# ADULT CONSEQUENCES *of* CHILD PSYCHOPATHOLOGY

Joni Reef

Adult Consequences of Child Psychopathology
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# ADULT CONSEQUENCES *of* CHILD PSYCHOPATHOLOGY

## Psychopathologie in kindertijd en de gevolgen in volwassenheid

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# 1

# GENERAL INTRODUCTION

Joni Reef

Child and adolescent psychopathology is a great burden to individuals, their families, and to society at large. Children and adolescents with behavioral and emotional problems suffer from impairments in several domains of functioning, including difficulties with friendship, self-esteem and school functioning. Parents often suffer from a lack of knowledge about their child's problems, which keeps them from seeking professional help and which causes persistence of problems, difficulties in school, poor family relations, and concurrent psychopathology. Society is faced with the consequences of school dropout and higher workload, but also with costs associated with mental health care, police and the judicial apparatus. Psychopathology in children not also disturbs children's functioning, it may also have long lasting consequences into adulthood. For example, difficulties in sustaining intimate relationships, in educational success and in building up a professional career.

Longitudinal studies of the developmental course of psychopathology from childhood into adulthood are needed to determine which children are at increased risk of lifetime psychopathology. These children should be given special attention in prevention and interventional programs by mental health care professionals working with children and adolescents. This may reduce long-term continuity of psychopathology.

## CONTINUITY OF PSYCHOPATHOLOGY

Over the last 3 decades, several prospective community studies were performed to study continuity of childhood emotional and behavioral problems, including the National Study, of the United States (Achenbach, Howell, & McConaughy, 1995), the Dunedin Study (Moffitt & Caspi, 2001), the New York State Study (Pine, Cohen, Gurley, Brook, & Ma, 1998), the Christchurch study (Fergusson & Horwood, 2001), the Great Smokey Mountains Study (Costello, et al., 1996) and the Zuid-Holland Study (Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2009). In these studies, continuity of problems from childhood to early

adulthood (i.e., up to age 20-30 years) was found to be moderate to strong (Bongers, Koot, van der Ende, & Verhulst, 2004; Dekker, et al., 2007; Fergusson, Boden, & Horwood, 2007; Kim-Cohen, et al., 2003; Moffitt & Caspi, 2001; Moffitt, et al., 2007; Roza, Hofstra, van der Ende, & Verhulst, 2003; Woodward & Fergusson, 2001). Studies that used comparable assessment procedures at several time points (Achenbach, Howell, McConaughy, & Stanger, 1995; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Fergusson & Horwood, 2001; Hofstra, Van der Ende, & Verhulst, 2000; Moffitt, Caspi, Rutter, & Silva, 2001; Skodol, Johnson, Cohen, Sneed, & Crawford, 2007) have reported long-term persistence of childhood problems for antisocial behavior, depression and anxiety. Although much has been achieved in the examination of long-term continuities, follow-up period of the available studies is rarely very long. Consequently, continuity between early childhood problems and middle adulthood psychopathology (i.e., up to age 30-40 years) remains unknown.

### *Homotypic and heterotypic continuity*

Different forms of continuity of psychopathology from childhood into adulthood can occur, that is, behaviors may change in form even if they have the same starting point. Previous longitudinal studies have reported both homotypic continuity (i.e., the prediction of one disorder by the same disorder) and heterotypic continuity (i.e., the prediction of a disorder by a different disorder) (Achenbach, Howell, McConaughy, et al., 1995; Costello, et al., 2003; Fergusson & Horwood, 2001; Hofstra, et al., 2000; Moffitt, et al., 2001; Skodol, et al., 2007). Homotypic continuity was found for depression, anxiety and antisocial behavior (Fergusson, Boden, et al., 2007; Moffitt & Caspi, 2001; Moffitt, et al., 2007; Woodward & Fergusson, 2001). Heterotypic continuity was found between childhood depression and adult anxiety (Fergusson, Boden, et al., 2007; Moffitt, et al., 2007; Woodward & Fergusson, 2001), between childhood conduct problems and later anxiety and between childhood conduct problems and later schizophrenia (Kim-Cohen, et al., 2003; Roza, et al., 2003). Finally, studies based on the previous waves of the

present longitudinal study have reported both homotypic continuity for depression and antisocial behavior, between childhood and early adulthood, and heterotypic continuity between depression and anxiety (Bongers, et al., 2004; Dekker, et al., 2007; Hofstra, et al., 2000; Roza, et al., 2003).

### *Multiple continuities*

The phenomenon that a single type of behavior in childhood is associated with different psychopathological outcomes in adulthood is known as 'multifinality'. Conversely, a range of childhood predictors may also be associated with a single adult outcome, which is called 'equifinality'. Both multifinality and equifinality are relevant to developmental psychopathology (Cicchetti & Cohen, 1995). First, adult psychiatrists should be aware of childhood predictors of later psychopathology, as treatment of adult patients may depend on preceding childhood psychopathology. Second, child psychiatrists should be aware of adult outcomes of early psychopathology, as treatment of child psychiatric disorders may anticipate adult psychopathology. However, most previous studies only reported the continuity of a restricted set of childhood problems (Fergusson, Boden, et al., 2007; Fergusson, Horwood, & Ridder, 2007; Moffitt & Caspi, 2001; Moffitt, et al., 2007; Woodward & Fergusson, 2001), without considering the fact that one disorder can branch out into many different disorders or that a range of different disorders can develop into the same disorder (Cicchetti & Cohen, 1995; Egeland, Pianta, & Ogawa, 1996). To accurately describe continuities of problem behaviors, it is essential to assess a wide range of problems both at baseline and follow-up.

It is also well established that co-occurrence of behavioral and emotional problems in childhood and adolescence are likely to influence the continuity of childhood psychopathology (Angold, Costello, & Erkanli, 1999). Co-occurrence of behavioral and emotional problems is more the rule than the exception (Lilienfeld, 2003). For instance, depressive symptoms in early adolescence precede negative outcomes in adulthood only when they are combined with initial conduct problems

(Capaldi & Stoolmiller, 1999). So also from this point of view, assessment of a large range of childhood behavioral and emotional problems is essential: to investigate which individual childhood problems or which specific combinations of childhood problems predict adult psychopathology.

### *Continuity towards adult violence*

Externalizing behavior is the most common and persistent problem behavior in childhood and adolescence, and the most significant antecedent of aggressive problem behaviors including violent and criminal behavior (Bongers, et al., 2004; Brame, Nagin, & Tremblay, 2001; Broidy, et al., 2003; Moffitt, 1993; Nagin & Tremblay, 1999; Simonoff, et al., 2004). Individual and societal burdens are inherent in adult violent delinquency. Also, it is violence that the public and decision makers most want to prevent and predict. In addition, previous studies reported that individuals who show relatively high levels of violent offending also show relatively high levels of other kind of criminal offences (Brame, Mulvey, & Piquero, 2001; Loeber, Farrington, Stouthamer-Loeber, & White, 2008). Moreover, violent and criminal adults show a poor treatment response (Dolan & Coid, 1993). Therefore, understanding the origin of adult delinquency is important, because it may give mental health professionals directions with respect to treatment and prevention.

Previous longitudinal studies on continuity of externalizing behavior reported differences in the degree of persistence over time (Bongers, et al., 2004; Brame, et al., 2001; Broidy, et al., 2003; Nagin & Tremblay, 1999). High levels of aggressive behavior and oppositional behavior are associated with later criminal behavior (Broidy, et al., 2003; Copeland, Miller-Johnson, Keeler, Angold, & Costello, 2007; Loeber, Farrington, & Waschbusch, 1998; Mannuzza, Klein, & Moulton, 2008; Odgers, et al., 2008; Simonoff, et al., 2004). Moreover, even up to the age of 48 years, poor outcomes were found for the early and persistent offenders (Farrington, et al., 2006). Information on the long-term continuity of behavior problems from

early childhood to middle adulthood is scarce, because the literature is focused on youth delinquency (Pulkkinen, Lyyra, & Kokko, 2009). Furthermore, knowledge of criminal behavior in adulthood is based on detected offences, because the majority of studies have to rely on official sources. Self-report studies on delinquency among adults are rare (Thornberry & Krohn, 2000).

*Gender and age differences in continuity of externalizing psychopathology*

When investigating the development of childhood psychopathology, it is important to consider differences in development between boys and girls. Rates of disorders tend to differ in boys and girls, that is, internalizing behavior is more common in girls and externalizing behavior is more common in boys (Angold & Costello, 1995). However, the majority of research on the developmental course of disruptive behavior is based on male samples, as disruptive behavior is less prevalent in females (Fontaine, Carbonneau, Vitaro, Barker, & Tremblay, 2009; Odgers, et al., 2008). The development of disruptive behaviors in particular may differ by gender, that is, disruptive behaviors have more often been associated with depression in girls (Costello, et al., 2003). Furthermore, the prevalence of childhood-onset criminal offences is lower in females than in males. However, other studies reported a large overlap in the development between male and female trajectories of externalizing behavior (Odgers, et al., 2008). It is still under debate whether developmental theories on externalizing behavior in boys, can be applied to girls (Silverthorn & Frick, 1999). Therefore, it is valuable to further investigate the continuity of disruptive behavior in a study following the same males and females from childhood to middle adulthood.

# TRAJECTORIES OF EXTERNALIZING BEHAVIOR

## *Types of externalizing behavior*

There are a some classification systems for externalizing behavior. For example, the DSM-IV system (American Psychiatric Association, 1994) classifies externalizing behavior in oppositional defiant disorder (ODD; which comprises, among others, example temper and stubbornness), and conduct disorder (CD; which comprises physical aggression, running away and property violations). However many studies used questionnaires such as the Child Behavior Checklist (CBCL) of the Achenbach System of Empirically Based Assessment (ASEBA (Achenbach, 1991)), which classifies externalizing behavior in Aggressive Behavior (which comprises oppositional behavior and aggressive behavior) and Delinquent Behavior (which comprises Status violations and Property violations). Because of these different classification systems, previous findings on the development of externalizing behavior are difficult to compare (Hofstra, et al., 2000; Loeber, Green, Lahey, Frick, & McBurnett, 2000; Moffitt, Caspi, Harrington, & Milne, 2002).

We used a classification of externalizing behavior that is interpretable from all major sub classifications (Bongers, et al., 2004; Frick, et al., 1993; Timmermans, van Lier, & Koot, 2008). Frick et al (Frick, et al., 1993). distinguished subtypes of externalizing behavior based on a meta-analysis of 44 studies. Four types of problem behaviors within the broader category of externalizing behavior were identified: Property violations (e.g. lies, cruel to animals), Aggression (e.g. fights, bullies), Status violations (e.g. substance use, runaway) and Oppositional (e.g. temper, stubborn). Other studies confirm this subdivision of externalizing behavior and suggest that these different externalizing behavior types differ in their development and long-term outcome (Bongers, et al., 2004; Timmermans, et al., 2008; Tremblay, 2000). Behavior problems included in the status violations and oppositional type of externalizing behavior have been found to predict most social problems (Bongers, Koot, van der Ende, & Verhulst, 2008), whereas behavior

problems included in the Aggression and Property violation type predict drug abuse and risky sexual behavior. Behavior problems included in the Status violations type predict drug abuse (Timmermans, et al., 2008).

### *Externalizing developmental trajectories*

Because externalizing behavior can change to a great extent with aging (Bongers, et al., 2004; Brame, et al., 2001; Moffitt, 1993), a single time measurement of this behavior during childhood may underestimate the problem. Therefore, externalizing behavior is best studied from a developmental perspective (Achenbach, Dumenci, & Rescorla, 2001). The continuity of childhood externalizing behavior follows different developmental trajectories. Developmental trajectories describe the course of behavior over time (i.e. changes in both the level and the growth of behaviors). Previous longitudinal studies on this issue reported 'increasing', 'decreasing', 'stable high' and 'stable low' trajectories of externalizing behavior (Bongers, et al., 2004; Brame, et al., 2001; Broidy, et al., 2003; Nagin & Tremblay, 1999). In addition to the level and the growth or decline of behaviors, problem behavior may first appear at different ages (Tremblay, 2000). As a result, some studies report a 'child onset' type, an 'adolescent onset' type (American Psychiatric Association, 1994; Moffitt & Caspi, 2001; Roisman, Aguilar, & Egeland, 2004), or a 'life-course persistent' and 'adolescence-limited' developmental trajectories of externalizing behavior (Brame, et al., 2001; Moffitt, 1993; Moffitt, et al., 2002).

Different developmental trajectories have different adult outcomes (Tremblay, 2000). For instance, children in stable high-level trajectories are more likely to show poor outcomes (e.g. delinquency, aggression or substance use) (Brame, et al., 2001; Broidy, et al., 2003; Timmermans, et al., 2008) than children on low-level or increasing trajectories (Bongers, et al., 2008; Brame, et al., 2001; Roisman, et al., 2004). Furthermore, individuals in externalizing behavior trajectories of the 'life-course-persistent' and 'child onset' subtype experience more adult problems (e.g.

delinquency and economic problems) than individuals in 'adolescent onset' and 'adolescent limited' trajectories (Odgers, et al., 2008; Roisman, et al., 2004). However, some studies fail to identify 'adolescent-limited' trajectories of externalizing behavior, or, report poor outcomes in adulthood for individuals who started to display problem behavior in adolescence (Brame, et al., 2001; Odgers, et al., 2008). Evidently, both the type and the developmental course of externalizing behavior appear to widely differ among individuals. Different types and developmental courses of externalizing behavior may lead to very different adult outcomes. Therefore, it is important to examine groups of children that follow developmental trajectories varying in level and shape. An average developmental trajectory describing expected development for most children may be insufficient (Nagin, 1999).

### *Adult adverse outcomes*

In a previous research project, developmental trajectories of four types of antisocial behavior (i.e. Property violations, Aggression, Status violations and Oppositional) were identified in children with ages across 4-18 years (Bongers, et al., 2004). About 5% of the sample showed persistent high levels of antisocial behavior. Some children had high levels of antisocial behavior, but also followed other paths (i.e. increasing and decreasing trajectories) and other children had only low levels of antisocial behavior. The shape of the trajectories was the same across gender, but males were predominant in the trajectories with persistent high levels of antisocial behavior.

Few studies have investigated this subdivision of externalizing behavior and have suggested that these different externalizing behavior types differ in their development and long-term outcome (Bongers, et al., 2004; Bongers, et al., 2008; Timmermans, et al., 2008; Tremblay, 2000). Overall, Status violations increased with increasing age (Bongers, et al., 2004) whereas the other subtypes did not change or decreased over time. Oppositional predicted social problems in adulthood, while Status violations predicted both social problems and drug abuse,

and aggression and property violations to predict drug abuse and risky sexual behavior (Bongers, et al., 2008; Timmermans, et al., 2008). Of the four types of antisocial behavior, Status violations had the largest impact on outcome. It remains unknown as to how these developmental trajectories are related to a broad range of psychopathological outcomes in adulthood.

From this overview of existing literature, it can be concluded that much has been accomplished in longitudinal studies on children's mental health problems. However, existing knowledge needs clarification on a number of issues.

The Zuid-Holland prospective longitudinal study on the course of behavioral and emotional problems in a general population sample started in 1983. After initial assessment, the sample has been approached many times, and was asked to complete equivalent questionnaires. In 2007, all subjects reached middle adulthood (ages 28 to 40 years) and were approached again (the seventh time). This recent follow-up of the Zuid-Holland study offers a unique opportunity to investigate associations between children's emotional and behavioral problems and their functioning in middle adulthood, including psychiatric disorders and violent delinquency. Moreover, it adds to findings of studies that lack:

- information about the continuity of psychopathology from childhood to middle adulthood;
- the use of equivalent assessment instruments across a long-follow-up period;
- a large set of behavior problems, to examine the influence of co-occurring emotional and behavioral problems;
- information on both the normative and the deviant course of the development of behavioral and emotional problems from a general population sample (instead of only information on the deviant course of development in a clinical sample);
- information both male and female development of externalizing behavior;

- self-reported delinquency in adulthood (as opposed to delinquency based on detected offences, gathered from official sources).

The Zuid-Holland longitudinal study also offers a unique opportunity to extend existing knowledge on the predictive value of developmental trajectories of externalizing behavior into adult functioning, including emotional and behavioral problems and psychiatric disorders. Our study also adds to findings of studies that are lacking:

- information about children's psychiatric outcomes in middle adulthood;
- the capability to determine the presence of different developmental trajectories for individuals in different clusters of externalizing behavior from ages 4 to 18 years.

## THE PRESENT STUDY

### *Aims*

The first aim of the present thesis was to determine associations between children's emotional and behavioral problems and their adult functioning, including psychiatric disorders and criminal offences. The second aim of the study was to investigate how developmental trajectories of externalizing behavior are related to adult functioning, including emotional and behavioral problems and psychiatric disorders.

## METHOD

### *Sample from 1983-1991*

This is a multi-cohort longitudinal study of emotional and behavioral problems, in which parents' reports were initially obtained in home interviews for 13 cohorts of Dutch children, 100 of each gender at each age from 4 to 16 years. In 1983, the original sample of 2,600 children was drawn from the Dutch province of Zuid-Holland, using municipal birth registers that list all residents (Verhulst, Akkerhuis, & Althaus, 1985). Of the 2,477 parents reached, 2,076 (85%) responded and

provided usable data at baseline measurement. After the first time of measurement in 1983 (time 1), the sample was approached again in 1985 (time 2), 1987 (time 3), 1989 (time 4), 1991 (time 5), and 1997 (time 6). Response rates ranged from 80 to 85% at each time of measurement. The follow-up period from 1983 to 1997 was 14 years, so that the children aged 4 to 16 years at time 1 were young adults aged 18 to 30 years at time 6.

### *Sample in 2007*

Between January 2006 and June 2007, the 7th wave of the study, which forms the basis of the current thesis, was carried out. Again, we approached all participants from the original sample (n=2,076), except 23 who had died, 10 who were intellectually disabled, and 48 who had requested to be removed from the study. Of the 1995 remaining participants, 1,365 participants provided valid information (68%), 427 (21%) refused to participate, and 204 (10%) could not be reached.

We assessed a broad range of mental health problems, social functioning, criminal behavior, and various other behaviors. In addition to self-reports, we also obtained information about the participants from their partners and their parents. During home visits, interviewers collected completed questionnaires and interviewed respondents. We used standardized interviews to acquire current and lifetime psychiatric DSM-IV diagnoses. We also used interviews to acquire information on antisocial behavior and criminal behavior. Additional questionnaires were used to assess emotional and behavioral problems, interpersonal functioning, and social functioning.

### *Instruments (childhood)*

The Child Behavior Checklist (CBCL) (Achenbach, 1991) is a rating scale intended for completion by parents of 4 to 18 year old children. It contains 120 items covering behavioral or emotional problems that have occurred over the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat*

*or sometimes true*) and 2 (*very true or often true*). The items of the CBCL can be scored on eight syndrome scales (see table 1.1); Withdrawn, (i.e. enjoys little, sad, shy) Somatic Complaints (i.e. headaches, tired, vomiting) and Anxious/Depressed (i.e. fearful, cries a lot, worries) which form the Internalizing scale; Delinquent Behavior (i.e. lies, steals, uses drugs) and Aggressive behavior (i.e. gets in fights, temper, destroys things) (which form the Externalizing scale); Social Problems (i.e. teased, dependent, clumsy), Thought Problems (i.e. hears things, repeats acts, strange behavior) and Attention Problems (i.e. cannot concentrate, inattentive, impulsive). The reliability and validity of the CBCL (Achenbach, 1991) have been confirmed for the Dutch version (Verhulst, van der Ende, & Koot, 1996).

The CBCL items can also be scored on DSM-oriented scales that were constructed by enlisting panels of expert psychiatrists and psychologists. This enables identification of CBCL items that are very consistent with particular DSM-IV diagnostic categories (Achenbach, et al., 2001). Four of 55 items that belong to the DSM-oriented scales could not be scored (i.e. Enjoys little, Fails to finish, Inattentive and Breaks rules), due to the fact that they were not measured in the 1983 version of the CBCL. The items were scored on six DSM-oriented scales (see table 1.1): Affective problems, Anxiety problems, Somatic problems, Attention Deficit/Hyperactivity problems, Oppositional Problems and Conduct Problems. A Total Problem Score is calculated by summing 118 of the item scores. Good reliability and validity of the CBCL were confirmed for the Dutch version of the CBCL (Verhulst, et al., 1996).

*Instruments (adulthood)*

The ASR (Achenbach & Rescorla, 2003) is a rating scale intended for completion by adults aged 18-59. It contains 126 items on problem behaviors that have occurred over the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat or sometimes true*) and 2 (*very true or often true*). The items can be scored on eight syndrome scales (see table 1.1); Withdrawn, Somatic

Complaints and Anxious/Depressed (which form the Internalizing scale), Delinquent Behavior and Aggressive Behavior (which form the Externalizing scale) Intrusive, Thought Problems and Attention Problems. A Total Problems Score is calculated by summing the individual item scores. Good reliability and validity has been shown for the American version of the ASR (Achenbach & Rescorla, 2003).

The computerized version of the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1992) and three sections of the Diagnostic Interview Schedule (DIS) for DSM-IV diagnoses (Robins, Helzer, Croughan, & Compton, 1997) were used to diagnose psychiatric disorders in the 12 months prior to the interview (i.e. past year diagnoses). The CIDI and DIS are fully structured interviews to allow administration by lay interviewers and scoring of DSM-IV (American Psychiatric Association, 1994) by computer. Good reliability and validity have been reported for the CIDI (Andrews & Peters, 1998). Because information concerning disruptive disorders in adulthood (i.e. oppositional defiant, antisocial personality disorder, and attention deficit/hyperactivity disorder) was lacking in the current version of the CIDI, sections of the DIS covering these disorders were added. Because the cell sizes for specific disorders were small for the majority of diagnoses, we constructed the following groupings of DSM-IV categories (see table 1.1): (1) anxiety disorder: including generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, agoraphobia, social phobia, specific phobia, and other anxiety disorders; (2) mood disorder: including major depressive episode, bipolar disorder, and dysthymia; (3) substance use disorders: including alcohol abuse/dependence and drug abuse/dependence; (4) disruptive disorders: including oppositional defiant disorder, antisocial personality disorder, attention deficit/hyperactivity, and impulsivity disorders; and (5) any disorder: consisting of any of the above disorders or any other assessed disorders such as bulimia nervosa, somatization, conversion, pain disorder, hypochondriasis, and brief psychotic disorder.

TABLE 1.1. Schematic overview of the Scales (CBCL) and Diagnoses (CIDI) used in this study.

| CHILDHOOD | | ADULTHOOD |
|---|---|---|
| Syndrome scales (CBCL): | | Syndrome scales (CBCL): |
| anxious/depressed | → | anxious/depressed |
| withdrawn | | withdrawn |
| somatic complaints | | somatic complaints |
| thought problems | | thought problems |
| attention problems | | attention problems |
| aggressive behavior | | aggressive behavior |
| delinquent behavior | | rule-breaking behavior |
| social problems | | intrusive |
| DSM-oriented scales (CBCL): | | DSM-diagnosis (CIDI): |
| affective problems | → | mood disorder |
| anxiety problems | | anxiety disorder |
| somatic problems | | substance use/abuse |
| attention deficit/hyperactivity problems | | disruptive disorder |
| conduct problems | | |
| oppositional defiant problems | | |

Criminal behavior was measured in a face-to-face interview, using a standardized questionnaire (Elliott & Huizinga, 1989). This questionnaire is based on a modified version of the questionnaire that was developed for the International Self-Report Delinquency Study (Junger-Tas, Terlouw, & Klein, 1994). The adaptation was performed to make the questionnaire suitable for adults. Two categories were added: traffic offences and fraud (Donker, Smeenk, Van der Laan, & Verhulst,

2003). The interview comprised eight questions on violent offences. Violent delinquency was scored on the basis of the following variables: armed robbery, threatening behavior with a weapon, threatening behavior without a weapon, threatening behavior without a weapon to force or frighten someone, wounding with a weapon, physical attack without wounding, physical attack with wounding, sexual harassment. Violent offenders were defined as respondents who reported one or more violent offences. Violent offences were explicitly queried for a reference period of 1 year. In addition, we explicitly queried offending for reference period of 5 years, to include more respondents that committed offences in the adult stage of life.

## STRUCTURE OF THIS THESIS

In chapter 2, we evaluate the continuity of psychopathology from childhood to middle adulthood using cross-informant (i.e. parent-self) information. We examined the degree of continuity (i.e. percentage of participants displaying problems), the form of continuity (i.e. homotypic and heterotypic) and the predictive value of individual childhood problems for adult psychopathology.

In chapter 3, we examined the strength of multiple continuities of psychopathology from childhood into adulthood. We determined associations between childhood psychopathology and psychiatric outcomes in middle adulthood.
In chapter 4, we examined early disruptive development into violent delinquent behavior in middle adulthood.

In chapter 5, we investigated the prediction of adult behavioral and emotional problems from developmental trajectories of externalizing behavior from in a 24-years longitudinal population-based study of 2,076 children. Trajectories of four externalizing behavior types (i.e. aggression, opposition, property violations and status violations) were determined separately, using data of five waves, covering ages 4 to 18 years.

In chapter 6, we examined the prediction of adult DSM-IV disorders from developmental trajectories of externalizing behavior.

In chapter 7, the main findings of the foregoing chapters are discussed.

Table 1.2 provides an overview of the predictors and outcomes that were studied in each chapter.

TABLE 1.2. Overview of predictors and outcomes that were studied in each chapter of the current thesis.

| Chapter | Instrument | Predictor | Phase | Instrument | Outcome |
|---|---|---|---|---|---|
| 2 | CBCL | Syndrome scales | 1983 - 2007 | ASR | Syndrome scales |
| 3 | CBCL | DSM-oriented scales | 1983 - 2007 | CIDI | DSM diagnoses |
| 4 | CBCL | Oppositional Defiant and Conduct Problems | 1983 - 2007 | Delinquency | Violent delinquency |
| 5 | CBCL | Trajectories of externalizing behavior | (1983-1991)- 2007 | ASR | Syndrome scales |
| 6 | CBCL | Trajectories of externalizing behavior | (1983-1991)- 2007 | CIDI | DSM diagnoses |

# 2

# CHILD TO ADULT CONTINUITIES OF PSYCHOPATHOLOGY: A 24 YEAR FOLLOW-UP

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# ABSTRACT

## OBJECTIVE

To determine continuities of mental health problems of children across a 24 year follow-up period.

## METHOD

In 1983, parent ratings of emotional and behavioral problems were collected with the Child Behavior Checklist (CBCL) in a general population sample of 2,076 children. Twenty-four years later, 1,365 participants completed Adult Self-Reports (ASR) to assess emotional and behavioral problems.

## RESULTS

Of the participants who were classified as deviant in childhood, 22.2% were also classified as deviant in adulthood. Both homotypic and heterotypic continuity was found. Childhood aggressive, delinquent, and anxious/depressed problems were associated with most adult psychopathology. Attention problems did not predict later problems independently.

## CONCLUSIONS

Even though assessed with parent-reports in childhood and analogous self-reports in adulthood, and over a large period of 24 years, continuity of psychopathology was found from childhood into adulthood. Anxious/depressed problems, delinquent behavior and aggressive behavior in childhood are core predictors for adult psychopathology.

# INTRODUCTION

Studies of the long-term development of childhood emotional and behavioral problems are essential for predicting adult psychopathology and for planning early intervention and prevention. Although much has been achieved in the examination of continuities and discontinuities in psychopathology between childhood and adulthood, the literature is limited in three important ways. First, information about the continuity of a multiple problems from early childhood to middle adulthood in a large general population sample, is limited. Second, most previous studies on the issue have examined the continuity of a limited set of behavior problems, often overlooking the influence of co-occurring emotional and behavioral problems on the individual predictive values of childhood problems. Third, findings on continuity in clinical samples give us little information on the normative course of the development of behavioral and emotional problems in the general population. To overcome the above limitations, we examined, in a prospective community study, the continuity of a large range of child behavioral and emotional problems into middle adulthood.

Several prospective community studies of childhood psychopathology repeatedly used well-validated standardized assessment procedures that are comparable across time and were able to determine the continuity of emotional and behavioral problems (Achenbach, Howell, McConaughy, et al., 1995; Costello, et al., 2003; Fergusson & Horwood, 2001; Hofstra, et al., 2000; Moffitt, et al., 2001; Skodol, et al., 2007). In these studies, both homotypic continuity (i.e., the prediction of one disorder by the same disorder) and heterotypic continuity (i.e., the prediction of a disorder by another disorder) of psychopathology from childhood up to early adulthood (i.e., up to age 20-30 years) were found (Fergusson, Horwood, et al., 2007; Moffitt, et al., 2007; Moffitt, et al., 2001; Woodward & Fergusson, 2001). Homotypic continuity was found for both specific problem behaviors and for DSM-IV diagnoses including antisocial behavior, depression and anxiety (Fergusson, Boden, et al., 2007; Moffitt & Caspi, 2001; Moffitt, et al., 2007;

Woodward & Fergusson, 2001). Heterotypic continuity was found between childhood depression and adult anxiety (Fergusson, Boden, et al., 2007; Moffitt, et al., 2007; Woodward & Fergusson, 2001) and between childhood conduct problems and later anxiety and schizophreniform problems (Kim-Cohen, et al., 2003). Finally, studies based on the previous waves of the present longitudinal study have reported both homotypic continuity for depression and antisocial behavior, between childhood and early adulthood, and heterotypic continuity between depression and anxiety (Bongers, et al., 2004; Dekker, et al., 2007; Hofstra, et al., 2000; Roza, et al., 2003). Despite the significance of the above findings in understanding the associations between childhood behavior and emotional problems and later psychopathology, because the follow-up time in the above studies was seldom very large, the continuity of childhood psychopathology up to middle adulthood (i.e., up to age 30-40 years) remains to be examined.

It is well established in the literature that the co-occurrence of behavioral and emotional problems in childhood and adolescence is more the rule than the exception (Crawford, et al., 2008; Lilienfeld, 2003). Co-occurring problems are highly likely to influence the continuity and discontinuity of childhood psychopathology (Angold, et al., 1999). For instance, previous studies report that, compared to children who display either only conduct problems or depressive symptoms, children with co-occurring such problems have more severe outcomes in adulthood, including higher rates of psychopathology, substance abuse, and suicidality (Capaldi & Stoolmiller, 1999; Fombonne, Wostear, Cooper, Harrington, & Rutter, 2001; Sourander, et al., 2007). Furthermore, findings on the heterotypic continuity of childhood psychopathology into early adulthood indicate that just as the outcomes of childhood behavioral and emotional problems in adulthood may vary, adult psychopathology may be preceded by a number of different childhood problems (Bongers, et al., 2004; Dekker, et al., 2007; Fergusson, Boden, et al., 2007; Hofstra, et al., 2000; Kim-Cohen, et al., 2003; Moffitt, et al., 2007; Roza, et al., 2003; Woodward & Fergusson, 2001).

Consequently, to establish which individual childhood problems independently predict adult psychopathology, a large range of childhood behavioral and emotional problems needs to be assessed.

In 1983, in the first wave of the longitudinal Zuid-Holland Study (Verhulst, et al., 1985), behavioral and emotional problems in children aged 4 to 16 years were assessed in a large population sample. The present study is part of the seventh wave of the Zuid-Holland Study (Bongers, et al., 2004; Dekker, et al., 2007; Hofstra, et al., 2000; Roza, et al., 2003). Its follow-up period covers 24 years and the participants are now aged 28 to 40 years. We were able to use analogous instruments to assess their adult behavioral and emotional problems and this gave us the opportunity to propose the following aims.

The aim of this study was to examine both the degree and type (i.e. homotypic and heterotypic) continuity of psychopathology from childhood to middle adulthood using cross-informant (i.e. parent and self) information. In order to identify which childhood behavioral en emotional problems were independently associated with adult psychopathology, we investigated the predictive values of parental assessments of psychopathology, adjusted and non-adjusted for co-occurring behavioral and emotional problems.

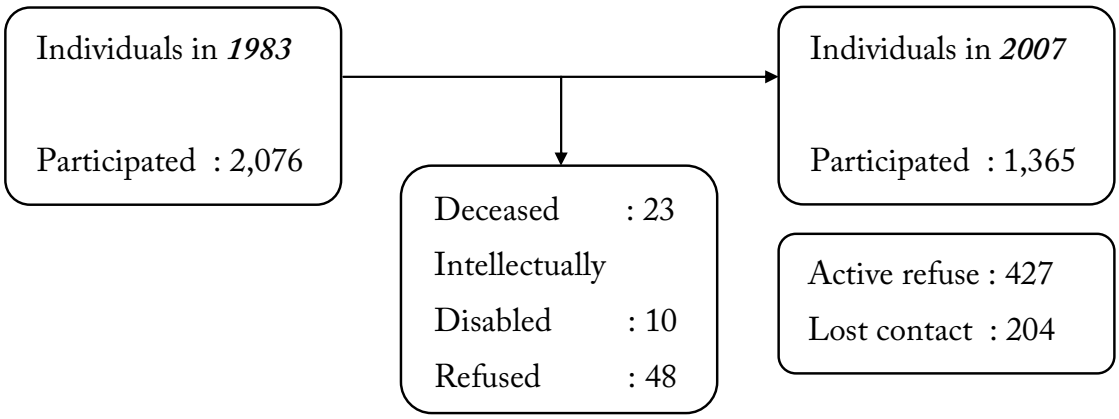
## METHOD

### *Sample*

In 1983, a sample of 2,600 children aged four to sixteen years was randomly selected from the general population of the Dutch province of Zuid-Holland (Verhulst, et al., 1985). A hundred children of each gender and age were drawn from the municipal registers listing all residents in the province. A total of 2,447 parents could be reached, of whom 2,076 (84.8%) completed the Child Behavior Checklist (CBCL) on their child.

This study presents data from baseline and follow-up. Between January 2006 and June 2007, we approached all participants from the original sample, except 23 who had died, 10 who were intellectually disabled, and 48 who had requested to be removed from the sample at an earlier stage of the study. We reached 1,791 of the 1,995 participants, 427 refused and 1,365 respondents filled in the ASR, see figure 2.1. The response rate in the seventh data collection was 67% (1,365 of 2,044).

FIGURE 2.1 Flowchart of the data collection.




Flowchart of the data collection between 1983 and 2007.

To investigate selective attrition, we performed logistic regression analyses to look at associations between age, gender and socio economic status (SES) of participants at baseline, and participation of participants at follow-up. SES was scored on a six-step scale of parental occupation (van Westerlaak, Kropman, & Collaris, 1975) with 1 = lowest SES. Age, gender and SES all had significant influence on participation at follow-up. Participation was more likely when participants were women (69.7% versus 61.6%; OR = 1.4; CI 1.1–1.7; $p < .001$), if they were younger (mean age at baseline was 10.2 years for dropouts and 9.8 years for participants; OR = 1.0; CI 0.9–1.0; $p < .004$), had a higher SES (3.4 for dropouts and 3.7 for participants; OR = 1.1; CI 1.1–1.2; $p < .000$) and a nondeviant Total Problems Score at baseline (17.3% for dropouts and 13.4% for participants; OR = 0.8; CI

0.6–1.0; $p < .043$). Two of the eight scale scores had influence on participation. Participants showed more deviant scores on anxious/depressed problems (12.2% for dropouts and 12.9% for participants; OR = 1.6; CI 1.1–2.2; $p < .008$) and more nondeviant scores on aggressive behavior (16.7% for dropouts and 11.1% for participants; OR = 0.7; CI 0.5–0.9; $p < .015$).

## MEASURES

### *Child Behavior Checklist (CBCL)*

The CBCL (Achenbach, 1991) is a rating scale intended for completion by parents of 4 to 18-year-old children. It contains 120 items covering behavioral or emotional problems that have occurred over the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat or sometimes true*) and 2 (*very true or often true*). The items can be scored on eight syndrome scales; Withdrawn, (i.e. enjoys little, sad, shy) Somatic Complaints (i.e. headaches, tired, vomiting) and Anxious/Depressed (i.e. fearful, cries a lot, worries) (which form the Internalizing scale); Delinquent Behavior (i.e. lies, steals, uses drugs) and Aggressive Behavior (i.e. gets in fights, temper, destroys things) (which form the Externalizing scale); Social Problems (i.e. teased, dependent, clumsy), Thought Problems (i.e. hears things, repeats acts, strange behavior) and Attention Problems (can't concentrate, inattentive, impulsive). A Total Problems Score is calculated by summing the individual item scores. The reliability and validity of the CBCL (Achenbach, 1991) have been confirmed for the Dutch version (Verhulst, et al., 1996).

### *Adult Self-Report (ASR)*

The ASR (Achenbach & Rescorla, 2003) is a rating scale intended for completion by adults aged 18-59. It contains 126 items on problem behaviors that have occurred over the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat or sometimes true*) and 2 (*very true or often true*). The items can be scored on eight syndrome scales; Withdrawn (i.e. enjoys little, no

friends, rather be alone), Somatic Complaints (i.e. headaches, tired, vomiting) and Anxious/Depressed (i.e. fearful, cries a lot, worries) (which form the Internalizing scale), Rule-Breaking Behavior (i.e. lies, steals, uses drugs) and Aggressive Behavior (i.e. gets in fights, temper, threatens) (which form the Externalizing scale), Intrusive (i.e. wants attention, teases, loud), Thought Problems (i.e. hears things, repeats acts, strange behavior) and Attention Problems (can't concentrate, forgetful, disorganized). A Total Problems Score is calculated by summing the individual item scores. Good reliability and validity has been shown for the American version of the ASR (Achenbach & Rescorla, 2003).

## STATISTICAL ANALYSES

### *Proportions at initial assessment and follow-up*

To categorize individuals as deviant versus non-deviant, thus to dichotomize the scale scores, we used cut-off points for all scales of the CBCL at baseline and the ASR at follow-up based on the 85$^{th}$ percentile of the frequency distributions. Cut-offs were determined separately for males and females and age groups. For the CBCL the age groups were 11 years and younger versus 12 years and older (Achenbach, 1991). For the ASR the age groups were 35 years and younger versus 36 years and older (Achenbach, 1997).

### *Logistic regression analyses*

To investigate associations between specific deviant behaviors at baseline and behaviors at follow-up, we performed univariate and multiple logistic regression analyses. We adjusted for sex, age and socio economic status in both analyses. We assessed the associations between each deviant behavior at baseline and each deviant behavior at follow-up by conducting univariate logistic regression analyses. To assess the associations between deviant behaviors at baseline and deviant behaviors at follow-up with control for co-occurring problems, we conducted multiple logistic regression analyses. In these latter analyses we used the forward stepwise selection to determine the best predictors. We performed all analyses with

dichotomized scale scores. We dichotomized scores for each individual scale according to the four norm groups (i.e. age and sex separately) (Achenbach, 1991) described in the previous paragraph. For all models we first determined whether there were interaction effects with sex or age of the separate subscales but because no sex or age effects were found, we did not split the sample accordingly.

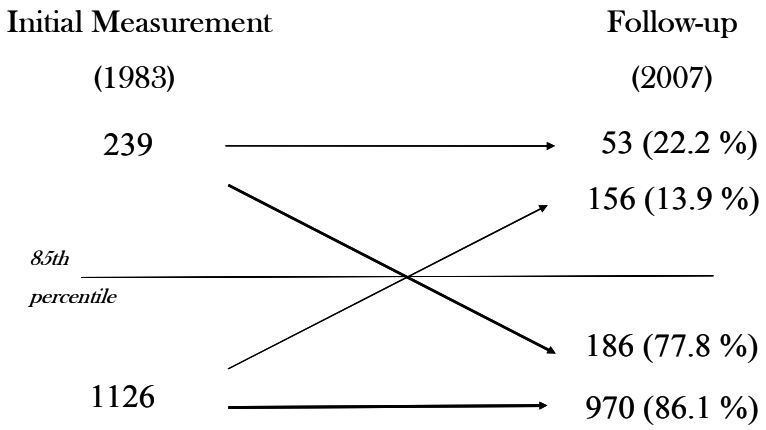
## RESULTS

### *Proportions at initial assessment and follow-up*

Figure 2.2 shows the distribution of deviant and nondeviant behavior at follow-up (Total Problems Score of the ASR respectively above and below the 85$^{th}$ percentile) of both deviant (Total Problems Score of the CBCL > 85$^{th}$ percentile) and nondeviant scoring participants (Total Problems Score of the CBCL <85$^{th}$ percentile) at initial assessment.

At initial assessment in 1983, 239 (17,5%) participants were scored in the deviant range of their Total Problems Scores of the CBCL. At follow-up, almost one-fourth of the participants of this deviant group had scores in the deviant range, and 77.8% of the participants had scores in the nondeviant range of the ASR. Of the 1126 children assessed as nondeviant at initial assessment, 13.9% scored in the deviant range 24 years later; 86.1% of these children continued to be in the nondeviant group ($\chi^2$ =10.5, d.f.= 1, $p$ < 0.001).

FIGURE 2.2. Pathways of 24-year behavior.




Distribution of deviant (Total Problems Score of the ASR > 85th percentile) and normative behavior (Total Problems Score of the ASR < 85th percentile) at follow-up of both deviant (Total Problems Score of the CBCL > 85th percentile) and normative behaving participants (Total Problems Score of the CBCL < 85th percentile) at initial assessment.

### *Logistic regression analyses*

Table 2.1 shows the associations between scores in the deviant range at initial assessment and scores in the deviant range at follow-up. Only significant results are presented. For all eight CBCL syndrome scales significant associations were found with one or more ASR scales. The CBCL scales *Aggressive Behavior* and *Delinquent Behavior* predicted most problems in adulthood. Also the *Anxious/Depressed* scale predicted a variety of problems reflected by five ASR scales. Except for *Thought Problems* and *Attention Problems,* CBCL scales showed homotypic continuity with equivalent ASR scales. In addition, with the exception of the scale *Withdrawn*, all other scales showed heterotypic continuity.

TABLE 2.1. Univariate associations between deviant baseline scale scores and deviant scale scores at follow-up.

| | | *Outcome Follow-up ASR* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Predictor*** | | Anxious/ | Withdrawn | Somatic | Thought | Attention | Aggressive | Rule-Breaking | Intrusive |
| ***Baseline CBCL*** | | Depressed | | Complaints | Problems | Problems | Behavior | Behavior | |
| | | *n* = 212 | *n* = 247 | *n* = 218 | *n* = 192 | *n* = 221 | *n* = 189 | *n* = 218 | *n* = 197 |
| Anxious/Depressed | *n* = 202 | 2.0 (1.4-2.9) | 1.5 (1.1-2.2) | 1.8 (1.3-2.7) | 1.7 (1.1-2.4) | 1.8 (1.2-2.5) | | | |
| Withdrawn | *n* = 186 | | 1.5 (1.0-2.1) | | | | | | |
| Somatic Complaints | *n* = 183 | 1.6 (1.1-2.3) | | 1.6 (1.1-2.3) | | | | | |
| Thought Problems | *n* = 226 | 1.5 (1.0-2.2) | | 1.7 (1.2-2.5) | | 1.5 (1.1-2.2) | | | 1.8 (1.2-2.6) |
| Attention Problems | *n* = 169 | | | 1.6 (1.1-2.3) | 1.6 (1.0-2.4) | | | | |
| Aggressive Behavior | *n* = 281 | 1.5 (1.1-2.1) | | 1.8 (1.3-2.5) | 2.1 (1.3-3.0) | | 1.6 (1.1-2.3) | 1.4 (1.0-2.1) | 1.6 (1.1-2.3) |
| Delinquent Behavior | *n* = 202 | 1.6 (1.1-2.4) | | 1.6 (1.1-2.3) | 1.7 (1.2-2.6) | | 1.9 (1.3-2.7) | 1.7 (1.2-2.5) | 1.5 (1.0-2.2) |
| Social Problems | *n* = 208 | | | 1.7 (1.2-2.4) | | | | | |

Odds ratios (95% Confidence interval) are derived from logistic regression analysis, adjusted for sex, age and SES. Only significant results are presented. CBCL=Child Behavior Checklist; ASR=Adult Self-Report; Baseline=1983; Follow-up=2007.

Analysis of the broadband scales (Table 2.2) showed that the *Externalizing* scale in childhood predicted both *Externalizing* and *Internalizing* scale scores in adulthood. The CBCL *Internalizing* scale predicted the *Internalizing* scale in adulthood only.

TABLE 2.2. Univariate associations between deviant baseline broadband scores and deviant broadband scores at follow-up.

| | ***Outcome Follow-up ASR*** | |
|---|---|---|
| | Internalizing Behavior | Externalizing Behavior |
| ***Predictor Baseline CBCL*** | *n* = 217 | *n* = 208 |
| Internalizing Behavior *n* = 206 | 1.8 (1.2-2.5) | |
| Externalizing Behavior *n* = 288 | 1.5 (1.0-2.0) | 1.6 (1.1-2.2) |

Odds ratios (95% Confidence interval) are derived from logistic regression analysis, adjusted for sex, age and SES. Only significant results are presented. CBCL=Child Behavior Checklist; ASR=Adult Self-Report; Baseline=1983; Follow-up=2007.

Table 2.3 shows the multivariate associations between deviant scale scores at initial assessment and deviant scale scores at follow-up. Only significant results are presented. CBCL scores on four of the eight syndrome scales (*Thought Problems, Anxious/Depressed, Aggressive Behavior and Delinquent Behavior*) predicted problem behaviors at follow-up. *Aggressive Behavior* predicted *Somatic Complaints* and *Thought Problems*, while *Delinquent Behavior* predicted *Aggressive Behavior* and *Rule-Breaking Behavior*. Childhood *Attention Problems* did not predict later problem behavior. Of the nine associations between the syndromes, seven were heterotypic. Only for *Anxious/Depressed* and *Delinquent Behavior* homotypic associations were found. Multivariate analysis of the broadband scales (Table 2.4) showed that *Externalizing Behavior* in childhood predicted *Externalizing Behavior* in adulthood and *Internalizing Behavior* in childhood predicted *Internalizing Behavior* in adulthood.

TABLE 2.3. Multiple associations between deviant baseline scale scores and deviant scale scores at follow-up.

| | | *Outcome Follow-up ASR* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Predictor*** | | Anxious/ | Withdrawn | Somatic | Thought | Attention | Aggressive | Rule-Breaking | Intrusive |
| ***Baseline CBCL*** | | Depressed | | Complaints | Problems | Problems | Behavior | Behavior | |
| | | *n* = 212 | *n* = 247 | *n* = 218 | *n* = 192 | *n* = 221 | *n* = 189 | *n* = 218 | *n* = 197 |
| Anxious/Depressed | *n* = 202 | 2.0 (1.4-2.9) | 1.5 (1.1-2.2) | 1.6 (1.1-2.4) | | 1.7 (1.2-2.5) | | | |
| Withdrawn | *n* = 186 | | | | | | | | |
| Somatic Complaints | *n* = 183 | | | | | | | | |
| Thought Problems | *n* = 226 | | | | | | | | 1.9 (1.2-2.6) |
| Attention Problems | *n* = 169 | | | | | | | | |
| Aggressive Behavior | *n* = 281 | | | 1.5 (1.1-2.1) | 2.1 (1.5-2.9) | | | | |
| Delinquent Behavior | *n* = 202 | | | | | | 1.8 (1.3-2.7) | 1.7 (1.2-2.4) | |
| Social Problems | *n* = 208 | | | | | | | | |

Odds ratios (95% Confidence interval) are derived from multiple logistic regression analysis (Forward Stepwise) significance level α =.05, adjusted for sex, age and SES. Only significant results are presented. CBCL=Child Behavior Checklist; ASR=Adult Self-Report; Baseline=1983; Follow-up=2007.

TABLE 2.4. Multiple associations between deviant baseline broadband scores and deviant broadband scores at follow-up.

| | *Outcome Follow-up ASR* | |
|---|---|---|
| | Internalizing Behavior | Externalizing Behavior |
| ***Predictor Baseline CBCL*** | *n* = 217 | *n* = 208 |
| Internalizing Behavior *n* = 206 | 1.8 (1.2-2.5) | |
| Externalizing Behavior *n* = 288 | | 1.6 (1.1-2.2) |

Odds ratios (95% Confidence interval) are derived from logistic regression analysis, adjusted for sex, age and SES. Only significant results are presented. CBCL=Child Behavior Checklist; ASR=Adult Self-Report; Baseline=1983; Follow-up=2007.

## DISCUSSION

The aim of this study was to determine the continuity of behavioral and emotional problems from childhood to middle adulthood. A second aim was to determine the predictive values of a large range of child emotional and behavioral problems for adult psychopathology. We found significant associations between parent-reported problems in children aged 4-16 years and self-reported problems in adulthood, 24 years later. Given both the long time-span and the use of different informants, these continuity findings are quite remarkable. Findings show that childhood aggression, delinquent behavior and anxious/depressed problems are the strongest predictors for later psychopathology. All childhood problems showed both homotypic and heterotypic continuity into adulthood. This prospective community study is unique in terms of its long follow-up time, the use of equivalent instruments over this time, and its ability to determine continuity of multiple behavioral and emotional problems up to middle adulthood.

Based on our analyses of the Total Problem Scores, in this study, almost one-fourth of the children categorized as deviant were still regarded as deviant 24 years

later. The fact that almost 14% of the non-deviant children reported problems in adulthood indicates that adult psychopathology might not necessarily be preceded by problem behaviors in childhood; however, deviant children report significantly more problems in adulthood. In the previous wave of this study, Hofstra et al. (2000) found in a 14-year follow-up a total continuity of 29% between parent reported problems in childhood and self-reported problems in adolescence. Ten years later we found an almost equal total continuity of psychopathology, the minor decrease was expected given that continuity generally decreases with increasing age (Rutter, Kim-Cohen, & Maughan, 2006).

In line with previous studies that investigated the continuity of externalizing and internalizing behaviors from childhood to early adulthood, (Rutter, et al., 2006) in this study, we found primarily homotypic continuity for the broad categories of externalizing and internalizing problem behavior. However, in line with some other previous findings, (Colman, et al., 2009; Fergusson, Horwood, & Ridder, 2005; Maughan & Kim-Cohen, 2005; Moffitt & Caspi, 2001; Reinherz, Paradis, Giaconia, Stashwick, & Fitzmaurice, 2003; Rutter, et al., 2006) without control for initial internalizing problems, externalizing problems were also found to precede internalizing problems in middle adulthood. Taken together, the above findings indicate that unless internalizing problems are initially present in childhood, it is highly unlikely that childhood externalizing problems will develop into internalizing problems in adulthood.

When we examined the predictive value of each childhood behavior or emotional problem for adult psychopathology without the control for co-occurring problems, primarily heterotypic continuities emerged. All childhood problems predicted problems in adulthood, and all adult problems were predicted by more than one childhood problem. However, out of all the childhood problems, primarily anxious/depressed problems, aggressive behavior, and delinquent behavior showed the strongest associations with adult psychopathology. Furthermore, whereas

anxious/depressed problems primarily predicted emotional problems, aggressive behavior and delinquent behavior predicted both emotional and behavioral problems. The above findings illustrate the developmental phenomenon of equifinality: multiple syndromes can develop into one syndrome over time, and they also illustrate the phenomenon of multifinality: one syndrome can develop into multiple syndromes (Cicchetti & Rogosch, 2002). Our results confirm, that even for a 24-year developmental period, the existence of a unique pathway for one type of problem is exceptional (Ollendick & Hirshfeld-Becker, 2002).

When we further investigated which of the childhood problems were fundamental predictors of adult psychopathology by controlling for co-occurring problems in childhood, anxious/depressed problems, aggressive behavior, and delinquent behavior were the strongest predictors of adult psychopathology. The homotypic continuities that we found for anxious/depressed and delinquent behavior are in accordance with previous findings on the continuity these problems from childhood and adolescence to adulthood (Colman, Wadsworth, Croudace, & Jones, 2007; Costello, et al., 2003; Kim-Cohen, et al., 2003; Ollendick & Hirshfeld-Becker, 2002; Pelkonen, Marttunen, Kaprio, Huurre, & Aro, 2008) and also, with previous community studies reporting long-term associations between anxiety and several adult internalizing problems (Fergusson, Horwood, & Boden, 2006; Goodwin, Fergusson, & Horwood, 2004; Pine, Cohen, & Brook, 2001). Interestingly, our findings of the analyses with and without control for co-occurring problems indicate that the strongest predictor for adult internalizing problems are anxious and depressed problems in childhood, and the best predictors for adult externalizing problems is childhood delinquent behavior.

Some unexpected findings emerged in this study. First, we found no homotypic continuity for aggressive behavior, but instead, aggressive behavior in childhood predicted somatic complaints and thought problems in adulthood. However, delinquent problems did only predict externalizing behavior in adulthood,

including aggressive behavior and rule-breaking behavior. In agreement with earlier findings, we can conclude that delinquent behavior and aggressive behavior tap different constructs and follow distinct developmental pathways (Bongers, et al., 2004; Frick, et al., 1993) insofar as they predict different outcomes. The longitudinal association between externalizing behavior and both later thought problems and somatic complaints have been reported before in young children (Egger, Costello, Erkanli, & Angold, 1999; Frick, et al., 1993; Pihlakoski, et al., 2006). However, until replicated in future studies that report up to adulthood, these results should be considered preliminary.

Second, childhood attention problems did not predict adult attention problems or any other problem behavior in adulthood. Instead, attention problems in adulthood were primarily predicted by anxious/depressed problems in childhood. Although there is currently no consensus on how attention problems or ADHD are manifested in adulthood (Wilens & Dodson, 2004), in line with some previous findings (Biederman, et al., 2008; Salvatore Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998), our findings suggest that the predictive value of childhood attention problems for adult psychopathology is primarily caused by comorbidity with other childhood behavior. That is, we did not find any independent association with adult psychopathology for attention problems.

Finally, a remarkable finding in this study is the relative strong predictive value of childhood thought problems. The thought problems scale of the CBCL consists of diverse childhood emotions and behaviors including delusions, strange behaviors, hallucinations and obsessive-compulsive symptoms (e.g. 'hears things', 'repeats acts', 'strange ideas' and 'can't get his/her mind off certain thoughts'). Although this scale comprises various problems, the stability of this scale did not differ from other scales (Ferdinand, Verhulst, & Wiznitzer, 1995). In addition, previous studies showed that childhood thought problems predicted later problems (Ferdinand, et al., 1995; Hofstra, van der Ende, & Verhulst, 2001). The findings of these studies

support the validity of the thought problems scale. We found that the thought problems scale predicted multiple problems 24 years later which indicates that children who score in the deviant range of this scale need additional attention in clinical practice.

Regarding the cross-informant consistency in assessment of externalizing and internalizing problem behavior in adolescence, previous studies showed disagreement in reports for internalizing and externalizing behavior across informants at one time point. They describe that parents report the behavioral problems of their children accurately but adolescents themselves tend to be more accurate regarding internalizing symptoms (Achenbach, McConaughy, & Howell, 1987; van der Ende & Verhulst, 2005). Therefore, it is possible that internalizing problems were underreported in our sample. However, other studies report agreement among all informants in adolescence for internalizing problems (Thomas, Forehand, Armistead, Wierson, & Fauber, 1990), besides, prediction across varied informants at two time points indicate validity of findings.

In our study we focused on homotypic and heterotypic relations among multiple types of psychiatric problems across two time points. Including several time points would enable investigating long-term outcomes for children with either persistent or recurrent psychiatric problems. In previous studies, differences in outcome were reported for internalizing behavior that emerges in single episodes or persisting symptoms (Colman, et al., 2007; Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000). It would be of interest to investigate if this difference in outcome holds for a larger range of psychopathology.

## CONCLUSIONS

This longitudinal study shows that the continuity of childhood behavior and emotional problems can span even over a 24 years time-interval. We conclude that childhood anxious/depressed problems, delinquent behavior problems and aggressive behavior are fundamental predictors of adult psychopathology and should be given special attention in prevention and intervention programs. However, it should be noted that after 24 years, a great majority of deviant children were no longer deviant, whereas almost 14% of non-deviant children were regarded as deviant in middle adulthood. Our findings confirm the idea that psychopathology needs to be studied through a developmental perspective (Costello & Angold, 2000), insofar as the degree and form of the continuity of behavioral and emotional problems appears to greatly vary throughout development. Our findings also suggest that, because problem behavior in adulthood can have different preceding forms, it is important to take into account all kinds of foregoing problem behaviors in the assessment of adult psychopathology. Finally, our findings suggest that early interventions should be used with caution insofar as both false negatives and false positives appear to be frequent in the continuity of childhood psychopathology.

# CHILDREN'S PROBLEMS PREDICT ADULTS' DSM-IV DISORDERS ACROSS 24 YEARS

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*Submitted for publication*

# ABSTRACT

## OBJECTIVE

The goal of this study was to determine continuities of a broad range of psychopathology from childhood into middle adulthood in a general population sample across a 24-year follow-up.

## METHOD

In 1983, parent ratings of children's problems were collected with the Child Behavior Checklist (CBCL) in a general population sample of 2,076 children aged 4 to 16 years. Twenty-four years later in 2007, 1,339 of these children were reassessed with the CIDI, a standardized DSM-IV interview. We used logistic regression analyses to determine the associations between children's problems and adults' psychiatric disorders.

## RESULTS

Parent reported total problems scores in the deviant range predicted disruptive disorders in adulthood (Odds Ratio 1.7; 95% CI [1.1-

2.8]). High levels of parent-reported childhood anxiety predicted anxiety disorders in middle adulthood. Conduct problems predicted both mood disorders (Odds Ratio 2.3; CI [1.1-4.8]) and disruptive disorders (Odds Ratio 2.1; CI [1.3-3.4]) and oppositional defiant problems predicted only mood disorders (Odds Ratio 2.3; CI [1.0-5.2]). Attention deficit hyperactivity problems did not predict any of the DSM-IV disorders in adulthood.

## CONCLUSIONS

Children who suffer from psychopathology are at greater risk to meet criteria for DSM-IV diagnoses in adulthood than children without psychopathology, even after 24 years. Moreover, different types of continuities of children's psychopathology exist across the lifespan. We found that anxious children, oppositional defiant children, and children with conduct problems are at greater risk of adult psychopathology. Effective identification and treatment of children with these problems may reduce long-term continuity of psychopathology.

# INTRODUCTION

Studies on long-term development of childhood emotional and behavioral problems are essential to understand childhood origins of adult psychiatric disorders and to determine the need for early intervention strategies (Rutter, et al., 2006). Nevertheless, knowledge on the development of childhood psychopathology is limited because existing studies suffer from several shortcomings. First, information about the continuity of a broad range of psychopathology from early childhood up to middle adulthood in large population samples is scarce. Second, most previous long-term studies have only reported the continuity of a restricted set of childhood problems over time (Fergusson, Boden, et al., 2007; Fergusson, Horwood, et al., 2007; Moffitt & Caspi, 2001; Moffitt, et al., 2007; Woodward & Fergusson, 2001), without considering the fact that one disorder can branch out into many different disorders or that different disorders can develop into the same disorder (Cicchetti & Rogosch, 2002; Egeland, et al., 1996). Third, results from longitudinal clinical studies have limited generalizability because these results do not describe the normative course of development and are hampered by selection bias (Caron & Rutter, 1991). To overcome the above limitations, we examined, in a prospective community study, the continuity of a large range of child psychopathology into middle adulthood.

A number of prospective population-based studies have reported on the continuity between childhood problems and adult psychiatric disorders. Studies that used comparable assessment procedures at several time points (Achenbach, Howell, McConaughy, et al., 1995; Costello, et al., 2003; Fergusson & Horwood, 2001; Hofstra, et al., 2000; Moffitt, et al., 2001; Skodol, et al., 2007) have reported different types of continuity of psychopathology, that is, several pairs of disorders are thought to appear in series. Long-term persistence of childhood problems was found for antisocial behavior, depression and anxiety (Bongers, et al., 2004; Dekker, et al., 2007; Fergusson, Boden, et al., 2007; Moffitt & Caspi, 2001; Moffitt, et al.,

2007; Woodward & Fergusson, 2001), however, associations were also found between childhood depression and adult anxiety (Fergusson, Boden, et al., 2007; Moffitt, et al., 2007; Woodward & Fergusson, 2001) and between childhood externalizing behavior problems and later mood, anxiety and schizophreniform problems (Kim-Cohen, et al., 2003; Roza, et al., 2003). Thus, both heterotypic continuity (i.e. prediction of a disorder by a different disorder) and homotypic continuity (i.e. prediction of a disorder by the same disorder) (Achenbach, Howell, & McConaughy, 1995; Colman, et al., 2009; Costello, et al., 2003; Fergusson & Horwood, 2001; Fergusson, Horwood, et al., 2007; Hofstra, et al., 2000; Moffitt, et al., 2007; Moffitt, et al., 2001; Skodol, et al., 2007; Woodward & Fergusson, 2001) has been demonstrated. Although much has been achieved in the examination of different long-term continuities, follow-up time of existing prospective community studies was seldom very large. Despite the importance of knowing the long-term continuity of prevalent childhood problems, continuity between early childhood problems and middle adulthood psychopathology (i.e., up to age 30-40 years) remains to be examined. (Achenbach, Howell, McConaughy, et al., 1995; Colman, et al., 2009; Costello, et al., 2003; Fergusson & Horwood, 2001; Hofstra, et al., 2000; Moffitt, et al., 2001; Skodol, et al., 2007).

In the present study, we aimed to describe the long-term continuity of childhood problem behavior, to middle adulthood. The follow-up period of this study covers 24 years. To study how the most prevalent childhood problems manifest themselves in time and to overcome limitations in studies that have only examined the continuity of a single type of disorder, we examined associations between multiple problem behaviors in childhood, and multiple psychiatric disorders in middle adulthood in a general population sample. This study uses data from two waves of the longitudinal Zuid-Holland Study (Verhulst, et al., 1985); participants were initially aged 4-16 years and were 28-40 years at follow-up.

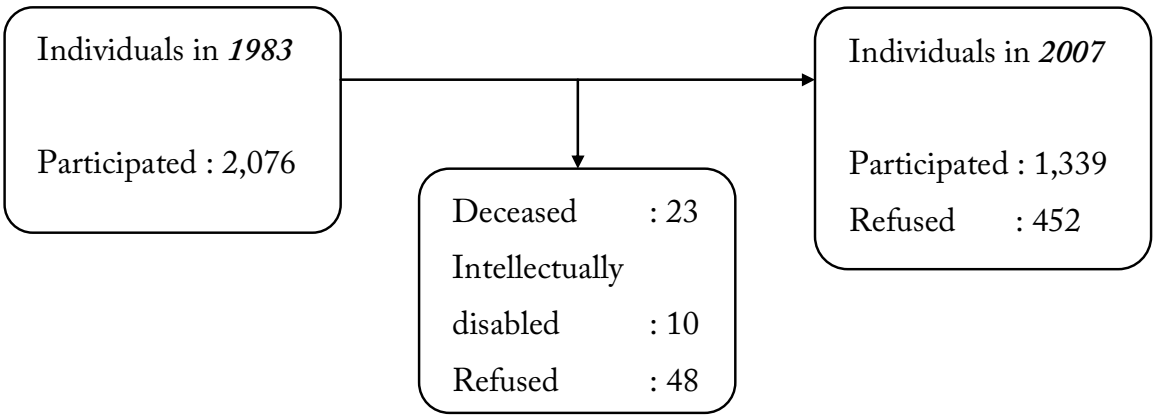
## METHOD

### *Sample*

In 1983, a sample of 2,600 children aged four to 16 years was randomly selected from the general population of the Dutch province of Zuid-Holland. One hundred children of each gender and age were drawn from the municipal registers listing all residents in the province. A total of 2,447 parents were reached, of whom 2,076 (84.8%) completed the Child Behavior Checklist (CBCL) (Achenbach, 1991) on their child.

Between January 2006 and June 2007, we approached all participants from the original sample from 1983, with the exception of 23 who had died, 10 who were intellectually disabled, and 48 who had requested to be removed from the sample at an earlier stage of the study (Van Meurs, Reef, Verhulst, & van der Ende, 2009). We were able to reach 1,791 of the 1,995 participants, out of which 1,339 took part in a home interview for determining DSM-IV diagnoses (see figure 3.1) and 452 refused further participation. The response rate in the present study was 66% (1,339 of 2,043) (Van Meurs, et al., 2009). Written informed consent was obtained from all participants.

FIGURE 3.1. Flowchart of the data collection




Flowchart of the data collection between 1983 and 2007

Selective attrition was evaluated using logistic regression. We investigated associations between age, gender, parental socio-economic status (SES) and Total Problems Score (calculated by summing 118 of the specific item scores on emotional and behavioral problems in the CBCL) of participants at baseline, and participation of participants at follow-up. SES was scored on a six-step scale of parental occupation (van Westerlaak, et al., 1975) (1 = lowest SES). Although age, gender and SES had significant influence on participation at follow-up, the differences were small: Participation was more likely when participants were women (51.1% for dropouts versus 53.7% for participants; OR = 1.33; CI 1.11–1.60; $p < .002$), if they were younger (mean age at baseline was 10.2 years for dropouts and 9.8 years for participants; OR = 0.97; CI 0.95–1.00; $p < .026$), and had a higher SES (3.4 for dropouts and 3.7 for participants; OR = 1.12; CI 1.06–1.19; $p < .000$). No influence on participation was found for Total Problems Score.

## MEASURES

### *Child Behavior Checklist (CBCL)*

Emotional and behavioral problems in childhood and adolescence were assessed with the CBCL (Achenbach, 1991). The CBCL is a rating scale intended for completion by parents of 4 to 18-year-old children. It contains 118 specific and 2 open ended items covering behavioral or emotional problems that have occurred over the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat or sometimes true*) and 2 (*very true or often true*). The CBCL items can be scored on DSM-oriented scales that were constructed by enlisting panels of expert psychiatrists and psychologists to identify CBCL items that are very consistent with particular DSM-IV diagnostic categories (Achenbach, et al., 2001). Four of 55 items from the DSM-oriented scales (i.e. Enjoys little, Fails to finish, Inattentive and Breaks rules) could not be assessed, due to the fact that they were not included in the 1983 version of the CBCL. The items were scored on six DSM-oriented scales: Affective problems, Anxiety problems, Somatic problems, Attention Deficit/Hyperactivity problems, Oppositional Problems and Conduct

Problems. A Total Problem Score is calculated by summing 118 of the item scores. Good reliability and validity of the CBCL (Achenbach, 1991) were confirmed for the Dutch version of the CBCL (Verhulst, et al., 1996).

*Psychiatric interview*

The computerized version of the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1992) and three sections of the Diagnostic Interview Schedule (DIS) for DSM-IV diagnoses (Robins, et al., 1997) were used to obtain diagnoses of psychiatric disorders in the 12 months prior to the interview (i.e. past year diagnoses). The CIDI and DIS are fully structured interviews to allow administration by lay interviewers and scoring of DSM-IV (American Psychiatric Association, 1994) by computer. Good reliability and validity have been reported for the CIDI (Andrews & Peters, 1998). Because information concerning disruptive disorders in adulthood (i.e. oppositional defiant, antisocial personality disorder, and Attention Deficit/Hyperactivity Disorder) was lacking in the current version of the CIDI, sections of the DIS covering these disorders were added. Because the cell sizes for specific disorders were small for the majority of diagnoses, we constructed the following groupings of DSM-IV categories: (1) anxiety disorder: including generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, agoraphobia, social phobia, specific phobia, and other anxiety disorders; (2) mood disorder: including major depressive episode, bipolar disorder, and dysthymia; (3) substance use disorders: including alcohol abuse/dependence and drug abuse/dependence; (4) disruptive disorders: including antisocial personality disorder, oppositional defiant disorder, attention deficit/hyperactivity, and impulsivity disorders; and (5) any disorder: consisting of any of the above disorders or any other assessed disorders such as bulimia nervosa, somatization, conversion, pain disorder, hypochondriasis, and brief psychotic disorder.

## STATISTICAL ANALYSES

### *Logistic regression*

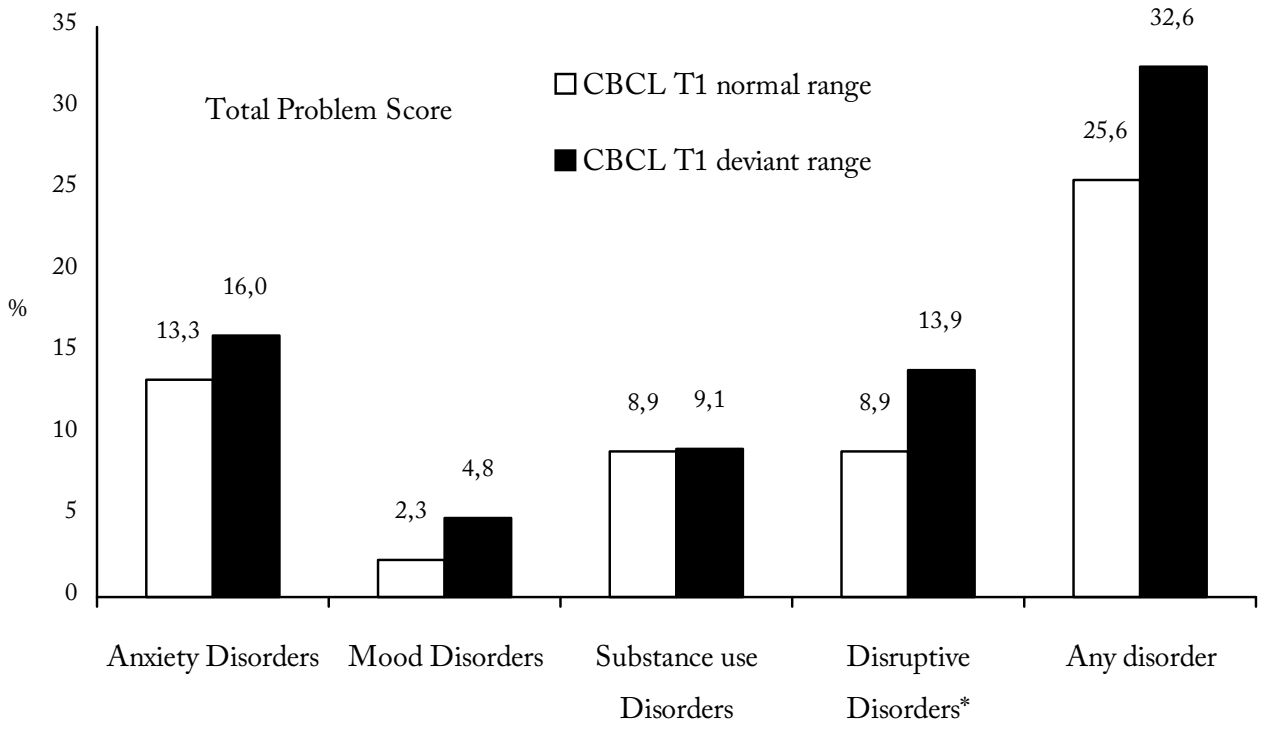
Associations between deviant levels of problem behaviors at baseline and psychiatric diagnoses at follow-up were investigated with univariate logistic regression analyses adjusted for sex, age and socio-economic status. We estimated odds ratio's with univariate analyses to determine the associations between proportions of individuals scoring in the deviant versus normal range of the Total Problem Score at baseline (1983) and groupings of DSM-IV diagnoses at follow-up (2007). We also assessed the associations between scores in the deviant versus normal range of each DSM-oriented behavior at baseline and groupings of DSM-IV disorders at follow-up. We investigated associations for each separate childhood problem and adult psychiatric diagnosis. All analyses were performed with dichotomized scale scores. Cut-off points for the Total Problems Score and the DSM-oriented scales of the CBCL were based on the 85$^{th}$ percentile of the frequency distributions in the sample. We determined separate cut-off points for males and females, and for 4-11-year-olds and 12-16-year-olds (Achenbach, 1991). To determine the need to analyze males and females separately, we tested interaction effects between gender and the dichotomized scales for all models.

## RESULTS

### *Childhood Total Problems Score predicting adult disorders*

Figure 3.2 shows the 12-month prevalence of adult DSM-IV disorders of children who had CBCL Total Problems scores in the deviant range at baseline, as compared to children with CBCL Total Problems scores in the normal range. Although the proportions of children who were scored in the deviant range of the CBCL Total Problems Score were greater for each DSM-IV grouping in adulthood, the prevalences for childhood scores were only significantly different for the grouping of DSM IV disruptive disorders (OR 1.7; CI [1.1-2.8] $p < .05$).

FIGURE 3.2. DSM-IV disorders in adulthood for those with scores in the normal range or in the deviant range on the Child Behavior Checklist Total Problem Scale.




* Significant ($p$ < .05) difference in prevalence rates for childhood scores in the normal range and in the deviant range derived from simple logistic regression analysis

*Childhood DSM-oriented scales predicting adult disorders*

Table 3.1 shows the associations between scores in the deviant range at initial assessment and DSM-IV disorders at follow-up. Childhood anxiety problems predicted anxiety disorders and any disorder in adulthood, and oppositional defiant problems predicted mood disorders in adulthood. The conduct problems scale predicted both mood disorders and disruptive disorders in adulthood. When we tested interaction effects between gender and the dichotomized scales, only one effect was found (anxiety problems predicting any disorder: OR 2.2; CI [1.4-3.5] for girls and OR 0.8; CI [0.4-1.5] for boys). Because this was the only significant interaction effect of 30 effects, we did not separate males from females in the entire analysis, but underline that girls with anxiety problems were more likely to suffer from any disorder in adulthood, and boys with anxiety problems were not.

To determine which predictor of adult mood disorders (i.e oppositional defiant problems and conduct problems) was the strongest, we entered both childhood predictors at the same time in the logistic regression analysis. Neither childhood oppositional defiant problems, nor conduct problems was significant. Confidence intervals of conduct problems and oppositional defiant problems overlapped largely, which indicated no difference in the strength of the association between the two problems. Childhood attention deficit/hyperactivity problems, affective problems, and somatic problems did not predict adult disorders.

## DISCUSSION

This prospective study showed continuity of the most prevalent childhood problem behaviors in a general population sample over a period of 24 years. Various DSM-oriented problems (i.e. anxiety, oppositional defiant problems and conduct problems) in children aged 4-16 years predicted DSM-IV disorders (i.e. anxiety problems, mood disorders and disruptive disorders) in adults aged 28-40 years. In general, prevalence of disorders in adulthood was higher for children who CBCL Total Problems scores in deviant range at baseline, although this only reached statistical significance for adult disruptive disorders.

### *Continuity of internalizing behavior*

For childhood anxiety problems, only homotypic continuity was found. Children's anxiety problems predicted anxiety disorders in later life, 24 years later. This was in line with previous studies reporting homotypic continuity of anxiety problems in children and adolescents (Ferdinand, Dieleman, Ormel, & Verhulst, 2007; Ferdinand, et al., 1995; Pine, et al., 1998; Roza, et al., 2003; Woodward & Fergusson, 2001), although earlier studies never had a follow-up period that extended into middle adulthood (i.e. 40 years or older).

TABLE 3.1. Logistic regression analyses yielding associations between deviant CBCL DSM scale scores at baseline and DSM-IV diagnoses at follow-up.

| | | *DSM-IV diagnoses at follow-up in 2007* | | | | |
|---|---|---|---|---|---|---|
| ***CBCL DSM Scales at baseline in 1983*** | *n* baseline | Anxiety disorders *n*=183 OR (95% CI) | Mood disorders *n*=36 OR (95% CI) | Substance use disorders *n*=120 OR (95% CI) | Disruptive disorders *n*=121 OR (95% CI) | Any disorder *n*=356 OR (95% CI) |
| Affective Problems | 180 | 1.1 (.7-1.7) | 1.9 (0.8-4.2) | 0.8 (0.4-1.4) | 0.9 (0.5-1.6) | 1.0 (0.7-1.4) |
| Anxiety Problems | 149 | 1.6 (1.0-2.5)* | 1.8 (0.8-4.3) | 1.3 (0.7-2.2) | 1.3 (0.8-2.4) | 1.5 (1.0-2.1)* |
| Somatic Problems | 183 | 0.7 (0.5-1.2) | 1.7 (0.8-3.8) | 0.8 (0.5-1.5) | 1.1 (0.7-2.0) | 1.0 (0.7-1.4) |
| Attention Deficit /Hyperactivity Problems | 156 | 0.7 (0.4-1.2) | 0.8 (0.3-2.4) | 0.7 (0.3-1.3) | 0.9 (0.5-1.6) | 0.8 (0.5-1.2) |
| Oppositional Defiant Problems | 201 | 0.9 (0.6-1.5) | 2.3 (1.1-4.8)* | 1.4 (0.8-2.3) | 1.1 (0.7-1.9) | 1.2 (0.9-1.7) |
| Conduct Problems | 160 | 1.1 (0.7-1.8) | 2.3 (1.0-5.2)* | 1.3 (0.8-2.3) | 2.1 (1.3-3.4)* | 1.7 (1.1-2.4)* |

OR (95% CI) = Odds ratios (95% Confidence interval), derived from univariate logistic regression analyses, adjusted for sex, age and SES; CBCL = Child Behavior Checklist; Baseline=1983; Follow-up=2007, * $p < .05$.

Persistence of anxiety problems can have several causes. Anxiety problems may be associated with impairments in several domains of functioning, including problems with friendships, self-esteem and school functioning (Essau, Conradt, & Petermann, 2002). These impairments may hinder children to desist from anxiety problems. Genetic factors may also play a role in the persistence of psychopathology (Hettema, Neale, & Kendler, 2001).

In the current study, children's affective problems did not predict problem behavior later in life. This is surprising because other studies showed long-term continuity of affective problems. However, some studies report long-term continuity, only in individuals with post-pubertal onset of affective disorders, whereas others report continuity of affective disorders starting in childhood (Korczak & Goldstein, 2009; Rutter, et al., 2006). The fact that the current study did not show a predictive value of childhood affective disorders for later psychopathology may be explained by the fact that the prevalence of serious affective problems at baseline was low. It has been previously suggested that affective problems primarily start in late adolescence and early adulthood (Jaffee, et al., 2002; Roza, et al., 2003; Wittchen, Kessler, Pfister, & Lieb, 2000), and less often in childhood (i.e. up to the age of 12 years) (Korczak & Goldstein, 2009). Consequently, in our study, the incidence of affective problems may have increased after baseline measurement (i.e. after the age of 16 years). The late emergence of affective problems has been explained by mood disturbances due to hormonal and psychosocial changes during the transition from childhood to adulthood (Cyranowski, Frank, Young, & Shear, 2000).

### *Continuity of externalizing behavior*

For childhood conduct problems, homotypic continuity was found. Children's conduct problems predicted disruptive disorders 24 years later. Long-term homotypic continuity of conduct problems in children and adolescents has previously been reported (Mannuzza, et al., 2008; Moffitt, 1993; Simonoff, et al., 2004), but never into middle adulthood (i.e. 40 years or older).

In addition to homotypic continuity, we found heterotypic continuities of childhood conduct problems and oppositional defiant problems, which were both associated with mood disorders. Previous studies showed long-term continuity of childhood conduct problems and oppositional defiant problems into mood disorders up to early adulthood (Fergusson, et al., 2005; Kim-Cohen, et al., 2003). Conduct problems and oppositional defiant problems frequently co-occur in childhood (American Psychiatric Association, 1994; van Lier, van der Ende, Koot, & Verhulst, 2007). This co-occurrence raises the question which of the two problems is the strongest predictor of later problem behavior.

To determine the contribution of conduct problems and oppositional defiant problems, we included both variables in multivariate analysis. Oppositional defiant problems did not predict mood disorders after correction for conduct problems, and conduct problems did not predict mood disorders after correction for oppositional defiant problems. This suggests that children with conduct and oppositional problems are more likely to develop mood disorders in adulthood, due to co-occurrence of conduct problems and oppositional defiant problems in childhood. In addition, conduct and oppositional problems in childhood may lead to peer rejection and participation in deviant peer groups, which increase the risk for major depression in later life (Fergusson, et al., 2005).

In the current study, oppositional defiant problems did not predict adult disruptive disorders. Therefore, and in agreement with previous findings in the present sample (Bongers, et al., 2004), and findings of other studies (Frick, et al., 1993), we showed that children with behavior problems of the oppositional defiant type are different from children with behavior problems from the conduct type (Bongers, et al., 2004; Frick, et al., 1993). That is, conduct problems predicted both adult mood and disruptive disorders, whereas oppositional defiant problems predicted only adult mood disorders. An explanation for the fact that oppositional defiant problems are not associated with later disruptive behavior could be that

oppositional defiant problems are primarily reactive nondestructive and affective behaviors which entail negative emotionality (e.g. temper, stubborn, disobedient), in contrast to conduct problems that primarily comprise proactive and violent behaviors that are offensive and instrumental (e.g. cruel, attacks vandalism) (Dodge & Coie, 1987; Vitaro, Brendgen, & Tremblay, 2002). In line with previous studies, we found that children with oppositional defiant problems (i.e. reactive externalizing problems caused by emotional provocation) are at risk for later internalizing problems (Dodge, Lochman, Harnish, Bates, & Pettit, 1997; Vitaro, et al., 2002). Possibly, oppositional defiant problems account for the association between conduct problems and mood disorders through co-morbidity.

Finally, we found that childhood attention deficit/hyperactivity problems did not predict disruptive behavior, which comprises Attention Deficit/Hyperactivity Disorder (ADHD), or any other problem behavior in adulthood. Previous studies suggest that the predictive value of childhood attention problems for adult psychopathology without the presence of childhood antisocial or depressive problems is poor (Fergusson, Horwood, et al., 2007; Wilens & Dodson, 2004). Because of the lack of consensus on how attention problems or ADHD are manifested in adulthood (Costello & Angold, 2000), and the relatively poor predictive value of childhood attention problems for adult psychopathology in the current study, further longitudinal research on this topic is needed.

The major strengths of the current study include the prospective design, the long follow up period of 24 years and the relatively large sample from the general population. In addition, we studied a wide range of predictors in childhood and outcomes in middle adulthood. Potential weaknesses are the use of different informants across time (i.e. parents at baseline versus subjects themselves in adulthood), which is inevitable in longitudinal studies, and the use of different assessment procedures (i.e. questionnaires in childhood versus standardized diagnostic interviews in adulthood). However, given the above, it is quite

remarkable that continuity was still found. While we achieved a relatively high response rate for a 24-year follow-up, a considerable proportion of the original sample from 1983 did not participate in this follow-up. Although selective attrition was limited in the present study, children with the most severe psychopathology may have been lost to follow up. Therefore, to confirm the present findings on the predictive value of childhood psychopathology, studies focusing specifically on high-risk children are needed.

## CONCLUSIONS

Our study shows that the continuity of children's behavior and emotional problems predict psychiatric problems even over a period of 24 years. Moreover, the degree and form of the continuity of behavioral and emotional problems appears to vary throughout development. These findings support the idea that psychopathology needs to be studied through a developmental perspective (Mannuzza, et al., 2008; Moffitt, 1993; Simonoff, et al., 2004). Continuity of childhood psychopathology into middle adulthood may also have important implications for clinical practice. Adult psychiatrists should be aware of childhood predictors of later psychopathology, because treatment of adult psychiatric disorders may depend on different preceding childhood psychopathology.

Most importantly, as we have shown that anxious children, oppositional defiant children, and children with conduct problems have an increased risk of lifetime psychopathology, these children should be given special attention in prevention and interventional programs by mental health care professionals working with children and adolescents. This may reduce long-term continuity of psychopathology.

# 4

# CHILDHOOD PREDICTORS OF ADULT VIOLENT DELINQUENCY: DIFFERENCES BETWEEN MALES AND FEMALES

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Inge van Meurs
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*Submitted for publication*

# ABSTRACT

## OBJECTIVE

Adult violent delinquency is a great burden to individuals, their families, and to society at large. Knowledge on childhood predictors of adult delinquency could be helpful to define at-risk children for long-term disruptive development. This topic is rarely investigated in females. We investigated which behavior problems in childhood predicted adult violent delinquency in a large sample of both males and females.

## METHOD

In 1983, parent ratings of behavior problems (i.e. oppositional defiant problems and conduct problems) were collected with the Child Behavior Checklist (CBCL) in a general population sample of 2,076 children aged 4-16 years. Twenty-four years later, 1335 of these children who are now adults completed standardized self-reports on their violent delinquency in the last 5 years. We investigated associations between child and adult behavior problems with logistic regression.

## RESULTS

In females, childhood *c*onduct problems were significantly associated with adult violent delinquency (Odds Ratio 4.8, 95%-Confidence Interval 2.1-10.6, $p < .001$). In males, there were no significant associations.

## CONCLUSIONS

Girls who suffer from conduct problems are at considerable risk for long-term disruptive development. We therefore recommend health professionals to be alert on girls with conduct problems, because early identification and treatment of these high-risk girls may reduce violent delinquency in later adult life.

# INTRODUCTION

Childhood disruptive behavior is associated with a broad range of later problem behaviors including violent and delinquent behavior (Bongers, et al., 2004; Brame, et al., 2001; Broidy, et al., 2003; Nagin & Tremblay, 1999). Violent delinquency is a great burden to individuals, their families and to society at large, and it is violence that the public and decision makers most want to predict and prevent. It has been reported that individuals with high levels of violent delinquency are likely to show high levels of other kinds of delinquency (i.e. serious, and non-serious delinquency) as well (Brame, et al., 2001; Loeber, et al., 2008). Moreover, adults show poor treatment response for disruptive behavior (Dolan & Coid, 1993). Therefore, identification of early predictors of adult disruptive behavior is highly relevant for prevention. Expertise in recognizing at-risk children enables mental health professionals to plan effective prevention and treatment strategies at a time when behavior is still flexible. In the current study, we examined childhood predictors of adult violent delinquency.

Young children with high levels of conduct problems have an increased risk of violent behavior in adulthood, as are children with oppositional behavior (Broidy, et al., 2003; Copeland, et al., 2007; Loeber, et al., 1998; Odgers, et al., 2008; Simonoff, et al., 2004). Although conduct problems and oppositional defiant problems frequently co-occur in childhood (American Psychiatric Association, 1994; van Lier, et al., 2007), these problems follow distinct developmental pathways and are associated with varying outcomes (Bongers, et al., 2004; Frick, et al., 1993; Simonoff, et al., 2004). Oppositional defiant problems comprise nondestructive behaviors (e.g. temper, stubborn, disobedient), and conduct problems comprise destructive behaviors (e.g. cruel, attacks vandalism) (Dodge & Coie, 1987; Vitaro, et al., 2002). Both children's conduct problems and oppositional problems are known predictors of later offending in boys (Farrington, et al., 2006).

Because disruptive behavior is less prevalent in females (Kim-Cohen, et al., 2003; Moffitt, et al., 2001), most of the research on the onset and development of disruptive behavior is based on studies that only included males (Fontaine, et al., 2009; Odgers, et al., 2008). It was found that especially boys who develop disruptive behavior early in childhood, are at risk of adult violent delinquency (Odgers, et al., 2008). Individuals who start to display disruptive behavior at a later age are also at risk, although to a lesser degree (Brame, et al., 2001; Odgers, et al., 2008). Findings from the Cambridge Study of Delinquent Development have shown that boys who started offending in late childhood or early adolescence had by far the longest criminal careers (up to age 50) (Farrington, et al., 2006).

It is still under debate whether findings on long-term disruptive development in boys can be extrapolated to girls (Silverthorn & Frick, 1999). One of the few longitudinal studies in which gender differences in disruptive development were analyzed is the Dunedin Multidisciplinary Health and Development Study (Moffitt & Caspi, 2001). In this study, childhood-onset female offenders were significantly less represented than their male counterparts, but the results supported a large overlap in the development between male and female trajectories up to the age of 32 years (Odgers, et al., 2008). However, a difference between genders was found in age of emergence of disruptive behavior (Silverthorn, Frick, & Reynolds, 2001). Females tend to inhibit disruptive behavior during childhood possibly due to social influences, and therefore show a relative late onset of disruptive behavior (Fontaine, et al., 2009). In addition, gender differences in disruptive behavior types were found; from a very early age on, girls are significantly more relationally aggressive and less overtly aggressive than boys (Crick, Casas, & Mosher, 1997). Moreover, girls' conduct problems primarily predict difficulties with home life and health, whereas boys' conduct problems predict difficulties with work, criminal justice, and substance use (Moffitt, et al., 2001). Yet, one of the rare studies able to

say something about this topic shows that domestic violence is equally prevalent among males and females (Moffitt, et al., 2001).

The literature on the development of delinquent behavior is limited in three important ways. First, the majority of empirical research on this topic has focused on youth (Pulkkinen, et al., 2009). Therefore, information about the continuity of behavior problems from early childhood to adulthood is scarce, particularly for above 25 years (Arnett, 2000). Second, most of the research on this topic is based on studies that only included males (Fontaine, et al., 2009; Odgers, et al., 2008). Thus, knowledge of the development of violent delinquency among females is limited. It is necessary to gain insight into differences between males and females to improve prevention of disruptive development in females. Third, research on delinquent behavior in adulthood is primarily based on official sources. Therefore, knowledge on delinquent behavior is based on *detected* offences, which may cause underestimation of the incidence. Although self-reported delinquency is more reliable when it comes to actual delinquent behavior (Thornberry & Krohn, 2000), the number of self-report studies among adults is low.

In this study, we investigated the predictive value of parent-reported disruptive behaviors in childhood for self-reported delinquency 24 years later. We used data from a population-based, longitudinal sample of 2,076 girls and boys. We focused on associations between children's conduct problems and oppositional deviant problems and adult violent delinquency.

## METHOD

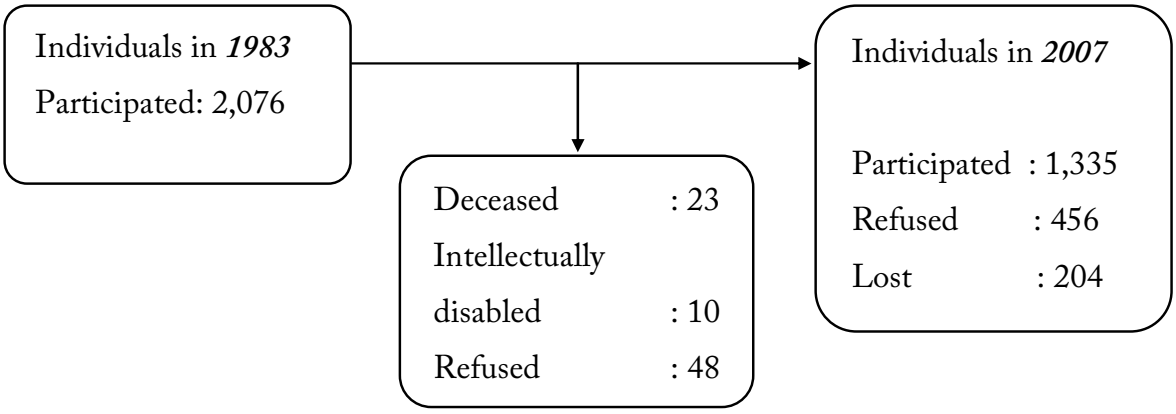
### *Sample*

In 1983, a sample of 2,600 children aged 4 to 16 years was randomly selected from the general population of the Dutch province of Zuid-Holland. One hundred children of each gender and age were drawn from the municipal registers listing all

residents in the province. A total of 2,447 parents could be reached, of whom 2,076 (84.8%) completed the Child Behavior Checklist (CBCL) (Achenbach, 1991) on their child.

This study presents data from baseline measurements in 1983 and follow-up measurements in 2007. Between January 2006 and June 2007, we approached all participants from the original sample from 1983, with the exception of 23 who had died, 10 who were intellectually disabled, and 48 who had requested to be removed from the sample at an earlier stage of the study (Van Meurs, Reef, Verhulst, & van der Ende, 2008). We were able to reach 1,791 of the 1,995 participants. Of these, 456 refused further participation, and 1,335 respondents agreed to take part in this study (see figure 4.1). The response rate was 65% (1,335 of 2,043). After giving a complete description of the study to the participants, written informed consent was obtained.

FIGURE 4.1. Flowchart of the data collection.




Flowchart of the data collection between 1983 and 2007.

To check for selective attrition, we performed logistic regression analyses, investigating associations between age, parental socio-economic status (SES), oppositional defiant problems and conduct problems of participants at baseline, and participation at follow-up. SES was scored on a six-step scale of parental

occupation (van Westerlaak, et al., 1975) (1 = lowest SES). Because this study focused on gender differences, we performed analyses for males and females separately. Only SES had significant influence on participation at follow-up. Participation was more likely when female participants had a higher SES (Odds Ratio [OR] 0.90, 95%-Confidence Interval [CI] 0.81-0.95, $p < .05$; SES = 3.4 for dropouts and SES = 3.7 for participants.), and also more likely when male participants had a higher SES (OR 0.90 95%-CI 0.83-0.97, $p < .05$; SES = 3.4 for dropouts and SES = 3.7 for participants).

## MEASURES

### *Oppositional defiant problems and conduct problems*

To measure emotional and behavioral problems in childhood and adolescence, we used the CBCL (Achenbach, 1991). The CBCL is a rating scale intended for completion by parents of 4 to 18-year-old children. It contains 120 items covering behavioral or emotional problems that have occurred over the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat or sometimes true*) and 2 (*very true or often true*). The items can be scored on DSM-oriented scales (Achenbach, 1991) of which we used oppositional problems and conduct problems. Cut-off points for DSM-oriented scales were based on the 85$^{th}$ percentile of the frequency distributions in the present sample. We determined separate cut-off points for males and females, and for 4-11-year-olds and 12-16-year-olds (Achenbach, 1991).The reliability and validity of the CBCL (Achenbach, 1991) have been confirmed for the Dutch version (Verhulst, et al., 1996).

### *Self-Reported Violent Delinquency*

Violent delinquency was measured in a face-to-face interview, using a standardized questionnaire (Elliott & Huizinga, 1989). This questionnaire is based on a modified version of the questionnaire that was developed for the International Self-Report Delinquency Study (Junger-Tas, et al., 1994). The adaptation was designed to make the questionnaire suitable for adults (Donker, et al., 2003). The interview

comprised seven questions on violent delinquency: armed robbery, threatening behavior with a weapon, threatening behavior without a weapon, threatening behavior without a weapon to force or frighten someone, wounding with a weapon, physical attack without wounding, and physical attack with wounding. The responses to these questions indicated whether the participants admitted violent delinquency in the last 5 years. Participants were regarded being violent delinquent when they reported one or more violent offences on any of the seven questions.

## STATISTICAL ANALYSIS

To investigate associations between oppositional problems and conduct problems at baseline and self-reported violent delinquency at follow-up we performed logistic regression analyses. All analyses were adjusted for age. Results are depicted as odds ratios with corresponding 95%-confidence intervals. To determine the influence of gender on the predictive value of oppositional problems and conduct problems, we performed univariate logistic regression to test interaction effects between gender and the dichotomized childhood problem scales. A *p*-value of < 0.05 was considered statistically significant.

## RESULTS

Sixty six males and 32 females reported violent offences. The mean age of males was 32 years (SD = 3.9) and of females 33 years (SD = 4.1). Table 4.1 shows the distribution of violent offences of male and female violent offenders in adulthood. Both females and males reported to by far most 'physical attack without wounding', followed by 'threaten without a weapon', and 'physical attack with wounding'. Significant interaction effects between gender both oppositional problems (OR -0.30 95%-CI 0.93-0.99, $p < .05$) and conduct problems (OR -0.28 95%-CI 0.98-0.79, $p < .05$) indicated gender differences in the predictive value of both childhood behavior problems. We therefore presented separate analyses for males and females.

TABLE 4.1. Distribution of violent delinquency among males and females admitting it at least once in the last 5 years.

| *Violent delinquency in adulthood* | *Males*<br>n = 66<br>n (%) | *Females*<br>n = 32<br>n (%) |
|---|---|---|
| Physical attack without wounding | 44 (67 %) | 28 (88 %) |
| Threatening without a weapon | 22 (33%) | 5 (16 %) |
| Physical attack with wounding | 20 (30 %) | 2 (6 %) |
| Threatening with a weapon | 3 (5 %) | 0 (0%) |
| Threatening to force or frighten someone | 2 (3 %) | 0 (0%) |
| Wounding with a weapon | 1 (2 %) | 0 (0%) |
| Armed robbery | 1 (2 %) | 0 (0%) |

Table 4.2 shows the associations between DSM-oriented problem scores at initial assessment when respondents were 4-16 years old, and violent offences at follow-up 24 years later. In females, the Conduct Problems Scale predicted violent delinquency in adulthood. Girls with conduct problems were almost 5 times more likely to show violent delinquency in adulthood. For males, there were no significant associations.

TABLE 4.2. Logistic regression analyses yielding associations between deviant disruptive behavior at baseline and self-reported violent delinquency at follow-up.

| | *Violent delinquency in adulthood* | | | |
|---|---|---|---|---|
| | Males | | Females | |
| | *n* = 66 | | *n* = 32 | |
| Childhood disruptive behavior | *n* | OR (95%CI) | *n* | OR (95% CI) |
| ***Oppositional Defiant Problems*** | *n* = 82 | 0.6 (0.2-1.4) | *n* = 119 | 2.0 (0.9-4.4) |
| ***Conduct Problems*** | *n* = 91 | 1.2 (0.6-2.4) | *n* = 69 | 4.8 (2.1-0.6)* |

OR (95% CI) = Odds ratios (95% Confidence interval), derived from univariate logistic regression analyses, adjusted for age. CBCL = Child Behavior Checklist; Baseline=1983; Follow-up = 2007; * $p < 0.001$.

## DISCUSSION

In this study we examined the relation between disruptive behaviors in childhood and self-reported violent delinquency in adulthood. We followed 2,076 males and females over a period of 24 years in a longitudinal population-based study. Our major finding is that girls with parent-reported deviant conduct problems were 5 times more likely to report violent delinquency in adulthood 24 years later. We controlled for gender differences in contributions of disruptive behavior in childhood, by using gender specific norm groups. In this way, we did not use boys' criterions to determine girls' deviant behavior. No significant associations were found between boys' disruptive behavior and adult violent delinquency.

Girls' oppositional defiant problems, in contrast to conduct problems, did not predict adult violent delinquency in our study. In agreement with findings of other

studies (Frick, et al., 1993) and previous findings in the present sample (Bongers, et al., 2004), our results suggest that children with oppositional defiant problems are different from children with conduct problems (Bongers, et al., 2004; Frick, et al., 1993). An explanation for the fact that oppositional defiant problems are not associated with later violence could be that this disorder comprises primarily reactive nondestructive and affective behavior that is caused by negative emotionality (e.g. temper, stubborn, disobedient). In contrast, conduct problems primarily comprise violent behaviors that are offensive and instrumental (e.g. cruel, attacks, vandalism) (Dodge & Coie, 1987; Vitaro, et al., 2002). Earlier studies demonstrated that children with conduct problems are more at risk for later externalizing problems, whereas children with oppositional defiant problems (i.e. reactive externalizing problems caused by emotional provocation) are more at risk for later internalizing problems (Dodge, et al., 1997; Vitaro, et al., 2002).

The literature is far more abundant on adolescent delinquent behavior than on adult delinquent behavior, particularly when it comes to self-reported delinquent behavior. Moreover, the knowledge of violent delinquency in adulthood is based primarily on data from official sources, whereas self-report studies with adults are rare. However, official data are less useful as a measure of actual delinquent behavior than self-reported data because a substantial amount of crime is not reported in official reports. Therefore, in the current study, we collected self-reported delinquent behavior data. Fewer women than men reported offences in our study, which is a common finding (Junger-Tas, et al., 1994; Moffitt, et al., 2001).

Differences in prevalence of disruptive behaviors between genders may be due to differences in types of aggression, that is, male types of aggression may be more easily recognized. Parents and teachers may report more often recognizable *male* types of aggression, and underreport less recognizable *female* types of aggression. For example, studies report more nonaggressive disruptive behavior types and

relational aggression in females, in contrast to more aggressive behavior types and verbal and physical aggression in males (Crick, 1996). However, other studies show that types of offences are very similar for males and females (Silverthorn & Frick, 1999), particularly regarding domestic violence (Broidy, et al., 2003). In the current study, we found differences between adult male and female types of offences that were admitted the last 5 years. Females reported primarily 'physical attack without wounding' and 'threatening without a weapon' in adulthood, whereas males also reported more serious violent delinquency such as 'threatening with a weapon' and 'armed robbery'.

Given that we analyzed the predictive value of disruptive behavior for both males and females, we were able to investigate whether development of disruptive behavior differs among males and females. Previous studies have reported negative outcomes such as dysfunctional relationships and health problems for girls with conduct problems (Pajer, Kazmi, Gardner, & Wang, 2007). Moreover, cross-sectional studies demonstrate that 60%-80% of women with criminal records have histories of disruptive behavior as teenagers (Pajer, 1998). Silverthorn and Frick (Silverthorn & Frick, 1999), reported that an early onset life-course persistent pathway does not exist for females and that female offending follows a delayed onset pathway. However, similar to our findings, Fergusson and Horwood (Fergusson & Horwood, 2002) found that there are females who do follow early onset life-course persistent pathways. Recent results from the Dunedin study, show that disruptive girls more frequently report violent acts than non-disruptive girls, even until age of 32 years (Odgers, et al., 2008). Results show that a large percentage of life-course persistent women engage in violence against partners and children in adulthood (Odgers, et al., 2008). Our findings extend to previous findings of longitudinal studies that report consequences of childhood disruptive behavior up to adulthood (Broidy, et al., 2003; Fergusson, et al., 2005; Moffitt, et al., 2002), because we found consequences of disruptive behavior even up to *middle*

adulthood, up to the age of 40 years. Remarkably, we did not find consequences for both sexes.

We did not find an association between childhood disruptive behavior and adult violent delinquency in males, in contrast with other longitudinal studies (Farrington, et al., 2006; Moffitt, et al., 2002). We propose the following explanation for the lack of predictive value for disruptive disorders in boys. Regarding differences between male and female levels of aggression, previous studies found that chronically aggressive females show higher rates of aggression than the vast majority of chronically aggressive males (Broidy, et al., 2003). In addition, studies showed that females have experienced greater risk factors than their male counterparts before they develop delinquent behavior. Female adjudicated delinquents have significantly higher rates of parent-reported psychopathology, maltreatment history, and familial risk factors than male adjudicated delinquents (McCabe, Lansing, Garland, & Hough, 2002). This shows that females may need to reach a higher threshold of risk before delinquency develops (Loeber & Keenan, 1994; Robins, 1986), and are therefore found to have a more severe form of psychopathology than male delinquents. This is in line with the 'gender paradox' hypothesis (Robins, 1986). This hypothesis states that although conduct problems are relatively uncommon among girls, those girls who meet criteria for conduct problems are likely to be particularly severely affected (Loeber & Keenan, 1994). Thus, disruptive disorders in deviant girls were possibly more pervasive than in deviant boys, and may therefore exclusively predict female violent delinquency.

Our findings should be interpreted in light of two limitations. First, although we achieved a high response rate in a 24-year follow-up, a shared limitation among longitudinal studies is that long-term results are based on relatively small proportions of adult violent offenders. Second, the results of this study may have

been influenced by time dependent environmental covariates, such as ethnic distributions, or family structures that we did not control for.

Future studies should examine which disruptive behavior problems are more specific to females (e.g. social, relational or indirect aggression), and specific to males (e.g. physical and verbal aggression). Regarding the fact that childhood conduct disorder comprises several types of disruptive items, we therefore recommend to investigate the prediction of adult violence on item level. In addition, we suggest future research on mechanisms behind gender differences because these are not yet fully understood.

## CONCLUSIONS

This longitudinal study shows that the childhood disruptive behavior can have consequences even over a long time interval of 24 years. Continuity of childhood psychopathology into middle adulthood may have important implications for clinical practice. First, we recommend being alert on girls that show conduct problems, because these girls are 5 times more likely to show violent delinquency in adulthood. Second, our findings suggest that mental health professionals should be aware of differences between disruptive boys and girls. Although our findings cannot directly inform treatment, we suggest to reconsider prevention and intervention programs especially for girls, because current programs are primarily based on empirical knowledge from male samples.

# 5

# PREDICTING ADULT EMOTIONAL AND BEHAVIORAL PROBLEMS FROM EXTERNALIZING PROBLEM TRAJECTORIES IN A 24-YEAR LONGITUDINAL STUDY

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# ABSTRACT

## OBJECTIVE

This study was to examine the prediction of adult behavioral and emotional problems from developmental trajectories of externalizing behavior in a 24-years longitudinal population-based study of 2,076 children. The adult psychiatric outcome of these trajectories has not yet been examined.

## METHOD

Trajectories of the four externalizing behavior types aggression, opposition, property violations and status violations were determined separately through latent class growth analysis (LCGA) using data of 5 waves, covering ages 4 to 18 years. We used regression analyses to determine the associations between children's trajectories and adults' psychiatric problems based on the Adult Self-Report.

## RESULTS

The developmental trajectories of the four types of externalizing behavior mostly predicted intrusive, aggressive and rule-breaking behavior in adulthood. Nondestructive behaviors in childhood such as opposition and status violations predict adult problems to a larger extent than destructive behaviors such as aggression and property violations.

## CONCLUSIONS

In general, children who develop through high-level trajectories are likely to suffer from both internalizing and externalizing problem behavior in adulthood, regardless the direction of change (i.e. increasing/decreasing/persisting) of the high-level trajectory. We can conclude that the level rather than the developmental change of externalizing behavior problems has a larger impact on adult outcome.

## INTRODUCTION

To study externalizing behavior is of great importance because externalizing behavior causes many disturbances for the child and its social environment. Externalizing behavior in childhood and adolescence is highly predictive for later externalizing behavior (Mannuzza, et al., 2008; Moffitt, 1993; Simonoff, et al., 2004) and other psychopathology (Kim-Cohen, et al., 2003; Zoccolillo, 1992). Because externalizing behavior can change both in form and severity over time (Bongers, et al., 2004; Brame, et al., 2001; Moffitt, 1993; Stanger, Achenbach, & Verhulst, 1997), studies on the development of externalizing behavior need to employ a developmental perspective including several measurement points to provide complete information about the severity of the problem. In addition, externalizing behavior problems comprise different types of behaviors that not only develop in different ways but also lead to different outcomes (Bongers, et al., 2004; Frick, et al., 1993), consequently, developmental studies need to distinguish between development of different types of externalizing behavior (Achenbach, et al., 2001). In this 24-year follow-up study, we investigated the predictive strength of developmental trajectories in various childhood externalizing behavior types for a large range of adult psychopathology.

Because externalizing behavior comprises a large range of problem behaviors, Frick et al. (1993) derived a classification through a meta-analysis of 44 studies. Four types of problem behaviors within the broader category of externalizing behavior were identified: property violations (e.g. lies, cruel to animals), aggression (e.g. fights, bullies), status violations (e.g. substance use, runaway) and oppositional (e.g. temper, stubborn). Only a few studies have confirmed this subdivision of externalizing behavior and have suggested that these different externalizing behavior types differ in their development and long-term outcome (Bongers, et al., 2004; Bongers, et al., 2008; Timmermans, et al., 2008; Tremblay, 2000). To our knowledge, no studies have reported about psychiatric outcomes in adulthood. Overall, status violations has been found to increase with increasing age (Bongers,

et al., 2004) whereas the other subtypes decrease or persist over time. In addition, oppositional has been found to predict social problems in adulthood, while status violations has been found to predict both social problems and drug abuse, and aggression and property violations to predict drug abuse and risky sexual behavior (Bongers, et al., 2008; Timmermans, et al., 2008).

It is well established in the literature that the continuity of childhood externalizing behavior can follow different developmental trajectories over time. Developmental trajectories describe the course of behavior over time, that is, changes in both the level and the growth or decline of behaviors. It is important to know which change in level and growth across age may be considered normative for children and adolescents. Because, from both theoretical and clinical perspective, for defining abnormal behavior at any age point, it is indispensable to understand normal development. Previous longitudinal studies on the issue reported 'increasing', 'decreasing', 'stable high' and 'stable low' trajectories of externalizing behavior (Bongers, et al., 2004; Brame, et al., 2001; Broidy, et al., 2003; Nagin & Tremblay, 1999). In addition to the level and the growth or decline of behaviors, individuals can start to display problem behavior at different ages (Tremblay, 2000). As a result, some studies report a 'child onset' type, an 'adolescent onset' type (American Psychiatric Association, 1994; Moffitt & Caspi, 2001; Roisman, et al., 2004), or a 'life-course persistent' and 'adolescence-limited' developmental trajectories of externalizing behavior . In the 'adolescent-limited' subgroup, externalizing behavior emerges in adolescence and desists after adolescence (Brame, et al., 2001). Considering these different developmental trajectories of externalizing behavior that groups of children follow, an average developmental trajectory that describes expected development for most children may be considered inadequate because of substantial variation around the mean. Therefore, it is important to consider groups of children that follow developmental trajectories that vary in level and shape. In the current study, we determined distinctive groups of individuals who are more

likely to follow one developmental trajectory than another, within each type of externalizing behavior.

Different developmental trajectories have been found to have different adult outcomes (Tremblay, 2000). For instance, children in stable high-level trajectories are more likely to show poor outcomes (e.g. delinquency, aggression or substance use) (Brame, et al., 2001; Broidy, et al., 2003; Timmermans, et al., 2008) than children on low-level or increasing trajectories (Bongers, et al., 2008; Brame, et al., 2001; Roisman, et al., 2004). Furthermore, individuals in externalizing behavior trajectories of the 'life-course-persistent' and 'child onset' subtype experience in general more adult problems (e.g. delinquency and economic problems) than individuals in 'adolescent onset' and 'adolescent limited' trajectories (Odgers, et al., 2008; Roisman, et al., 2004). However, some studies fail to identify 'adolescent-limited' trajectories of externalizing behavior, or, report poor outcomes in adulthood for individuals who started to display problem behavior in adolescence (Brame, et al., 2001; Odgers, et al., 2008). Evidently, both the type and the developmental course of externalizing behavior appear to widely differ among individuals and different types and developmental courses of externalizing behavior may lead to very different adult outcomes. Therefore, to be able to predict the adult outcome of externalizing behavior, different trajectories of distinct externalizing behavior types need to be examined.

In the present study, we investigated associations between developmental trajectories of externalizing behavior in childhood and a large range of psychiatric problems in adulthood. In a 24-year longitudinal population based study, we examined the predictive value of trajectories of the four externalizing behavior types (Frick, et al., 1993) (i.e., oppositional, aggression, property violations and status violations), based on five waves covering 4-18 years.

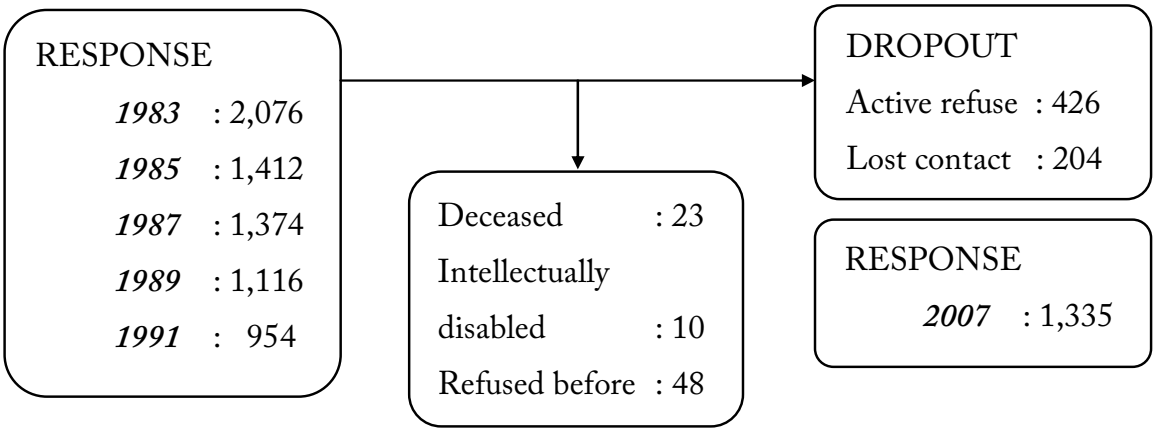
# METHOD

## *Sample*

In 1983, a sample of 2,600 children from 13 birth cohorts aged four to sixteen years was randomly selected from the general population of the province of Zuid-Holland in the Netherlands. Of each gender and age, 100 children were drawn from the municipal registers listing all residents in the province. A total of 2,447 parents could be reached, of whom 84.8% (2,076 parents) completed the Child Behavior Checklist (CBCL) on their child. Parents were interviewed and completed the CBCL at 2-year time intervals in 1983, 1985, 1987, 1989 and 1991 (Bongers, Koot, van der Ende, & Verhulst, 2003). Participants themselves were interviewed again in 2006 and 2007, when they were 28-40 years old.

Between January 2006 and June 2007 (Van Meurs, et al., 2008), we approached all participants from the original sample, except 23 who had died, 10 who were intellectually disabled, and 48 who had requested to be removed from the sample at an earlier stage of the study (see Figure 5.1). We reached 1,791 of the 1,995 participants, 426 refused and 1,365 respondents provided usable data. The response rate in the data collection was 67% (1,365 of 2,043).

FIGURE 5.1. Flowchart of the data collection.




Flowchart of the data collection between 1983 and 2007.

To investigate selective attrition, we performed logistic regression analyses to look at associations between age, gender, socio-economic status (SES) and Total Problems Score of participants in 1983, and participation in 2006 and 2007. SES was scored on a six-step scale of parental occupation (van Westerlaak, et al., 1975) with 1 = lowest SES. Total Problems Score was calculated by summing 118 of the specific item scores on emotional and behavioral problems in the CBCL. Cut-off points for a deviant versus nondeviant Total Problems Score of the CBCL were based on the 85$^{th}$ percentile of the frequency distributions in the sample. Age, gender, Total Problems Score and SES were significantly associated with participation. Participation was more likely when participants were women (69.7% versus 61.6%; OR = 1.44; CI 1.20–1.73; $p < .000$), if they were younger (mean age at baseline was 10.2 years for dropouts and 9.8 years for participants; OR = 0.97; CI 0.94–0.99 $p < .005$), had a higher SES (3.4 for dropouts and 3.7 for participants; OR = 1.12; CI 1.06–1.18; $p < .000$) and a nondeviant Total Problems Score at baseline (17.3% for dropouts and 13.4% for participants; OR = 0.77; CI 0.59–0.99; $p < .043$).

## MEASURES

### *Externalizing behavior trajectories*

Externalizing behavior trajectories were based on assessment with the Child Behavior Checklist (CBCL) (Achenbach, 1991). The CBCL is a questionnaire intended for completion by parents of 4 to 18-year-old children; it contains 120 items covering behavioral or emotional problems that have occurred during the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat* or *sometimes true*) and 2 (*very true* or *often true*). The reliability and validity of the CBCL (Achenbach, 1991) have been confirmed for the Dutch version (Verhulst, et al., 1996).

Externalizing behavior items of the CBCL which content showed a good match to the original items described by Frick (Bongers, et al., 2004; Frick, et al., 1993),

were subdivided in four types: aggression, opposition, property violations and status violations. The 21 items were used to create a score on these four types (see Table 5.1). A good fit of the four clusters was confirmed with a confirmatory factor analyses (the average goodness-of-fit index (GFI) was 0.92 for males and 0.96 for females; (Bongers, et al., 2004)).

TABLE 5.1. Item description of the four externalizing behavior types.

| *Frick Cluster* | *Child Behavior Checklist Item* |
|---|---|
| Aggression | Cruelty, bullying, or meanness to others |
| | Gets in many fights |
| | Physically attacks people |
| | Threatens people |
| Opposition | Argues a lot |
| | Disobedient at home |
| | Disobedient at school |
| | Stubborn, sullen, or irritable |
| | Sulks a lot |
| | Teases a lot |
| | Temper tantrums or hot temper |
| Property violations | Cruel to animals |
| | Lying or cheating |
| | Sets fires |
| | Steals at home |
| | Steals outside the home |
| | Vandalism |
| Status violations | Runs away from home |
| | Swearing or obscene language |
| | Truancy, skips school |
| | Uses alcohol or drugs for not medical purposes |

CBCL items to which the content showed a good match to the description provided by the authors of the types (Frick et al., 1993) that were clustered to form four types of externalizing behavior.

Trajectories of externalizing behavior for ages 4-18 years were identified in a previous study on the Zuid-Holland data (see Figure 5.2). A semi-parametric, group-based approach (Nagin, 1999) was used to determine developmental trajectories of the four classified externalizing behavior types. In the first five waves of this study, 6932 observations were collected on which basis the trajectories were computed. For every child, his/her trajectory was determined within each externalizing behavior type.

The semi-parametric mixture model allows for differences between groups in the shape of the developmental trajectories and is also appropriate for analyzing within-subject-level development. Within the behavior types, the best possible number of groups with different developmental trajectories were estimated and selected using the Bayesian information criterion (Nagin, 1999). We used a Zero-Inflated Poisson (ZIP) distribution for estimating the trajectories. Estimation using a ZIP distribution addresses both non-normality and the abundance of zeros typically found in distributions of externalizing behavior (Bongers, et al., 2004; Nagin, 1999). Model estimation produces two key outputs: parameter estimates that distinguish the shapes of the developmental trajectories (Bongers, et al., 2004) and also, for each of the trajectories, the probability of group membership for each individual in the sample. The largest probability for each individual indicated the trajectory that best matched to that individual's behavior over time. With these probabilities, each child was assigned to the trajectory of each externalizing type that best described their individual developmental trajectory. Therefore, each child could be classified at the same time in, for example, a high level trajectory for opposition and a low-level trajectory for aggression. There were equal amounts of younger and older children classified in each trajectory, since there were no age effects in the assignment of the individuals to the trajectories. The child's classifications were used in further analyses.

Three trajectories were found for the externalizing behavior type aggression: a 'near zero' trajectory, a 'low decreasers' trajectory, and a 'high decreasers' trajectory. Six trajectories were found for the behavior type opposition: a 'near zero' trajectory, a 'low decreasers' trajectory, a 'medium decreasers' trajectory, an 'adolescent increasers' trajectory, a 'high persisters' trajectory and a 'high decreasers' trajectory. Four trajectories were found for property violations: a 'near zero' trajectory, a 'low decreasers' trajectory, a 'high persisters' trajectory, and an 'extremely high persisters' trajectory. In status violations, a 'near zero' trajectory, an 'adolescent decreasers' trajectory, a 'medium increasers' trajectory, and a 'high increasers' trajectory was found.

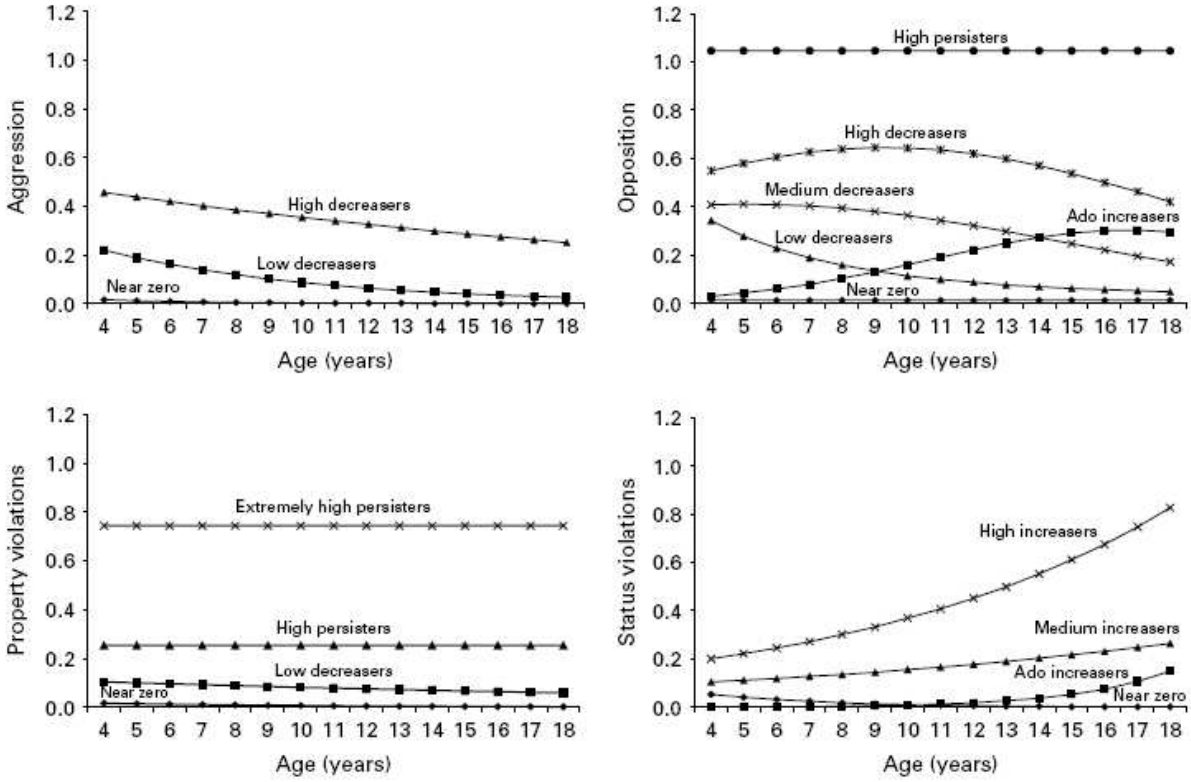
In the current study, 1,365 adults participated. Of this group of participants, 407 were assigned to a high-level trajectory in at least one type. Of these high-level participants, 302 participated in only one externalizing behavior type in a high-level group, 82 participants in two types, 17 participated in three externalizing behavior types in a high-level group, and 6 in all four externalizing behavior types. Because the 'extremely high persisters' group of opposition consisted of only 2 participants, this group was combined with the 'high persisters' group. The number of individuals within each trajectory can be found in table 5.2. No significant differences were found between participants with missing assessments and participants with assessments in all five waves on any of the CBCL scales (see Bongers, et al., 2004) for further details of this analysis).

TABLE 5.2. Number of participants in the developmental trajectories

| *Developmental trajectory* | *n* | *Percentage of total sample* | *Percentage males* |
|---|---|---|---|
| *Aggression* | | | |
| Near zero | 1473 | 71.0 | 41.7 |
| Medium decreasers | 444 | 21.4 | 65.3 |
| High decreasers | 159 | 7.7 | 70.4 |
| *Opposition* | | | |
| Near zero | 148 | 7.1 | 43.9 |
| Low decreasers | 491 | 23.7 | 44.6 |
| Medium decreasers | 674 | 32.5 | 50.3 |
| Adolescence increasers | 125 | 6.0 | 41.6 |
| High decreasers | 503 | 24.2 | 53.5 |
| High persisters | 135 | 6.5 | 53.3 |
| *Property violations* | | | |
| Near zero | 1548 | 74.6 | 45.4 |
| Low decreasers | 421 | 20.3 | 56.3 |
| High persisters | 107 | 5.2 | 71.0 |
| *Status violations* | | | |
| Near zero | 1052 | 50.7 | 43.7 |
| Adolescence increasers | 485 | 23.4 | 46.8 |
| Medium increasers | 514 | 24.8 | 60.5 |
| High increasers | 25 | 1.2 | 72.0 |

Number of individuals within each trajectory, percentage of individuals within each trajectory of the total sample, and percentage of males within each trajectory of the total sample.

FIGURE 5.2. Developmental trajectories in childhood externalizing behavior types.




Group-based developmental trajectories of aggression, opposition, property violations, and status violations. The y axis represents the raw syndrome scores. (From Bongers et al. (2004); reprinted with permission of Blackwell Publishing.) "Ado" = "Adolescence"

### *Adult behavioral or emotional problems*

The Adult Self-Report (ASR) (Achenbach, 1997) is the adult equivalent of the CBCL. It is a questionnaire intended for completion by adults of 18- to 59-years old and it includes 123 problem items, covering behavioral or emotional problems that have occurred during the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat* or *sometimes true*) and 2 (*very true* or *often true*). The items can be scored on eight syndrome scales: Withdrawn, Somatic Complaints and Anxious/Depressed (which form the Internalizing scale), Rule-Breaking Behavior, Aggressive Behavior and Intrusive (which form the

Externalizing scale), Thought Problems and Attention Problems. A Total Problem Score is calculated by summing the individual item scores. The reliability and validity of the ASR (Achenbach, 1997) have been confirmed for the Dutch version (Vanheusden, et al., 2009). In our sample, the ASR had high internal consistency coefficients, i.e. Cronbach's alphas higher than .70 (range .72-.89), except for thought problems (.56) and rule-breaking behavior (.66).

## STATISTICAL ANALYSIS

### *Linear regression analyses*

To investigate associations between childhood externalizing developmental trajectories and emotional and behavioral problems in adulthood, we performed multiple linear regression analyses. We tested whether associations existed between all the trajectories in all four externalizing behavior types and adult ASR scale scores. The regression analyses were performed in steps, for every subtype and ASR scale separately. In the first step we entered the demographic variables gender and SES in the model as predictors, and in the second step, we entered the trajectories of externalizing behavior in the model as predictors. This analysis indicates whether individuals in other trajectories were at higher risk for adverse outcomes than the individuals in the near-zero group. In the third step, we determined for all models, whether there were interaction effects between gender and the separate trajectories. We also tested whether associations between trajectories within every externalizing behavior type and outcomes were significantly different from each other. We reported significant ß values of the multiple linear regression analyses with the 'near zero' trajectories of each type as reference category, adjusted for gender and SES.

## RESULTS

In the multiple regression analyses, many associations were found between childhood externalizing developmental trajectories and adult problem behavior (see table 5.3). In general, we primarily found associations between high-level

trajectories in the four externalizing behavior types and externalizing behavior in adulthood, and not between low-level trajectories and later problem behavior. Developmental trajectories of opposition and status violations showed more associations than the trajectories of aggression and property violations. The high-level and medium-level trajectories predicted problems in all the eight syndrome scales in adulthood. Furthermore, the adolescent increasers trajectories of opposition and status violations predicted very few problems in adulthood, and only showed associations with the adult problems in externalizing scales. Overall, the externalizing behavior trajectories predicted mostly aggressive behavior and rule-breaking behavior at follow-up.

Comparison of the regression coefficients of the different trajectories predicting adult outcome within each externalizing behavior type indicated that, first, for all the significant associations of aggression, high decreasers showed significantly stronger associations with adult outcome than low decreasers. Second, for opposition, associations between high persisters and high decreasers were significantly different for anxious/depressed and aggressive behavior, and unexpectedly, high decreasers showed a stronger association with adult outcome than the high persisters. In addition, high-level trajectories showed significantly stronger associations with adult outcome than medium-level trajectories in this subtype. Third, as regards the developmental trajectories of property violations, the high persisters showed significantly stronger associations with adult outcome than low decreasers. Finally, for status violations, associations were significantly stronger between high increasers and anxious/depressed, somatic complaints, withdrawn and aggressive behavior. Associations with somatic complaints, thought problems, attention problems, rule-breaking behavior and intrusive problems were significantly stronger for medium increasers.

TABLE 5.3. Associations between developmental trajectories of child to adolescent externalizing problems and emotional and behavioral problems in adulthood.

| | | *Emotional and behavioral problems in adulthood* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Trajectories of externalizing behavior problems* | *N* | *Anxious Depressed* | *Withdrawn* | *Somatic Complaints* | *Thought Problems* | *Attention Problems* | *Aggressive Behavior* | *Rule-Breaking Behavior* | *Intrusive* |
| ***Aggression*** F(df) | *1365* | F(4,1354) = 12.15 | F(4,1354) = 10.72 | F(4,1354) = 16.47 | F(4,1354) = 7.87 | F(4,1354) = 2.09 | F(4,1354) = 13.46 | F(4,1354) = 28.60 | F(4,1354) = 14.08 |
| High decreasers [1] | 84 | ***.097*** | ***.072*** | ***.121*** | ***.098*** | ***.063*** | ***.125*** [2] | ***.122*** [2] | ***.147*** [2] |
| Low decreasers [2] | 274 | .022 | .038 | .041 | .063 | .027 | ***.077*** [1] | ***.081*** [1] | ***.107*** [1] |
| * Near zero | 1007 | | | | | | | | |
| ***Oppositional*** F(df) | *1365* | F(7,1351) = 9.47 | F(7,1351) = 7.22 | F(7,1351) = 10.11 | F(7,1351) = 6.10 | F(7,1351) = 2.63 | F(7,1351) = 12.20 | F(7,1351) = 17.87 | F(7,1351) = 7.86 |
| High persisters [1] | 71 | ***.148*** [2345] | ***.081*** | ***.112*** | ***.110*** [4] | ***.080*** | ***.186*** [234] | ***.148*** [34] | ***.120*** |
| High decreasers [2] | 317 | ***.158*** [15] | ***.123*** | ***.147*** | ***.133*** | ***.106*** | ***.220*** [1] | ***.183*** | ***.224*** |
| Ado increasers [3] | 90 | .044 | .053 | .025 | .035 | .039 | ***.103*** [1] | ***.082*** [1] | ***.124*** |
| Medium decreasers [4] | 440 | ***.134*** [15] | ***.116*** | .087 | ***.104*** [1] | .098 | ***.195*** [1] | ***.146*** [1] | ***.191*** |
| Low decreasers [5] | 340 | .058 | .032 | .027 | .005 | .010 | .066 | 0.58 | .087 |
| * Near zero | 107 | | | | | | | | |

TABLE 5.3. (Continued.)

| *Trajectories of externalizing behavior problems* | *N* | *Emotional and behavioral problems in adulthood* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Anxious Depressed* | *Withdrawn* | *Somatic Complaints* | *Thought Problems* | *Attention Problems* | *Aggressive Behavior* | *Rule-Breaking Behavior* | *Intrusive* |
| ***Property violations*** F(df) | *1365* | F(4,1354) = 11.83 | F(4,1354) = 10.13 | F(4,1354) = 15.13 | F(4,1354) = 5.45 | F(4,1354) = 2.12 | F(4,1354) = 11.80 | F(4,1354) = 30.64 | F(4,1354) = 6.98 |
| High persisters [1] | 53 | ***.091*** | .053 | ***.106*** | .052 | .039 | ***.105*** [2] | ***.129*** [2] | ***.061*** |
| Low decreasers [2] | 283 | .023 | .041 | .025 | .050 | ***.057*** | ***.066*** [1] | ***.100*** [1] | ***.071*** |
| * Near zero | 1029 | | | | | | | | |
| ***Status violations*** F(df) | *1365* | F(5,1353) = 12.64 | F(5,1353) = 8.87 | F(5,1353) = 14.05 | F(5,1353) = 7.79 | F(5,1353) = 4.71 | F(5,1353) = 13.01 | F(5,1353) = 29.45 | F(5,1353) = 11.23 |
| High increasers [1] | 16 | ***.124*** [2] | ***.068*** | ***.110*** [2] | .027 | ***.084*** [2 3] | ***.129*** [2] | ***.077*** [2] | ***.059*** |
| Medium increasers [2] | 309 | ***.079*** [1] | .046 | ***.090*** [1] | ***.137*** | ***.099*** [1] | ***.114*** [1] | ***.198*** [1] | ***.159*** |
| Ado increasers [3] | 333 | .040 | -.010 | .026 | .052 | ***.064*** [1] | .055 | ***.086*** | ***.108*** |
| * Near zero | 707 | | | | | | | | |

ß values of multiple linear regression analysis with the 'near zero' trajectory of each type as reference category, adjusted for gender and SES. ß values in bold are significantly different ($p<.05$). Superscripts correspond to the trajectory of the subtype that the ß values showed significant difference with. "Ado" = "Adolescence".

# DISCUSSION

The aim of this study was to predict adult problems from several child developmental trajectories of four types of externalizing behavior over a period of 24 years in a longitudinal population-based study of 2,076 children. Consistent with previous findings (Fergusson, Horwood, et al., 2007; Kim-Cohen, et al., 2003; Mannuzza, et al., 2008; Odgers, et al., 2008; Simonoff, et al., 2004), we found that children displaying high levels of externalizing behavior at any time point, and regardless of the course of their problems (i.e., increasing /decreasing /persisting), run a larger risk to have poor outcomes in adult life, compared with children with low levels of externalizing behavior. Furthermore, children displaying externalizing behaviors of the oppositional and status violations types showed a larger variety of psychopathology in adulthood than children displaying externalizing behaviors of the aggressive and property violations types. This prospective community study is unique in terms of its long follow-up time, and its ability to determine the predictive strength of various developmental trajectories in empirically derived types of externalizing behavior on psychopathology in middle adulthood.

In general, and in line with previous studies that investigated the long-term continuity of externalizing behavior (Broidy, et al., 2003; Moffitt, et al., 2002), we found that externalizing behavior problems in childhood showed persistence into adulthood. Trajectories in all externalizing behavior types predicted aggressive behavior, rule-breaking behavior and intrusive problems, which are the three externalizing subscales of the ASR. Even the low-level trajectories of aggression and property violations predicted externalizing behavior in adulthood. Our findings confirm that childhood externalizing behavior shows long-term continuity, even up to middle adulthood.

Apart from predicting externalizing behavior problems in adulthood, severe developmental trajectories of externalizing behavior also predicted adult internalizing problems. Although relatively few population-based studies have reported outcomes in adulthood, heterotypic continuity of childhood externalizing

behavior into adult internalizing problems has been previously reported (Fergusson, et al., 2005). However, the majority of previous studies indicate that this heterotypic continuity results primarily from the comorbidity between externalizing and internalizing problems in childhood (Angold, et al., 1999; Moffitt, et al., 2002; Sourander, et al., 2007). Hence, a possible reason why externalizing behavior trajectories predict internalizing problems in adulthood in this study could be because we did not control for co-occurring internalizing problems in childhood or adolescence.

Of the four types of externalizing behavior we investigated, oppositional and status violations were most predictive of later emotional and behavioral problems. These results are in line with findings on previous waves of this study (Bongers, et al., 2008), and with studies reporting associations between oppositional and adult psychopathology even after control for co-occurring conduct problems (Nock, Kazdin, Hiripi, & Kessler, 2007; Timmermans, et al., 2008). One possible explanation to these findings could be that these two externalizing behavior types comprise behaviors that are primarily reactive, nondestructive and affective behaviors and entail negative emotionality (e.g., anger, runaway, rule breaking), in contrast to aggression and property violations that primarily comprise proactive and violent behaviors that are offensive and instrumental (e.g. bullying, vandalism). Proactive and reactive aggression have been found to be two distinct subtypes of externalizing behavior with different adult outcomes. Proactive and violent individuals tend to bully and be very unemotional, whereas reactive individuals show impulsive, angry responses to aversive events, particularly perceived by interpersonal threat (Dodge & Coie, 1987; Vitaro, et al., 2002). We found that children who show these reactive externalizing problems caused by emotional provocation suffer from later internalizing and attention problems (Dodge, et al., 1997; Vitaro, et al., 2002).

Because previous studies showed that development of externalizing behavior can follow various trajectories (Brame, et al., 2001; Broidy, et al., 2003; Moffitt, 1993; Nagin & Tremblay, 1999; Odgers, et al., 2008), we used LCGA to analyze trajectories of externalizing behavior, because this method is well adapted for modeling growth of phenomena within a population in which population members are not following a common developmental process of growth or decline. Given that we analyzed the distinctive trajectories within the externalizing behavior types, we were able to look at the differences in the associations between trajectories and outcomes in adulthood. In accordance with findings of previous studies (Moffitt, et al., 2002; Odgers, et al., 2007; Odgers, et al., 2008; Zoccolillo, Pickles, Quinton, & Rutter, 1992), we found that high-level externalizing trajectories are most predictive for adult problems. In a review of conduct disorder and its outcomes in general population studies it was found that increasing severity of externalizing behavior was associated with an increasing risk of an emotional disorder in adulthood (Zoccolillo, 1992). Also, Moffitt et al. (2002) investigated the continuity of externalizing behavior and found a severe 'life-course-persistent' trajectory in a sample of externalizing individuals in a follow-up at age 26 years. In a 32 year follow-up of the above sample it was found that individuals that developed through the most severe developmental subtype of DSM-IV conduct problems suffered from the most mental health problems (Odgers, et al., 2008). Taken together, we can confirm that high-levels of externalizing behavior in childhood and adolescence are linked to poor outcomes in adulthood.

Investigating the predictive value of distinct trajectories to problems in adulthood, we found that primarily the level of the trajectories, and not the direction had impact. These findings are consistent with the findings of previous studies in which children in high-level trajectories had more problems in adulthood, independent from the direction of the development (Bongers, et al., 2008; Odgers, et al., 2008). The present study extends these findings because we were able to report that all high-level trajectories in every type of externalizing behavior showed associations

with the majority of the behavioral problems up to the age of 40 years. In addition, the medium-level trajectories, which are still relatively high in severity, showed multiple associations. In general, we can conclude that children who develop along a relatively high-level trajectory are more at risk for adult problems, despite the course of their high-level trajectory.

Longitudinal studies have repeatedly reported a developmental subtype of externalizing behavior in which individuals only suffer from problem behavior during adolescence (Brame, et al., 2001; Moffitt, et al., 2002; Odgers, et al., 2007). In the current study, we did not find significant associations between the adolescent increasers trajectory of status violations and adult problems. This confirms the existence of an adolescence-limited subgroup. However, we also found an adolescent increasers subgroup that did show associations with externalizing behavior; the adolescent increasing trajectory of oppositional predicted all externalizing behavior scales (i.e., aggressive behavior, rule-breaking behavior and intrusive). This contradicts the existence of an adolescent-limited subtype of externalizing behavior. Interestingly, this was also found in a recent study of Odgers et al. (2007). Their results also showed mixed evidence for the existence of the adolescent onset group. Although preliminary, the above findings could indicate that the adolescent-limited subtype does not exist in all types of externalizing behavior, which confirms the importance of examining subtypes of externalizing behavior.

Our findings should be interpreted in light of two limitations. First, although we achieved a relatively high response rate in a 24-year follow-up, a considerable proportion of the original sample from 1983 did not participate in this follow-up. By interpreting our results, one should be aware of the fact that in longitudinal population based studies, high-risk people are the most difficult to keep included. Although selective attrition effects were small in the present study, some children with the most severe externalizing behavior problems were not be included.

Therefore, results may not generalize to high-risk populations. Consequently, studies on high-risk children are essential to complete the present findings on the predictive value of developmental trajectories of externalizing behavior. Second, the results of this study may have been influenced by time dependent environmental covariates, such as economic growth, ethnic distributions, or family structures that we did not control for.

## CONCLUSIONS

Despite the above limitations, this longitudinal study shows a relation between child and adolescent externalizing behavior and adult psychopathology, even over a 24 years time-interval. We can conclude that, high levels of externalizing behavior in childhood and adolescence are associated with poor adult outcome, regardless of the developmental course of these behaviors. Therefore, intervention and prevention should focus on individuals that show severe externalizing problems at any point in childhood or adolescence. Because children and adolescents with externalizing behavior in the oppositional behavior and status violations subtypes were most likely to suffer from adult psychopathology, we recommend that prevention and intervention should focus on children and adolescents showing 'reactive' externalizing behavior (such as anger, temper and runaway) and substance abuse.

# 6

# DEVELOPMENTAL TRAJECTORIES OF CHILD TO ADOLESCENT EXTERNALIZING BEHAVIOR AND ADULT DSM-IV DISORDER: RESULTS OF A 24-YEAR LONGITUDINAL STUDY

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# ABSTRACT

## OBJECTIVE

Childhood externalizing behavior is found to be relatively persistent. Developmental pathways within types of externalizing behavior have been recognized from childhood to adolescence. We aimed to describe the prediction of adult DSM-IV disorders from developmental trajectories of externalizing behavior over a period of 24 years on a longitudinal multiple birth cohort study of 2,076 children. This has not been examined yet.

## METHOD

Trajectories of the four externalizing behavior types aggression, opposition, property violations and status violations were determined separately through latent class growth analysis (LCGA) using data of 5 waves, covering ages 4 to 18 years. Psychiatric disorders of 1,399 adults were assessed with the CIDI. We used regression analyses to determine the associations between children's trajectories and adults' psychiatric disorders.

## RESULTS

All externalizing behavior types showed significant associations with disruptive disorder in adulthood. In all antisocial behavior types high-level trajectories showed the highest probability for predicting adult disorders. Particularly the status violations cluster predicted many disorders in adulthood. Disruptive disorders were most frequently predicted in adulthood. Only status violations predicted adult anxiety, mood and substance use disorders.

## CONCLUSIONS

We can conclude that an elevated level of externalizing behavior in childhood has impact on the long-term outcome, regardless of the developmental course of externalizing behavior. Furthermore, different types of externalizing behavior (i.e., aggression, opposition, property violations and status violations) were related to different adult outcomes, and children and adolescents with externalizing behavior of the status violations subtype were most likely to be affected in adulthood.

# INTRODUCTION

It is well established in the literature that externalizing behavior in childhood and adolescence is associated with a wide range of poor concurrent and longitudinal outcomes (Broidy, et al., 2003; Copeland, et al., 2007; Mannuzza, et al., 2008; Odgers, et al., 2008; Simonoff, et al., 2004). Regarding longitudinal outcomes, studies report that children and adolescents with externalizing behavior problems are at risk for a wide range of disorders in adulthood that include: disruptive behavior (Moffitt, et al., 2002; Nock, et al., 2007; Sourander, et al., 2007; Zoccolillo, 1992), mood and anxiety problems (Fergusson, Horwood, et al., 2007; Nock, et al., 2007; Odgers, et al., 2008) and substance use and abuse (Frick, et al., 1993).

However, because externalizing behavior is an umbrella concept encompassing several different kinds of behavior, Frick et al. (1993; Bongers, et al., 2008; Timmermans, et al., 2008) performed a meta-analysis of 44 published studies and empirically divided externalizing behavior into four types: aggression (e.g, fights, bullies), oppositionality (e.g. temper, stubborn), property violations (e.g., lies, cruel to animals) and status violations (e.g. substance use, runaway). To our knowledge, only two studies have examined the adult outcome of types of externalizing behavior problems as suggested by Frick and colleagues (1993). These studies underline the need to distinguish between types of externalizing behavior, that is, they report that status violations predict substance use and social impairment, that oppositionality only predicts social impairment, whereas property violations and aggression predict both substance use and risky sexual behavior (Chung, Hill, Hawkins, Gilchrist, & Nagin, 2002; White, Bates, & Buyske, 2001; Wiesner, Kim, & Capaldi, 2005).

Regarding development of externalizing behavior, previous studies have provided evidence for variation in developmental trajectories of externalizing behavior in childhood and adolescence with most studies identifying four to six distinctive

trajectories (Nagin, 1999). Developmental trajectories describe changes in both the level and the growth or decline of behaviors over time (Frick, et al., 1993). It is important to know which change in level and growth across age may be considered normative for children and adolescents. Because from both theoretical and clinical perspective, it is indispensable to understand normal development for defining abnormal behavior at any age point. In the only previous study that examined the development of the four externalizing behavior types suggested by Frick et al. (1993; Bongers, et al., 2004) from early childhood up to young adulthood (i.e., from age 4 to age 18) the following developmental trajectories were identified: three trajectories for aggression ranging from very low to high, six trajectories for oppositionality ranging from very low to high and including a trajectory where oppositionality increased in adolescence, and four trajectories for property and status violation ranging from low to high (Bongers, et al., 2008; Moffitt, et al., 2002; Odgers, et al., 2007; Odgers, et al., 2008; Zoccolillo, 1992; Zoccolillo, et al., 1992). Considering these different developmental trajectories of externalizing behavior that groups of children follow, it is important to examine groups of children that follow developmental trajectories that vary in level and shape, because an average developmental trajectory that describes expected development for most children may be considered insufficient. In the current study, we determined distinctive groups of individuals who are more likely to follow one developmental trajectory than another, within each type of externalizing behavior.

In the study by Bongers et al. (2004), status violations was the only externalizing behavior type that increased with age, whereas the remaining types primarily showed a persisting or decreasing course. In a more recent study by Bongers et al. (2008), in which the relation of both level and growth of externalizing problems, as suggested by Frick et al. (1993), to adult outcomes was examined, primarily the level of the trajectories was found to be predictive. Children with high-level trajectories of opposition and status violations reported more impaired social functioning, regardless of the direction, or growth, or decline of these high-level

trajectories. However, in the study by Timmermans et al. (2008) both the level and growth of opposition, aggression and property violations were related to poor adolescent outcomes such as risky sexual behavior and substance use. In this latter study only the level of status violations predicted later negative outcomes. Hence, findings are inconclusive as to how developmental trajectories of these externalizing behavior types are related to other long-term outcomes, and further research on this issue is needed.

In the present study, we aimed to investigate associations between childhood externalizing behavior and adult psychopathology. We examined the prediction of adult DSM-IV disorders from developmental trajectories of the four types of externalizing behavior suggested by Frick et al. (1993; i.e., opposition, aggression, property violations and status violations) over a period of 24 years in a longitudinal, multiple birth cohort study of 2,076 children from the general population. Because studies have reported prognostic differences between the four types of childhood externalizing behavior as suggested by Frick et al. (1993), we investigated the linkage between childhood externalizing behavior and adult psychopathology, distinguishing these types of externalizing behavior. In addition, although previous studies reported outcomes for the four externalizing behavior types up to young adulthood (i.e., age 18 in the study by Timmermans et al., (2008); up to age 30 in the study by Bongers et al., (2008)), knowledge about their outcome beyond young adulthood is lacking. Therefore, we aimed to extend the findings of Bongers et al. (2008), which are based on a previous wave of the current study, by examining the prediction of developmental trajectories in middle adulthood (i.e., from age 28 to 40 years).

Based on earlier findings, we expect that an elevated level of externalizing behavior in childhood has impact on the long-term outcome, in addition to the developmental course of externalizing behavior (Bongers, et al., 2008; Timmermans, et al., 2008). Furthermore, we expect that different types of

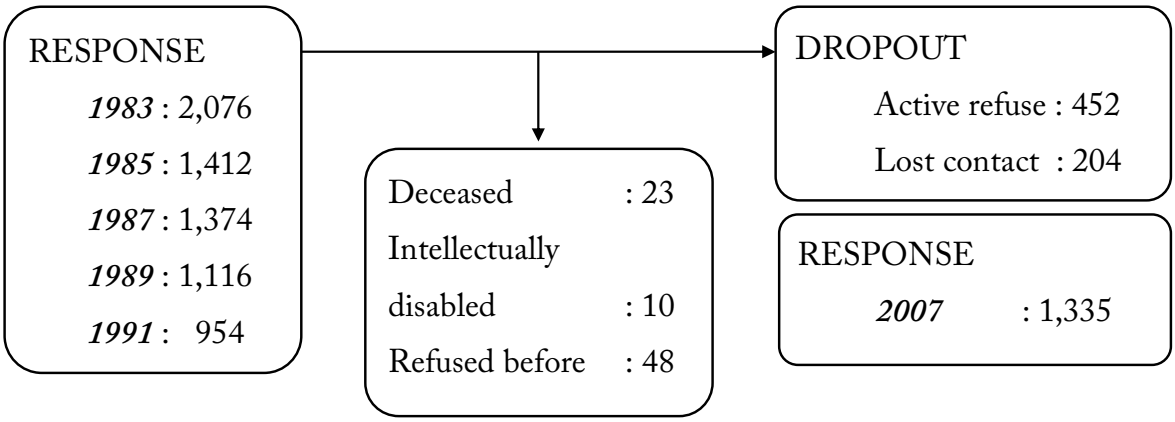
externalizing behavior (i.e., aggression, opposition, property violations and status violations) are related to different adult outcomes (Dodge & Coie, 1987; Vitaro, et al., 2002). Finally, according to the fact that the oppositional and status violations type consist of more reactive and nondestructive behaviors, these types of problems are expected to develop into emotional problems. Because the property violations and aggression type consist of proactive, destructive behaviors, these types are expected to develop into behavior problems in adulthood (Bongers, et al., 2004). Because behavior problems of the status violations type have been found to increase with age (Van Meurs, et al., 2008), we expect that this type is associated with most adult problems.

## METHOD

### *Sample*

In 1983, a sample of 2,600 children aged four to sixteen years was randomly selected from the general population of the Dutch province of Zuid-Holland. A hundred children of each gender and age were drawn from the municipal registers listing all residents in the province. A total of 2,447 parents of child participants could be reached, of whom 2,076 (84.8%) completed the Child Behavior Checklist (CBCL) on their child. Parents were interviewed at 2-year intervals until 1991 and the participants themselves were interviewed in 2006 and 2007 when they were 28–40 years old. We approached all participants from the original sample, except 23 who had died, 10 who were intellectually disabled, and 48 who had requested to be removed from the sample at an earlier stage of the study (van Westerlaak, et al., 1975). We reached 1,791 of the 1,995 participants, 452 refused and 1,339 respondents provided information for determining DSM-IV diagnoses, see Figure 6.1. The response rate in the seventh data collection was 66% (1,339 of 2,043).

FIGURE 6.1. Flowchart of the data collection.




Flowchart of the data collection between 1983 and 2007.

To investigate selective attrition, we performed logistic regression analyses to look at associations between age, gender, socio-economic status (SES) and Total Problems Score of participants in 1983, and participation in 2006 and 2007. SES was scored on a six-step scale of parental occupation (Achenbach, 1991) with 1 = lowest SES. Total Problems Score was calculated by summing 118 of the specific item scores on emotional and behavioral problems in the CBCL. Although age, gender and SES had significant influence on participation at follow-up, the differences were small. Participation was more likely when participants were women (51.1% for dropouts versus 53.7% for participants; OR = 1.33; CI 1.11–1.60; $p < .002$), if they were younger (mean age at baseline was 10.2 years for dropouts and 9.8 years for participants; OR = 0.97; CI 0.95–1.00; $p < .026$), and had a higher SES (3.4 for dropouts and 3.7 for participants; OR = 1.12; CI 1.06–1.19; $p < .000$). No influence on participation was found for Total Problems Score.

## MEASURES

### *Externalizing behavior trajectories*

From 1983 to 1991 the Child Behavior Checklist (CBCL) was used to obtain standardized parent reports of children's problem behaviors. Externalizing behavior trajectories were based on assessment with the CBCL. The CBCL is a rating scale intended for completion by parents of 4 to 18-year-old children; it contains 120 items covering behavioral or emotional problems that have occurred during the past six months. The items are scored on a three-point scale: 0 (*not true*), 1 (*somewhat* or *sometimes true*) and 2 (*very true* or *often true*). The items can be scored on eight syndrome scales; Withdrawn, Somatic Complaints and Anxious/Depressed (which form the Internalizing scale); Delinquent Behavior and Aggressive Behavior (which form the Externalizing scale); Social Problems, Thought Problems and Attention Problems. The reliability and validity of the CBCL (Verhulst, et al., 1996) have been confirmed for the Dutch version (Bongers, et al., 2004).

We selected 21 externalizing behavior items of the CBCL, corresponding to items that Frick et al. (1993) used for the classification of antisocial behavior into four types which are: aggression, opposition, property violations and status violations (Table 6.1). The structure of the four types was confirmed with confirmatory factor analyses. The average goodness-of-fit index (GFI) across time 1 - time 5 was 0.92 for males and 0.96 for females (Bongers, et al., 2004).

Trajectories of externalizing behavior for ages 4-18 years were identified in a previous study on the Zuid-Holland data (see figure 6.2) (Nagin, 1999). A semi-parametric, group-based approach (Bongers, et al., 2004; Nagin, 1999) was used to determine developmental trajectories of the four externalizing behavior types. The trajectories were based on the first five waves of this study. For every child, a trajectory was determined within each externalizing behavior type.

TABLE 6.1. Item description of the four externalizing behavior types.

| *Frick Cluster* | *Child Behavior Checklist Item* |
|---|---|
| Aggression | Cruelty, bullying, or meanness to others |
| | Gets in many fights |
| | Physically attacks people |
| | Threatens people |
| Opposition | Argues a lot |
| | Disobedient at home |
| | Disobedient at school |
| | Stubborn, sullen, or irritable |
| | Sulks a lot |
| | Teases a lot |
| | Temper tantrums or hot temper |
| Property violations | Cruel to animals |
| | Lying or cheating |
| | Sets fires |
| | Steals at home |
| | Steals outside the home |
| | Vandalism |
| Status violations | Runs away from home |
| | Swearing or obscene language |
| | Truancy, skips school |
| | Uses alcohol or drugs for not medical purposes |

CBCL items to which the content showed a good match to the description provided by the authors of the types (Frick et al., 1993) that were clustered to form four types of externalizing behavior.

Within the behavior types, the best possible number of groups with different developmental trajectories were estimated and selected using the Bayesian information criterion (Nagin, 1999). We used a Zero-Inflated Poisson (ZIP) distribution for estimating the trajectories. Estimation using a ZIP distribution addresses both non-normality and the abundance of zeros typically found in distributions of externalizing behavior (Bongers, et al., 2004; Nagin, 1999). The

largest probability for each individual indicated the trajectory that best matched to that individual's behavior over time. With these probabilities, each child was assigned to the trajectory of each externalizing type that best described their individual developmental trajectory. Therefore, each child could be classified at the same time in, for example, a high-level trajectory for opposition and a low-level trajectory for aggression. There were equal amounts of younger and older children classified in each trajectory, since there were no age effects in the assignment of the individuals to the trajectories. The child's trajectory group classifications were used in further analyses.

Three trajectories were found for the externalizing behavior type aggression: a 'near zero' trajectory, a 'low decreasers' trajectory, and a 'high decreasers' trajectory. Six trajectories were found for the behavior type opposition: a 'near zero' trajectory, a 'low decreasers' trajectory, a 'medium decreasers' trajectory, an 'adolescent increasers' trajectory, a 'high persisters' trajectory and a 'high decreasers' trajectory. Four trajectories were found for property violations: a 'near zero' trajectory, a 'low decreasers' trajectory, a 'high persisters' trajectory, and an 'extremely high persisters' trajectory. Because the 'extremely high persisters' group of property violations consisted of only two participants, this group was combined with the 'high persisters' group. In status violations, a 'near zero' trajectory, an 'adolescent decreasers' trajectory, a 'medium increasers' trajectory, and a 'high increasers' trajectory was found. The number of individuals within each trajectory can be found in table 6.2.

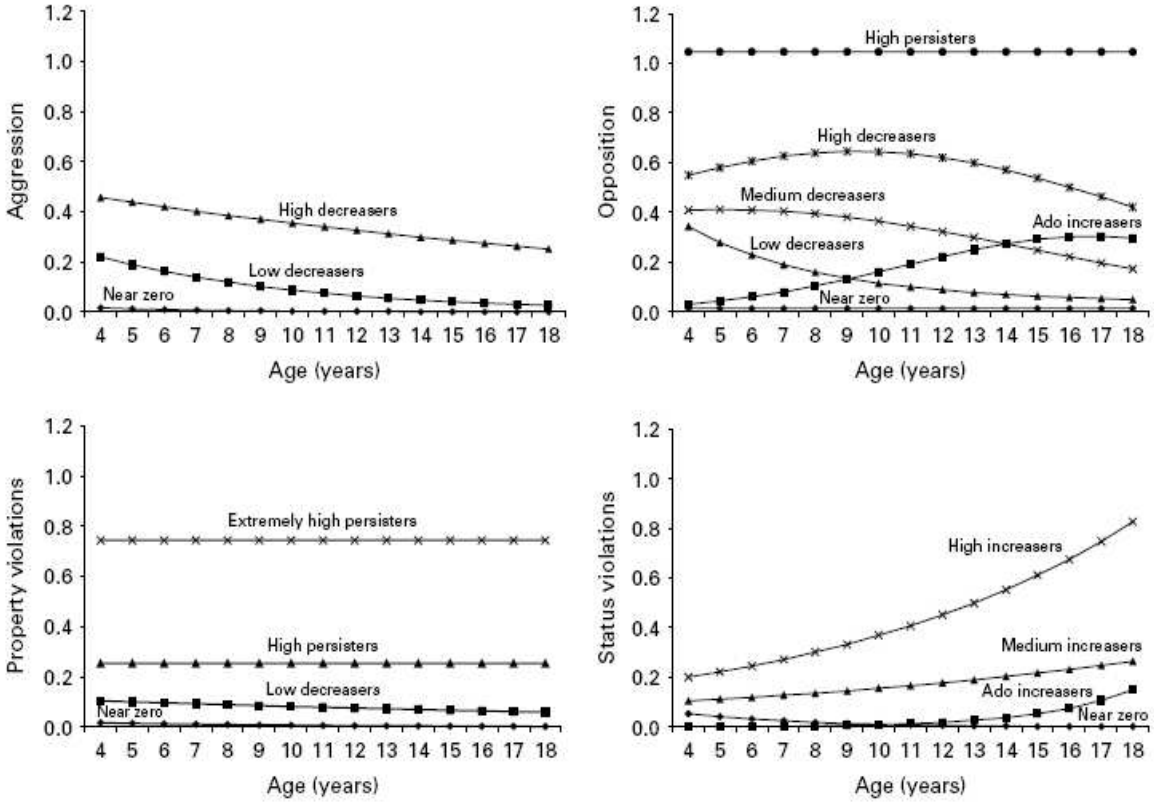
To investigate selective attrition, all dropouts and participants were compared with respect to their 1983 scale scores, using analysis of variance (ANOVA) and adjusting for age and gender. No significant difference was found between participants with missing assessments and participants with assessments in all five waves, on any of the CBCL scales (see Bongers et al. 2004) for further details about the analysis).

TABLE 6.2. Number of participants in the developmental trajectories

| *Developmental trajectory* | *n* | *Percentage of total sample* | *Percentage males* |
|---|---|---|---|
| *Aggression* | | | |
| Near zero | 1473 | 71.0 | 41.7 |
| Medium decreasers | 444 | 21.4 | 65.3 |
| High decreasers | 159 | 7.7 | 70.4 |
| *Opposition* | | | |
| Near zero | 148 | 7.1 | 43.9 |
| Low decreasers | 491 | 23.7 | 44.6 |
| Medium decreasers | 674 | 32.5 | 50.3 |
| Adolescence increasers | 125 | 6.0 | 41.6 |
| High decreasers | 503 | 24.2 | 53.5 |
| High persisters | 135 | 6.5 | 53.3 |
| *Property violations* | | | |
| Near zero | 1548 | 74.6 | 45.4 |
| Low decreasers | 421 | 20.3 | 56.3 |
| High persisters | 107 | 5.2 | 71.0 |
| *Status violations* | | | |
| Near zero | 1052 | 50.7 | 43.7 |
| Adolescence increasers | 485 | 23.4 | 46.8 |
| Medium increasers | 514 | 24.8 | 60.5 |
| High increasers | 25 | 1.2 | 72.0 |

Number of individuals within each trajectory, percentage of individuals within each trajectory of the total sample, and percentage of males within each trajectory of the total sample.

FIGURE 6.2. Developmental trajectories in childhood antisocial behavior types.




Group-based developmental trajectories of aggression, opposition, property violations, and status violations. The y axis represents the raw syndrome scores. (From Bongers et al. 2004; reprinted with permission of Blackwell Publishing.) 'Ado' = Adolescence.

### *Composite International Diagnostic Interview*

The computerized version of the Composite International Diagnostic Interview (CIDI; (World Health Organization, 1992) and three sections of the Diagnostic Interview Schedule (DIS) for DSM-IV diagnoses (Robins, et al., 1997) were used to obtain diagnoses of mental disorder in the 12 months prior to the interview (past year diagnoses). The CIDI and DIS are fully structured interviews to allow administration by lay interviewers and scoring of DSM-IV (American Psychiatric Association, 1994) by computer. Good reliability and validity have been reported for the CIDI (Andrews & Peters, 1998). Because information concerning disruptive disorders in adulthood (oppositional defiant, antisocial personality

disorder, and ADHD) was lacking in this version of the CIDI, sections of the DIS covering these disorders were administered. Because the cell sizes for specific disorders were small for the majority of diagnoses, we constructed the following groupings of DSM-IV categories: (1) anxiety disorders, consisting of generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, agoraphobia, social phobia, specific phobia, or any anxiety disorder; (2) mood disorders, consisting of major depressive episode, bipolar disorder, dysthymia, or any mood disorder; (3) substance abuse/dependence, consisting of alcohol abuse/dependence, drug abuse/dependence, or both; (4) disruptive disorders, consisting of oppositional defiant disorder, antisocial personality disorder, ADHD, attention deficit only, hyperactivity only, or any disruptive disorder; and (5) any disorder, consisting of any of the above disorders or other disorders such as bulimia nervosa, somatization, conversion, pain disorder, hypochondriasis, and brief psychotic disorder.

## STATISTIC AL ANALYSES

### *Logistic regression analyses*

To investigate associations between childhood externalizing developmental trajectories in childhood and psychopathology in adulthood, we performed multiple logistic regression analyses for each externalizing behavior type separately. We tested whether associations existed between the trajectories in the four externalizing behavior types and DSM-IV disorders at follow-up. The regression analyses included gender, age and SES at follow-up as covariates. In addition, we included both general externalizing behavior and general internalizing behavior as covariates in the analysis. We added an internalizing behavior variable to the model to adjust for internalizing effects on the associations. We added an externalizing behavior variable to the model to adjust for a general externalizing effect on the associations, and ascertain whether information on subtype trajectories improves prediction. For all models, we first determined whether there were interaction effects of sex or age with the separate trajectories. No significant

interaction effects were found. The 'near zero' trajectory of each type was used as reference group in each regression analysis.

## RESULTS

In the multiple regression analyses, many associations were found between childhood externalizing developmental trajectories and adult disorders (Table 6.3). In general, all four externalizing types predicted later disruptive disorders. Primarily high-level trajectories in the types predicted problems, but also medium-level trajectories were highly predictive. The low decreasing oppositional trajectory was negatively associated with anxiety problems in adulthood. Except for the status violations type, the types only predicted disruptive disorders. The trajectories in the status violations type also predicted substance abuse/dependence and anxiety disorder.

## DISCUSSION

This study examined the relations between childhood trajectories of four distinctive types of externalizing behavior and DSM-IV disorders in adulthood in a longitudinal general population sample that included males and females aged 4-16 years assessed at six time periods. All four types of externalizing behavior (i.e., aggression, opposition, property violations and status violations) in childhood, showed associations with disruptive behavior in adulthood. Children displaying externalizing behavior of the status violation type (e.g. runaway, truancy, drug and alcohol use) showed primarily substance use and anxiety disorder in adulthood. Furthermore, we found that children who are in high-level externalizing behavior trajectories are most at risk to suffer from disruptive disorders in adulthood. This 24-year follow-up study is unique in prospectively examining the adult outcomes of different developmental trajectories in four childhood types of externalizing behavior, in a large general population sample of 1,399 children.

TABLE 6.3. Associations between developmental trajectories of child externalizing problems and disorders in adulthood.

| | | *DSM-IV disorders at follow-up* | | | | |
|---|---|---|---|---|---|---|
| ~~Near zero~~ | ~~320~~ | | | | | ~~2.8 (1.1-7.1)~~ |
| *sex (male)* | 695 | | | | | |
| ~~*SES*~~ | | ~~3.3 (2.2-5.1)~~ | ~~2.7 (1.8-4.2)~~ | ~~0.4 (0.3-0.6)~~ | ~~0.3 (0.1-0.7)~~ | |
| *Predictor* | | Any disorder | Disruptive disorder | Substance abuse/ dependence | Anxiety disorder | Mood disorder |
| *General externalizing* | | N = 356 | N = 121 | N = 120 | N = 183 | N = 36 |
| *General internalizing* | N | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| ~~*Aggression*~~ | | | | | | |
| High decreasers | | | | | | |
| Low decreasers | 82 | | 2.4 (2.1-5.1) | | | |
| Near zero | 275 | | | | | |
| *sex (male)* | 982 | | | | | |
| *SES* | | | 3.3 (2.1-5.1) | 2.9 (1.9-4.5) | 0.4 (0.3-0.6) | 0.3 (0.2-0.8) |
| *General externalizing* | | | 0.9 (0.8-1.0) | | | |
| *General internalizing* | | | | | | |
| ***Oppositional*** | | | | | | |
| High persisters | | | | | | |
| High decreasers | 73 | 3.1 (1.3-7.5) | 4.6 (1.2 – 17.7) | | 3.1(1.1-9.6) | |
| Ado increasers | 315 | 2.3 (1.2-4.3) | | | | |
| Medium decreasers | 89 | | | | | |
| Low decreasers | 426 | | | | | |
| Near zero | 334 | | | | | |
| *sex (male)* | 102 | | | | | |
| *SES* | | | 3.7 (2.4-5.7) | 3.0 (1.9-4.5) | 0.4 (0.3-0.6) | 0.3 (0.1– 0.7) |
| *General externalizing* | | | 0.9 (0.8-1.0) | | | |
| *General internalizing* | | | | | | |
| ***Property Violations*** | | | | | | |
| High persisters | | | | | | |
| Low decreasers | 55 | 2.3 (1.3-4.3) | 3.8 (1.8-8.2) | | | |
| Near zero | 276 | 1.3 (1.0-1.8) | 1.6 (1.0-2.6) | | | |
| *sex (male)* | 1008 | | | | | |
| *SES* | | | 3.3 (2.2-5.1) | 2.8 (1.9-4.3) | 0.4 (0.3-0.6) | 0.3 (0.1-0.7) |
| *General externalizing* | | | | | | |
| *General internalizing* | | | | | | |
| ***Status Violations*** | | | | | | |
| High increasers | | | | | | |
| Medium increasers | 15 | 3.8 (1.3-11.1) | | 11.7 (3.4-40.2) | | 7.1 (1.1-47.1) |
| Ado increasers | 309 | 1.9 (1.4-2.6) | 1.7 (1.1-2.8) | 2.3 (1.4-3.8) | 1.6 (1.1-2.5) | |

Table 6.3. (Continued.) Odds ratios (95% Confidence interval) are derived from multiple logistic regression analysis. Near zero groups were reference groups in the regression analyses. Only significant results are presented. 'Ado' = Adolescence.

Consistent with results of previous longitudinal studies in the general population that investigated the long-term continuity of early externalizing behavior (Fergusson, et al., 2005; Hofstra, et al., 2000; Odgers, et al., 2008), we can conclude that children with externalizing behavior are at increased risk for adverse outcomes in adulthood. Moreover, even after 24 years, children in all subtypes of externalizing behavior are at increased risk to suffer from adult disorders. In addition, our study emphasizes the need to distinguish between the subtypes of externalizing behavior because we found differences between the predictive values of the different types of externalizing behavior. Of the four types of externalizing behavior, aggression (mainly including physical aggression) showed the least associations with adult psychopathology, whereas opposition and property violations mainly predicted adult disruptive disorder.

The status violations subtype was the weakest predictor for later disruptive behavior. However, children with behavior problems of this type showed primarily substance use in adulthood. In a study that investigated which subtypes of externalizing behavior accounted for substance use (Timmermans, et al., 2008), it was also found that status violations predicts substance use in late adolescence. In our study, we found that even up to middle adulthood, strong associations were found between status violations and substance use. Studies that investigated the comorbidity between alcohol, drugs and anxiety disorders reported that 'self medication' with alcohol or drugs was associated with an increased likelihood of anxiety disorders (Robinson, Sareen, Cox, & Bolton, 2008). This verifies our finding of anxiety and substance use disorder in adulthood being related to status violations. Furthermore, another possible explanation to these findings could be

that status violations comprises behaviors, that are more reactive, nondestructive and affective behaviors, and entail negative emotionality (e.g., anger, runaway, rule breaking), in contrast to aggression and property violations types that primarily comprise proactive and violent behaviors that are offensive and instrumental (e.g. bullying, vandalism). Proactive and reactive aggression are two distinct subtypes of externalizing behavior and they have been found to differ in adult outcome. Proactive individuals tend to bully and be very unemotional, whereas reactive individuals show impulsive, angry responses to aversive events, particularly perceived by interpersonal threat (Dodge & Coie, 1987; Vitaro, et al., 2002). In accordance with previous findings on reactive and proactive aggressive behavior, we found that children with more reactive, nondestructive externalizing problems (i.e., status violations) suffer from later internalizing problems (Dodge, et al., 1997; Vitaro, et al., 2002).

Because externalizing behaviors are expected to change largely in level and growth during childhood and adolescence (Loeber, et al., 1993; Odgers, et al., 2008), and are therefore best described from a developmental point of view (Achenbach, et al., 2001), we explored outcomes of trajectories of behavior in the current study, taking into account the developmental change through childhood and adolescence. We used LCGA to analyze trajectories of externalizing behavior, because this method is well adapted for modeling growth of phenomena within a population in which population members are not following a common developmental process of growth or decline. Consequently, we were able to report unique associations between distinctive developmental trajectories within every externalizing behavior type and adult outcomes.

In accordance with findings of previous studies that investigated development of externalizing behavior, we found that children in high-level externalizing trajectories are most likely to suffer from adult problems (Bongers, et al., 2008; Moffitt, et al., 2002; Odgers, et al., 2007; Odgers, et al., 2008; Zoccolillo, 1992;

Zoccolillo, et al., 1992). Children in the most severe, high-level trajectory of opposition and property violations were two to four times more likely than children not displaying these problems to suffer from any disruptive behavior in adulthood. Findings of a study that investigated continuity of externalizing behavior up to the age of 32 show that externalizing individuals in a severe 'life-course-persistent' trajectory suffered from the most mental health problems (Odgers, et al., 2008). In a review of conduct disorder and its outcomes in general population studies it was found that increasing severity of externalizing behavior was associated with an increasing risk of an emotional disorder in adulthood (Zoccolillo, 1992). What this study adds to the literature is that we extend the above findings by confirming that high-levels of externalizing behavior in childhood and adolescence are linked to poor outcomes in adulthood even up to age 40.

However, it should be noted that children in both low and high level trajectories of property violations showed persistence of externalizing behavior into adulthood in terms of having disruptive behavior in adulthood. This shows that children displaying behavior of the property violations type are at risk to suffer from adult problems, even if they develop through a low-level and decreasing trajectory during childhood and adolescence. Property violations comprise behaviors such as cruel to animals, fire setting and vandalism. These behaviors are symptoms of both psychopathy and antisocial personality disorder (American Psychiatric Association, 1994; Hare, Hart, & Harpur, 1991), which are both very serious diagnoses. Possibly, the separate symptoms in this property violations type are that severe and radical, that even children who show relatively few of the symptoms comprising this property violations type , thus who develop through a low level in this type, suffer from disruptive disorder in adulthood.

Our findings should be interpreted in light of two limitations. First, although we achieved a relatively high response rate in a 24-year follow-up, a considerable

proportion of the original sample from 1983 did not participate in this follow-up. By interpreting our results, one should be aware of the fact that in longitudinal population based studies, high-risk people are the most difficult to keep included. Although selective attrition effects were small in the present study, some children with the most severe externalizing behavior problems were not included. Therefore, results may not generalize to high-risk populations. Consequently, studies on high-risk children are essential to complete the present findings on the predictive value of developmental trajectories of externalizing behavior. Second, the results of this study may have been influenced by time dependent environmental covariates, such as economic growth, ethnic distributions, or family structures that we did not control for.

## CONCLUSIONS

Our study shows a relation between child to adolescent externalizing behavior and adult psychopathology, even over a 24 years time-interval. We can conclude that an elevated level of externalizing behavior in childhood has impact on the long-term outcome, regardless of the developmental course of externalizing behavior. Therefore, intervention and prevention should focus on individuals that show severe externalizing problems at any point in childhood or adolescence. Furthermore, we can conclude that different types of externalizing behavior (i.e., aggression, opposition, property violations and status violations) are related to different adult outcomes, and it is therefore advisable to treat them separately. Mental health professionals working with children and adolescents with externalizing behavior should anticipate different developmental trajectories through life. Because children and adolescents with externalizing behavior of the status violations subtype were most likely to be affected in adulthood, we recommend that prevention and intervention should focus on children and adolescents showing behavior of this type such as substance abuse, truancy and runaway.

# 7

# GENERAL DISCUSSION

Joni Reef

In the present study, we investigated the continuity of children's psychopathology and the consequences for their adult functioning. Two main research questions were addressed in this thesis.

1. What is the long-term prognosis of children's emotional end behavioral problems regarding adult functioning, including psychiatric disorders and criminal offences?

2. Which developmental trajectories of externalizing behavior are related to adult functioning, including emotional and behavioral problems and psychiatric disorders?

## CONTINUITY OF PSYCHOPATHOLOGY

The current study prospectively describes the 24-year continuity of a broad range of psychopathology in a general-population sample. To assess psychopathology, we used equivalent rating scales across the years; using different informants (i.e. parent and self-report). We examined associations between proportions of individuals scoring in the deviant versus normal range at baseline and at follow-up.

In general, the prevalence of disorders in adulthood was higher for children who had CBCL Total Problems scores in deviant range at baseline. Almost 25% of the children categorized as deviant showed continuity of psychopathology, and were still regarded as deviant 24 years later. However, almost 14% of the children categorized as non-deviant reported problems in adulthood, indicating that adult psychopathology might not necessarily be preceded by problem behaviors in childhood. In the previous wave of this study, Hofstra et al. (2000) found in a 14-year follow-up a total continuity of 29% between parent-reported problems in childhood and self-reported problems in adolescence. Ten years later we found a comparable total continuity of psychopathology, this minor decrease was expected given that continuity generally decreases with increasing age (Rutter, et al., 2006). The fact that we found significant associations between parent-reported problems

in children and self-reported problems in adulthood is remarkable, given both the long time span between two measurements, and the use of different informants.

### *Approaches towards diagnosis of psychopathology*

The long-term prognosis of children's psychopathology was tested in two different ways. On the one hand, we used the empirical quantitative approach, using empirically derived syndrome scales in both childhood and adulthood. On the other hand, we used the clinical-diagnostic approach, using DSM oriented scales in childhood and DSM-IV diagnoses in adulthood. We tested the prognosis of childhood psychopathology with these two assessment approaches, to be able to evaluate results in terms of psychiatric disorders and in terms of empirical quantitative patterns of co-occurring problems (i.e. syndrome scales).

Research and diagnosis in psychopathology is often based on the clinical-diagnostic based approach. The approach is derived from the diagnostic and Statistical Manual (DSM) of the APA and starts with the current psychopathological diagnosis of an individual. That is, it theoretically starts with existing descriptions of disorders. The DSM-IV is a categorical classification system; an individual with a strict amount of present features from a category is said to have a disorder. Consequently, the disorder is either present or absent in an individual. However, this approach contains limitations that cause serious problems in research and clinical practice (Maughan & Kim-Cohen, 2005). One major limitation is the categorical approach of classification. The use of categories to classify diagnoses of disorders, forces a practitioner to assign a set of symptoms to a category, even though the fit is low. In this way, the complexity of disorders is ignored. When diagnosis of complex psychopathology is too elementary, intervention based on the diagnosis will probably have shortcomings.

An alternative method to describe psychopathology is based on the empirical-quantitative approach. This method differs from the clinical-diagnostic approach, because it progresses just the other way around. Here, large samples of subjects are assessed with standardized instruments to collect data describing their current problems. Out of these data, patterns of co-occurring problems are identified through multivariate analyses, and syndrome scales are formed out of problems items that go together. These syndrome scales form the basis on which problem behavior of individuals are described.

*Continuity using DSM-oriented scores; the clinical-diagnostic approach*

In chapter 3, we describe the prognosis of childhood psychopathology according to the clinical-diagnostic approach; we used parent-reported DSM-oriented scale scores (CBCL) in childhood, and a diagnostic interview to categorize individuals in terms of DSM-IV psychiatric disorders (CIDI) in adulthood. We aimed to describe the predictive value of a large range of childhood diagnoses, to adult DSM-IV disorders.

We found that anxiety, oppositional defiant and conduct problems in children aged 4-16 years old, predicted self-reported DSM-IV disorders in adulthood. Regarding anxiety problems, our results show that they children's anxiety problems predicted adult anxiety disorders. This extends findings of previous studies reporting homotypic continuity (i.e., the prediction of one disorder by the same disorder) of anxiety problems in children and adolescents, because earlier studies never had a follow-up period that extended into middle adulthood. Children's conduct problems predicted adult's disruptive disorders. Also, long-term homotypic continuity of conduct problems in young children and adolescents was never reported up to middle adulthood (Mannuzza, et al., 2008; Moffitt, 1993; Simonoff, et al., 2004). In addition to homotypic continuity, we found heterotypic continuities (i.e., the prediction of a disorder by another disorder) of childhood

conduct problems and oppositional defiant problems, which were both associated with mood disorders. Previous studies showed long-term continuity of childhood conduct problems and oppositional defiant problems into mood disorders up to early adulthood (Fergusson, et al., 2005; Kim-Cohen, et al., 2003).

*Continuity using Syndrome Scale scores; the empirical-quantitative approach*

In chapter 2, we describe the prognosis of childhood psychopathology according to the empirical-quantitative approach; we used comparable instruments in childhood (CBCL) and in adulthood (ASR), both measuring syndrome scales (i.e. empirically derived groups of problems that co-occur). To categorize individuals as deviant versus non-deviant, we used cut-off points for all scales of the CBCL at baseline and the ASR at follow-up based on the 85$^{th}$ percentile of the frequency distributions. Individuals scoring above the cut-off were regarded as deviant.

Our results showed that of the nine associations between the syndromes, seven were heterotypic. Children's high scores on aggressive behavior predicted somatic complaints and thought problems. Remarkably, aggressive behavior did not predict externalizing behavior in adulthood, however, these associations were found before in young children (Egger, et al., 1999; Pihlakoski, et al., 2006). The homotypic continuities that we found for anxious/depressed and delinquent behavior are in accordance with previous findings on the continuity of DSM–IV diagnoses from childhood to adulthood (Costello, et al., 2003; Kim-Cohen, et al., 2003) and with previous findings of studies reporting long-term associations between anxiety and several adult internalizing problems (Fergusson, et al., 2006; Goodwin, et al., 2004; Pine, et al., 2001). Our results of the analyses with and without control for co-occurring problems indicate that the strongest predictor for adult internalizing problems are anxious and depressed problems in childhood, and the best predictors for adult externalizing problems is childhood delinquent behavior.

From chapter 2 and 3, we can conclude that results of both approaches in our studies add to each other: oppositional defiant problems versus conduct problems and childhood aggression versus delinquent behavior tap different constructs and follow distinct developmental pathways (Bongers, et al., 2004; Frick, et al., 1993), insofar as they predict different outcomes. An explanation to these findings could be that Oppositional Defiant Problems Scale and Aggressive Behavior Scale comprise reactive non-destructive and affective behaviors and entail negative emotionality (e.g., temper, stubborn, disobedient), in contrast to Conduct Problems and Delinquent Behavior Scale that comprise proactive and violent behaviors that are offensive and instrumental (e.g. stealing, lying, vandalism) (Dodge & Coie, 1987; Vitaro, et al., 2002). In line with our findings, studies found that primarily children that show these reactive externalizing problems caused by emotional provocation suffer from later internalizing problems, and children that show these proactive externalizing problems suffer from later externalizing problems (Dodge, et al., 1997; Vitaro, et al., 2002). Although the clinical-diagnostic based and empirical quantitative based results are theoretically different, the results of both approaches equally indicate differences between externalizing problem behaviors (i.e. proactive and reactive form of behavior). The results may be helpful to understand origins of adverse development.

### *Multifinality and Equifinality*

When we examined the predictive value of each childhood problem for adult psychopathology, all childhood problems predicted problems in adulthood, and all adult problems were predicted by more than one childhood problem. These findings illustrate the developmental phenomenon of both equifinality (i.e. different predicting syndromes can have the same outcome), and multifinality (i.e. a predicting syndrome can have different outcomes) (Cicchetti & Rogosch, 2002). Many studies on the continuity of psychopathology have examined the continuity of one kind of disorder over time, often overlooking multifinality and equifinality.

However, our results suggest that the existence of a unique pathway for one type of problem is exceptional. We believe that it is important for psychiatrists to be aware of equifinality and multifinality, because treatment of child psychiatric disorders may depend on different future psychopathology, and treatment of adult psychiatric disorders may depend on different preceding childhood psychopathology.

### *Development of violent delinquency*

In chapter 3, we aimed to describe which children are at risk to show violent delinquency in adulthood, and investigated associations between children's externalizing behavior and adult self-reported violent offences. In extension of previous studies that investigated the long-term continuity of externalizing behavior up to early adulthood (Broidy, et al., 2003; Fergusson, et al., 2005; Moffitt, et al., 2002), we found that externalizing behavior problems in childhood can persist all through early adulthood, into middle adulthood. However, we only found this in females. Few studies investigated whether comparable development of externalizing behavior exists among males and females, given that we studied both males and females, we were able to look at the differences in development. Girls with conduct problems are 5 times more likely to report violent delinquency 24 years later. For boys, we did not find associations between childhood externalizing problems and adult violent delinquency.

Our findings verify recent findings of the Dunedin study (Odgers, et al., 2008), in which disruptive girls reported more violent acts up to the age of 32 years, as compared to non-disruptive girls. A large percentage of life-course persistent women engaged in violence against partners and children in adulthood. Fergusson and Horwood (Fergusson & Horwood, 2002) show that females follow early onset life-course persistent pathways, however, far fewer than males. In addition, persistent violent offending females were found to be rare. Regarding differences in persistence of aggression between males and females, it is found that, although

females generally show lower mean levels of aggression, persistent aggressive females show higher rates of aggression than the vast majority of persistent aggressive males (Broidy, et al., 2003). Our findings support the 'gender paradox' hypothesis. This explains that although conduct disorder is relatively uncommon among girls, those girls who meet criteria for conduct disorder are likely to be particularly severely affected (Loeber & Keenan, 1994). Thus, disruptive disorders in deviant girls were possibly more pervasive than in deviant boys, and therefore strongly predict female violent crime.

## EXTERNALIZING PATHWAYS TO ADULT PSYCHOPATHOLOGY

In chapter 5 and 6, we aimed to predict adult problems from several child developmental trajectories of externalizing behavior. In fact, we predicted trajectories of four types of behavior (i.e status violations, property violations, aggression and oppositional) that are interpretable from all major sub classifications for externalizing behavior (Bongers, et al., 2004; Frick, et al., 1993; Timmermans, et al., 2008). Only a few studies have confirmed this subdivision of externalizing behavior and have suggested that these different externalizing behavior types differ in their development and long-term outcome (Bongers, et al., 2004; Bongers, et al., 2008; Timmermans, et al., 2008; Tremblay, 2000). To our knowledge, no studies have reported about psychiatric outcomes in adulthood.

Investigating the predictive value of distinct trajectories to problems in adulthood, we found that primarily the level of the trajectories, and not the direction had impact. These findings are consistent with the findings of previous studies in which children in high-level trajectories had more problems in adulthood, independent from the direction of the development (Bongers, et al., 2008; Odgers, et al., 2008). The present study extends these findings because we were able to report that all high-level trajectories in every type of externalizing behavior showed associations with the majority of the behavioral problems up to the age of 40 years. Taken

together, we can confirm that high-levels of externalizing behavior in childhood and adolescence are linked to poor outcomes in adulthood. In line with the long-term continuity of psychopathology, we also tested externalizing pathways to adult psychopathology from both the empirical-quantitative approach and clinical-diagnostic approach.

Combining results of both approaches, we can conclude that trajectories in all externalizing behavior types predicted disruptive disorders in adulthood, and that disruptive problems consist of aggressive behavior and rule-breaking behavior, and less from attention problems. Of the four types of externalizing behavior we investigated, oppositional and status violations were most predictive for later externalizing and internalizing problems. These results are in line with findings on previous waves of this study (Bongers, et al., 2008), and with studies reporting associations between oppositional and adult psychopathology even after control for co-occurring conduct problems (Nock, et al., 2007; Timmermans, et al., 2008). Children displaying externalizing behavior of the status violation type (e.g. runaway, truancy, drug and alcohol use) showed primarily substance use and anxiety disorder in adulthood. Studies that investigated the comorbidity between alcohol, drugs and anxiety disorders reported that 'self medication' with alcohol or drugs was associated with an increased likelihood of anxiety disorders (Robinson, et al., 2008). This verifies our finding of anxiety and substance use disorder in adulthood being related to status violations. In accordance with our previous described findings on reactive and proactive aggressive behavior, we found that children in more reactive, nondestructive externalizing trajectories (i.e., status violations) suffer from later internalizing problems (Dodge, et al., 1997; Vitaro, et al., 2002).

The fact that the two methods to assess and diagnose psychopathology (i.e. empirical-quantitative scales versus clinical-diagnostic scales) exist together and are both widely used shows that neither of them is absolutely satisfactory with regard to assessment and diagnosis. Regarding the general agreement between findings of

continuity of psychopathology using the clinical-diagnostic approach and the empirical-quantitative approach, the combination of both approaches is valuable to compensate for limitations of either method.

### *Adolescence limited trajectories*

Longitudinal studies have repeatedly reported a developmental subtype of externalizing behavior in which individuals only suffer from problem behavior during adolescence (Brame, et al., 2001; Moffitt, et al., 2002; Odgers, et al., 2007). In the current study, we did not find significant associations between the adolescent increasers trajectory of status violations and adult problems. This confirms the existence of an adolescence-limited subgroup. However, we also found an adolescent increasers subgroup that did show associations with externalizing behavior; the adolescent increasing trajectory of oppositional predicted all externalizing behavior scales (i.e., aggressive behavior, rule-breaking behavior and intrusive). This contradicts the existence of an adolescent-limited subtype of externalizing behavior. Interestingly, this was also found in a recent study of Odgers et al. (2007). Their results also showed mixed evidence for the existence of the adolescent onset group. Although preliminary, the above findings could indicate that the adolescent-limited subtype does not exist in all types of externalizing behavior, which confirms the importance of examining subtypes of externalizing behavior.

## STRENGTHS AND WEAKNESSES OF THIS STUDY

The design of the current study has several features that are essential to study the long-term development of psychopathology from childhood into adulthood. Despite the importance of knowledge about this topic, the great majority of studies in this area are hampered by a number of methodological limitations. First, the generalizability of findings is limited by referral bias, as a result of reliance on clinical samples. Second, studies use retrospective designs, which influence reporting or recall. Third, the focus on a limited range of behaviors limits

generalizability of results, because studies have not taken account of comorbidity. Fourth, studies often use assessment procedures are different across time, through what it will be unclear whether differences in the level and type of psychopathology reflect developmental processes or merely the differences between assessment procedures. Fifth, regarding studies on the development of externalizing behavior, samples were often limited to males, or presented results on males only. The strengths of the current study, that is, using a general population sample, taking account of sex and age, using a prospective longitudinal design, and using equivalent assessment instruments that cover a broad range of behaviors, makes our study most suitable to elucidate developmental continuities over a large age range. Conclusions drawn from this study are relevant for the general population, because they are based on the development of large sample of individuals, which were repeatedly measured over an extensive developmental phase, in a representative community sample.

A potential weakness of this study, which is common to longitudinal studies, is that attrition has taken place. A proportion of the original sample from 1983 did not participate in the 7$^{th}$ follow-up, due to death, because they were untraceable, or because they had requested to be removed from the sample at an earlier stage of the study. By interpreting our results, one should be aware of the fact that in longitudinal population based studies, high-risk people are the most difficult to keep included. Although selective attrition was limited in the present study, children with the most severe psychopathology may have been lost to follow up. Therefore, to verify the present findings, results on continuity of psychopathology in high-risk people are essential.

Because self-reports of psychopathology are considered reliable only from age 10, and the baseline measurement of this study covers an age range from 4 to 16 years, it was inevitable to use parent-reports at baseline. Parents are not aware of all behaviors showed by their children. Parents may be unaware of, first, covert

internalizing behavior of their children, second, externalizing behavior in situations such as school and neighborhood. Therefore, problems reported in this study are potentially influenced by parental reporting bias. At follow-up, we used self-reports to assess psychopathology in adulthood. The use of different informants in our study may have caused underestimation of effects.

Though the self-report method for measuring delinquency is a reliable and valid technique, and has several strengths compared to official records (Thornberry & Krohn, 2000), the self-report method has its limitations. Firstly, respondents may conceal offences; secondly, offending individuals are more likely to drop out in a study (Farrington 1995). This causes a small contribution of violent offenders in the study, and decreases strengths of associations.

Finally, the results of this study may have been influenced by time dependent environmental covariates, such as economic growth, ethnic distributions, or family structures that we did not control for. Generalizability of our findings across time periods is therefore indefinite.

## CLINICAL IMPLICATIONS

Our study shows that the continuity of children's behavior and emotional problems predict psychiatric problems even over a period of 24 years. This has several clinical implications both for mental health professionals working with children and adolescents or working with adults:

- adult psychiatrists should be aware of childhood predictors of later psychopathology, because treatment of adult psychiatric disorders may depend on different preceding childhood psychopathology.
- child psychiatrists should be aware of adult outcomes of child psychopathology, because treatment of childhood problems may depend on different future psychopathology.

- anxious children, oppositional defiant children, and children with conduct problems should be given special attention in prevention and interventional programs because they are most at risk of lifetime psychopathology.
- we recommend to be alert on girls that show conduct problems, because these girls are 5 times more likely to show violent delinquency in adulthood
- mental health professionals should be aware of differences between disruptive boys and girls. We suggest to evaluate prevention and intervention programs when used in girls, because current programs are primarily based on empirical knowledge from male samples.
- treatment is important for individuals that show severe externalizing problems at any point in childhood or adolescence.
- we recommend attentiveness on children and adolescents showing 'reactive' externalizing behavior (such as anger, temper and runaway) and substance abuse.

## FUTURE RESEARCH

Since this thesis shows considerable continuity of psychopathology until middle adulthood, it will be valuable to investigate underlying mechanisms of this long-term continuity. That is, to investigate genetic contribution, and effects of variables such as family and peer influences, parenting factors, temperament, negative life-events, help-seeking behavior, and treatment on the continuity of child psychopathology. Furthermore, additional long-term consequences of childhood problems, such as social impairment, difficulties at work, and poor family relations should be investigated for 30-40 year olds.

We suggest future research on long-term trajectories of multiple childhood psychopathology. It would be useful if future studies investigate trajectories from childhood all through middle adulthood.

Regarding the long-term development externalizing behavior in females, more research is needed to improve the understanding and prevention of the development of externalizing behavior in females. Future studies should examine externalizing behaviors that are more specific to females (e.g. social, relational or indirect aggression). In addition, studies should investigate gender differences and reconsider validity of current diagnostic instruments for girls, since these are primarily based on empirical knowledge from male samples.

We suggest future longitudinal research on childhood attention problems. Because of the lack of consensus on how attention problems or ADHD are manifested in adulthood (Wilens & Dodson, 2004), and the relatively poor predictive value of childhood attention problems for adult psychopathology in our study, this topic should be further examined.

In light of our findings of differences between proactive and reactive antisocial behavior, we suggest further research on the consequences of underlying emotionality in antisocial behavior.

Finally, the lack of clarity of results due to the immense variety of terms used for antisocial behavior types, asks for tuning of terminology.

## CONCLUSIONS

The present thesis includes results of an ongoing longitudinal study on the continuity and change of psychopathology from childhood into adulthood. Results show development of psychopathology over a period of 24 years. Evidence was found for considerable continuity of psychopathology from childhood into adulthood. We found many associations between children's emotional and

behavioral problems and their adult functioning, including psychiatric disorders and criminal offences.

As we have shown that anxious children, oppositional defiant children, and children with conduct problems have an increased risk of lifetime psychopathology, these children should be given special attention in prevention and interventional programs.

We found that developmental trajectories of externalizing behavior in childhood are related to adult functioning, including emotional and behavioral problems and psychiatric disorders. We can conclude that intervention and prevention should focus on individuals that show severe externalizing problems at any point in childhood or adolescence.

Because treatment of disorders may depend on both preceding and future psychopathology, we recommend psychiatrists to be alert on the fact that pathways for one type of problem vary. It is very important to define effective prevention and intervention for children and adolescents with psychopathology. This may reduce chronicity of psychopathology.

# SUMMARY

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This objective of this thesis was to examine long-term consequences of child psychopathology over a period of 24 years. In ***chapter 1***, the background and rationale were described. The following research questions were addressed in this thesis: 1) Which childhood psychopathology predicts problem behavior in adulthood, including psychiatric disorders and criminal offences? 2) Which trajectories of externalizing behavior develop into the most serious psychiatric problems in adulthood?

In ***chapter 2***, long-term consequences of emotional and behavioral problems of children were examined. Of the participants who were classified as deviant in childhood, 22.2% were also classified as deviant in adulthood. Predictive relations between psychopathology in childhood and adulthood were found. Both homotypic and heterotypic continuities were found. Childhood aggressive, delinquent, and anxious/depressed problems were associated with most adult psychopathology. Attention problems did not predict later problems. Even though childhood problems were assessed with parent-reports and adult problems with equivalent self-reports, predictive relations of child psychopathology were found over a large period of 24 years.

In ***chapter 3***, associations between a broad range of children's DSM-oriented problems and adult DSM-IV disorders were examined. The prevalence of disruptive disorders in adulthood was higher for children who had CBCL Total Problems scores in deviant range at baseline. High levels of childhood anxiety predicted anxiety disorders in middle adulthood. Children's conduct problems predicted both mood disorders and disruptive disorders, whereas children's oppositional defiant problems predicted only mood disorders. Attention deficit hyperactivity problems did not predict any of the DSM-IV disorders in adulthood. Results in this chapter suggest the existence of different types of continuities of childhood psychopathology up to the age of 40.

In ***chapter 4***, childhood predictors of adult violent delinquency were determined in a large general population sample, with the aim to define at-risk children for long-term disruptive development. Gender differences in the development of adult violence were found. Remarkably, boys' disruptive behavior showed no significant associations with adult violent delinquency. However, girls suffering from conduct problems were found to be at considerable risk for long-term disruptive development. This indicates that one should be aware of gender differences in disruptive behavior, and to be alert on girls with conduct problems. Early identification of high-risk children may reduce violent delinquency later in life.

In ***chapter 5***, the association between developmental trajectories of four types of externalizing behavior (i.e. aggression, opposition, property violations and status violations) and behavioral and emotional problems in adulthood was examined. Nondestructive behaviors in childhood, such as opposition and status violations, predicted adult problems to a larger extent than destructive behaviors, such as aggression and property violations. In general, children who develop through high-level trajectories are likely to suffer from both internalizing and externalizing problem behavior in adulthood, regardless of the direction of change of the high-level trajectory (i.e. increasing, decreasing and persisting). The level of externalizing behavior problems, rather than the developmental change, has a large impact on adult outcome.

Also in ***chapter 6***, developmental trajectories of externalizing behavior were examined. In this study, the predictive relations of these trajectories with adult DSM-IV disorders were described. All externalizing behavior types were significantly associated with disruptive disorder in adulthood. In all externalizing behavior types high-level trajectories most likely predicted adult disorders. Different types of externalizing behavior (i.e. aggression, opposition, property violations and status violations) were related to different adult outcomes. Children

and adolescents with externalizing behavior of the status violations subtype were most likely to be affected in adulthood.

In ***chapter 7***, the main findings of in this thesis were summarized and discussed, as well as the limitations and implications for future research.

The present thesis describes results of a study that is among a select group of ongoing longitudinal studies examining the development of psychopathology from childhood into adulthood. Evidence was found for considerable consequences of children's psychopathology over a period of 24 years. Several associations between children's psychopathology and their adult functioning, including psychiatric disorders and criminal offences were found. In addition, children who follow a trajectory of externalizing behavior that reached a relative high level during childhood or adolescence were more likely to suffer from several emotional and behavioral problems and psychiatric disorders in adulthood. Because effective treatment of disorders may depend on both preceding and future psychopathology, psychiatrists are recommended to be aware of the fact that long-term pathways for one type of problem vary.

# SAMENVATTING

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Het doel van dit proefschrift was het onderzoeken van de lange termijn gevolgen van psychopathologie in kindertijd, over een periode van 24 jaar. In ***hoofdstuk 1*** werd de achtergrond van het onderzoek beschreven. De volgende onderzoeksvragen werden gesteld: 1) Welke emotionele- en gedragsproblemen in kindertijd voorspellen moeilijkheden in volwassenheid, op het gebied van zowel psychiatrische problemen als gewelddadig gedrag? 2) Welke ontwikkelingstrajecten van externaliserend gedrag in kindertijd, voorspellen psychopathologie in volwassenheid?

In ***hoofdstuk 2*** werden de gevolgen van emotionele- en gedragsproblemen van kinderen onderzocht. Van de personen die in kindertijd als afwijkend werden geclassificeerd, werd 22% ook in volwassenheid als afwijkend geclassificeerd. Psychopathologie in kindertijd voorpelde psychopathologie in volwassenheid. Resultaten lieten zowel homotypische als heterotypische continuïteit zien. Naast agressief gedrag, werden ook delinquent gedrag en angstig/depressief gedrag in kindertijd geassocieerd met volwassen problemen. Aandachtsproblemen voorspelden geen latere problemen. Hoewel problemen in kindertijd door ouders werden gerapporteerd, en volwassen personen werd gevraagd zelf over problemen te rapporteren, werd na een lange periode van 24 jaar een voorspellende waarde gevonden van psychopathologie in kindertijd.

In ***hoofdstuk 3*** werd de voorspellende waarde van een groot aantal DSM-georiënteerde problemen in kindertijd voor volwassen DSM-IV stoornissen onderzocht. Kinderen die werden geclassificeerd als afwijkend op de CBCL Totale Probleemscore op de baseline meting, vertoonden een hogere prevalentie van gedragsstoornissen in volwassenheid. Antisociale gedragsproblemen in kindertijd voorspelden zowel stemmingsstoornissen als gedragsstoornissen, terwijl oppositionele gedragsproblemen in kindertijd alleen stemmingsstoornissen voorspelden. Aandachts/Hyperactiviteitsproblemen voorspelden geen enkele

DSM-IV stoornis in volwassenheid. De bevindingen in dit hoofdstuk wijzen op het bestaan van verschillende soorten langdurige ontwikkeling van kinderpsychopathologie, tot aan een leeftijd van 40 jaar.

Om te beschrijven welke kinderen risico lopen op het ontwikkelen van gedragsproblemen op lange termijn, werd in ***hoofdstuk 4*** onderzocht welke problemen in kindertijd, gewelddadig gedrag in volwassenheid voorpellen. Er werden verschillen gevonden tussen jongens en meisjes, in de ontwikkeling naar volwassen gewelddadig gedrag. Een opmerkelijke bevinding was dat gedragsproblemen onder jongens geen verband hield met gewelddadig gedrag op volwassen leeftijd. Echter, meisjes met antisociale gedragsproblemen bleken een aanzienlijk risico te lopen op het ontwikkelen van gewelddadig gedrag in volwassenheid. Dit impliceert dat men zich bewust moet zijn van verschillen tussen jongen en meisjes met betrekking tot gedragsproblemen, en dat men alert moet zijn op meisjes met antisociale gedragsproblemen. Tijdige herkenning van kinderen met gedragsproblemen zou gewelddadig gedrag op latere leeftijd kunnen beperken.

In ***hoofdstuk 5*** werd het verband onderzocht tussen vier typen externaliserende ontwikkelingstrajecten (agressief gedrag, oppositioneel gedrag, antisociaal gedrag, en heimelijk gedrag) en emotionele- en gedragsproblemen op volwassen leeftijd. Non-destructief gedrag in kindertijd, zoals oppositioneel gedrag en heimelijk gedrag, voorpelde meer problemen in volwassenheid dan destructief gedrag in kindertijd, zoals agressief gedrag en antisociaal gedrag. In het algemeen liepen kinderen in een traject met een hoog niveau van probleemgedrag meer kans op zowel internaliserende als externaliserende problemen in volwassenheid, ongeacht de richting of verandering in een hoog ontwikkelingstraject (i.e. stijgend, dalend of stabiel). Eerder het niveau van het ontwikkelingstraject, dan de verandering in ontwikkeling van externaliserend gedrag had invloed op het ontwikkelen van probleemgedrag in volwassenheid.

Ook in ***hoofdstuk 6*** werden ontwikkelingstrajecten van externaliserend gedrag onderzocht. Echter in deze studie werd de voorspellende waarde van deze trajecten voor volwassen DSM-IV stoornissen beschreven. Alle typen externaliserend gedrag waren significant geassocieerd met gedragsstoornissen in volwassenheid. En voor alle typen externaliserend gedrag waren hoog niveau trajecten het meest voorspellend voor stoornissen in volwassenheid. Verschillende typen externaliserend gedrag (agressief gedrag, oppositioneel gedrag, antisociaal gedrag, en heimelijk gedrag) bleken gerelateerd aan verschillende uitkomsten in volwassenheid. Kinderen en adolescenten die heimelijk gedrag vertoonden (weglopen, spijbelen en alcohol- en drugsgebruik) liepen de meeste kans op latere gedragsproblemen.

In ***hoofdstuk 7*** werden de belangrijkste bevindingen van dit proefschrift samengevat en bediscussieerd, evenals de tekortkomingen en aanbevelingen voor toekomstig onderzoek.

In het huidige proefschrift worden resultaten beschreven van een van de langst lopende longitudinale studies naar de ontwikkeling van psychopathologie van kindertijd tot in volwassenheid. De studies in dit proefschrift laten zien wat de lange termijn effecten zijn van psychopathologie in kindertijd. Er werden verscheidene verbanden aangetoond tussen psychopathologie in kindertijd en problemen in volwassenheid, op het gebied van zowel psychiatrische problemen als crimineel gedrag. Bovendien bleek dat kinderen die in externaliserende ontwikkelingstrajecten een relatief hoog niveau bereikten tijdens kindertijd of adolescentie, een groter risico lopen op verschillende emotionele en gedragsproblemen en psychiatrische stoornissen in volwassenheid. Omdat een effectieve behandeling van gedragsstoornissen mogelijk afhangt van zowel eerdere als toekomstige psychopathologie, wordt psychiaters geadviseerd om zich bewust te zijn van het feit dat psychopathologie zich op de lange termijn op verschillende manieren kan ontwikkelen.

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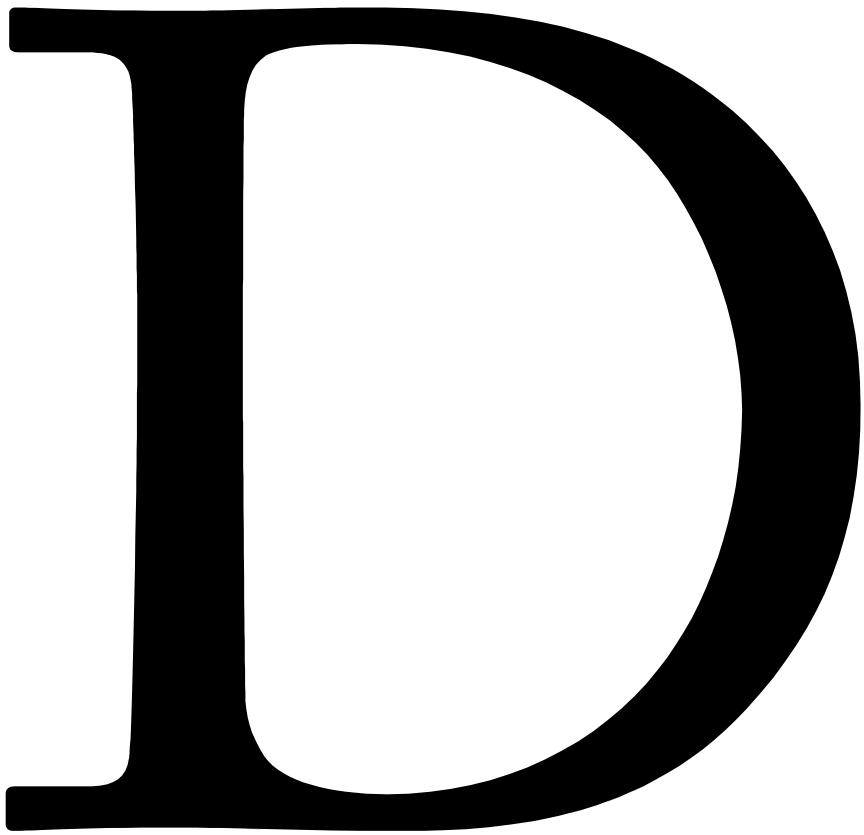

ANKWOORD

# DANKWOORD

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# CURRICULUM VITAE

# CURRICULUM VITAE

Joni Reef werd geboren op 14 februari 1979 in Hilversum. In juni 1998 behaalde zij haar Gymnasiumdiploma aan het Stedelijk Gymnasium Johan van Oldenbarnevelt in Amersfoort. In september 1999 begon zij aan een studie psychologie aan de Universiteit van Maastricht, zij koos voor de richting ontwikkelingspsychologie en neuropsychologie en deed tijdens haar studie psychofysiologisch onderzoek naar de cognitieve capaciteiten van kinderen met het Prader-Willi Syndroom. Zij behaalde haar doctoraal in 2003.

Aansluitend hield zij zich bezig met communicatie en attitude training binnen het klinische vaardigheden onderwijs op de Faculteit Geneeskunde van Universiteit Utrecht en schrijfonderwijs op het Instituut voor Psychologie van Erasmus Universiteit Rotterdam. In juni 2005 werd zij aangesteld bij de afdeling Kinder- en Jeugdpsychiatrie van het Universitair Medisch Centrum Rotterdam-Sophia, waar zij promotieonderzoek uitvoerde. In deze periode werd de zevende meting van een longitudinaal onderzoek naar de continuïteit van probleemgedrag bij kinderen uit een algemene bevolkingspopulatie uitgevoerd, waarvan de resultaten in dit proefschrift beschreven zijn.

Sinds juli 2009 is zij aangesteld aan de Universiteit van Leiden op de Faculteit der Rechtsgeleerdheid. Op de afdeling Strafrecht en Criminologie doet zij als postdoc onderzoek naar de bedoelde en onbedoelde effecten van gevangenisstraf.

*PhD Portfolio Summary*

Summary of PhD training and teaching activities

| | | | |
|---|---|---|---|
| Name PhD student: | J. Reef | PhD period: | June 2005 – May 2010 |
| Erasmus MC Department: | Child and Adolescent Psychiatry | Promotor(s): | Prof.dr. F. C. Verhulst |
| | | Supervisor: | J. van der Ende, M. Sc. |

| *1. PhD training* | Year | Workload (ECTS) |
|---|---|---|
| *General courses* | | |
| • Classical Methods for Data Analysis, NIHES, Rotterdam | 2006 | *6* |
| • Biomedical English Writing and Communication, Rotterdam | 2007 | *1.4* |
| *Specific courses* | | |
| • Latent Variable Modelling with Mplus, B. Muthén and L. Muthén, Florence, Italy | 2007 | *2* |
| • Models for Longitudinal and Incomplete Data, G.Verbeke en G. Molenberghs, University of Leuven | 2008 | *1.4* |
| *International conferences – participation and presentations* | | |
| • Lifespan perspectives in psychiatry, Institute of Psychiatry, London | 2005 | *2* |
| • 3rd International Conference on Child and Adolescent Psychopathology, Roehampton University, London | 2008 | *2* |
| *Other* | | |
| • Diagnostic Consultation Multidisciplinary Team, Department of Child and Adolescent Psychiatry, Erasmus Medical Center Rotterdam | 2006 - 2007 | *2* |
| *2. Teaching activities* | Year | Workload (ECTS) |
| • Supervising practicals, Department of Child and Adolescent Psychiatry, Erasmus Medical Center Rotterdam | 2005 - 2009 | *2.4* |
| • Lecturing and coordinating Methodology & Statistics, Institute for Criminal Law and Criminology, Leiden | 2009 | *10* |
| *1 ECTS (European Credit Transfer System) is equal to a workload of 28 hrs* | | |