the developmental course of externalizing behavior between individuals. Specifically, life-course theories predict that within the population there are distinctive groups with distinctive etiologies that follow distinctive trajectories of externalizing behavior. Therefore, we investigated the group-based developmental trajectories within externalizing behavior.

Within each behavior cluster there were three to six different group-based developmental pathways, most of which followed the shape of the average trajectories at various levels. For each externalizing behavior cluster we identified a large group (50%) of individuals who followed a developmental trajectory at a low level, indicating that most individuals exhibit very little externalizing problem behavior as reported by the parents, and a small group (less than 8%) of individuals who exhibited more externalizing behavior than their peers throughout the measurement period, which we called the deviant developmental trajectories. The deviant developmental trajectory within aggression showed a decreasing course, for opposition and property violations a chronic high course, and for status violations an increasing course. We found for both opposition (6%) and status violations (23%) a small group of individuals who showed an adolescent onset of problem behaviors.

In chapter 4, 5, and 6 we investigated the predictive relations between the parent reported group-based developmental trajectories found in chapter 3 and self-reported adverse outcomes in adulthood.

In chapter 4, the predictive association between developmental trajectories of child/adolescent externalizing behaviors and psychiatric disorders was investigated. At young adulthood, lifetime psychiatric diagnoses were obtained by a standardized DSM-IV interview.

Individuals with deviant, i.e., persistently high developmental trajectories of parent-reported externalizing behaviors showed the most increased risk for psychiatric disorders. Deviant status violations predicted oppositional defiant disorder, antisocial personality disorder, and substance abuse disorder, while individuals with a deviant opposition trajectory were more likely to report mood disorder and individuals with a deviant property violations trajectory were at risk for developing anxiety disorder. A cross-time link between trajectories of aggression and psychiatric disorders was only found when aggression was associated with one or more other deviant externalizing trajectories. The study indicates that developmental trajectories of distinguishable types of problem behaviors are related to different psychiatric disorders and that this pattern varies for males and females.

Chapter 5 addressed the issue which developmental trajectories of child/adolescent externalizing behaviors predict delinquency in young adulthood. Delinquency was assessed using lifetime reports by young adults aged 18 - 30 years, categorized in non-serious, serious, and violent delinquency. As expected, individuals who follow deviant externalizing developmental trajectories, especially during childhood, appeared to be at increased risk of all types of delinquency in young adulthood. Youngsters with deviant trajectories of property and status violations report more delinquent acts as young adults than youngsters with deviant

trajectories within aggression and opposition. Of two increasing externalizing trajectories in adolescence, one characterized by an increase in truancy and alcohol and drug use (status violations) did not increase the risk of young adult delinquency while another, characterized by an increase in oppositional behavior was associated with an increased risk of both serious and violent delinquency.

In Chapter 6, the predictive link between developmental trajectories and social functioning in adulthood was described. Social functioning was assessed using self-reports by young adults aged 18 - 30 years. We found a dose-response relationship between the level of externalizing problems and later social outcome risk, with later risks tending to increase with increasing severity of externalizing behaviors. Females with persistent externalizing behavior problems reported more impairment in relationships than males in the same persistent trajectory.

In chapter 7, the main findings and conclusions of the previous chapters were summarized and discussed.

The findings from the present study confirmed some theoretical assumptions and discarded others. The assumed heterogeneity within antisocial behaviors was confirmed in the present study. We found groups that are comparable to the early onset or life-course persistent groups proposed in the current literature. Moreover, individuals following persistently high externalizing developmental trajectories appeared to be most at risk for developing psychiatric disorders, delinquent behavior, and impaired social functioning and characteristics of the deviant trajectories were as expected by the theories of the development of antisocial behavior (Moffitt, 1993; Loeber et al., 1993; Patterson & Yoerger, 1993).

Although we found strong evidence for the existence of a life-course persistent or early starter groups, we could not identify the so-called adolescence-limited group (cf., Moffitt, 1993), which is in convergence with other studies that tried to identify it (e.g., Fergusson & Horwood, 2002; Lacrouse et al., 2002; Brame et al., 2001; Nagin & Tremblay, 1999). Thus, confirmation of Moffitt's assumption (1993) is still wanting. The limited number of individuals who showed increasing trajectories of opposition and status violations also did not reach the level of problem behavior of the identified deviant trajectory (that showing the highest level of problem behavior throughout) which refutes Moffitt's assumption that it is normative to show increasing problem behaviors during adolescence. However, individuals with adolescence onset problems showed more adverse outcome in adolescence or young adulthood than individuals within the near zero developmental trajectories.

Our findings also clearly show the importance of the differentiation between different types of externalizing problems, given the variety of associations with adverse outcomes like psychiatric disorders, and delinquent behavior. This differentiation is in contrast with the broad antisocial construct adopted by Moffitt and colleagues (Moffitt & Caspi, 2001; Moffitt, Caspi, Rutter, & Silva, 2001). They suggest that the heterogeneity within developmental continuity is only dependent on the course of the antisocial behaviors (Moffitt, 1993). However, the present study indicates that the developmental continuity is dependent on both the course of the developmental trajectories and the types of externalizing problems.

The investigation of the developmental continuity within externalizing behaviors revealed unexpected relations between externalizing developmental trajectories and adverse outcomes. Our study showed that the long-term consequence of the deviant trajectory of physical aggression for the individual is the least problematic of all deviant trajectories. These individuals are most likely to develop into healthy and well-adapted adults. However, when individuals show deviant aggressive behavior in combination with deviant developmental trajectories of opposition or status violations they are much more at risk for adverse outcomes. It seems that externalizing behaviors that are harmful for the individual themselves, such as alcohol and drug abuse, have more severe long-term consequences than externalizing behaviors that have direct consequences for the society or environment of the individual. Because of these unexpected patterns within externalizing behaviors, further studies must emphasize the developmental continuities within externalizing behavior and the links between different types of externalizing behaviors and adverse outcomes.

Considering our results, it seems very important to provide early prevention and adequate early intervention for both boys and girls before their externalizing behaviors develop into problematic patterns and accordingly will be less susceptible for improvement. Future research should focus on the mechanisms leading to the differences in the externalizing developmental trajectories and differences in the developmental continuity from childhood into adulthood. For this, emphasis should be placed on the identification of genetic and biological markers and the unique contribution of genetic and biological and family/environmental factors on the development of externalizing behaviors in males and females.

Samenvatting

Samenvatting

Het doel van dit onderzoek was om de ontwikkeling van gedragsproblemen tijdens de kindertijd en de puberteit in kaart te brengen, alsook om te kijken hoe de verschillende ontwikkelingspaden van gedragsproblemen zijn gerelateerd aan delinquent gedrag, psychopathologie en sociale problemen in de jongvolwassenheid.

In hoofdstuk 1 wordt de achtergrond van het onderzoek uitgelegd. Verschillende theorieën uit de ontwikkelings- en levensloopstudies suggereren dat er groepen kinderen zijn die verschillende ontwikkelingspatronen van externaliserend gedrag laten zien. Deze theorieën verwachten dat er een kleine groep kinderen is die gedurende de kindertijd ernstige gedragsproblemen laat zien die voortduren in de adolescentie en vervolgd worden door ernstige problemen in de volwassenheid (de zogenaamde life-course persistent group of de early starters). Een andere, grotere, groep kinderen wordt door de theorieën gekenmerkt door gedragsproblemen die pas beginnen in de puberteit terwijl in de kindertijd geen gedragsproblemen voorkwamen. De veronderstelling is dat dit ernstig probleemgedrag in de puberteit normatief of normaal is voor een grote groep kinderen en dat deze groep in de volwassenheid geen gedragsproblemen meer laat zien (de zogenaamde adolescent limited group of late starters). Om deze veronderstelde ontwikkelingspatronen te onderzoeken hebben we vier groepen van gedragsproblemen beschreven, die op empirische gronden zijn samengesteld door Frick et al. (1993); agressief gedrag (vechten), oppositioneel gedrag (driftig, koppig), antisociaal gedrag (stelen, brandstichten en liegen), heimelijk gedrag (weglopen, spijbelen en alcohol- en drugsgebruik). Verschillende theorieën hebben gesuggereerd dat elk van deze vier groepen een verschillend ontwikkelingspad volgt dat gekenmerkt wordt door een bepaald startniveau en een uniek beloop in de tijd. Gedurende lange tijd was het voor wetenschappers moeilijk om het beloop van gedragsproblemen te beschrijven en te relateren aan psychiatrische stoornissen en delinquentie. Onlangs is er een statistische methode ontwikkeld, het *semiparametrisch* model, dat in staat is om ontwikkelingspaden te identificeren in grootschalige en longitudinale steekproeven. Longitudinale steekproeven die bestaan uit meerdere geboortecohorten zijn daarbij vooral belangrijk, omdat de ontwikkelingspaden dan het meest betrouwbaar geschat kunnen worden zonder onbedoelde effecten van cohort of specifieke tijdsperiodes. Op deze manier is het dus mogelijk om te onderzoeken of veranderingen over de leeftijd toe te schrijven zijn aan veranderingen in probleemgedrag of aan verschillen in cohorten die zijn gebruikt of verschillen in tijdsperiodes (zie bijvoorbeeld Farrington, 1991).

Met het semiparametrische model willen we de bestaande kennis over ontwikkelingspaden tijdens de kindertijd, puberteit en jongvolwassenheid uitbreiden. We hebben (1) de normale ontwikkeling van emotionele problemen en gedragsproblemen van kinderen en adolescenten tussen 4 - 18 jaar onderzocht; (2) individuele verschillen in de

ontwikkelingspaden van de vier gedragsproblemen bekeken; (3) de voorspellende waarde van de ontwikkelingspaden van gedragsproblemen naar verscheidene belangrijke indicatoren van problemen in de jongvolwassenheid nagegaan (te weten delinquentie, psychiatrische stoornissen en sociale problemen); en (4) geslachtsverschillen in het niveau en patroon van ontwikkelingspaden onderzocht, alsook geslachtsverschillen in de voorspelling van problemen in de jongvolwassenheid.

De longitudinale steekproef die is gebruikt om de ontwikkelingspaden te onderzoeken is gebaseerd op vijf opeenvolgende ouderrapportages van emotionele problemen en gedragsproblemen van 2.076 jongens en meisjes van 4 tot 18 jaar uit de algemene bevolking. Daarnaast is er ook gebruik gemaakt van zelfrapportages van 2.076 jongens en meisjes van 18 tot 30 jaar.

In hoofdstuk 2 zijn de normale ontwikkelingspaden van emotionele poblemen en gedragsproblemen van kinderen van 4 tot 18 jaar geïdentificeerd uit de ouderraportage, de CBCL (Achenbach, 1991). De CBCL meet de volgende syndromen: teruggetrokken gedrag, lichamelijke klachten, en angstig-depressief gedrag. Deze drie syndromen vormen samen de schaal internaliserende problemen. Daarnaast meet de CBCL de volgende twee syndromen, delinquent gedrag en agressief gedrag, die samen de schaal externaliserende problemen vormen. De overige syndromen uit de CBCL zijn sociale problemen, denkproblemen, en aandachtsproblemen. De meeste syndromen nemen in de tijd gemiddeld lineair toe of af, of ze hebben een combinatie van een toenemende en afnemend score over de tijd (curvilineair). Tussen 4 en 18 jaar laten de CBCL syndromen lichamelijke klachten, teruggetrokken gedrag, en totale internaliserende problemen een gemiddelde toename van problemen zien en de CBCL syndromen agressief gedrag, totale externaliserende problemen en totale probleem score een gemiddelde afname van problemen. De syndromen angstig-depressief gedrag, delinquent gedrag, sociale problemen en aandachtsproblemen hebben gemiddeld een curvilineair patroon van problemen. De ontwikkelingspaden voor de meeste syndromen verschillen daarbij voor jongens en meisjes, behalve voor de ontwikkelingspaden teruggetrokken gedrag, sociale problemen en denkproblemen. Internaliserende problemen zijn in de kindertijd voor meisjes en jongens gelijk, maar meisjes hebben meer internaliserende problemen dan jongens in de puberteit. Externaliserende problemen komen meer bij jongens voor dan bij meisjes. Het belang van de gevonden ontwikkelingstrajecten is dat ze gebruikt kunnen worden als referentie voor de ontwikkeling van gedrag in de algemene bevolking, alsook om de mogelijke afwijkingen in de ontwikkeling van gedrag te ontdekken.

In hoofdstuk 3 zijn de gemiddelde en de individuele ontwikkelingspaden van externaliserend gedrag beschreven. Externaliserend gedrag is beschreven aan de hand van de vier groepen van gedragsproblemen zoals door Frick et al. (1993) voorgesteld. Het belangrijkste voordeel van deze vier aparte groepen van gedragsproblemen is dat de ontwikkeling van deze vier groepen nu ook apart onderzocht kunnen worden.

De gemiddelde ontwikkelingspaden voor de vier externaliserende gedragingen laten gemiddeld meer gedragsproblemen voor jongens zien dan voor meisjes. Tussen de kindertijd en de puberteit daalt het gemiddeld aantal gedragsproblemen voor agressief gedrag, oppositioneel gedrag en antisociaal gedrag, terwijl heimelijk gedrag een gemiddelde toename laat zien. Echter, theorieën uit de ontwikkelings- en levensloopstudies van externaliserende problemen gaan er vanuit dat er in de algemene bevolking meerdere ontwikkelingspad zijn die een verschillend beloop van gedragsproblemen over de tijd laten zien. Daarom hebben we met behulp van het semiparametrisch model onderzocht of we verschillende groepen van kinderen konden identificeren die andere ontwikkelingspaden volgen.

Binnen elk externaliserend gedrag hebben we drie tot zes verschillende ontwikkelingspaden gevonden. De meeste van deze paden volgen de vorm van de gemiddelde ontwikkelingspaden op een hoger of lager niveau van probleemgedrag. Voor elke groep van externaliserend gedrag vonden we een grote groep (van ongeveer 50%) van kinderen, die een laag ontwikkelingspad volgde, gekenmerkt door weinig externaliserend gedrag volgens de ouders. Een kleine groep kinderen (kleiner dan 8%) lieten meer externaliserende gedragingen zien dan hun leeftijdsgenoten gedurende de kindertijd en de puberteit volgens hun ouders. Deze groep kinderen volgt een deviant ontwikkelingspad. Binnen het agressieve gedrag laat het deviante ontwikkelingspad een afnemende beloop zien, terwijl binnen oppositioneel en antisociaal gedrag de deviante ontwikkelingspaden een chronisch hoog beloop laten zien en binnen heimelijk gedrag een toenemend beloop. Daarnaast is er voor oppositioneel en heimelijk gedrag ook een kleine groep gevonden (respectievelijk 6% en 23%) met een ontwikkelingspad dat gekenmerkt wordt door geen gedragsproblemen in de kindertijd en toenemende gedragsproblemen in de puberteit.

In hoofdstuk 4, 5 en 6 hebben we de voorspellende relaties tussen de gevonden ontwikkelingspaden in hoofdstuk 3 en door de kinderen zelf gerapporteerde problemen in de jongvolwassenheid beschreven.

In hoofdstuk 4 is de associatie tussen de ontwikkelingspaden van externaliserend gedrag en psychiatrische stoornissen onderzocht. Alle psychiatrische stoornissen die de kinderen en adolescenten ooit meegemaakt hebben zijn vastgesteld met behulp van een gestandaardiseerd psychiatrisch interview (DSM IV). Individuen met een deviant ontwikkelingspad hebben het grootste kans op het ontwikkelen van een psychiatrische stoornis. Maar de verschillende deviante ontwikkelingspaden voorspellen verschillende psychiatrische stoornissen. Het volgen van het deviante ontwikkelingspad binnen heimelijk gedrag voorspelt de ontwikkeling van oppositioneel-opstandige gedragsstoornis, antisociale persoonlijkheidsstoornis, en middelen misbruik. Individuen die een deviant ontwikkelingspad binnen oppositioneel gedrag volgen, hebben het grootste risico van het rapporteren van een stemmingsstoornis en individuen die een deviant ontwikkelingspad binnen antisociaal gedrag volgen, hebben het grootste risico van een angststoornis. Er is alleen een associatie gevonden

tussen het deviante ontwikkelingspad binnen agressief gedrag en een psychiatrische stoornis, wanneer er naast een deviant agressief ontwikkelingspad ook nog één of meer andere deviante ontwikkelingspaden waren. Het belangrijkste in deze studie is dat de ontwikkelingspaden van verschillende externaliserende gedragingen gerelateerd zijn aan verschillende psychiatrische stoornissen en dat dit patroon verschillend is voor mannen en vrouwen.

In hoofdstuk 5 is gekeken welke ontwikkelingspaden binnen externaliserend gedrag delinquentie in de jongvolwassenheid voorspellen. Met behulp van een interview dat door de jongvolwassenen zelf is ingevuld is vastgesteld of er ooit een delict is gepleegd. Delinquentie is hierbij onderverdeeld in drie categorieën: niet ernstig (d.w.z. vandalisme, winkeldiefstal en kopen van gestolen goederen), ernstig (d.w.z. verkopen van soft- en/of harddrugs, handelen in gestolen goederen, autodiefstal, en inbraak) en gewelddadig delinquent gedrag (d.w.z. deelname aan een gevecht in een publieke ruimte, bedreiging, geweld leidend tot letsel en verwonding met een wapen). Zoals verwacht kon worden, hebben de individuen die een deviant ontwikkelingspad volgen het grootste risico om elk type delinquent gedrag te plegen. Jongvolwassenen die een deviant ontwikkelingspad binnen antisociaal en heimelijk gedrag volgen hebben een groter risico om een delict te rapporteren dan jongvolwassenen die een deviant ontwikkelingspad binnen agressief en oppositioneel gedrag volgen. De twee ontwikkelingspaden met toenemende gedragsproblemen in de puberteit hebben een verschillend kans op het rapporteren van delinquent gedrag. Het ontwikkelingspad dat gekenmerkt wordt door een toename van spijbelen en alcoholgebruik in de puberteit heeft geen verhoogd risico van het vertonen van delinquent gedrag. Individuen daarentegen die toenemend oppositioneel gedrag in de puberteit laten zien hebben wel een verhoogde kans op het rapporteren van ernstig en gewelddadig delinquent gedrag.

In hoofdstuk 6 is de relatie tussen de ontwikkelingspaden en sociaal functioneren in de jongvolwassenheid beschreven. Het sociaal functioneren in de jongvolwassenheid is vastgesteld met behulp van een vragenlijst. We hebben aangetoond dat hoe hoger het niveau van het ontwikkelingspad was hoe groter het risico van problemen in het sociaal functioneren van jongvolwassenen. Het bleek dat vrouwen met deviante ontwikkelingspaden meer problemen met relaties rapporteren dan mannen met een vergelijkbaar deviant ontwikkelingspad.

In hoofdstuk 7 zijn de belangrijkste bevindingen en conclusies van de voorgaande hoofdstukken samengevat en bediscussieerd. De resultaten van dit onderzoek bevestigen de heterogeniteit binnen externaliserende gedragingen. We vonden ontwikkelingspaden die vergelijkbaar zijn met 'life-course persistent' of 'early starters' ontwikkelingspaden die in de literatuur worden beschreven. Bovendien hebben individuen uit de deviante ontwikkelingspaden de grootste kans op het ontwikkelen van een psychiatrische stoornissen, het plegen van een delict en het hebben van de meeste sociale problemen in de jongvolwassenheid. Dit zijn ook de kenmerken die we volgens de theorieën over de

ontwikkeling van externaliserend gedrag zouden verwachten (Moffitt, 1993; Loeber et al., 1993; Patterson & Yoerger, 1993).

Hoewel we sterke evidentie vonden voor het bestaan van een 'life-course persistent' of 'early starters' ontwikkelingspad, hebben we echter geen ontwikkelingspad gevonden dat vergelijkbaar was met het 'adolescence-limited' ontwikkelingspad (cf., Moffitt, 1993). Dit komt overeen met andere studies die ook niet in staat waren een dergelijk pad aan te tonen (zie bijvoorbeeld Fergusson & Horwood, 2002; Lacrouse et al., 2002; Brame et al., 2001; Nagin & Tremblay, 1999). De resultaten hebben dus niet alle assumpties van Moffitt (1993) kunnen bevestigen. We hebben niet alleen geen grote groep kinderen kunnen vinden met toenemende problemen in de puberteit, maar de problemen van deze groep kinderen halen ook niet het verwachtte problematische niveau (cf., Moffitt, 1993). Dit suggereert dat in tegenstelling tot de assumptie van Moffitt (1993) het niet normatief of normaal is om in de puberteit ernstige externaliserende gedragingen te laten zien.

Onze bevindingen tonen duidelijk aan dat het belangrijk is onderscheid te maken tussen verschillende externaliserende gedragingen, omdat we verschillende associaties vinden voor verschillende externaliserende gedragingen met problemen in de jongvolwassenheid. De differentiatie in verschillende externaliserende gedraging is in contrast met het brede begrip voor probleemgedrag dat Moffitt en collega's gebruiken (Moffitt & Caspi, 2001; Moffitt, Caspi, Rutter, & Silva, 2001). Zij suggereren dat de verschillende patronen van de continuïteit binnen externaliserend gedrag alleen maar afhankelijk is van het ontwikkelingspatroon van externaliserend gedrag (Moffitt, 1993). Echter, de huidige studie toont aan dat continuïteit van externaliserend gedrag afhankelijk is van het patroon van de ontwikkelingspaden én van het type externaliserend gedrag.

Het onderzoek naar de continuïteit van gedrag binnen externaliserende gedragingen leverde onverwachte relaties op tussen externaliserende ontwikkelingspaden en problemen in de jongvolwassenheid. Onze studie toont aan dat langdurige consequenties voor het deviante ontwikkelingspad binnen agressief gedrag voor het individu het minst ernstig zijn van alle deviante ontwikkelingspaden. Individuen met een deviant ontwikkelingspad binnen agressief gedrag ontwikkelen zich hoogstwaarschijnlijk in gezonde en goed aangepast volwassenen. Echter, individuen die deviant agressief gedrag laten zien in combinatie met deviante ontwikkelingspaden van oppositioneel of heimelijk gedrag hebben een veel grotere risico van het ontwikkelen van problemen in de volwassenheid. Het lijkt er op dat externaliserende gedragingen die problematisch zijn voor het individu zelf, zoals alcohol- en drugsgebruik, ernstigere en langdurigere consequenties hebben dan externaliserende gedragingen, zoals agressief gedrag, die direct consequenties hebben voor de maatschappij of de omgeving van het individu. Omdat er zulke onverwachte patronen van de continuïteit binnen externaliserend gedrag gevonden zijn, zullen verder studies de nadruk moeten leggen op de ontwikkeling van

verschillende gedraging binnen externaliserende problemen en de relaties van verschillende externaliserende gedragingen met problemen in de volwassenheid.

Onze resultaten suggereren dat het belangrijk is om op vroege leeftijd te interveniëren om het probleemgedrag niet te laten ontwikkelen in problematische patronen die niet meer gevoelig zijn voor verbetering. Verder onderzoek zou zich moet richten op de mechanismen die leiden tot de verschillende externaliserende ontwikkelingspaden en de verschillen in de continuïteit van gedrag van de kindertijd tot de volwassenheid. Om dit bereiken zou de nadruk meer moeten liggen op de etiologie van deze ontwikkelingspaden bijvoorbeeld door de identificatie van genetische en biologische markers en de unieke bijdrage van genetische, biologische en familie/omgevingsfactoren op de ontwikkeling van externaliserend gedragingen in vrouwen en mannen.

Dankwoord

Curriculum Vitae

Dankwoord

Curriculum Vitae

Ilja Luise Bongers werd op 20 april 1975 in Hunsel geboren. In 1994 behaalde zij het V.W.O. diploma aan de Philips van Horne Scholengemeenschap te Weert. In 1994 begon zij met de studie Psychologie aan de Vrije Universiteit in Amsterdam, afstudeerrichting neuropsychologie, waar het doctoraal werd behaald in oktober 1999. Vanaf 1996 was zij werkzaam als student assistent bij het Nederlands Tweeling Register (hoofd: Prof.dr.D.I. Boomsma) waar ze geholpen heeft met de dataverzameling van verscheidene onderzoeken.

Na haar studie heeft zij als onderzoeksassistent de dataverzameling op zich genomen voor een onderzoek naar de genetische achtergrond van meerling zwangerschappen dat in samenwerkingsverband was tussen het NTR aan de Vrije Universiteit in Amsterdam en Queensland Institute of Medical Research in Brisbane, Australië.

Vanaf februari 2000 tot en met februari 2004 was zij als assistent in opleiding (AIO) verbonden aan de afdeling Kinder- en jeugdpsychiatrie van het Erasmus MC – Sophia Kinderziekenhuis te Rotterdam (hoofd: Prof.dr. F.C. Verhulst).

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