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Developmental Trajectories of Aggression from Late Childhood through Adolescence: Similarities and Differences across Gender

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Abstract

Although numerous investigations of overt aggressive and antisocial trajectories have been undertaken, there is a dearth of literature examining gender differences and similarities in trajectory patterns and their correlates. To address these gaps, we investigated gender differences in the prevalence rates, predictive validity during transition to adulthood, childhood risk factors, and adolescent correlates of different trajectories of teacher-reported overt aggression (i.e., fights, argues, gets in trouble) among 220 participants (116 girls and 104 boys) evaluated annually from grade 4 to grade 12. Four patterns of trajectories were identified: low, increasing (i.e., adolescent-onset), decreasing (i.e., childhood-limited), and high (i.e., childhood-onset). majority large proportion of youth, particularly girls, displayed low levels of aggression over time. A small proportion followed the childhood-onset trajectory. Across gender, the childhood-onset trajectory was associated with the highest rates of maladjustment during the transition to adulthood, the highest number of childhood risk factors, and multiple problems during adolescence. The adolescent-onset trajectory was associated with few childhood risk factors, but with high levels of independent status during adolescence. In contrast, the childhood-limited trajectory was associated with several childhood risk factors, but high levels of parental monitoring and school engagement during adolescence. Romantic involvement differentiated the adolescent-onset and childhood-limited trajectories among girls.

Keywords

overt aggression; developmental trajectories; gender; childhood risk; adolescent correlates; predictive validity

Antisocial behaviors, including aggression, delinquency, and other disruptive behavior problems, display both significant continuity and changes over the life course (e.g., Cairns & Cairns, 1994; Huesmann, Eron, Lefkowitz, & Walder, 1984; Loeber & Stouthamer-Loeber, 1998; Pulkkinen & Pitkaenen, 1993; Rutter, Kim-Cohen, & Maughan, 2006). Two theoretical perspectives have been highly influential in guiding studies of aggressive and antisocial trajectories. From a social-interactional perspective, Patterson and colleagues (e.g., Patterson, DeBaryshe, & Ramsey, 1989; Patterson & Yoerger, 1997) identified an

early-onset (i.e., during childhood) and a *late-onset* (i.e., during adolescence) path of delinquency. Similarly, Moffitt (1993) proposed that antisocial individuals may follow either a *life-course persistent* pathway (i.e., childhood onset with little desistance throughout adulthood) or an *adolescence-limited* pathway (i.e., adolescence onset with desistance in adulthood). These theoretical frameworks have been extended to a variety of antisocial behaviors, including bullying, criminal offending, conduct disorder, delinquency, externalizing behavior, hyperactivity, oppositional behavior, physical aggression, and violence (e.g., Aguilar, Sroufe, Egeland, & Carlson, 2000; Broidy, Nagin, Tremblay, et al., 2003; Lahey, Van Hulle, Waldman, et al., 2006; Martino, Ellickson, Klein, McCaffrey, & Edelen, 2008; Moffitt & Caspi, 2001; Odgers, Moffitt, Broadbent, et al., 2008; Patterson & Yoerger, 1997; Pepler, Jiang, Craig, & Connolly, 2008; Pulkkinen, Lyyra, & Kokko, 2009; van Lier, Wanner, & Vitaro, 2007).

In addition to identifying patterns of antisocial trajectories, previous research has been concerned with additional factors that may be useful for understanding change and continuity in antisocial behaviors, including (a) prevalence of trajectories, (b) predictive utility of different trajectories, (c) childhood risk factors, and (d) adolescent correlates. Nevertheless, few studies have examined these issues simultaneously, which has the potential to clarify the developmental processes involved with these trajectories. Furthermore, there is a relative dearth of literature considering gender differences and similarities with regard to these issues. Theoretical accounts provide minimal guidance concerning gender differences. Given the greater focus on boys than girls in previous research, the model developed by Patterson and colleagues (1989, 1997) did not specify potential gender differences. In Moffitt's (1993) model, gender differences were expected only in prevalence rates, with girls less likely to follow the life-course-persistent pathway because of fewer temperamental and neuro-cognitive problems in childhood (Moffitt, Caspi, Rutter, & Silva, 2001). Other theories, however, have brought gender to the forefront. For instance, based on research with adjudicated populations, Silverthorn and Frick (1999) proposed that antisocial girls may be more likely to display a delayed-onset trajectory because of their cognitive competence and contextual influences that minimize the display of externalizing behaviors earlier in development. Thus, explicit studies of gender differences and similarities with regard to antisocial trajectories could address these unresolved issues concerning gender.

To address these gaps, the present study examined different pathways of overt aggression from childhood through adolescence. Several important studies have investigated trajectories of physical aggression during childhood or from childhood through early adolescence (e.g., Broidy et al., 2003; NICHD Early Child Care Research Network, 2004) and from childhood to mid-adolescence (e.g., Bongers, Koot, van der Ende, & Verhulst, 2004; Nagin & Tremblay, 1999). In the present study, we considered trajectories of overt aggression from late childhood throughout adolescence. Because physical aggression is relatively rare during adolescence, we examined the broader construct of overt aggression, which includes additional behaviors (e.g., verbal aggression) that are prevalent throughout these developmental periods and consequently permit sufficient variability for modeling

trajectories. In the following sections, we review literature relevant to our goals, with a focus on studies that have included overt aggression.

Number of Trajectories and Prevalence Rates

Recent studies have reported additional trajectories besides the two – childhood-onset and adolescent-onset trajectories – proposed in Moffitt's theory and Patterson and colleagues' model. These trajectories include moderate stable, moderate decreasing, childhood-limited, and adult-onset trajectories (e.g., Aguilar et al., 2000; Brame, Nagin, & Tremblay, 2001; Eggleston & Laub, 2002; Huesmann, Dubow, & Boxer, 2009; Lahey et al., 2006; Martino et al., 2008; Odgers et al., 2008; Pepler et al., 2008; Pulkkinen et al., 2009; Schaeffer, Petras, Ialongo, et al., 2006; White, Bates, & Buyske, 2001). In addition, some studies on physical aggression have failed to identify an adolescent-onset trajectory (e.g., Brame et al., 2001; Nagin & Tremblay, 1999). Given normative decreases in physical aggression from childhood through adolescence (e.g., Cairns & Cairns, 1994; Tremblay et al., 1999), very few youth display increasing levels of physical aggression during adolescence. As noted, we consider overt aggression (i.e., verbal aggression, norm-breaking behaviors, and physical aggression). Given that verbal aggression and norm-breaking behaviors are more prevalent than physical aggression during adolescence, we expected to identify an adolescent-onset trajectory in addition to three other trajectories consistently found in recent studies: childhood-onset, childhood-limited, and chronic low (e.g., Martino et al., 2008; Odgers et al., 2008). Specifically, we expected that the childhood-onset trajectory would display high levels of aggression from childhood throughout adolescence, the childhood-limited trajectory would show decreasing levels of aggression, and the adolescence-onset trajectory would display increasing levels of aggression.

Developmental Outcomes

Both Patterson and colleagues' (1989, 1997) model and Moffitt's (1993) theory predict high levels of maladjustment for the childhood-onset trajectory. Empirical evidence strongly supports this prediction (e.g., Moffitt, Caspi, Harrington, & Milne, 2002; Schaeffer et al., 2006). Patterson and colleagues (1989, 1997) speculated that following the adolescent-onset trajectory would be associated with fewer and less severe negative outcomes than the childhood-onset path. Moffitt (1993) further proposed that this trajectory would not be associated with significant maladjustment in adulthood because of expected desistance from antisocial behaviors. However, the adolescent-onset trajectory is associated with psychosocial and adjustment problems, such as internalizing symptoms, criminal behavior, unstable employment, poor romantic relationships, and substance use during both adolescence and adulthood (e.g., Aguilar et al., 2000; Bergman & Andershed, 2009; Farrington, Ttofi, & Coid, 2009; Moffitt et al., 2001; Odgers et al., 2008; Woodward et al., 2002). Less is known about associations between the childhood-limited trajectory and adult maladjustment, though recent reports suggest that this trajectory confers risk for substance use (Huesmann et al., 2009; Odgers, et al., 2008). In the present study, we employed three measures of maladjustment during the transition to adulthood: education failure, teen parenthood, and criminal arrest, each of which marks important issues during this period. Consistent with previous research, we expected to find the highest levels of maladjustment

for the childhood-onset trajectory, and elevated (but lower) levels of maladjustment for the adolescent-onset and childhood-limited trajectories.

Childhood Risk Factors

Patterson and colleagues (1989, 1997) proposed that the childhood-onset path is rooted in early contextual risks (e.g., coercive interactions at home). In addition, Moffitt (1993) proposed that neuro-cognitive deficits and difficult temperament are associated with the life-course persistent trajectory. Consistent with these theories, childhood contextual and child-specific risk factors have been identified for aggressive trajectories. Contextual factors include single parenthood, low family socioeconomic status (SES), poor maternal mental health, parental delinquency, ineffective parenting, life stress, and conflict within the family (e.g., Aguilar et al., 2000; Lahey et al., 2006; Moffitt et al., 2003; Odgers et al., 2008; Pepler et al., 2008). Child-specific factors include low verbal ability, hyperactivity, oppositional behavior, and attention-deficit/hyperactivity disorder (ADHD; Lahey et al., 2006; Moffitt et al., 2003; Odgers et al., 2008). Compared to the childhood-onset trajectory, the adolescent-onset trajectory evidences fewer associations with childhood risk factors (e.g., Aguilar et al., 2000; Lahey et al., 2006; Moffitt et al., 2003). Like the childhood-onset trajectory, the childhood-limited trajectory is associated with contextual risk factors such as maltreatment, family conflict, and maternal maladjustment (Aguilar et al., 2000; Odgers et al., 2008). Given these findings, we hypothesized that the highest levels of childhood risk factors would be associated with the childhood-onset trajectory; elevated, but relatively lower, levels of childhood risk factors would be associated with the childhood-limited trajectory; and fewer childhood risk factors would be associated with the adolescent-onset trajectory.

Adolescent Correlates

Both theoretical models (Patterson et al., 1989, 1997; Moffitt, 1993) propose that the adolescent-onset path primarily results from negative peer influences in adolescence, which is consistent with evidence that youth following this trajectory report elevated levels of peer delinquency during adolescence (Aguilar et al., 2000; Odgers et al., 2008). Overt aggression in adolescence often co-occurs with other problem behaviors such as low academic achievement, risk-taking, multiple sexual partners, and substance use (e.g., Ary, Duncan, Biglan, Metzler, Noell, & Smolkowski, 1999; Cairns & Cairns, 1994; Donovan, Jessor, & Costa, 1988; Fisher, Kramer, Hoven, et al., 2000; Patterson, Dishion, & Yoerger, 2000). Given that unsupervised socialization with deviant peers and lack of parental monitoring support adolescent problem behaviors (e.g., Dishion, McCord, & Poulin, 1999), we would expect the childhood-onset and adolescent-onset trajectories to be associated with not only these adolescent risk taking behaviors and academic problems, but also low levels of parental monitoring.

The childhood-limited trajectory may be of particular interest to developmental scientists, given that identification of adolescent correlates of the childhood-limited trajectory can inform our understanding of the developmental processes associated with decreasing levels of overt aggression during adolescence. Moffitt (1993) speculated that (a) not experiencing the maturation gap because of late puberty or early attainment of adult roles, and/or (b)

limited opportunities for involvement with antisocial peers or to mimic life-course-persistent delinquents may account for decreasing or low levels of antisocial behaviors during adolescence. Similarly, Dishion and Patterson (2006) hypothesized that youth in the childhood-limited trajectory were not likely to be involved in deviancy training during adolescence. Consistent with these expectations, Odgers et al. (2008) reported that youth in the childhood-limited trajectory associated with fewer delinquent peers during adolescence. In addition, changes in parenting during adolescence, particularly increased parental monitoring, likely mitigate deviant peer influences and adolescents' risk for antisocial behaviors (e.g., Dishion & Patterson, 2006; Laird, Criss, Pettit, Dodge, & Bates, 2008; Lansford et al., 2006; Patterson et al., 1997). Therefore, we expected that high levels of parental monitoring and low levels of deviant peer interactions in adolescence would be associated with the childhood-limited path.

Gender Differences and Similarities

According to Moffitt (1993), high levels of gender similarity should be observed in the number of overt aggression trajectories, adult outcomes, childhood risk factors, and adolescent correlates. The only gender difference should involve prevalence rates, with males outnumbering females in the childhood-onset trajectory. In contrast, Silverthorn and Frick (1999) proposed that girls may not follow the childhood-onset trajectory; despite exposure to early risk factors. However, puberty, coupled with opportunities to model adolescent boys' delinquent behaviors, may facilitate overt antisocial behaviors among girls exposed to risk factors earlier in development. These authors propose only one antisocial trajectory among girls, namely, the delayed-onset trajectory, which is associated with the same risk factors as the childhood-onset trajectory among boys, but manifests a developmental course similar to the adolescent-onset trajectory (Silverthorn, Frick, & Reynolds, 2001). Consequently, this model predicts that girls in the adolescent-onset trajectory would experience higher levels of childhood risk factors and greater maladjustment in adulthood than boys in the adolescent-onset trajectory.

Given that the Silverthorn and Frick (1999) model was developed based on research with adjudicated youth with severe conduct problems, whereas the present study focused on less severe overt antisocial behaviors among a community-based sample, we expected to identify both childhood-onset and adolescent-onset trajectories among girls. This expectation is supported by empirical evidence indicating that a small proportion of girls do follow the childhood-onset trajectory of antisocial behaviors (e.g., Lahey et al., 2006; Moffitt & Caspi, 2001; Odgers et al., 2008; Pepler et al., 2008; Schaeffer et al., 2006; van Lier et al., 2007), although oftentimes they are outnumbered by boys (e.g., Lahey et al., 2006; Moffitt & Caspi, 2001; Pepler et al., 2008; Schaeffer et al., 2006). Gender differences with regard to prevalence rates for antisocial trajectories have been consistently identified. For example, girls are more likely than boys to follow a low aggressive and antisocial trajectory throughout childhood and adolescence (e.g., Broidy et al., 2003; Fergusson & Horwood, 2002; Martino et al., 2008; van Lier et al., 2007; Woodward, Fergusson, & Horwood, 2002), though the likelihood of following the adolescent-onset pathway is similar among boys and girls (e.g., Lahey et al., 2006; Odgers et al., 2008). Thus, we expected a similar number and shape of aggression trajectories across the two genders, but different rates of trajectory

membership, with more girls following the low-aggression trajectory and more boys following the childhood-onset trajectory.

In terms of adult outcomes, the childhood-onset trajectory is associated with the highest level of maladjustment in both genders (e.g., Odgers et al., 2008). The evidence for the adolescent-onset trajectory is mixed, with studies suggesting significant risk for both genders (e.g., Moffitt et al., 2002), higher risk among males in domains such as violence and mental health problems (Odgers et al., 2008), and greater risk for adjudicated girls than boys (Silverthorn et al., 2003). Little is known about potential gender differences in the predictive validity of the childhood-limited trajectory. A recent study (Odgers et al., 2008) suggests that the childhood-limited trajectory conferred no risk for females, but modest, yet significant, risk for males (e.g., financial difficulties, smoking, internalizing problems). Based on these reports, we hypothesized that similar outcomes would be found among boys and girls for the childhood-onset trajectory of overt aggression. However, the childhood-limited trajectory would be associated with greater maladjustment among boys during the transition to adulthood, whereas the adolescent-onset trajectory would be associated with greater maladjustment among girls.

In terms of childhood risk factors, no gender differences have been reported in the prediction of trajectory membership (e.g., Lahey et al., 2006; Moffitt et al., 2001; Odgers et al., 2008), suggesting that risk factors operate in a similar fashion among boys and girls (e.g., Bergman & Andershed, 2009; Fergusson & Horwood, 2002). Therefore, we hypothesized strong gender similarity in the childhood risk factors for different trajectories of overt aggression. In terms of adolescent correlates, a potential gender difference may be related to romantic involvement. Older and/or delinquent males potentially play an important role in the initiation of delinquency and antisocial behaviors among females via romantic association (e.g., Caspi, Lynam, Moffitt, & Silva, 1993; Magnusson, Stattin, & Allen, 1985; Pepler & Craig, 2005). In addition, early dating experience negatively affects adolescent adjustment among girls more than boys (e.g., Simmons, Blyth, Van Cleave, & Bush, 1979). Therefore, we expected that romantic involvement during mid-adolescence would be more strongly associated with the adolescent-onset trajectory among girls than among boys.

Method

Participants and Design

The present study involved 220 participants (116 girls and 104 boys) from the younger cohort of the Carolina Longitudinal Study (Cairns & Cairns, 1994). Participants were first seen in 4th grade. Date of birth was obtained during annual interviews and confirmed by official records. The mean age of participants upon entry into the study was 10.2 years ($SD = .56$). Fifteen percent (33/220) of the sample was African-American; the rest were European-American. Participants were recruited from four elementary schools from suburban and rural areas in the mid-Atlantic US. All fourth grade students were invited to participate. A signed consent was required from both parent and student. The average participation rate was 74% (220/296). No participation bias was found in terms of sex, race, and extreme cases of aggressive behaviors. Semi-structured individual interviews were conducted annually through grade 12. Teacher ratings of overt aggression, academic

competence, and social competence were obtained each year until grade 12. The retention rate ranged from 87% to 99% across the study's time points; 99% of the original sample was individually interviewed at the end of high school.

Measures

Interpersonal Competence Scale - Teacher (ICS-T)—Annually from grades 4 to 12, a teacher or counselor filled out the Interpersonal Competence Scale (15 items) for each participant. This scale assessed social competence, behavioral characteristics, and cognitive development. Three major factors were identified: aggression (i.e., “gets into a fight,” “gets in trouble,” “argues”); popularity (i.e., “popular with boys,” “popular with girls,” “has friends”); and academic competence (i.e., “good at spelling,” “good at math”). High test-retest reliability was obtained over three weeks: .89, .82, and .88 for aggression, popularity, and academic factors, respectively (Cairns, Leung, Gest, & Cairns, 1995). Scores ranged from 1.0 to 7.0, with higher scores representing higher standing on each factor. The three aggression items assessed overt forms of physical and verbal aggression. These items have emerged as a coherent and reliable factor in previous studies (e.g., Farmer, Estell, Bishop, O’Neal, & Cairns, 2003; Rodkin, Farmer, Pearl, & Van Acker, 2000). In the current study, the alpha levels ranged from .70 to .87 with a median of .82. Teacher ratings of aggression reliably correlated with observed incidents of physical and verbal aggression in peer interactions, peer reported conflicts, and school personnel nominations of aggression (e.g., Xie, Cairns, & Cairns, 2002). Therefore, the measure of overt aggression has strong internal consistency and external validity.

Developmental maladjustment during the transition to adulthood—Three indices were used to assess participants’ maladjustment during late adolescence and early adulthood. (1) *Education failure*. Information on participants’ education was obtained during interviews with parents and participants when participants were aged 20 and 24. Education failure was defined as not completing high school or an equivalent degree (i.e., GED) by age 20. The rates of education failure did not differ between males (16%, 15/96) and females (20%, 23/113), $\chi^2_{(1,209)} = 0.78, p = .37$. (2) *Teen parenthood*. Teen parenthood was defined as becoming a biological parent before age 20 (Xie, Cairns, & Cairns, 2001). Information on childbirth was obtained in participant interviews and interviews with participants’ parents and grandparents, and confirmed by other sources (e.g., newspaper announcements, official birth records). There were more teen mothers (29%, 33/113) than teen fathers (8%, 8/99), $\chi^2_{(1,212)} = 15.09, p < .001$. (3) *Criminal arrest*. When the participants were in their early 20s, information on criminal arrests was obtained from the State Bureau of Investigation for 95% (209/220) of the participants who remained in the original state. No arrest had occurred for 82% of the participants, and 12% had been arrested more than once. The measure was transformed into a dichotomous variable (0 = *not arrested*, 1 = *arrested at least once*). The rates of arrest did not differ between males (21%, 21/101) and females (15%, 16/108), $\chi^2_{(1,209)} = 1.28, p = .28$.

Family background and participant adjustment at or prior to age 10—Two factors assessed family background. Teacher ratings were used to assess individual and peer adjustment.

1. *Family socioeconomic status (SES)*. Information on parental employment was obtained during grade 4 interviews. Parental occupational status was indexed using a revised version of Duncan's Socioeconomic Index (Stevens & Featherman, 1981). The full range of occupations was represented in the sample with a mean score of 30.21 ($SD = 17.14$; range 12-87).
2. *Family structure at age 10*. During the grade 4 interview, we asked about family structure (e.g., "Who lives in your house?"). On the basis of participants' reports, whether the child lived with both biological parents was coded (1 = *yes*, 0 = *no*).
3. *Individual adjustment at age 10*. Teacher ratings of academic competence and popularity on the ICST scale in grade 4 were used to assess individual adjustment at age 10.
4. *Peer adjustment at age 10*. Peers with whom a participant affiliated were identified using the Social Cognitive Map (SCM) procedure to map out classroom social networks (Cairns, Gariépy, & Kindermann, 1991; Cairns, Perrin, & Cairns, 1985). The SCM procedure utilizes children's free recall of peer groups (e.g., "Who hangs around together a lot?") within a class and aggregates the reports across multiple participants to generate a matrix of associations among members of a class (or grade). Peer groups are identified on the basis of the strengths of associations. Peer groups identified by the SCM procedure have shown significant external validity with observed patterns of peer interactions (Cairns et al., 1985; Gest, Farmer, Cairns, & Xie, 2003). The identification of a participant's close peers in the social group enabled us to calculate the average scores of these peers (excluding the target participant) on three aspects of adjustment: aggression, popularity, and academic competence. Peer adjustment was based on the ICS-T ratings of the peers in a participant's group.

Adolescent individual and interpersonal factors—Five domains of individual and interpersonal factors during adolescence were assessed.

1. *Physical maturation for female participants*. The age of menarche for female participants was calculated based on self report. The mean age of menarche was 12.56 ($SD = 1.15$; range =9.50-15.50).
2. *Adjustment in school*. Three measures assessed participants' adjustment in school during mid-adolescence: mean teacher ratings of *academic competence* and *popularity* across grade 8 (the last year in middle school) and grade 9 (the first year in high school), and the total number of years of participation in *extracurricular activities* from grade 7 to grade 10 according to school yearbooks (e.g., Mahoney, 2000).
3. *Relationship at home*. Two indices of an adolescent's relationship with parents were included. At the age 20 interview, participants were asked whether they had *run away from home* and, if so, the age(s) at which this occurred. A dichotomous variable was used to indicate if a participant reported running away between ages 10 and 17 (1 = *yes*, 0 = *no*). The gender difference approached significance, Fisher

Exact $p = .07$, with girls (21/108) being more likely than boys (9/93) to run away from home. The second index involved parental monitoring, which focused on participants' voluntary disclosure of whereabouts. For interviews conducted at ages 14, 15, and 16, participants' answers were coded using three levels: 0 (*never tell parents*), 1 (*sometimes tell*), and 2 (*always tell*). A mean score was calculated across the three years for the variable "*telling parents when out*."

4. *Peer activities and romantic involvement*. Two measures were included to assess participants' involvement with peers and romantic relationships: (a) *Out with friends*: At ages 14, 15, and 16, participants were asked the number of nights per week they went out with friends, and a mean score was calculated across the three years; and (b) *Dating*: At ages 14, 15, and 16, participants were asked whether they went out on dates. Answers were coded using three levels: 0 (*no*), 0.5 (*sometimes*), or 1 (*yes*). A mean score was calculated across the three years.
5. *Achieving independent status*. Two separate variables were used to index participants' independent or adult status: (a) *Having a car at age 16*: At the age 16 interview (when participants were first eligible to drive), participants provided information on whether they had a car to use. Answers were coded as 0 (*no*) or 1 (*yes*). Thirty-two percent of participants (68/213) had a car at age 16, and this rate was the same across gender. (b) *Adolescent working*: During the interviews between ages 15 and 17, participants reported on their most recent jobs. Their work experience at each interview was coded into three levels: 0 (*not working*), 1 (*part-time job*), and 2 (*full-time job*). A mean score for "adolescent working" was calculated across the three years.

Analytic Plan

We first identified the number of distinct trajectory patterns using a semi-parametric mixture model (Nagin, 1999) on teacher ratings of overt aggression for the whole sample. We then tested gender differences in the trajectory patterns and prevalence rates. Next, we compared different trajectories in terms of (a) developmental outcomes during transition to adulthood, (b) childhood risks at the beginning of the study, and (c) adolescent correlates, using analyses of variance (ANOVAs) in which ethnicity was controlled. Given that the classifications of individuals into different trajectory classes were not perfect, the posterior probabilities were used as weights.¹ Following the practice of previous studies (e.g., Odgers et al., 2008), we conducted two sets of planned comparisons. In the first set of comparisons, the low-aggression trajectory was used as the reference group, which permits an evaluation of specific factors associated with elevated levels of aggression. In the second set of comparisons, the high-aggression trajectory was the reference group, which allows us to

¹An alternative approach to handle classification imperfection is to simultaneously estimate the trajectory classes with covariates entered in the model (e.g., Nagin, 2005). However, this approach allows covariates to influence the shape of trajectories and class membership, which is inconsistent with the research question of how different trajectory classes differ across covariates or outcomes. In some instances, the number and shape of trajectories estimated from the model with covariates could change significantly from the trajectory estimates from a model without the covariates (e.g., Muthén, 2004). Furthermore, recent studies (Clark & Muthén, 2009; Petras & Masyn, 2009) show that such an approach tends to overestimate the actual associations between class membership and covariates or outcomes. Given the above considerations, a decision was made to use probability-weighted regression analyses to adjust for class imperfection.

identify factors that differentiate the persistently high-aggression trajectory from these other aggression trajectories. To evaluate gender differences, we examined the gender $\times$ trajectory interaction terms. When an interaction effect was significant, we conducted follow-up analyses separately by gender to clarify the interaction.

Results

Number, Shape and Prevalence of Diverse Trajectories

To identify different trajectories, a semi-parametric mixture model was fitted using the SAS-based “TRAJ” procedure (Nagin, 1999, 2005) on teacher ratings of overt aggression from age 10 to age 18 (i.e., grades 4 to 12), with the highest order quadratic. Fit indices of models with two to five classes are listed in Table 1. The Bayesian Information Criterion (BIC), which performs well in correctly identifying the number of classes in growth models (e.g., Nagin, 2005; Nylund, Asparouhov, & Muthén, 2007; Tofighi & Enders, 2007), was used to determine the number of trajectory classes. Often the absolute values of BIC decrease as the number of class increases until the optimal model is reached, and then the BIC values increase. Thus, the lowest absolute value of BIC corresponds to the best-fit model for the data. Accordingly, the four-class model was selected, which had the lowest absolute value of BIC and high levels of entropy.² To ensure the stability of the 4-class model, different starting values were used, and the same solution was obtained.

Following Nagin (2005), the 4-class model was refined by eliminating two quadratic parameters that were highly non-significant ($ps > .70$). Table 2 summarizes the parameter estimates, and Figure 1 depicts the estimated trajectories and observed scores. Trajectory 1 (low aggression) manifested low levels of aggression over time (44% of sample, 97/220; 58 girls). Trajectory 2 (increasing aggression) showed modest increases through adolescence (22% of sample, 48/220; 25 girls). Trajectory 3 (decreasing aggression) started high at age 10 and decreased substantially thereafter (20%, 43/220; 21 girls). Trajectory 4 (high aggression) was characterized by high levels of aggression over time (15%, 32/220; 12 girls). Children's aggression scores decreased from ages 10 to 18, except among youth in the increasing trajectory.

Gender differences were examined in the intercept and slope of each trajectory. As Table 2 shows, significant gender differences were identified for the increasing aggression and high aggression trajectories. Specifically, in the increasing aggression trajectory, girls' aggression levels were lower than boys' levels at age 10 (intercept) but increased more over time. In the high aggression trajectory, boys started higher (intercept) and had steeper decreases (slope) than girls. Figure 2 depicts the trajectories for boys and girls separately.

Table 3 lists gender compositions of the trajectory patterns. Half of the girls (50%, 58/116) and a little over a third of boys (38%, 39/104) followed a low aggression trajectory. The

²Statistical tests also were obtained to compare models with different classes by conducting growth mixture modeling in Mplus version 5.2. Both Lo-Mendell-Rubin Likelihood Ratio test (LMR-LRT) and Bootstrapped LRT indicated that the 4-class model was the best-fitting model (i.e., significant improvement from 3-class model to 4-class model, but non-significant improvement from 4-class model to 5-class model). It should be noted that the four trajectory patterns identified in Proc Traj and in Mplus were highly similar and the most likely membership across the two approaches overlapped for 90% (198/220) of the participants (i.e., 90% were members of the same corresponding trajectories).

difference approached significance, $\chi^2_{(1, 220)} = 3.48, p = .062$. Compared to the low aggression trajectory, boys were more likely to be in the high aggression trajectory, Fisher exact test, $p = .04$, and no gender differences were found for the increasing and decreasing trajectories, Fisher exact tests, $ps > .12$. Furthermore, the increasing and decreasing trajectories did not differ from the high aggression trajectory in gender compositions, Fisher exact tests, $ps > .26$.

In summary, four trajectories of overt aggression were identified: low, high, increasing, and decreasing. Despite the overall similarity in the shape of the trajectories across the two genders, significant differences in slopes and intercepts were identified for the increasing and high aggression trajectories. In terms of prevalence rates, boys were over-represented in the high aggression trajectory and girls were over-represented in the low aggression trajectory.

Predictive Validity of Outcomes during the Transition to Adulthood

The four trajectories were compared on three maladjustment indices during the transition to adulthood: education failure, teen parenthood, and criminal arrest (Table 4). Among boys and girls, the high aggression trajectory was associated with the highest rates of education failure, teen parenthood, and criminal arrest. A significant gender $\times$ trajectory interaction effect suggested that the high-aggression trajectory conferred greater risk for teen parenthood among females, $F_{(1,120)} = 6.26, p = .014$. The decreasing trajectory yielded higher rates of teen parenthood and criminal arrest compared to the low aggression trajectory.

Youth in the increasing trajectory also experienced more education failure and criminal arrest than participants in the low aggression trajectory. An interaction effect involving gender approached significance for teen parenthood, $F_{(1,137)} = 3.68, p = .061$. Girls in the increasing, compared to the low, aggression trajectory were more likely to become teen mothers, $F_{(1,81)} = 5.74, p = .019$, whereas boys in the increasing and low aggression trajectories did not differ in the rates of teen fatherhood, $F_{(1,58)} = 0.01, p = .939$.

In summary, the high aggression trajectory was associated with the highest level of maladjustment (i.e., education failure, teen parenthood, and criminal arrest). Both increasing and decreasing trajectories conferred significant risk for maladjustment. Gender differences primarily involved teen parenthood, with both the increasing and high aggression trajectories conferring greater risk for teen parenthood among females than males.

Childhood Risk Factors at Age 10

As shown in Table 5, compared to children in the low aggression trajectory, children in the high aggression trajectory were more likely to (a) be older (indicating possible past school failure, Cairns & Cairns, 1994); (b) come from disadvantaged families (i.e., lower SES and less likely to live with both biological parents); (c) have poorer adjustment in school (i.e., lower academic competence and popularity); and (d) affiliate with peers with poorer adjustment (i.e., higher levels of aggression and lower levels of popularity). Gender differences were found for peer academic competence, $F_{(1,112)} = 11.61, p < .001$. Follow-up

analyses indicated that girls in the high aggression trajectory were more likely to affiliate with peers who were also low in academic competence, $F_{(1,61)} = 26.04, p < .001$.

Compared to the low- aggression trajectory, the decreasing aggression trajectory was associated with a similar set of childhood risk factors as the high aggression trajectory, but to a lesser degree. Children in the decreasing trajectory had peers with lower levels of aggression and higher levels of popularity than children in the high aggression trajectory. A gender $\times$ trajectory class (i.e., low vs. decreasing) interaction was found for family SES, $F_{(1,136)} = 5.44, p = .021$. Follow-up analyses indicated that boys in the decreasing trajectory had lower family SES than boys in the low aggression trajectory; this difference was not significant among girls. A significant gender $\times$ trajectory class interaction also was found for family SES when comparing the decreasing and high aggression trajectories, $F_{(1,71)} = 4.95, p = .029$. In this case, girls in the decreasing trajectory had higher family SES than girls in the high aggression trajectory; no difference was found among boys. The increasing trajectory was similar to the low aggression trajectory in all of the childhood risk factors except age. Children in the increasing trajectory were older than children in the low aggression trajectory, which might be indicative of previous school failure.

In summary, compared to low aggression children, children following the high aggression trajectory experienced multiple risks. Children in the decreasing trajectory experienced similar but less severe risks than those in the high aggression trajectory. In contrast, children in the increasing trajectory experienced few risk factors in childhood, with the exception of being older than children in the low aggression trajectory. Significant gender differences were found for family SES among youth in the decreasing trajectory, though these differences were dependent on the reference group examined.

Adolescent Correlates

Table 6 illustrates findings regarding the participants' adjustment and correlates during adolescence. Adolescents in the high aggression trajectory were least involved in extracurricular activities, scored lowest in popularity, and reported the lowest level of parental monitoring. In addition, they scored lower in academic competence, dated more often, and were more likely to work than adolescents in the low aggression trajectory. A gender $\times$ trajectory (high vs. low) interaction effect, $F_{(1,121)} = 5.94, p = .016$, indicated that girls in the high aggression trajectory reported going out with friends more frequently than girls in the low aggression trajectory, but no difference was found in this regard among boys.

Adolescents in the decreasing trajectory were similar to those in the low aggression trajectory with the exceptions of academic competence (decreasing $<$ low aggression) and adolescent's working (decreasing $>$ low aggression). In addition, compared to girls in the low aggression trajectory, girls in the decreasing trajectory reported later age of menarche. Compared to youth in the high aggression trajectory, adolescents in the decreasing trajectory were more involved in extracurricular activities, were more popular with peers, and reported higher levels of telling their parents when going out. In addition, girls in the decreasing trajectory reported going out with friends less often and were less involved in dating than

high aggression girls, gender $\times$ trajectory (decreasing vs. high) interactions, $F_{(1,71)}s > 4.35$, $ps < .05$.

Compared to youth in the low aggression trajectory, adolescents in the increasing aggression trajectory exhibited lower academic competence, were more likely to run away from home, and achieved greater independent status (i.e., having a car and working more). In addition, girls following the increasing trajectory were more involved in dating, $F_{(1,78)} = 7.35$, $p = .008$, whereas boys in the increasing and low aggression trajectories did not differ in terms of dating, $F_{(1,58)} = 0.01$, $p = .918$. Girls in the increasing trajectory were also rated as lower in popularity than the low aggression girls, $F_{(1,77)} = 15.24$, $p < .001$, whereas no difference was found among boys, $F_{(1,57)} = 0.03$, $p = .876$.

In summary, the high aggression trajectory was associated with multiple problems during adolescence. The increasing trajectory displayed compromised adjustment in multiple domains. Despite its association with childhood risk factors, the decreasing trajectory differed from the low aggression trajectory only in academic competence and working. Dating and unsupervised peer interaction differentiated the trajectories among girls.

Discussion

Results of the present study indicated that individuals display diverse trajectories of overt aggression from late childhood through adolescence. Using teacher-ratings of overt aggression from 4th to 12th grade, four trajectories were identified: low, high, decreasing, and increasing. A major goal of this study was to identify gender differences in the prevalence, predictive validity, childhood risk factors, and adolescent correlates of these trajectories. Overall, the results indicated (a) certain gender differences in the shape and prevalence of trajectories, but (b) strong similarities in predictive validity of developmental outcomes, childhood risk factors, and adolescent correlates.

Number, Shape and Prevalence of Different Trajectories

The trajectory groups found in the present study are highly similar to previous reports on trajectories of adolescent physical aggression (e.g., Brame et al., 2001; Martino et al., 2008) and antisocial behavior (e.g., Odgers et al., 2008). Specifically, the high aggression trajectory identified in the current sample resembles the childhood-onset trajectory of antisocial behaviors, the decreasing trajectory resembles the childhood-limited trajectory, and the increasing trajectory largely resembles the adolescent-onset trajectory (e.g., Aguilar et al., 2000; Odgers et al., 2008; van Lier et al., 2007). A small number of girls followed the childhood-onset path. Although this finding contradicts Silverthorn and Frick's (1999) proposal that the childhood-onset trajectory may be difficult to identify among girls, it is consistent with Moffitt's (1993) model and recent empirical reports (e.g., Martino et al., 2008; Odgers et al., 2008; Pepler et al., 2008).

Three of the four trajectories displayed decreasing levels of aggression from middle childhood throughout adolescence, though the rates of decline differed among trajectories. These patterns are consistent with the overall expected developmental decline in aggression during these periods (e.g., Cairns & Cairns, 1994; Tremblay et al., 1999). The only

exception was the adolescent-onset (increasing) trajectory, which showed significant increases in aggression among females, but remained relatively flat among males. This pattern of findings is consistent with Silverthorn and Frick's (1999) argument that the delayed-onset trajectory may be more prominent in girls' antisocial development, as well as with some reports that have failed to identify an adolescent-onset trajectory among males (e.g., Nagin & Tremblay, 1999). There were no gender differences in the shape of the low and decreasing aggression trajectories; however, males in the high aggression trajectory started higher than females and displayed steeper decreases. Girls were more likely to follow the low aggression trajectory, whereas boys were more likely to follow the high aggression trajectory. These gender differences are consistent with our hypotheses, previous research (e.g., Bergman & Andershed, 2009; Broidy et al., 2003; Fergusson & Horwood, 2002; van Lier et al., 2007), and Moffitt's (1993) model.

Predictive Validity of Developmental Outcomes

Consistent with hypotheses, the small number of participants following a childhood-onset (high aggression) trajectory was most likely to experience maladjustment during the transition to adulthood (i.e., education failure, teen parenthood, and criminal arrest). This was true for both genders and highly consistent with previous reports (e.g., Farrington et al., 2009; Huesmann et al., 2009; Moffitt & Caspi, 2001; Odgers et al., 2008; Pulkkinen et al., 2009; Woodward et al., 2002). Also as expected, the adolescent-onset (increasing) trajectory conferred moderate but significant risk for education failure and criminal arrest. The only gender difference involved teen parenthood: the adolescent-onset trajectory was associated with greater risk among girls than boys. Overall, the findings did not provide strong support for Silverthorn and Frick's (1999) proposal that the adolescent-onset trajectory would confer greater risk among females than males. However, results do not exclude the possibility that the adolescent-onset trajectory may be relevant for gender-related maladjustment patterns among females. This possibility needs to be examined in future studies.

The significant associations between the childhood-limited (decreasing) trajectory and developmental outcomes (i.e., teen parenthood and criminal arrest) among both boys and girls contradicted our hypotheses and previous findings by Odgers and colleagues (2008), who reported that the childhood-limited trajectory was associated with adjustment problems at age 32 only among males. Another study found that at age 48, individuals in a childhood-limited aggressive group differed from a low-aggression group only on problem drinking (Huesmann et al., 2009). However, gender differences were not reported. The discrepancies among the three reports may reflect differences in the trajectory variables (i.e., aggression vs. conduct problems), sample characteristics, outcome variables, and the ages when adulthood outcomes were assessed. It could be the case that as individuals move further into adulthood, the lingering negative effects of childhood aggression may be attenuated. Future life-span longitudinal studies would be useful for evaluating the life course trajectories of individuals who display childhood-limited antisocial behaviors (see also Farrington & Pulkkinen, 2009).

Childhood Risk Factors

Compared to children in the low aggression trajectory, children in the childhood-onset trajectory were more likely to exhibit low levels of academic competence and popularity, come from families with lower SES, live with a single parent, affiliate with poorly adjusted peers, and be older, suggesting the possibility of previous academic failures. The childhood-limited (decreasing) trajectory also was associated with several childhood risks relative to the low aggression trajectory, including lower levels of academic and social competence, lower likelihood of living with both biological parents, and higher levels of affiliating with aggressive and low-achieving peers. In contrast, the adolescent-onset (increasing) trajectory was associated with age-appropriate adjustment in grade 4 among both genders; youth following this trajectory showed few differences from the low-aggression participants. Contrary to Silverthorn and Frick (1999), girls in the increasing trajectory experienced few childhood risk factors, and their low levels of contextual and individual risks were quite similar to those of boys in the same trajectory. In general, these findings are consistent with our expectations and previous research (e.g., Aguilar et al., 2000; Moffitt et al., 2003). However, our indices of childhood factors focused on children's school adjustment and peer characteristics; we did not include other familial and child-specific variables that have been shown to predict early-onset conduct problems (e.g., ineffective and coercive parenting, neuro-cognitive difficulties). Despite such differences, our findings on childhood school adjustment, which likely is affected by a combination of family and individual risk factors, are highly consistent with previous studies on antisocial trajectories in which family dynamics and child-specific factors have been examined. Future research will be needed to determine whether these variables predict the trajectories in the present study or are more specific to severe conduct problems or high-risk samples.

The only gender difference in childhood risk factors involved family SES for the childhood-limited trajectory. Compared to the low aggression trajectory, boys following the childhood-limited trajectory tended to come from low SES families, whereas no difference was found among girls. This pattern is in line with the argument that boys may be more vulnerable than girls to childhood contextual risks, potentially due to their less mature cognitive functioning and social emotional skills (e.g., Eme & Kavanaugh, 1995; Hetherington & Stanley-Hagan, 1999). Taken together, the findings suggest strong gender similarities in childhood risk factors.

Adolescent Correlates

We examined multiple factors in the domains of family, peers, and individual social and physical development. Youth in the childhood-onset trajectory exhibited numerous difficulties, including poor school adjustment (i.e., academic, popularity, school activities) and low levels of communication with their parents regarding their activities (or parental monitoring; Stattin & Kerr, 2000). They also reported high levels of involvement in dating and working, suggesting that the childhood-onset trajectory is associated with an array of both individual and contextual factors that may serve to support continued overt aggression during adolescence.

Despite their adequate adjustment in childhood, youth following the adolescent-onset trajectory evidenced declines in their academic competence and were more likely to run away and to achieve independent status than their low aggression peers. These findings are consistent with our hypotheses and the processes proposed by Patterson and colleagues (1989, 1997) and Moffitt (1993) regarding adolescent delinquency. Girls in this trajectory also reported higher levels of romantic involvement and were rated by their teachers as lower in popularity than the low aggression girls, consistent with our hypotheses and the proposal that older and/or delinquent males, via romantic association, may facilitate initiation of antisocial behaviors among females (e.g., Caspi et al., 1993; Magnusson et al., 1985; Pepler & Craig, 2005). Nevertheless, the possibility of bidirectional influence from overt aggression to romantic involvement cannot be excluded. Future studies are needed to disentangle the relation between romantic involvement and the development of antisocial behaviors among adolescent females.

Consistent with Moffitt's (1993) model, girls in the childhood-limited trajectory reported later ages of menarche than girls in the low aggression trajectory and lower levels of dating and going out with friends than the high aggression trajectory. Note that these findings apply to girls but not boys, suggesting that other mechanisms (e.g., lower parental monitoring) in adolescence may operate to confer risk for aggression among boys. In line with this possibility, both males and females in the decreasing trajectory reported more parental monitoring than participants in the high-aggression trajectory, consistent with evidence that parental monitoring attenuates antisocial behaviors and negative peer influences (e.g., Laird et al., 2008; Lansford et al., 2006).

Limitations

Several limitations of this study should be noted. First, the measurement of overt aggression is just one element of antisocial behavior. Our measure relied on three inter-related items to assess overt aggression (i.e., fighting, arguing, and getting in trouble). Although two items specifically measure overt aggression, the third item – getting in trouble at school – only indirectly assesses aggression and may be considered a form of disruptive behavior. Nevertheless, this measure of overt aggression has demonstrated high levels of internal consistency and external validity across developmental periods, and our findings on aggression trajectories and adolescent correlates are highly consistent with recent studies.

Second, compared to antisocial behaviors investigated in some other studies (e.g., severe conduct problems or criminal offending; Silverthorn et al., 2001), overt aggression in our study may be viewed as a less severe form, and some of the behaviors (e.g., arguing) are normative during adolescence. Therefore, discrepancies between the findings of this and other studies may be attributable to differences in the severity of specific antisocial behaviors studied. However, the consistencies evidenced among our study and previous work on physical aggression suggests that some of the correlates of aggression trajectories can be generalized across samples. Future research should clarify how the theoretical models that framed the previous work apply to different antisocial behaviors that vary in form and severity.

Third, the childhood risk factors focused on peer and school adjustment variables, with relatively less attention to other risk factors that have been examined in previous work (e.g., coercive parenting, family conflict, child neuro-cognitive functioning). These differences in risk factors may have affected the conclusions that we could draw regarding childhood risk factors. Fourth, causal relations among the trajectory groups and their associated factors cannot be inferred, particularly for adolescent factors that were measured concurrently with overt aggression. Therefore, it is not clear whether the adolescent variables were risk factors, correlates, or consequences of specific trajectories of aggression. Future research that evaluates these alternative roles and considers additional childhood and adolescent variables will be necessary to disentangle these associations.

Fifth, the sample size is relatively small and, given that this is a community-based sample with relatively lower levels of overt aggression than high-risk or adjudicated samples, the power to detect gender differences may be limited. This issue may be especially prominent for the childhood-onset trajectory given the low number of girls who followed this trajectory. Nevertheless, our findings of gender similarities in this trajectory are highly consistent with previous reports with larger sample sizes. In addition, other aspects of gender differences (e.g., prevalence rates) and similarities (e.g., childhood school adjustment) found in this sample are reasonably in line with previous reports and theoretical considerations. Given the paucity of literature on gender differences in the predictive validity and adolescent correlates of different antisocial trajectories, future research should investigate gender differences in a systematic manner. Such research could evaluate the generalizability of these findings to samples with varying levels of aggression and that may have increased power to evaluate differences among males and females in the domains considered in the present study.

Implications and Conclusions

From middle childhood throughout adolescence, children display distinct pathways of overt aggression. Three of the four trajectories characterized by elevated levels of aggression in childhood and/or adolescence were associated with some degrees of risk for subsequent maladjustment during the transition to adulthood, with the childhood-onset trajectory conferring the highest risk. Results indicate that significant changes in overt aggression can occur during adolescence, as evidenced by the childhood-limited and adolescent-onset trajectories. These changes are often correlated with the child's school adjustment, family relationships, peer or romantic interactions, and the process of achieving independent status. Some of the changes occur despite the presence of childhood risk factors (as in the childhood-limited trajectory) or in the absence of obvious childhood risks (as in the adolescence-onset trajectory). Nevertheless, continuity of high levels of aggression appears to be supported or exacerbated by high levels of both childhood risks and adolescent problems.

Perhaps the most noteworthy gender difference observed in the present study involves the role of romantic involvement in changes of overt aggression among females during adolescence. Specifically, high levels of romantic involvement were associated with girls' adolescent-onset trajectory, whereas low levels of romantic involvement were associated

with the childhood-limited trajectory. These findings suggest that romantic involvement may play a unique role in the initiation and desistance of aggression or other overt antisocial behaviors among girls. Future research that systematically evaluates gender differences in aggressive and antisocial behaviors will have important implications for etiological, prevention, and intervention efforts, and inform our understanding of developmental processes associated with these gender differences.

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Appendix

Overview of Measures and Age of Assessment included in this study

Measures	Age/Time of Assessment
Overt Aggression	Ages 10 through 18 teacher ratings
Developmental Outcomes	
Education Failure	Ages 20 & 24 interviews with participant
Teen Parenthood	Official records & Adolescent interviews
Criminal Arrest	Official records from SBI (up to age 24)
Childhood factors	
Family SES	Age 10 interview with participant
Family structure	Age 10 interview with participant
Academic Competence	Age 10 teacher ratings
Popularity	Age 10 teacher ratings
Peer - Aggression	Age 10 teacher ratings on group members
Peer - Academic Competence	Age 10 teacher ratings on group members
Peer - Popularity	Age 10 teacher ratings on group members
Adolescent Correlates	
Academic Competence	Ages 14 & 15 teacher ratings
Popularity	Ages 14 & 15 teacher ratings
Extracurricular Activities	Ages 13 through 16 school year books
Ran away from home	Age 20 retrospective report
Parental Monitoring	Ages 14 through 16 interviews with participant
Out with friends	Ages 14 through 16 interviews with participant
Dating	Ages 14 through 16 interviews with participant
Having a car	Age 16 interview with participant
Adolescent Working	Ages 15 through 17 interviews with participant
Age of Menarche	Adolescent interviews

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Figure 1.
Predicted and observed aggression trajectories.

Figure 2.
Predicted aggression trajectories by gender.

Table 1

Model fit indices

	BIC	AIC	Loglikelihood	Entropy
2-class model	-2902.74	-2880.97	-2872.97	0.967
3-class model	-2872.54	-2839.89	-2827.89	0.934
4-class model	-2860.94	-2817.40	-2801.40	0.875
5-class model	-2868.58	-2814.15	-2794.15	0.814

Table 2

Parameter estimates for trajectory classes and gender differences in trajectory shapes: Coefficient and (standard errors)

	<u>TRAJ 1</u>	<u>TRAJ 2</u>	<u>TRAJ 3</u>	<u>TRAJ 4</u>
Parameters	Low Agg	Increasing	Decreasing	High Agg
Overall trajectory estimates				
Intercept	2.315 (0.11)	2.600 (0.148)	5.099 (0.204)	5.464 (0.162)
Linear	-0.223*** (0.063)	0.057 (0.38)	-0.876*** (0.108)	-0.199*** (0.035)
Quadratic	0.021** (0.007)		0.077*** (0.013)	
Gender differences in trajectory shapes				
Intercept	2.261 (0.135)	2.253 (0.170)	5.106 (0.247)	5.136 (0.162)
Linear	-0.217*** (0.064)	0.132** (0.046)	-0.962*** (0.112)	-0.146** (0.051)
Quadratic	0.019* (0.008)		0.085*** (0.013)	
Gender × Intercept	0.097 (0.175)	0.925*** (0.273)	0.082 (0.276)	0.8528** (0.306)
Gender × Linear	0.015 (0.035)	-0.195** (0.061)	-0.085 (0.058)	-0.138* (0.069)

* $p < .05$;

** $p < .01$;

*** $p < .001$.

Note. Agg = aggression. Gender (0 = girl, 1 = boy).

Table 3

Gender composition of different trajectory patterns

Gender	TRAJ 1		TRAJ 2		TRAJ 3		TRAJ 4	
	Low Agg	High Agg	Increasing	Decreasing	Increasing	Decreasing	High Agg	Total
Male	39 (38%)		23 (22%)	22 (21%)	20 (19%)			104 (100%)
Female	58 (50%)		25 (22%)	21 (18%)	12 (10%)			116 (100%)

Note. Agg = aggression.

Table 4

Estimated means and (standard errors) for maladjustment outcomes from probability-weighted comparisons:
Trajectory classes and gender

Gender & Outcome	<u>TRAJ 1</u>	<u>TRAJ 2</u>	<u>TRAJ 3</u>	<u>TRAJ 4</u>
	Low Agg	Increasing	Decreasing	High Agg
	(<i>n</i> = 97)	(<i>n</i> = 48)	(<i>n</i> = 43)	(<i>n</i> = 32)
Education Failure	0.08 (0.04)	0.23 ^{a1} (0.06)	0.16 ^{b1} (0.06)	0.40 ^{a3} (0.07)
Girls	0.13 (0.05)	0.26 (0.08)	0.23 (0.09)	0.33 (0.10)
Boys	0.02 (0.06)	0.20 (0.08)	0.09 (0.08)	0.47 (0.08)
Teenage Parenthood	0.08 (0.13)	0.20 ^{b1} (0.05)	0.24 ^{a1 b0} (0.05)	0.45 ^{a3} (0.06)
Girls	0.13 (0.04)	0.36 ^{a1} (0.07)	0.38 (0.10)	0.66 ^{a3} (0.09)
Boys	0.03 (0.05)	0.04 (0.07)	0.10 (0.07)	0.21 ^{a1} (0.08)
Criminal Arrest	0.02 (0.03)	0.16 ^{a2 b3} (0.04)	0.21 ^{a3 b2} (0.04)	0.52 ^{a3} (0.05)
Girls	0.02 (0.03)	0.22 (0.05)	0.14 (0.06)	0.42 (0.08)
Boys	0.02 (0.04)	0.10 (0.06)	0.27 (0.06)	0.61 (0.06)

Note. Agg = aggression. Means with a subscript differed significantly from the low-aggression trajectory:

^{a1}
 $p < .05$;

^{a2}
 $p < .01$;

^{a3}
 $p < .001$.

Means with a superscript differed significantly from the high-aggression trajectory:

^{b0}
 $p < .06$;

^{b1}
 $p < .05$;

^{b2}
 $p < .01$;

^{b3}
 $p < .001$.

Table 5

Family background, individual and peer adjustment at age 10 across trajectory classes: Estimated means and (standard errors)

Domains	<u>TRAJ 1</u>	<u>TRAJ 2</u>	<u>TRAJ 3</u>	<u>TRAJ 4</u>
	Low Agg	Increasing	Decreasing	High Agg
	(n = 97)	(n = 48)	(n = 43)	(n = 32)
Age	10.07 (0.06)	10.31 ^{a2} (0.08)	10.27 ^{a0} (0.09)	10.30 ^{a1} (0.08)
Girls	10.10 (0.07)	10.41 (0.11)	10.19 (0.12)	10.16 (0.15)
Boys	10.05 (0.09)	10.20 (0.12)	10.34 (0.12)	10.43 (0.12)
<u>Family background</u>				
Family SES	30.07 (1.71)	32.96 ^{b1} (2.47)	25.35 ^{a2} (2.55)	23.47 ^{a2} (2.88)
Girls	30.88 (2.17)	29.40 (3.37)	29.47 ^{b1} (3.70)	21.20 (4.54)
Boys	37.25 (2.64)	36.51 (3.61)	21.22 ^{a0} (3.52)	25.74 (3.56)
Both bio-parents	0.79 (0.045)	0.65 (0.07)	0.55 ^{a2} (0.07)	0.48 ^{a3} (0.08)
Girls	0.69 (0.06)	0.64 (0.10)	0.55 (0.11)	0.42 (0.13)
Boys	0.88 (0.08)	0.66 (0.10)	0.56 (0.10)	0.55 (0.10)
<u>Individual adjustment</u>				
Academic (ICST)	5.21 (0.17)	5.22 ^{b2} (0.24)	4.34 ^{a2} (0.25)	4.05 ^{a3} (0.28)
Girls	5.14 (0.21)	4.96 (0.33)	4.75 (0.36)	4.15 (0.44)
Boys	5.28 (0.26)	5.48 (0.36)	3.93 (0.34)	3.95 (0.35)
<u>Individual adjustment</u>				
Popularity (ICST)	5.09 (0.13)	5.46 ^{b3} (0.19)	4.47 ^{a2} (0.19)	3.90 ^{a3} (0.22)
Girls	5.14 (0.16)	5.34 (0.25)	4.42 (0.28)	3.51 (0.34)
Boys	5.04 (0.20)	5.58 (0.28)	4.52 (0.26)	4.30 (0.27)
<u>Peer adjustment</u>				
Peer-Aggression	2.79	3.20 ^{b2}	3.61 ^{a3 b1}	4.35 ^{a3}

Domains	<u>TRAJ 1</u>	<u>TRAJ 2</u>	<u>TRAJ 3</u>	<u>TRAJ 4</u>
	Low Agg	Increasing	Decreasing	High Agg
	(<i>n</i> = 97)	(<i>n</i> = 48)	(<i>n</i> = 43)	(<i>n</i> = 32)
	(0.14)	(0.21)	(0.21)	(0.25)
Girls	2.69	3.23	3.41	3.98
	(0.18)	(0.29)	(0.30)	(0.40)
Boys	2.89	3.17	3.80	4.71
	(0.22)	(0.30)	(0.29)	(0.31)
Peer-Academic	5.13	5.05 ^{b3}	4.51 ^{a2}	4.07
	(0.13)	(0.19)	(0.19)	(0.23)
Girls	5.38	4.91	4.47	3.44 ^{a3}
	(0.16)	(0.26)	(0.27)	(0.36)
Boys	4.88	5.20	4.55	4.71
	(0.20)	(0.27)	(0.26)	(0.28)
Peer-Popularity	5.04	5.12 ^{b2}	4.93 ^{b1}	4.29 ^{a2}
	(0.11)	(0.16)	(0.16)	(0.19)
Girls	4.91	5.22	4.93	3.91
	(0.14)	(0.22)	(0.22)	(0.30)
Boys	5.17	5.02	4.92	4.68
	(0.17)	(0.23)	(0.22)	(0.24)

Note. Agg = aggression, ICST = Interpersonal Competence Scale - Teacher.

Means with a subscript differed significantly from the low-aggression trajectory:

^{a0}_p .07;

^{a1}_p < .05;

^{a2}_p < .01;

^{a3}_p < .001.

Means with a superscript differed significantly from the high-aggression trajectory:

^{b1}_p < .05;

^{b2}_p < .01;

^{b3}_p < .001.

Table 6

Adolescent factors across trajectory classes: Estimated means and (standard errors)

	TRAJ 1	TRAJ 2	TRAJ 3	TRAJ 4
	Low Agg	Increasing	Decreasing	High Agg
	(n = 97)	(n = 48)	(n = 43)	(n = 32)
<u>School adjustment</u>				
Academic competence (ages 14 to 15)	4.90	4.32 ^{a2}	4.28 ^{a2}	3.97 ^{a3}
	(0.11)	(0.16)	(0.16)	(0.18)
Girls	5.09	4.27	4.77	4.26
	(0.14)	(0.21)	(0.24)	(0.28)
Boys	4.71	4.36	3.79	3.68
	(0.17)	(0.23)	(0.22)	(0.23)
Popularity (ages 14 to 15)	5.02	4.67 ^{a1b2}	4.84 ^{b3}	4.01 ^{a3}
	(0.10)	(0.14)	(0.14)	(0.16)
Girls	5.31	4.56 ^{a3}	4.96	3.69
	(0.12)	(0.19)	(0.21)	(0.25)
Boys	4.73	4.77	4.72	4.32
	(0.15)	(0.20)	(0.19)	(0.20)
Extracurricular activities	2.16	2.19 ^{b2}	2.17 ^{b2}	1.11 ^{a3}
	(0.16)	(0.22)	(0.23)	(0.26)
Girls	2.30	1.94	2.24	0.91
	(0.19)	(0.30)	(0.35)	(0.39)
Boys	2.03	2.43	2.09	1.30
	(0.25)	(0.33)	(0.31)	(0.33)
<u>Relationship with parents</u>				
Ran away from home (ages 10 to 17)	0.10	0.25 ^{a1}	0.14	0.19
	(0.04)	(0.05)	(0.06)	(0.07)
Girls	0.12	0.36	0.28	0.19
	(0.05)	(0.07)	(0.09)	(0.10)
Boys	0.09	0.14	0.00	0.19
	(0.06)	(0.08)	(0.08)	(0.08)
Parental monitoring (ages 14 to 16)	1.78	1.79 ^{b2}	1.89 ^{b3}	1.45 ^{a3}
	(0.04)	(0.06)	(0.06)	(0.07)
Girls	1.86	1.86	1.93	1.35 ^{a3}
	(0.05)	(0.08)	(0.09)	(0.11)
Boys	1.70	1.71	1.85	1.56
	(0.07)	(0.09)	(0.09)	(0.09)
<u>Peer and romantic involvement</u>				
Out with friends (ages 14 to 16)	3.20	3.46	2.93	3.48
	(0.17)	(0.24)	(0.25)	(0.28)
Girls	3.21	3.56	2.50 ^{b2}	4.33 ^{a1}

	<u>TRAJ 1</u>	<u>TRAJ 2</u>	<u>TRAJ 3</u>	<u>TRAJ 4</u>
	Low Agg	Increasing	Decreasing	High Agg
	(n = 97)	(n = 48)	(n = 43)	(n = 32)
	(0.22)	(0.33)	(0.37)	(0.44)
Boys	3.18	3.36	3.36	2.64
	(0.26)	(0.36)	(0.34)	(0.35)
Dating (ages 14 to 16)	0.56	0.66	0.61	0.70 ^{a1}
	(0.03)	(0.05)	(0.05)	(0.06)
Girls	0.59	0.78 ^{a2}	0.47 ^{b1}	0.71
	(0.04)	(0.06)	(0.07)	(0.09)
Boys	0.54	0.55	0.75	0.68
	(0.05)	(0.07)	(0.07)	(0.07)
<u>Achieving independent status</u>				
Having a car at age 16	0.26	0.52 ^{a2 b2}	0.24	0.23
	(0.05)	(0.07)	(0.07)	(0.08)
Girls	0.23	0.62	0.31	0.08
	(0.06)	(0.09)	(0.10)	(0.12)
Boys	0.30	0.41	0.18	0.38
	(0.07)	(0.10)	(0.10)	(0.10)
Adolescent Working (ages 15 to 17)	0.58	0.78 ^{a2}	0.80 ^{a2}	0.81 ^{a2}
	(0.04)	(0.06)	(0.06)	(0.07)
Girls	0.51	0.76	0.76	0.65
	(0.05)	(0.08)	(0.09)	(0.11)
Boys	0.66	0.81	0.84	0.96
	(0.07)	(0.09)	(0.09)	(0.09)
<u>Physical maturation (Girls)</u>				
Age of menarche	12.36	12.60	13.22 ^{a2}	12.42
	(0.16)	(0.25)	(0.27)	(0.31)

Note. Agg = aggression. Means with a subscript differed significantly from the low-aggression trajectory:

^{a1}
 $p < .05$;

^{a2}
 $p < .01$;

^{a3}
 $p < .001$.

Means with a superscript differed significantly from the high-aggression trajectory:

^{b1}
 $p < .05$;

^{b2}
 $p < .01$;

^{b3}
 $p < .001$.