Key objectives of the study

The central aim of this chapter is to examine the developmental patterns of Dutch adolescents’ conduct problem involvement. Using the definition provided in Fergusson et al. (2011), “conduct problems include a spectrum of antisocial, aggressive, dishonest, delinquent, defiant, and disruptive behaviours” (p.42), thus embrace a greater variety of behaviours than delinquency, which describes usually juvenile and often minor violations of the law. The current Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013) provides specific examples of conduct problem behaviours such as bullying or threatening others, cruelty to humans or animals, mugging, forced sexual activity (category aggressive behaviours), deliberate fire setting or otherwise destroying someone else’s property (category destructive behaviour), breaking in, lying to obtain goods, and substantial theft (category deceitful behaviour), and frequently running away from home and being truant (category rule violations). Clinical conduct disorder is diagnosed when a child or adolescent has shown three or more of these symptoms repeatedly during the past year. Indeed, diagnosed youngsters have often shown behavioural problems from a very early age already. The future of those individuals does not look rosy as high levels of conduct problems can place individuals at risk for maladjustment and health problems, low educational attainment and welfare dependence (Farrington et al., 1990; Kretschmer et al., 2013; Moffitt et al., 1996; Robins and Price, 1991).

Clinical diagnoses of conduct disorder refer to the most severe cases but will not apply to the large group of children and adolescents who infrequently or for a short amount of time engage in minor forms of conduct problem behaviour. These youngsters differ from the severe group particularly in level and variety of behaviours but have mostly been distinguished by age of onset. In other words, while only a small proportion of individuals show conduct problems in childhood and continue to do so as they grow older, an onset in adolescence and subsequent determination of conduct problem behaviour in early adulthood has been discussed as common, normative and even more adaptive than complete abstention (Moffitt, 1993, 2006). Thus, two distinct developmental trajectories – early-onset (life-course) persistent (EOP/LCP) and adolescent-limited/adolescent-onset (AL/AO) – appear to describe the course of conduct problems in two different groups of individuals, whereas a third group appears to abstain. The aim of this study was to test...
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this model in a Dutch population sample and compare patterns with studies conducted elsewhere. We were particularly interested in the proposed normativity of an AL/AO trajectory.

Several studies have identified risk factors for the EOP/LCP trajectory (Barker and Maughan, 2009; Broidy et al., 2003; Odgers et al., 2008) but less is known about distinct antecedents of conduct problems that are specific to the AL/AO trajectory. Thus, the second key objective of this study was to examine previously studied individual, social and demographic risk factors as predictors of the AL/AO trajectory.

Theoretical assumptions and empirical evidence

Developmental patterns of conduct problems, criminal involvement, delinquency and similar concepts (subsumed as “problem behaviour” in the following) are often examined with semiparametric and growth mixture modelling techniques (Muthén and Muthén, 2000; Nagin, 1999; Nagin and Land, 1993). These studies were systematically reviewed by Piquero (2008) and Van Dulmen and colleagues (2009), who showed that gender, number of informants and choice of measure affected how many distinct developmental pathways could be identified. Broader measures such as externalizing behaviour scales resulted in greater variability of trajectory classes compared to narrower measures such as police contact. The exclusion of males in female-only samples resulted in fewer trajectory classes. Finally, the inclusion of more than one reporter resulted in more classes. Piquero (2008) concluded that regardless whether offender or general population samples were examined, most studies identified three to five trajectory groups (but see Van Dulmen et al., 2009, whose review includes several studies with two to seven trajectory classes), typically including an EOP/LCP and an AL/AO group. Analyses conducted on general population samples usually also yielded a group with consistently low or no problem behaviour. In sum, the developmental pathways proposed by Moffitt (1993) were identified, sometimes together with a range of other patterns.

Early-onset persistent/life-course persistent

Severe problem behaviour is typically observed in only a small group of individuals (Farrington and West, 1993) who tend to have “criminal careers”, show problem behaviour early in childhood and throughout adolescence, and grow up to be antisocial adults. The problem behaviour in this group is stable across life stages and social and behavioural context. Individuals on this trajectory have been found in practically all studies (Piquero, 2008; Van Dulmen et al., 2009) and they have been labelled “life-course-persistent” (Moffitt, 1993), “early-onset persistent” (Barker and Maughan, 2009) and “chronic” (Young, 2014). Empirical research shows that approximately one in ten children (Dodge and Pettit, 2003; Fontaine et al., 2009; Odgers et al., 2008) displays EOP/LCP problem behaviour and are plagued by an interplay of various individual and social risks. In detail, EOP/LCP children frequently display co-occurring developmental psychopathology such as attention-deficit/hyperactivity disorder, and cognitive and neurological deficits, and often grow up in disadvantaged households. They are usually male and experience a greater number and more severe childhood adversities including maltreatment and parental problem behaviour such as substance use (Fontaine et al., 2009; Odgers et al., 2008; Zahn-Waxler et al., 2008) and differ from normatively developing individuals on a range of temperament dimensions including impulsivity (Martino et al., 2008; Tremblay et al., 1994).

Adolescent-onset/adolescent-limited

Keeping in mind the existence of the small group of individuals on an early-onset persistent conduct problem trajectory, simple inspection of age distributions of offending and crime
Adolescent-onset conduct problem behaviour

Statistics suggest that adolescents are more likely to engage in problem behaviour than any other age group. Age-crime curves impressively document how offending rates are very low in childhood, increase sharply in early to mid-adolescence and decrease again for adults (Farrington, 1986). Contributing to this pattern are likely both an increase in number of offences committed by individuals on the EOP/LCP trajectory as well as an increase in the number of offenders. Put differently, individuals without a history of conduct problems seem to join those on the early-onset persistent pathway in engaging in conduct problems once entering adolescence, the so-called adolescent-onset/adolescent-limited (Moffitt, 1993).

Notably, while we know relatively much about biological, psychological and social factors that distinguish individuals on an EOP/LCP trajectory from abstaining individuals (Barker and Maughan, 2009; Martino et al., 2008; Maughan et al., 2000; Odgers et al., 2008; Thompson et al., 2011; Wiesner and Windle, 2004), less clarity exists with regard to factors that are unique to the AO/AL pathway. Moffitt (1993) suggested that adolescents experience a discrepancy between their biological and social maturity, that is, they are physically developed enough to fulfill the adult task of reproduction while being financially dependent and socially and legally still considered minors. Trying to overcome this “maturity gap”, adolescents engage in problem behaviours that seem to convey social and financial status such as risky sexual behaviour and theft. In doing so, they seem to mimic the established problem behaviour of the EOP/LCP group.

According to Moffitt (2006), the maturity gap is universal and experienced at least to some extent by most adolescents. In consequence, AO/AL problem behaviour can be considered adaptive as negative affects arising from the maturity gap is alleviated. Is this assumption true for all adolescents? Do individuals on the AO/AL pathway indeed constitute the normative, that is, largest group?

In her review of research on early- and adolescent-limited/adolescent-onset conduct problem trajectories, Moffitt (2006) discussed studies that mostly support this argument in that they reported few abstainers but large groups of AO/AL individuals. Many other studies, however, implicitly or explicitly challenged this claim in that they either failed to identify an AO/AL group or found that only a minority of adolescents followed this trajectory. Van Dulmen and colleagues (2009) showed that models that were based on broader measures than criminal records yielded a large group of abstainers (variously termed Low, Non-offenders, Near Zero) and a smaller – thus less normative – group of individuals who increased in problem behaviour in adolescence and remained on high levels or desisted upon entering adulthood. In other words, findings from studies that used broad measures seem to suggest that AO/AL development occurs in less than one in three teenagers.

To name a few examples, Maughan et al., (2000) measured 15 behaviours that are included in the DSM conduct disorder set and used clinical cut-offs across four time points in children participating in the population-based Great Smoky Mountains Study (Costello et al., 1996). They identified trajectories of stable low, stable high and declining conduct problems but no increasing group. Importantly, the absence of an AO/AL group might be a consequence of the young age of the sample used (9 to 13 years).

This interpretation is supported by Broidy et al., (2003) who modelled physical aggression (assessed using three to eight items including fights with others, bullies/intimidates others, kicks, bites, hits others, is cruel to others) using six population cohorts from Canada (cohort 1: 6–15, cohort 2: 6–12 years), New Zealand (both cohorts 7–13 years) and the United States (cohort 1: 7.5–10.5 years, cohort 2: 6–12 years). They also failed to find groups with clear and steep problem behaviour increases in adolescence. Again, cohorts were largely limited to childhood and early adolescence, which might explain this pattern. Contrasting these findings, Barker and
Maughan (2009) used mother-reported conduct problem behaviours (stealing, lying, fighting, temper tantrums, disobedience) and showed that 12 per cent of their British population sample aged 4 to 13 years followed an AO conduct problem trajectory. Finding this group lends credit to the assumption of the AO/AL pathway, however, the proportion of individuals who fall into this group was quite small, which questions its normativity.

Extending the assessment period to include mid-adolescence, Wiesner and Windle (2004) examined delinquency trajectories in a community sample of American adolescents aged 15 to 17 years and found patterns denoting an increase in delinquency in approximately 28 per cent of the sample and an abstainer group containing 50 per cent of the sample. Based on a Dutch population (different to the one used in this chapter) and parental reports of children’s problem behaviour assessed using the Child Behaviour Checklist (Achenbach et al., 2003), Bongers and colleagues (2004) examined developmental pathways of status violations from early childhood to 18 years and found an AO pattern for almost one in four individuals.

Some studies included assessments in adulthood. For instance, Odgers et al., (2008) used longitudinal data from the Dunedin population sample from New Zealand, which contains antisocial behaviour assessments (physical fighting, bullying others, destroying property, telling lies, truancy, stealing) up to age 36 (though the authors note measurement invariance for younger and older ages within the female subsample) and found an adolescent-onset pattern in 20 per cent of the sample. Both Piquero (2008) and Van Dulmen and colleagues (2009) noted that the inclusion of adulthood yields different patterns and usually results in finding a group of individuals who show AO/AL problem behaviour.

These studies stand as examples for a burgeoning field of literature that utilizes person-oriented semiparametric and growth mixture modelling to describe and elucidate developmental pathways of problem behaviours, criminal involvement, delinquency and related phenomena. What these studies seem to reveal is that the actual proportion of AO/AL is moderate at best especially in population samples, making the AO/AL group a minority compared to abstaining adolescents or those who engage in very low levels of problem behaviour. Moreover, research into adult correlates of AO/AL conduct problems shows that this group does not seem to be problem-free in adulthood (Kretschmer et al., 2013; Odgers et al., 2008) challenging the notion that the increase in problem behaviour is limited to adolescence and a normative phenomenon. Consequently, shedding light on factors that increase the risk for an AO/AL pathway is an important task that we tackled in the second part of this study.

Individual risk factors

Beginning with factors most proximal to the adolescent, we examined the roles of gender, pubertal development and temperament in distinguishing adolescent-onset conduct problems from persistent high and stable low trajectories.

Clinical and crime statistics as well as a large body of prior research are consistent in suggesting that boys are at greater risk than girls to develop problem behaviour (Lahey et al., 1999; Maughan et al., 2004). Research has related the gender gap in problem behaviour to social desirability of behaviour but also biological factors such as testosterone (e.g. Rowe et al., 2004); for a review see Raine, 2002). Turning to developmental patterns, theory and empirical findings suggest that more boys than girls display EOP/LCP problem behaviour (Barker and Maughan, 2009; Broidy et al., 2003; Odgers et al., 2008). The gender ratio is hypothesized to be balanced with regard to the AO/AL pathway (Moffitt, 1993). In line, we hypothesized that gender would distinguish the EOP/LCP pathway from the AO/AL pathway as well as from abstainers, but did not expect gender to distinguish the AO/AL from the abstainer/low pathway.
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Is it likely that gender differences also occur in the shape of trajectories? Some argued this way and suggested that the taxonomy into early- and adolescent-onset problem behaviour may not apply to girls (Silverthorn and Frick, 1999) and modelled trajectories separately for boys and girls (e.g. Martino et al., 2008) but others did not detect different patterns for boys and girls (e.g. Barker and Maughan, 2009). In fact, there is no substantial reason to assume that fewer or more than the typical three to five groups should emerge and little empirical evidence has supported Silverthorn and Frick’s assumptions (1999). We do not detest that evolutionary, societal and biological mechanisms increase the risk for boys to engage in problem behaviour overall but it is difficult to see why the shape of developmental pathways would differ between boys and girls (Loeber et al., 2013), thus we examined shape and number of trajectories for the complete sample.

Turning to the second individual risk factor examined in this study, we focussed on pubertal development, that is, the age of onset and speed of biological development that involves physical changes such as breast and pubic hair growth as well as gonadrophic hormone changes. Pubertal development, particularly a relatively early or late onset and more rapidly occurring changes have been linked to AO/AL problem behaviour and explanations included biological as well as social mechanisms. For instance, Rowe and colleagues (2004) showed that increasing circulation of testosterone at the beginning of adolescence was associated with an increase in nonaggressive problem behaviour, at least when deviant peers constituted adolescents’ social context.

Moreover, earlier and/or faster biological development in comparison to same-age peers has been discussed as predictor of adolescent conduct problems particularly in girls (Costello et al., 2007; Felson and Haynie, 2002; Haynie, 2003; Kretschmer et al., 2014; Lynne et al., 2007; Negriff and Susman, 2014) as more grown-up looking girls seem more likely to affiliate with older boys and find themselves in social contexts that are conducive to conduct problem behaviour (Haynie, 2003). This mechanism essentially suggests that it is not biological changes as such that increase the risk for problem behaviour but the changes in one’s social setting. Thus, it may be debatable whether pubertal development as risk for AO/AL conduct problems really is an individual risk or whether it only is effective under particular social circumstances. Regardless of its category, pubertal development seems implicated in problem behaviour development and we expect those who are more developed than their peers to be at greater risk for AO/AL problem behaviour.

Thirdly, temperamental factors including the general concept of “difficult temperament” (Thomas and Chess, 1977) have a stable place in research on risk factors for problem behaviour (Farrington, 2005; Miller and Lynam, 2003) and with respect to predicting the likelihood for one developmental pathway over another. Moffitt (1993) discussed that individuals on the EOP/LCP trajectory often experienced disruptions to neural development which increases their risk for difficulties in executive functions (Morgan and Lilienfeld, 2000) including greater inattention and impulsivity problems. Indeed, childhood self-control has been found to distinguish EOP/LCP in boys (Pitzer et al., 2009). This is not surprising giving that children whose behaviour is characterized by high impulsivity and lack of self-control are more likely to evoke negative reactions from their social environments such as rejection by peers and reprimands from teachers. Parents of highly impulsive children face daily challenges that may not always pass without the use of harsh discipline. Such reactions, in turn, are likely to evoke more extreme problem behaviour.

Another trait, (negative) emotionality, has also been discussed as risk factor, both in terms of extremely low levels (see literature on callous-unemotional traits and conduct problems, Frick et al., 2014) as well as suggesting that very high levels of emotionality to environmental stimuli place children at risk. Highly emotional individuals have difficulty reading and
interpreting emotion-related cues in their environment (thus may interpret anger instead of, say, sadness, and feel provoked) and often also lack the skills to regulate their own emotional response (e.g. start a confrontation instead of walking away from an emotionally charged situation) (Eisenberg et al., 1997; Fabes et al., 1999).

These temperamental dimensions have quite stably distinguished the EOP/LCP trajectory from other trajectories which is feasible given that temperamental features emerge early in development and thus exert their influence from early on. In line, no strong assumptions have been formed regarding temperamental dimensions that distinguish the AO/AL group, but note Pitzer et al., (2009) who showed that novelty-seeking predicted adolescent-onset problem behaviour in girls. This association is feasible given that AO/AL behaviour is meant to compensate for the perceived discrepancy between biological and social maturity, where behaviours and contexts that are exclusive to adulthood are sought out. A degree of risk-taking and enjoyment of novelty are likely to purport pursuing this behaviour.

Taken together, we expected that temperamental traits, especially those representing (lack of) self-control and (negative) emotionality, would distinguish the EOP/LCP trajectory whereas traits that represent the desire for novel experiences and the absence of risk aversion should distinguish the AO/AL trajectory from those who abstain.

Social risk factors

The weight of individual factors, particularly those that are influenced by neurodevelopment, is substantial in affecting the risk for EOP/LCP problem behaviour, but social factors seem to be particularly implicated in differentiating the AO/AL pathway from other trajectories. The focus in this chapter is on parents and peers, the two major social contexts that children and adolescents are exposed to.

In detail, parenting styles and behaviours have received substantial interest as correlates of conduct problems. High levels of coercion, for instance, are linked to aggression and disruption in young children (McFadyen-Ketchum et al., 1996) but also neglectful parenting including physical care neglect and lack of supervision have been linked to antisocial and aggressive behaviour (Knutson et al., 2005; Knutson et al., 2004). Parental rejection has also been found to affect problem behaviour in offspring (Loeber and Stouthamer-Loeber, 1986; Rohner and Briner, 2002; Simons et al., 1988).

What are the mechanisms that explain the association between parenting and problem behaviour? Apart from genetic factors that influence harsh parenting as well as child behaviour (Moffitt, 2005), observational and social learning processes are at play. That is, children who frequently observe and experience aggression and harsh interaction as response to conflict are more likely to use such strategies themselves. A third mechanism focuses on bi-directionality. Of course, parenting children with conduct problems is challenging (Atzaba-Poria et al., 2014), and may promote the use of negative disciplining and rejection, which contributes to increased problematic child behaviour (Combs-Ronto et al., 2009; Lengua and Kovacs, 2005; Pardini et al., 2008). There is little doubt that harsh, coercive, and neglectful parenting are linked to variation in problem behaviour, but can parenting also distinguish between developmental pathways?

To explore this, we focussed on three parenting dimensions: First, we examined associations between developmental trajectories and perceived parental warmth, which is thought to reflect the “emotional tone” between the parent and the child (Darling and Steinberg, 1993). Warmth is usually negatively correlated with harsh disciplining practices and describes a positive disposition towards the young person, which helps create the perception of home as safe base
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for adolescents (Tolan et al., 2013). Perceiving parents as warm should thus decrease the likelihood for any problem behaviour trajectory. Second, we examined rejection to test the previously reported negative associations (Loeber and Stouthamer-Loeber, 1986; Rohner and Britner, 2002; Simons et al., 1988) in a developmental framework. Third, we examined (over-) protection, a behaviour that constitutes the opposite extreme to lack of monitoring as component of neglect. Importantly, we would expect (over-) protection to be low in individuals on an EOP/LCP trajectory but it is difficult to derive hypotheses with respect to the AO/AL group: On the one hand, parental protection should decrease the risk for problem behaviours. On the other hand, given the strong desire for autonomy in young adolescents (Moffitt, 1993), (over-) protection may promote the development of problem behaviour in adolescence.

Next to parents, adolescents’ peer environments play a significant role in problem behaviour development. A growing body of literature has shown that adolescents not only select themselves into social environments with peers that are behaviourally similar, they are also influenced by their peers in behavioural development (Veenstra et al., 2013). Somewhat less attention has been devoted to the role of peer relationship quality in spite of Moffitt’s (1993) own suggestion that whether an adolescent is accepted or rejected by peers should impact whether or not they will abstain or engage in problem behaviour in adolescence. In detail, Moffitt suggested that complete abstainers are “rare individuals who are excluded from normative peer group activities” (p.581; Moffitt, 2006). Of course, this notion is based on the assumption that some engagement in problem behaviour constitutes normative development, on which many previous studies appear to cast doubt.

Moreover, previous studies have shown that individuals on an EOP/LCP trajectory tend to experience greater peer problems (Barker et al., 2010), likely a consequence of them already displaying aggression and conduct problems early on when such behaviours are not conducive to demarc social maturity. This group shows some increase in popularity during the adolescent years (Young, 2014), which is in line with Moffitt’s (1993) assumption that they function as “role magnets” for their peers as they already engage in behaviours seen as socially mature. Popularity does not equal peer acceptance, however, and even if the social status of EOP/LCP individuals increases somewhat, they are still not liked by their peers (Rulison et al., 2014).

Taken together, we expect that individuals on the abstaining trajectory will be more rejected and less accepted by their peers than those on an AO/AL trajectory, who, in reverse, will be more accepted by their peers than those on the abstaining trajectory. Peer acceptance should be below and peer rejection above average for the EOP/LCP trajectory despite potential increases of popularity during adolescence.

Demographic risk factors

Social and individual risk factors are central in our understanding of child and adolescent problem behaviour, and it is necessary to keep in mind that variance in these is not distributed equally across the population and some families are more prone to use harsh parenting and contribute to increased risk of impaired neurodevelopmental development (Dodge et al., 1994; Schonberg and Shaw, 2007). Importantly, SES and growing up in a single-parent household are significant predictors of problem behaviour above and beyond their associations with parenting and individual psychological development as argued in the criminological literature and empirically established up to today (Pardini et al., 2015; Wright et al., 1999). While low socioeconomic status and growing up in a single-parent household are established risk factors for problem behaviour (Dodge and Pettit, 2003; Martino et al., 2008; Maughan et al., 2000) and have been linked to the EOP/LCP trajectory (Martino et al., 2008; Tibbetts and Piquero,
1999), it is less clear whether they affect AO/AL problem behaviour (Moffitt, 1993). In fact, no differences should be observed between AO/AL and abstainer trajectories but both should score higher on SES and less frequently grow up in single-parent homes than EOP/LCP individuals.

The Dutch context

Our study is based on adolescents growing up in the Netherlands, a country with liberal political positions towards societal issues like homosexuality and use of soft drugs. Young people are allowed to vote, purchase alcohol and tobacco from the age of 18 but are legally allowed to consume alcoholic drinks at a lower age if given to them for free, for instance by a parent. The liberal culture extends to values regarding the upbringing of children as shown in reports by Harkness and colleagues (2007; 2000) who asked parents and teachers to describe their own children and ideal students, respectively. Remarkably, Dutch teachers mentioned “independence” as a central quality in students substantially more often than teachers from other countries. Dutch parents were more likely than American parents to describe their children as enterprising and sociable and less likely to use descriptors such as “smart” or “a leader”. Another cross-cultural comparison concerned Dutch and American parents’ perceptions and opinions of their offspring’s engagement in romantic relationships, again revealing a much more pronounced desire in Dutch parents for their adolescent offspring’s own decision-making with regard to romance and sex (Schalet, 2011). These studies have in common that they paint a picture of Dutch adults as valuing independent and adventurous children and likely fostering such traits. In consequence, Dutch youth, who are encouraged to be independent, may suffer less from the maturity gap as they presumably feel less negative about being biologically mature yet socially and financially still dependent. It will be fascinating to see whether such cultural norms and behaviours are indeed reflected in developmental trajectories of conduct problems.

Method

Participants

The present study includes data from four waves of the Tracking Adolescents’ Individual Lives Survey (TRAILS). TRAILS is a prospective cohort study of Dutch adolescents, with biennial or triennial follow-up assessments. Data collection at the first assessment wave (T1) took place in 2001 and 2002 (mean age 11.1 years), the second wave (T2) in 2003 and 2004 (mean age 13.6 years), the third wave (T3) in 2006 and 2007 (mean age 16.3 years), and the fourth wave (T4) in 2008–10 (mean age 19.1 years). The TRAILS target sample comprised young adolescents from five municipalities in the north of the Netherlands, including both urban and rural areas. Details about the study are published elsewhere (Huisman et al., 2008; Nederhof et al., 2012; Oldehinkel et al., 2014; Winter et al., 2005). Briefly, 135 primary schools were approached, of which 122 agreed to participate. Parents were informed about the study and both parents and children were asked to provide informed consent for participation in the study. A total of 2,935 children were invited to participate, of whom 2,230 did so at the first wave in 2001 (mean age 11.6 years, 51 per cent female). As summarized in Ormel et al., (2012), initial participation was more likely when children were female, from higher SES background and with better school performance. Retention was excellent with 96.4 per cent at T2, 81.4 per cent at T3, and 84.3 per cent at T4. Individuals lost to attrition were male, of non-Western
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ethnicity, with divorced parents, low SES, low IQ and academic achievement, displayed poor physical health and externalizing problems as well as low peer status.

**Measures**

*Conduct problems.* Latent trajectories of conduct problems are based on self-reported conduct problems at all four measurement waves (i.e. T1 – T4) using the Youth Self Report (Achenbach et al., 2013; Achenbach and Rescorla, 2001). Scales comparable to DSM-IV diagnostic profiles for conduct disorder were created for all four assessments based on 15 items referring to cruelty to others, threatens others, fire setting, truancy, running away from home, stealing at home and elsewhere, using a response range from 0 = never to 2 = definitely/often. Continuous average scores were used as latent trajectory indicators.

**Predictors of conduct problem trajectory**

*Gender* was self-reported, with 50.8 per cent indicating they were female and 49.2 per cent indicating they were male.

*Pubertal stage* was assessed at T1 using Tanner stage drawings (Marshall and Tanner, 1968, 1969, 1970). Parents were presented with schematic drawings and asked to indicate which drawing most closely described the current developmental state of their son or daughter. Higher scores indicate higher Tanner stage, thus more advanced maturation. This measure was completed by 2,114 parents, indicating that 32 per cent of adolescents were in stage 1, 53 per cent were in stage 2, 12 per cent were in stage 3, 3 per cent in stage 4, and less than 1 per cent had already reached stage 5.

*Temperament* was assessed at T1 using the Early Adolescent Temperament Questionnaire – Revised Version (Putnam et al., 2001). As described in detail in Oldehinkel et al. (2004), parents reported on several dimensions: High intensity pleasure, which measures the pleasure derived from novel or high intensity activities (3 items, $\alpha = 0.64$), fear, which measures the level of worrying in anticipation of a negative event (6 items, $\alpha = 0.72$), frustration, which measures negative affect related to goal blocking and interruption (6 items, $\alpha = 0.75$), and effortful control, which measures one’s capacity to self-regulate behaviour (13 items, $\alpha = 0.69$).

*Perceptions of parental rearing behaviours* were assessed at T1 using warmth, rejection, and (over-) protection from the shortened version of the EMBU-C, My memories of Upbringing for Children (Markus et al., 2003), assessed for mothers and fathers. Children rated items as 1 = no, never, 2 = yes, sometimes, 3 = yes, often, and 4 = yes, almost always. (Over-) protection contained 12 items for each parent (e.g. “Does your mother/father forbid you to do things that your classmates are allowed to do because she/he is afraid of something happening to you?”) with internal consistencies of $\alpha = 0.70$ for fathers and $\alpha = 0.71$ for mothers. Rejection consisted of 17 items (e.g. “Does your mother/father blame you whenever something goes wrong at home?”) with internal consistencies of $\alpha = 0.84$ both for fathers and mothers. Warmth was assessed using 18 items (e.g. “Do you have the feeling that your mother/father loves you”) and had an internal consistency of $\alpha = 0.91$ both for mothers and fathers.

*Peer acceptance and rejection* were assessed at T1 using peer nominations. For this, a subsample of TRAILS participants took part in a classroom-based assessment in which TRAILS participants and their classmates nominated each other on a range of domains including acceptance and rejection (most liked and least liked). Peer nominations were only collected in classrooms with at least ten TRAILS respondents (Veenstra et al., 2005). The children received the questionnaire
with the names of their classmates listed. Adolescents were asked whom they disliked (rejection) and liked (acceptance), for which an unlimited number of same-gender and cross-gender classmates could be nominated. The nominations received for being disliked were divided by the total number of children in the class minus one, that is, the maximum number of nominations possible. The same procedure was applied to nominations received for being liked. These proportion scores take class size into account and range from 0 to 1, with higher scores indicating more rejection/acceptance. This procedure is commonly cited and a reliable way to treat peer nominations (cf. Bukowski and Hoza, 1989).

*Socioeconomic status* comprised of information on both mothers’ and fathers’ educational and occupational levels as well as a combined indicator of family income. Educational level of parents was assessed at T1 and measured in five categories. Occupational level was based on the International Standard Classification of Occupations (Ganzeboom and Treiman, 1996). Family income level was requested, with low family income defined as a monthly net family income of less than €1,135 per month, which approximately amounted to a welfare payment at time of assessment. SES was measured as the average of the standardized five items. The SES scale has a high internal consistency ($\alpha = 0.84$).

*Number of parents* was assessed in parent questionnaires at T1 and indicates the number of adolescents growing up in single-parent households. Those 15.5 per cent of adolescents who grew up with one parent only were assigned the code 1 whereas those who grew up in two-parent households were assigned the code 2.

**Analytic strategy**

The analyses proceeded in two steps: We first derived a latent trajectory model of conduct problem behaviour using the growth mixture modelling procedure in Mplus 7.1. The benefits of this methodological approach for the study of the development of conduct problems (as well as other forms of problem behaviour) include the systematic identification of groups that show distinctive patterns of stability and change over time. We computed models in which we only estimated intercept and slope as well as models in which we added quadratic polynomials to examine change in growth. Growth parameters were estimated based on the four conduct problem assessments. Individual variation in growth parameters within the subgroups was allowed (Andruff et al., 2009; Muthén and Asparouhov, 2008; Nylund et al., 2014).

Models with one to five trajectory groups were computed and compared using a range of fit indices: Bayesian Information Criterion (BIC, smaller relative values indicate better fit), entropy (measure of separation, with a value of 1.00 representing perfect separation and low values high classification error) as well as average classification probability, and Vuong-Lo-Mendell-Rubin Likelihood ratio test (LMR-LR, compares model with $k$ trajectory groups against a model with $k-1$ trajectory groups). Well-fitting solutions were evaluated from a theoretical perspective.

Modal trajectory group assignment and classification probabilities for the best fitting model were then used to examine whether social and individual factors predict trajectory group. To this effect, we saved most likely class membership and posterior probabilities (i.e. individual probabilities for each class for each individual) and conducted multinomial logistic regression analyses in Stata 12, using the trajectory class for which an individual had the highest probability as categorical dependent variable. All logistic regression analyses were weighted according to classification probability (conditional probability of belonging to specific trajectory group) to account for uncertainty in trajectory group assignment. The weighting procedure is necessary as it avoids biased estimation of standard errors. We estimated marginal effects, which refer to the absolute prediction of a trajectory group by social or individual factor as well as relative risk
ratios to compare the likelihood of an adolescent-onset trajectory group to that of other trajectory groups given higher or lower levels of a particular predictor.

**Results**

Table 11.1 contains the descriptive statistics of all variables and pairwise correlations between T1 to T4 conduct problem measures and all other study variables can be found in Table 11.2. Comparing correlation coefficients across the different time points suggests developmental variation. For instance, the strength of associations between parenting behaviours and conduct problems decreased from pre- to mid-adolescence but seemed to increase again towards late adolescence. Peer acceptance was negatively associated with conduct problems in mid- and late but not pre-adolescence but rejection was stably linked to conduct problems. With respect to individual factors, boys reported higher levels of conduct problems but this was more strongly the case in pre-adolescence than at later times. Pubertal development was modestly and significantly linked to conduct problems only at T2. Finally, high intensity pleasure and frustration were stably positively associated with conduct problems whereas effortful control was consistently negatively linked to conduct problems.

Following these preliminary analyses, we used growth mixture modelling to identify the latent conduct problem trajectory model. The models in which the quadratic polynomial was omitted fit the data better than the quadratic model, we thus retained the intercept and slope model. Comparison of models with varying numbers of classes yielded a four-class model as best fitting solution. In detail, the LMR-LR test suggested a significant improvement in fit in the four-class model compared to the three-class model (LMR-LR = 66.37, $p = 0.04$) and entropy was 0.77. One class contained relatively few cases (2.5 per cent, $n = 54$) but was theoretically

<table>
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<th>Table 11.1 Descriptive statistics of study measures</th>
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meaningful. The trajectory groups are presented in Figure 11.1. Note that instead of using standardized endorsement scores, we graphed actual averages of conduct problems from T1 to T4 in this measure to ease interpretation, thus the trajectory curves are not perfectly representative of a model that lacked a quadratic polynomial.

Based on posterior probabilities (i.e. using the probability for each class for each individual) the largest class (70.6 per cent) showed low levels of conduct problems across time (\(M_{\text{intercept}} 0.17, M_{\text{Slope}} -0.03\); “Abstainers” in the following), followed by a class (19.8 per cent) with moderately high but declining levels of conduct problems (\(M_{\text{intercept}} 0.42, M_{\text{Slope}} -0.07\); “Moderate-declining”)

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<th>Table 11.2 Correlations between conduct problems and risk factors</th>
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<td><strong>Demographic factors</strong></td>
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<td>Number of parents in the home</td>
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Note: *** \(p < 0.001\); ** \(p < 0.01\); * \(p < 0.05\).

Figure 11.1 Conduct problem trajectories based on actual Youth Self Report Scores per age and trajectory group (range 0–2)
Adolescent-onset conduct problem behaviour

in the following). The third largest class (7.1 per cent) showed initially low but increasing conduct problems ($M_{\text{intercept}} 0.25, M_{\text{slope}} 0.11$; “Adolescent-onset” in the following) and the smallest class (2.5 per cent) showed high but declining levels of conduct problems ($M_{\text{intercept}} 0.48, M_{\text{slope}} -0.09$; “High-declining” in the following). Expectedly, the classes differed in their average levels of conduct problems at all four time points as shown by omnibus and follow-up pairwise comparisons, which were all $p < 0.05$: $F_{T1} (3, 2187) = 486.32$, Abstainers < AO < Moderate-declining < High-declining; $F_{T2} (3, 2089) = 350.47$, Abstainers < AO, Moderate-declining < High-declining; $F_{T3} (3, 1647) = 199.50$, Abstainers < AO < Moderate-declining < High-declining; $F_{T4} (3, 2187) = 214.41$, Abstainers < AO < Moderate-declining < High-declining.

Predicting trajectory group using individual, social and demographic factors

Weighted multinomial logistic regression models were computed to estimate marginal effects, that is, absolute prediction of trajectory group, as well as relative risks ratios to compare likelihood for one trajectory compared to another. Table 11.3 contains marginal effects from adjusted models which suggest that experiencing lower maternal (over-) protection and paternal rejection but higher maternal warmth increased the likelihood for the Abstainers trajectory, as did being a girl, and displaying lower levels of high intensity pleasure and frustration but higher levels of effortful control. Growing up in a single-parent household and experiencing higher levels of parental rejection were predictive of the Adolescent-onset trajectory. In contrast, being a boy, experiencing

| Table 11.3 Prediction of trajectory group by risk factors: marginal effects |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                 | Abstainers (70.6%) | Adolescent-onset (7.1%) | Moderate-declining (19.8%) | High-declining (2.5%) |
| **Intercept**                   | 73%***           | 6%**            | 19%***          | 2%***           |
| **Individual factors**          |                 |                 |                 |                 |
| Gender (0 = girl, 1 = boy)      | -11%***          | 1%              | 9%***           | 1%              |
| Pubertal development            | -2%              | 0%              | 1%              | 1%              |
| High intensity pleasure         | -5%**            | 1%              | 3%*             | 1%              |
| Fear                            | 1%               | 0%              | 0%              | 0%              |
| Frustration                     | -4%*             | 1%              | 2%              | 0%              |
| Effortful control               | 4%*              | -1%             | -1%             | -2%*            |
| **Social factors**              |                 |                 |                 |                 |
| Maternal (over-) protection     | -3%**            | 3%              | 9%*             | 2%              |
| Paternal (over-) protection     | 5%               | 1%              | -6%             | 0%              |
| Maternal rejection              | -4%              | -2%             | 4%              | 2%              |
| Paternal rejection              | -18%**           | 6%*             | 13%**           | -1%             |
| Maternal warmth                 | 13%*             | -1%             | -9%*            | -2%             |
| Paternal warmth                 | -4%              | 0%              | 3%              | 0%              |
| Peer acceptance                 | 3%               | -3%             | -4%             | 5%              |
| Peer rejection                  | -6%              | 1%              | 1%              | 5%              |
| **Demographic factors**         |                 |                 |                 |                 |
| SES                             | 0.1%             | 0%              | -1%             | 0%              |
| Parents in the home             | 0.4%             | -4%*            | -3%             | 2%              |

Notes:
1 Obtained from weighted adjusted multinomial logistic regression.
2 Coefficients should add to 0, deviations are due to rounding to two decimal places.
3 *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. 
higher maternal overprotection and paternal rejection but lower maternal warmth and showing
greater high intensity pleasure all predicted the Moderate-declining trajectory. Finally,
peer rejection and earlier pubertal development as well as lower levels of effortful control were
associated with the High-declining trajectory.

We were particularly interested whether social and individual factors would distinguish the
Adolescent-onset trajectory from other developmental pathways. To this end, relative risk ratios
were obtained in adjusted multinomial logistic regression models with Adolescent-onset conduct
problem trajectory group as reference group (Table 11.4). Results suggest that individuals were
more likely to follow the Adolescent-onset path instead of abstaining from conduct problems if
they had experienced higher levels of paternal rejection. Higher levels of effortful control
increased the likelihood of individuals following the Adolescent-onset trajectory compared to
the High-declining trajectory. Growing up in a single-parent household increased the likelihood
of following an Adolescent-onset trajectory compared to an Abstainers or High-declining
trajectory, but it should be noted that the number of individuals who belonged to the High-
declining trajectory and grew up in single-parent homes was very small.

Discussing of key findings

Using longitudinal Dutch cohort data, we examined conduct problem development from pre- to
late adolescence, following prior studies in their use of latent trajectory modelling (e.g. Barker and

| Table 11.4 Prediction of Adolescent-onset versus other trajectories: relative risk ratio |
|---------------------------------|-----------------|-----------------|-----------------|
|                                | Adolescent-onset vs Abstainers | Adolescent-onset vs Moderate-declining | Adolescent-onset vs High-declining |
| Individual factors             |                               |                               |                               |
| Gender (0 = girl, 1 = boy)     | 1.38                          | 0.66                          | 0.38                          |
| Pubertal development           | 1.02                          | 0.90                          | 0.46                          |
| High intensity pleasure        | 1.28                          | 0.99                          | 0.76                          |
| Fear                           | 0.93                          | 0.95                          | 1.12                          |
| Frustration                    | 1.39                          | 1.11                          | 0.92                          |
| Effortful control              | 0.77                          | 0.91                          | 2.25*                         |
| Social factors                 |                               |                               |                               |
| Maternal (over-) protection    | 2.14                          | 1.00                          | 0.41                          |
| Paternal (over-) protection    | 1.03                          | 1.55                          | 1.11                          |
| Maternal rejection             | 0.75                          | 0.54                          | 0.21                          |
| Paternal rejection             | 3.82*                         | 1.34                          | 3.31                          |
| Maternal warmth                | 0.65                          | 1.41                          | 3.90                          |
| Paternal warmth                | 1.18                          | 0.92                          | 0.80                          |
| Peer acceptance                | 0.58                          | 0.74                          | 0.03                          |
| Peer rejection                 | 1.29                          | 1.01                          | 0.05*                         |
| Demographic factors            |                               |                               |                               |
| SES                            | 0.90                          | 0.97                          | 0.85                          |
| Parents in the home            | 0.51*                         | 0.62                          | 0.16*                         |

Notes:
1 Obtained from weighted adjusted multinomial logistic regression.
2 Coefficients depicted are relative risk ratios and depict risk for adolescent-onset compared to varying reference trajectory group.
3 * p < 0.05
Maughan, 2009; Bongers et al., 2004; Broidy et al., 2003; Maughan et al., 2000; Odgers et al., 2008). Before fitting the trajectory model to the Dutch data, we reviewed a range of studies using semiparametric and growth mixture modelling and concluded that the use of the measure impacted the number and shape of trajectories found. Thus, we need to ask whether the particular measure that we employed in our study may have impacted our results. The Youth Self Report is a broad self-report measure that encompasses aggressive as well as nonaggressive behaviours, thus the number of classes identified should be somewhat larger than for narrow definitions. With four identified groups, our model itself supports many previous studies but distributions and shape were not always in line with our expectations.

To begin with, the High-declining trajectory group resembled prior studies to the extent that conduct problems were already evident in pre-adolescence but the desisting course of this group in late adolescence comes as a surprise. It may be that the items used in the current study do not reflect conduct problems in late adolescence as well as they do in late childhood and throughout adolescence. The inclusion of additional waves and age-appropriate items that more validly measure conduct problems and antisocial behaviour in adulthood could possibly change this pattern and may indicate stability of conduct problems across life stages and contexts, at least for some. Notably, the small number of individuals and low proportion of girls in this trajectory group are supported by theoretical accounts and prior literature.

Second, although we found an adolescent-onset conduct problem trajectory, less than 10 per cent of the TRAILS sample followed this developmental pathway. As reviewed earlier, conduct problems with an onset in early adolescence are considered common (Moffitt, 1993, 2006) and some other studies have found this group to be moderate in size (Bongers et al., 2004; Odgers et al., 2008). However, our findings still support other studies that failed to confirm an adolescent-onset group that is more common than that of abstainers (Piquero, 2008; Van Dulmen et al., 2009). There may be reason to believe that the discrepancy between biological and social maturity and the resulting negative feelings does not generalize to all adolescents. If young people do not experience this discrepancy, for instance because their biological development is delayed or because they are granted increasing autonomy from early adolescence onwards, they should be less likely to experience the negative emotions connected to this discrepancy, and consequently show lower levels of problem behaviour engagement.

We have argued in the introduction that cultural factors might affect the extent to which the maturity gap is a normative experience. In detail, we suggested that cultural values affect parenting which in turn might affect the size of the gap between biological and social maturity through promoting or opposing independence, curiosity, novelty-seeking and autonomy. The Dutch context is a particular one with liberal attitudes towards many issues and views towards children and adolescents that differ from those elsewhere (Harkness et al., 2007, 2000). It is possible that Dutch adolescents are less affected by the maturity gap and feel less compelled to seek inappropriate means to alleviate negative emotions arising from it.

Although this interpretation has persuasive power, it is puzzling that of all studies reviewed earlier it is another Dutch one that finds a substantial group of individuals on an adolescent-onset trajectory (Bongers et al., 2004). Why did the adolescents studied by Bongers and colleagues (2004) get trapped in the maturity gap? One difference between our study and that by Bongers et al. (2004) is that they identified an adolescent-onset group for status violations (running away from home, swearing, skipping school, drug and alcohol use) but not for property violations or aggression and only a small adolescent-onset group for oppositional behaviour. Thus, when focussing on the Dutch context, it may be that status violations rather than other, more serious indicators of conduct problems drive the adolescent-onset trajectory and that such items were not assessed in great enough detail in our sample to identify a larger group.
Aiming to shed light on potential differentiating risks, we further examined a range of social and individual factors that have all been linked to conduct problems before as direct predictors of trajectory groups. Results show that rejection by fathers seemed to pose the greatest risk for the adolescent-onset conduct problem trajectory. Although parental rejection has been associated with conduct problems before (Loeber and Stouthamer-Loeber, 1986; Rohner and Britner, 2002; Simons et al., 1988), it is puzzling that the father’s behaviour was more strongly associated with conduct problem development than that of mothers. Moreover, growing up in a single-parent household significantly increased the likelihood for an adolescent-onset trajectory rather than for abstaining or showing an high-declining pattern. Several mechanisms have been proposed through which single-parenthood is predictive of conduct problems, including stressful home environments resulting from marital conflict and separation and changes in SES. In addition, parent-child conflict may be more common in single-parent household not least because the time spent in dyadic interaction is greater than in two-parent household (Webster-Stratton, 1989). Although it is surprising that neither the moderate- nor high-declining trajectories were predicted by single-parenthood, it is possible that individual factors were more powerful in distinguishing these early-onset groups and simply eliminated the effects of social factors in our multivariate models.

One consequence to be drawn from our review of the literature and analysis of Dutch population cohort data is that risk factors are likely intertwined, interacting with, and depending on each other. For instance, what does the risk of “growing up in a single-parent household” tell us if we do not also examine the mechanisms through which this risk becomes effective? The literature suggests that parenting in single-parent households tends to be less stable and more disrupted, which may result in variations in warmth, rejection and protection. Similarly, lone parents and parents in low-paid jobs may need to work longer or more irregular hours, which impinges on their ability to monitor and supervise their children. It is no secret that low socioeconomic status is often associated with low education, greater substance use, more frequent mental health problems (Bradley and Corwyn, 2002; McLoyd, 1998), factors that can accumulate and interact to increase the risk for offspring to be born into less than ideal conditions that increase the risk for impaired neural development. In short, it is likely that the risk factors we looked at in this study act in interconnected ways.

The dependencies should be taken into account to understand the development of problem behaviour but such models are complex and easily defy the notion of parsimony. It thus seemed to be sensible to examine the predictive power of various theoretically derived and previously tested demographic, social, and individual risks to see which of those risks predict problem behaviour development above and beyond the effect of potential intermediate variables. This approach did not account for interactions between risk factors (it is feasible, for instance, that very low levels of protection in combination with high levels of high intensity pleasure may double the risk for adolescent-onset/adolescent-limited problem behaviour), but we identified the strongest predictors of problem behaviour trajectories in adjusted regression models. We believe that these relatively stronger predictors need to be carried forward and their associations amongst each other tested as a next step.

Conclusion

Our study supports the notion of distinct trajectories of problem behaviour development in childhood and adolescence using a Dutch cohort sample and assessments from pre- to late adolescence. Our findings call into question the normativity of an adolescent-onset trajectory, which we discuss with a view on Dutch culture, and suggest that growing up in a single-parent household and being exposed to rejection by fathers increased the risk for an adolescent-onset
conduct problem trajectory. Given the destructive effect of conduct problems on individual development into adulthood and their detrimental impact on society as a whole, our findings make an important contribution to the identification of developmental patterns and unique risks for adolescent conduct problem development.

Notes

1 Note that this procedure corresponds to the traditional three-step approach in which the latent class model is estimated first and associations with covariates and distal variables estimated afterwards. A common criticism concerns the assumption inherent to this approach that class membership is fixed and certain, which is not the case. The weighting procedure accounts for the non-certainty, thus provides less biased estimates than analyses in which class membership is taken as certain. This approach was considered superior to the traditional one-step approach in which predictors of class membership are included in and influence model estimation, which means that different solutions are obtained when predictors change.

2 Additional model fit criteria for the 1 to 4-class solutions were as follows: 1 class: BIC = 770.69, 2 classes: BIC = -236.86, entropy = 0.79, LMR-LR = 988.19, p < 0.001, 3 classes: BIC = -421.51, entropy = 0.74, LMR-LR = 199.16, p = 0.02, 4 classes: BIC = -553.14, entropy = 0.77, LMR-LR = 148.35, p = 0.04, 5 classes: BIC = -619.59, entropy = 0.63, LMR-LR = 85.86, p < 0.01.

References


Adolescent-onset conduct problem behaviour


