Published in final edited form as:

J Appl Dev Psychol. 2017 September ; 52: 34–45. doi:10.1016/j.appdev.2017.06.005.

Clinically differentiating life-course-persistent and adolescence-limited conduct problems: Is age-of-onset really enough?

Amanda E. Halliburton^a, Ty A. Ridenour^b, Bradley A. White^a, and Kirby Deater-Deckard^c

^aDepartment of Psychology, Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA, USA

^bResearch Triangle Institute, International, Research Triangle Park, NC, USA

^cDepartment of Psychological and Brain Sciences, University of Massachusetts Amherst, Amherst, MA, USA

Abstract

One important subtyping of behavior problems is Moffitt's (1993) "life-course-persistent" (LCP) and "adolescent limited" (AL) categories of antisocial behavior, which she differentiated in terms of high impulsivity, poor academic performance, and aggression. These problems may be exacerbated by the cumulative effects of chronic stress. Copious evidence has documented validity and developmental differences between these subtypes, whereas far fewer data exist regarding their clinical utility, in spite of the Diagnostic and Statistical Manual's nomenclature including corresponding subtypes based on age-of-onset of behavioral symptoms. The present study evaluated how well age-of-onset based subtyping identifies distinct developmental patterns of antisocial behavior corresponding to Moffitt's subtypes in terms of risk factors and gender between LCP and AL in a prospective sample of chronically stressed youth. A computerized assessment tool (ALEXSA[®]) was used to obtain data from 1,147 youth aged 8–16. Implications for clinical assessment and intervention strategy, particularly with stressed youth, are discussed.

Keywords

conduct problems; sex differences; risk factors; chronic stress; adolescents

Moffitt (1993) specified two subtypes of antisocial behavior (AB). "Life-course-persistent" (LCP) begins in childhood, remains prevalent across the lifespan, and is consequent to vulnerabilities in many different areas, ranging from neurodevelopmental deficits to traumatic experiences and family dysfunction (Moffitt & Caspi, 2001). "Adolescence-limited" (AL) occurs only during adolescence, serves to win peer approval, and demonstrates coming-of-age independence (Moffitt, Caspi, Harrington, & Milne, 2002). Moffitt's taxonomy has been supported in subsequent studies (e.g., Tibbetts & Piquero,

Corresponding author: Amanda E. Halliburton, M.S. 109 Williams Hall (0436), Blacksburg, VA 24061, ahallibu@vt.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1999). Evidence also suggests a “childhood-limited” subtype in which conduct problems dissipate by adolescence (Moffitt et al., 2008) and one with comorbid antisocial behavior and substance use, beginning in adolescence and continuing into adulthood (Armstrong & Costello, 2002; Ridenour et al., 2002).

Moffitt and colleagues (2008) outlined the need for research on the clinical utility of age-of-onset based subtypes in diagnosing conduct disorder. Age-of-onset has classically served to illuminate etiological factors that contribute to antisocial behavior. Age criteria are used when organizing referrals to specialized services (e.g., from teachers or police), are helpful for identifying missing and delayed developmental tasks, and inform selection of intervention targets based on salient stressors (e.g., childhood family problems versus adolescent peer problems).

However, given the additional constraints on and challenges to care in high-risk populations, assessment of the subtypes in these populations (and their clinical utility) is needed to understand when and where collecting age-of-onset data merits the requisite clinical effort and time (i.e., collecting records from multiple providers and agencies, gathering reports from varied caregivers, and comparing these sources for consistency). Additionally, longitudinal studies are needed of community, clinical, and public service recipient samples, and translational evidence is needed to evaluate and adapt assessment techniques into convenient and effective clinical tools (for example, clinicians rarely have time to use timeline follow-back methods to maximize accuracy of estimated age-of-onset). Importantly, others have demonstrated that the age-of-onset distinction is fully accounted for by more clinically meaningful subtyping based on aggressive and rule-breaking behavior (Burt, Donnellan, Iacono, & McGue, 2011). Thus, subtyping based on other criteria (e.g., risk factor intensity) may be more proximal to use for diagnosis. This study aimed to present evidence relevant to these gaps in the literature, with one goal of assessing whether age-of-onset is the most appropriate and useful diagnostic tool for conduct disorder subtyping, particularly for clinicians who work with youth in high-risk populations.

Risk and Protective Factors for Conduct Problems

Risk and protective factors respectively exacerbate or alleviate the effects of existing stressors and are expected to differentiate LCP and AL subtypes. Treatment strategies to curb antisocial behavior typically include reducing risk factors and/or bolstering protective factors. Descriptions follow of the factors investigated here that are most relevant to Moffitt’s subtypes, with information about how these factors are likely to present in chronically stressed youth.

Social contagion

LCP youth are frequently rejected by normative peers and network with other rejected youth who exhibit antisocial behavior (Coie & Dodge, 1998). This may happen early on if youth have experienced physical and emotional abuse from parents, setting them up to be victimized by peers (Lev-Wiesel & Sternberg, 2012). AL youth, in contrast, often first engage in deviance after observing peers using antisocial behavior to ‘fit in’ or cope with stress (Moffitt et al., 1996). Thus, LCP youth are expected to have more delinquent peers

throughout the lifespan, whereas AL youths' number of deviant friends is expected to increase during adolescence. Deviant affiliations may be particularly detrimental if chronic abuse or other family stressors prevent the child from ever forming any healthy peer relationships, delinquent behavior results in expulsion (i.e., limiting contact with normative peers), or positive former friends begin to avoid a deviant peer, reducing his or her social acceptance. LCP youth may experience this bidirectional cycle multiple times as they distance themselves further from normative peers. AL youth tend to return to normative behavior in early adulthood, as they realize the negative effects of their behavior patterns on future goals (Moffitt et al., 1996).

School protection

Positive school performance is a potential protective factor against conduct problems, due to involvement with school activities and focus on achievement. However, school can be a place of estrangement for adolescents who fail to make these connections or have poor cognitive skills. Additionally, youth raised in intellectually poor or chaotic environments may be at a learning disadvantage early on, and their neighborhood schools may not be academically challenging (Evans & Kim, 2012). Moffitt (1993) theorized that poor school performance caused by neurological and cognitive deficits contributes to LCP conduct problems. However, improving academic skills does not always lead to reductions in antisocial behavior (Patterson, DeBaryshe, & Ramsey, 1989). AL youth may recognize the importance of school and reverse their behavior, potentially in time to permit access to higher education (Moffitt, 1993). LCP youth, on the other hand, are plagued by continuing barriers (e.g., lack of family support, likely no "college fund") that preclude their pursuit of an advanced degree.

Disinhibition and self-management

Although Moffitt (1993) originally posited that only LCP antisocial behavior results from disinhibition, more recent research suggests that AL youth may also share this risk factor at a subclinical level or only in a subset of individuals (Muscatello et al., 2014). In particular, adolescents under chronic stress may lack the support or skills needed to concentrate on difficult tasks and make long-term plans (e.g., applying to college), giving greater incentive to follow immediate impulses instead (Evans & Kim, 2012). Chronic stress seems to disrupt top-down emotional control and increase amygdala sensitivity to negative stimuli (Evans & Kim, 2012), increasing the likelihood that youth under stress may react impulsively to their problems (e.g., initiating a fight with a bully; lying to get out of trouble; running away from a stressful home). Thus, youth who lack positive coping strategies may respond with frustration, leading to anxiety, depression, and low self-esteem (Boyes, Hasking, & Martin, 2015) and perpetuating their estrangement from family, peers and institutions. LCP youth may not develop emotion regulation skills in childhood as a result of harsh parenting and poor relationships with peers, whereas AL youth may eventually pick up these skills or reduce their antisocial behavior in pursuit of their goals (Moffitt et al., 1996).

Family conflict and parental monitoring

Parents may skew offspring's perceptions of social bonds by using harsh and inconsistent discipline, limiting positive interactions, and inadequately monitoring the child (Patterson et

al., 1989). Poor coping may be modeled by stressed parents, and LCP youths' well-being may suffer as a result of parental neglect. Moffitt (1993) argued that family conflict is more likely to affect LCP than AL youth, and early family problems can deleteriously affect neural, intellectual, and social development, particularly if attempts at coping backfire or cause more turmoil in the home (Wadsworth, 2015). In contrast, AL youth may use deviant behavior as a means of escape from strict parents or family conflict, but they are more likely than LCP youth to learn adaptive coping methods, likely as a result of greater contact with normative peers and the much more likely prospect of leaving the home and going off to college or moving away to start a new job (Moffitt, 1993; Moffitt et al., 1996).

Sex Differences

Compared to boys, girls experience fewer childhood conduct problems, but their incidence increases during adolescence, suggesting a female-specific delayed-onset subtype of antisocial behavior (Silverthorn & Frick, 1999). Compared to girls, boys have more conduct problems that are likely to get noticed, including physical aggression, status offenses (e.g., underage alcohol use), and property offenses; girls are more prone to covert conduct problems such as shoplifting and fraud (Lahey et al., 2000). As a result, girls' conduct problems may fly under the radar, particularly if they are not recognized and diagnosed early on. However, the gap between male and female rates of delinquent behavior has narrowed over the past two decades, even for violent crimes (Hipwell & Loeber, 2006), suggesting that the incidence of conduct disorder diagnoses for girls may be on the rise over the next few decades.

Given these trends, it is important for researchers to identify clear intervention targets for girls with conduct problems. Although, as stated above, many conduct disordered girls do not develop problems until adolescence, some girls with conduct problems struggle to adapt to social situations and meet developmental milestones as early as preschool (Keenan & Shaw, 1997), which can have long-lasting consequences if left unchecked as the child matures. For example, Fergusson and Woodward (2000) reported that girls' conduct problems at age 13 correlated with poor academic performance, substance use, criminal offending, and internalizing and suicidal behavior and predicted negative outcomes at age 18. Notably, these findings were partially accounted for by childhood stressors (e.g., parental corporal punishment or substance use), indicating that chronic environmental risk factors are a key contributor to these poor outcomes.

Purpose of the Present Study

The present study prospectively tested in a chronically stressed sample (a) identification of Moffitt's theorized subtypes using a clinical tool and age-of-onset of conduct problems, (b) Moffitt's hypothesized differences between LCP and AL risk factors, and (c) the role of sex in distinguishing and intervening with LCP and AL youth. The study also tested differences between youth with and without conduct problems, both under chronic stress. The sample is fairly unique, as participants in previous applied studies were frequently clinic-referred (e.g., Barker & Maughan, 2009; Lahey, Loeber, Burke, & Rathouz, 2002) rather than guardian-referred. Thus, results may be salient for youth who are at high risk for conduct problems

but not receiving intervention. The sample also provides an opportunity to evaluate conduct problems longitudinally through middle childhood and adolescence, as many previous studies were limited to younger samples (e.g., Deater-Deckard, Wang, Chen, & Bell, 2012; Larsson et al., 2009). Finally, this study expands the literature by examining sex differences in risk factors.

We hypothesized that, in youth under chronic stress, both LCP and AL youth experience greater use of anger for coping, higher impulsivity, poorer planning and concentration skills, and poorer academic competency than Others (Hypothesis 1). Further, LCP youth are hypothesized to have greater anger coping, less academic competency, and greater family conflict compared to AL youth (Hypothesis 2). Additionally, LCP youth are expected to have more delinquent peers in childhood, whereas we predict that AL youth will experience a steeper increase in delinquent peers during adolescence (Hypothesis 3) and that a greater proportion of LCP youth will be male compared with the AL group (Hypothesis 4).

Method

Procedure and Participants

Additional information regarding the sample, assessment and other methods appears in Ridenour, Clark, and Cottler (2009) and Ridenour, Meyer-Chilenski, and Reid (2012). Data were originally collected from 2004 through 2010 as part of annual program evaluations that were required to receive state funding that supported the summer camp for 8- to 16-year-olds who were experiencing chronic stress. The portion of the weeklong camp schedule that was designed to build resilience involved each youth developing a plan to do something constructive over the following year for his/her family, community (e.g., school), and self. The plan was developed in collaboration with a camp counselor to ensure it would challenge the youth, consist of an attainable and desirable activity, and lead to meaningful benefits to the family, community and the youth). A secondary aim of the plan was to strengthen the youth's relationship with an adult mentor in the community, who received a copy of the plan and agreed to help the youth.

Youth who completed their plan earned the opportunity to attend camp the following summer. This resulted in a complex pattern of missing data in which participants entered the study at different ages, dropped out of the study at different ages, contributed varying lengths of data points, and may even have returned into the study after missing one or more years. Fortunately, latent class pattern mixture models can be (and were) used to compute age-related trajectories of each ALEXSA predictor while accounting for patterns of missingness among study participants (see Analyses). About 70% of campers from one year also attend camp the subsequent year.

The initial camp attendance was contingent upon a youth experiencing chronic stress. IRB approval was for de-identified data to be transferred to the second author, though open-ended applicant reports of stressors were maintained in camp records. Thus, the research team was unable to inspect participant records and camp staff scoring of the open-ended responses or contact participants to directly quantify their stress. Nevertheless, because camp funding was contingent upon the attendees experiencing significant long-term

stressors, camp staff used several steps to screen for youth experiencing chronic stress. An adult applied for camp attendance on a youth's behalf and described the source(s), duration and negative impact on functioning of the youth's stressor(s). Information was also collected from the youth's school personnel (e.g., teacher, psychologist) to corroborate the application and obtain additional information (e.g., academic performance, receiving mental health services, social functioning). Camp exclusion criteria consisted of physical and mental handicaps and history of arson or physical aggression; however, in self reports, 35.8% admitted to starting fights, 19.0% admitted to bullying and 13.3% admitted to "starting a fire where a fire was not supposed to be."

Youth experienced a mean 2.2 ($SD = 1.31$) stressors. Sources of chronic stress were categorized and rated by program staff as: low family income (55.3%), serious family problems (60.9%; e.g., an incarcerated or drug-addicted parent), social problems (57.9%; e.g., severe peer rejection), poor academic performance (50.8%), or emotional problems (57.3%; e.g., a mood disorder, although diagnoses were not made as part of this study). Income, family problems, and emotional problems were based on parental and school staff reports and scored as present or absent. Social problems ratings were based on research literature (Spangler and Gazelle, 2009) and scaled from one to seven with the two worst levels qualifying as chronic stress (the worst severity consisting of having few, if any, friendships and child is actively disliked by peer group). Likewise, poor academic performance comprised the worst two categories on a seven-point scale, which was based on school grades with the worst category consisting of failing grades in most subjects. The threshold used for camp qualification for social problems and academic performance were the worst two categories.

Between 2004 and 2010, 1,147 8- to 16-year-olds ($M = 11.8$, $SD = 1.64$) attended the summer camp. Following an IRB-approved protocol, during camp registration, youth and parents were informed of the assessment, research and opportunity to decline participation. Campers could withdraw before the evaluation, respond, "don't know," or refuse to answer any item. No parent declined participation, though one camper did (participation rate = 99.8%). On the third camp day, participants completed the ALEXSA in groups of 20–30 in a confidential fashion.

Participants were from urban, suburban and rural settings (although not measured per se) of a Northeastern U.S. state. Sample composition was 55.2% female; 73.4% Caucasian, 12.1% African-American, and 3.2% Latino (the rest being other or mixed identity); 26.6% received special education services. Sample prevalence was higher than the national prevalence for two or more conduct disorder criteria (47.6%), which have been demonstrated to be a better predictor of adult antisocial behavior than conduct disorder diagnosis (Ridenour, Cottler, Robins, Compton, Spitznagel, & Cunningham-Williams, 2002; Robins & Price, 1991).

Instrumentation

The *Assessment of Liability and EXposure to Substance Use and Antisocial Behavior*® (ALEXSA®; Ridenour et al., 2009) system was used during camp program evaluations to overcome challenges of poor reading abilities, youth inattention and perceived confidentiality and to quickly measure a breadth of risk factors. The ALEXSA is an

illustration-based, audio computer-assisted interview that provides a youth report of predictors and early forms of behavior problems (Ridenour et al., 2009; 2011, Ridenour & Feinberg, 2007).

The ALEXSA's psychometric properties, including test-retest reliability, concurrent validity, and construct validity, support its use for ages 6–16 (Chilenski, Ridenour, Whitworth-Bequette, & Caldwell, 2015; Ridenour & Feinberg, 2007; Ridenour et al., 2009; 2011, 2012). Of relevance to this study, the Conduct Disorder Criteria subscale consisted of 12 items based on DSM-IV criteria (Cronbach's α in this sample = .85). Items were rated dichotomously (yes or no) and questions were framed from a lifetime perspective (e.g., "have you ever broken into someone else's house or building"). Behaviors assessed by this subscale included breaking curfew, damaging property, lying, skipping school, stealing, starting a fight, intimidating someone, and breaking and entering, among others. The following subscales from the ALEXSA were analyzed (with their α in the present sample): Friends' Conduct Disorder Criteria (.89, 8 items), Peer Pressure Susceptibility (.73, 4 items), Academic Competency (.62, 6 items), School Commitment (.42, 2 items), Anger Coping or the tendency to cope with frustration by getting angry (.81, 6 items), Distractibility (.76, 5 items), Impulsivity (.74, 6 items), Planning and Concentration (.55, 7 items), Problem Solving (.65, 6 items), Family Conflict (.82, 10 items), and Parental Monitoring (.74, 6 items). Information about these scales and their properties has been previously published (Ridenour et al., 2012). In the Ridenour et al. (2012) student sample, the I.C.C. estimates of 1.5-week test-retest reliability were .69 for Conduct Disorder Criteria, .82 for Friends' Conduct Disorder Criteria, .75 for Peer Pressure Susceptibility, .76 for Academic Competency, .57 for School Commitment, .58 for Anger Coping, .74 for Distractibility, .60 for Impulsivity, .66 for Planning and Concentration, .70 for Problem Solving, .78 for Family Conflict, and .74 for Parental Monitoring (.39 or less = low; .40 to .59 = fair; .60 to .74 = good; greater than .74 = excellent; Cicchetti, 1994).

Age-of-onset criteria were used to categorize participants into LCP or AL subgroups because pubertal status data (the criterion proposed by Moffitt) were not collected, clinicians refer to age-of-onset more frequently than pubertal status, and Diagnostic and Statistical Manual (DSM) conduct disorder subtypes are age-based. For subgroup assignments, the pattern of onset (two or more conduct disorder behaviors) had to clearly fit an age-of-onset pattern of LCP or AL or neither (no conduct problem behaviors). Age-of-onset was based on the age of the second behavior because age of the first has been reported to be unreliable and have poor predictive validity (Sanford et al., 1999). Moreover, receiver operating characteristic curves have demonstrated that compared to DSM diagnosis (three behaviors required), two behaviors better predict adult antisocial personality (Ridenour et al., 2002; Robins & Price, 1991).

Participants were categorized into LCP if they reported 2 or more different conduct disorder behaviors before age 11 in girls and age 12 in boys. Slightly older ages than DSM's threshold of 10 were used (a) to err on the side of including all youth with LCP in that category, (b) based on sex-specific population average age of pubertal onset (Sun et al., 2002), and (c) for consistency with past studies (e.g., Lahey et al., 1998). Those categorized

as AL reported two or more conduct disorder behaviors onset after age 10 in girls and age 11 in boys.

Participants were included only if they could clearly be assigned to either the LCP or AL group (211 were excluded). To illustrate, boys (girls) whose data were only from ages 12 (11) or younger who had one or zero conduct disorder criteria were excluded (because LCP or AL could onset at later ages). Moreover, at least one wave of data was required for boys/girls during ages 12–16/11–16 (to distinguish onset) and assignment to the Non-AB subgroup group required a report of no conduct problems at any age (i.e., those reporting only one conduct disorder criterion were excluded).

The resultant subgroup sample sizes were Non-AB = 451, AL = 121, and LCP = 364. For trajectory analyses, participants were additionally required to have been assessed in three or more years of the study (to detect curvilinear growth), resulting in sample sizes of 91 for Non-AB, 85 for AL youth, and 96 for LCP youth. Participants with three or more observations closely resembled those with fewer observations (Ridenour et al., 2012).

Analyses

Hierarchical linear modeling analyses were conducted using SAS's Proc Mixed with final model estimates in Mplus to account for the complex missing data pattern. Competing error covariance structures, time-related trends, and parameters were first statistically determined using maximum likelihood estimation; each element was tested individually for improvement to model fit using traditional fit statistics (AIC, BIC, likelihood-ratio χ^2). Improved fit to the data was tested for each step in the model building process so that nested models could be compared (see example in Table 3). After determining the best fitting model, the model parameters were derived in Mplus using restricted maximum likelihood estimation to avoid potential bias that might occur from full maximum likelihood in smaller samples.

To quantify subgroup differences and test the fit of interactions, a variable (AB Type) was used in which LCP=2, AL=1, and Non-AB=0, based on overall pattern of mean subgroup differences in risk factors (see Table 1). As mentioned, prior to testing for subgroup effects, age (linear change over time), age² (quadratic change over time), sex, and age*sex terms were tested for fit to determine how these factors best accounted for within-person trends over time. After testing for subgroup differences, interactions between subgroups, sex and age were tested. Model fit results are not reported here due to space limitations but are available upon request.

Detailed descriptions of the trajectory analysis techniques used to test for missing data patterns were presented by Ridenour et al. (2012). Each trajectory consisted of a two-level hierarchical model (within individual observations at the lower level) with maximum likelihood estimation. The sample was extensively tested for the pattern of missing data in terms of age, sex, types of parents and their parenting, sources of chronic stress, race/ethnicity, age distributions, prevalence of alcohol and tobacco use, conduct disorder criteria, gambling behavior and risk factors. Results suggested that missing data were consistent with MCAR or at least MAR. Trajectory analyses tested for differences between antisocial

behavior subgroups and sexes, linear and quadratic effects of age, and interactions between subgroups with age or sex. Ridenour et al. (2012) also detailed the latent class pattern mixture model that accounted for the complex pattern in missing data among participants. In this statistical model, missing observations may occur before, after or even between study participation times (Morgan-Lopez and Fals-Stewart, 2007; Roy, 2003), as had occurred with the present study participants. To ensure that any individual camper's data reflect the shape of an age-related trajectory, data were only included in analyses if the camper had contributed three or more time points. The same pattern mixture model that was used by Ridenour et al. (2012) was used in the present analyses.

Results

Table 1 shows ANOVA comparisons among the LCP, AL, and Non-AB peer groups at time of study entry. As predicted by Hypothesis 4, the majority (70.3%) of LCP youth were male, in contrast to other groups, and they entered the study at a slightly younger age than Non-AB. Males generally met more criteria for conduct disorder than females, and LCP youth met more criteria than AL youth, who met more criteria than Non-AB (see Figure 1). Bivariate Pearson correlations among age and risk factors at participants' entry into the study appear in Table 2. Best fitting models resulting from mixed model trajectory analysis are presented with corresponding figures Figs. 2–7. Table 3 illustrates the process used for testing model fit, with the final model results appearing in Figure 1. First, the unconditional trajectory of the variable in a figure (e.g., conduct disorder) was delineated in terms of intercept and slope, accounting for error covariance structure. Then, differences between genders, AB Types, and their interaction, were tested one at a time with terms not attaining $p < .05$ being dropped from the model.

Overall, results were consistent with LCP youth experiencing greatest levels of risk, and AL youth experiencing greater risk than the Non-AB subtype, regardless of the specific factor. When there were differences among the AB subtypes' trajectory slopes across age, the slope direction tended to be similar across AB subtypes with risk accelerating the most for LCP youth and next for AL youth. One exception was anger coping, in which LCP and AL youth's trajectories converged toward the Non-AB youth, only partially consistent with Hypotheses 1 and 2. Problem solving was equivalent among AB subtypes at younger ages (perhaps due partly to poorer insight among LCP and AL youth). Of the risk factor trajectories with curvilinear growth, each suggested accelerating increase in risk between ages 10 and 12. The largest change occurs for parental monitoring which increases from age 8 to 11 and decreases thereafter for all groups.

Males reported greater levels of conduct disorder criteria, with differences being greatest for LCP youth, then AL youth, and very little difference between males and females in the Non-AB subtype. Consistent with large epidemiological samples, growth in antisocial behavior accelerated in all subtypes soon after age 12. Among the risk factors, males had greater risk than females associated with friends' conduct disorder criteria whereas females had greater risk associated with distractibility, poor problem solving, and family conflict. Although statistical differences were found for more factors associated with females' risk, the largest of the gender differences was friends' conduct disorder criteria. The risk factors that

changed the most with age were increasing friends' conduct disorder criteria and peer pressure susceptibility as well as decelerating school commitment and problem solving.

Discussion

Results were somewhat consistent with our hypotheses based on Moffitt's taxonomy. Hypothesis 1 was mostly supported; LCP youth differed significantly from Non-AB youth on anger coping, impulsivity, planning and concentration, and academic competency, but AL youth only differed statistically from Non-AB youth on the last two out of these four constructs. Hypothesis 2 was mostly not supported, as LCP youth only differed significantly from AL youth on anger coping. Hypothesis 3 was not supported, as LCP and AL youth had similar trajectories of increasing numbers of friends who met conduct disorder criteria. Hypothesis 4, which posited that the LCP group would have a higher proportion of males compared with the AL group, was supported.

Overall Group Differences

Significant differences were found between Non-AB youth and at least one AB subtype on every variable studied. The only factor on which Non-AB did not differ statistically from LCP youth was problem solving. Consistent with hypotheses, Non-AB youth statistically differed from AL youth on fewer risk factors: academic competency, distractibility, family conflict, parental monitoring, planning and concentration, and problem solving. LCP and AL youth differed on social contagion, disinhibition, and planning and concentration.

Specific Risk Factors

Social contagion—LCP youth's greater numbers of friends' conduct disorder symptoms and susceptibility to peer pressure indicate that LCP youth may seek friends who are like them or simply associate with them due to being rejected by normative peers (Madden, Bucholz, Todorov, Grant, & Heath, 2002). It is notable and surprising that social contagion did not differentiate between AL youth and Non-AB youth in our sample, given the prior implication that social influences predominate in AL (Moffitt et al., 1996). As mentioned, peer influence may not be the most salient factor in the development of AL conduct problems, at least among chronically stressed youth (who, again, are at a disadvantage for seeking out and befriending positive peers). This finding concurs with research on positive outcomes of group treatment when groups are composed purely of high-risk youth (Mager, Millich, Harris, & Howard, 2005).

School protection—Both LCP and AL youth demonstrated lower academic competency than Non-AB youth. In addition, LCP youth reported lower school commitment than Non-AB youth. These findings suggest that although both groups clearly suffer a reduction in competency compared with Non-AB youth, LCP youth may experience more intense or pervasive academic problems than AL youth; this, in turn, may reduce the perceived connection to school for LCP youth and impact their belief that school is necessary or beneficial. AL youth, as suggested above, may try to maintain or improve their grades in pursuit of higher education or a career.

Disinhibition and self-management—LCP youth were more likely than Non-AB youth to use anger to cope, be distracted and impulsive, and have poor planning and concentration. AL youth demonstrated greater distractibility and poorer self-management than Non-AB youth. These findings lend partial support to previous findings that implicate cognitive deficits and emotion dysregulation in LCP conduct problems (Moffitt, 1993). However, AL youth also demonstrated some difficulties compared to Non-AB youth, suggesting that their conduct problems may be more affected by poor executive functioning than previously suggested, although likely at a lower intensity and in fewer domains (i.e., acting out in class due to boredom, or engaging in deviant behavior to relieve frustration) than those demonstrated by youth in the LCP group. Additionally, these results speak to high potential for comorbidity between Attention-Deficit/Hyperactivity Disorder (ADHD) and conduct disorder in youth under chronic stress.

Family conflict and parental monitoring—The LCP and AL groups did not differ on family risk factors but had more dysfunctional behaviors related to family conflict and lower parental monitoring compared to Non-AB youth. Our findings may reflect the decreased ability of parents to watch over their children's behavior as youth autonomy increases, which may allow other conduct symptoms to occur (e.g., juvenile delinquency and criminal activity) and lead to parent-child or parent-spouse clashes. These findings were in contrast to Hypothesis 2 and prior literature, which suggested that family conflict was more salient for LCP than AL youth. However, they imply that family factors are essential in the development of conduct problems among chronically stressed youth, perhaps by laying a foundation for other stressors to develop.

Age-Related Trends

For all groups, academic competency, anger coping and self-management declined with age. Impulsivity and distractibility increased with age. School commitment and parental monitoring declined and family conflict worsened around ages 10–11, suggesting entry into middle school as a critical point for intervention among all three groups. Although some changes are normative at this age (e.g., lessening parental monitoring) and some suggest positive growth (e.g., using anger less for coping), most of them seem to be linked with problematic behaviors for stressed youth and suggest a need for prevention efforts. In particular, chronically stressed youth may struggle to respond to increasingly complex tasks, which is exacerbated by reductions in parental involvement (e.g., transitioning from being in after-school care to staying at home independently as a “latchkey kid”) and distancing from or reduced interest in academic pursuits. Without proper support, these youth may be at risk of dropping out of school before graduation, setting them up for negative consequences and continued stress and struggles in adulthood. However, as demonstrated by the Non-AB peer group in our sample, with proper intervention youth under chronic stress may still avoid the problems evidenced by our two antisocial groups.

Sex Differences

Girls had worse problem solving skills than boys, and distractibility and family conflict were greater for females, echoing prior research in which family conflict was implicated in girls' conduct problems (Keenan et al., 1999). Males had greater numbers of friends with more

conduct disorder behaviors than females, and we consequently suggest that social contagion may be more salient among boys than girls under chronic stress. That is, perhaps boys look more to peers when struggling to cope with stress for a potential outlet, which may cause them to engage in delinquent behavior. Girls, on the other hand, seem to struggle with problem solving, and their lack of family stability may leave them without anyone to consult for help. These differential risk factor presentations also reflect the higher proportion of boys in the LCP group, which is affected more heavily by delinquent peer influences compared with the other groups. Our findings here indicate some need for sex specificity in determining intervention targets; however, they do not suggest any need for wholly separate diagnostic or intervention protocols based on sex.

Strengths and Limitations

One major strength of this study is that the data came from a sample of chronically stressed youth. Given the relationship between stress and conduct problems, these findings have important implications for prevention and treatment in this population. These data permitted the examination of pre-adolescent youth (i.e., ages 8 to 10 or 11) and comparison of risk factors for boys and girls. The use of a sample of camp attendees provided a unique opportunity to obtain self-report data from a population not always captured in traditional clinic-based interventions.

It is important to note that participants were not diagnostically assessed for conduct disorder. Relatedly, the Conduct Disorder Criteria subscale used to categorize participants contains items more typical of adolescent behaviors than younger child behaviors, potentially impacting our groupings. In addition, small samples were analyzed for each longitudinal trend, resulting in large confidence intervals. Some constructs (namely those in the School Protection and Self-Management domains) had low alpha values due to the low number of items included in these subscales. Also, although parents and teachers of participants confirmed their experience with chronic stressors, participants were not queried about having *feelings* of stress, so the presence of emotional stress was only inferred. Future research on this topic could augment these findings by collecting data from larger disordered samples, particularly that which goes beyond the sole use of self-report measures, and soliciting direct information from participants about perceived stress, though notably many other studies we reviewed also utilized proxies in lieu of reported stress. Furthermore, more nuanced trends may be revealed in future studies when this study's subgroups are further divided (e.g., by region or one risk factor in the presence of another) or when comorbidities are more directly addressed (e.g., the role of ADHD in conduct disorder).

Concluding Remarks

Social contagion, anger coping, impulsivity, and school commitment emerged as the key factors that differentiated LCP youth from other groups. For AL youth, problem solving was this key factor. On other factors (academic competency, distractibility, planning and concentration, and family factors), the pattern of findings suggests that LCP and AL youth both struggle relative to Non-AB youth, with LCP youth simply having more intense or pervasive interference in these domains compared with AL youth. The LCP youth pattern is characterized by disengagement from normative social institutions, deficits in emotion

regulation, and limited coping skills; peer pressure susceptibility also increased at an earlier age for these youth compared to Non-AB youth. These factors suggest the presence of long-term effects of cognitive deficits, distancing from school and peers, and lack of exposure to helpful coping skills. In contrast, AL youth seem to struggle in a more temporary sense with resolving problems, suggesting that they are likely to develop more effective problem-solving skills eventually and are therefore less susceptible to chronic patterns of problem behavior observed among LCP youth. Motivation to develop these skills may come from a desire for positive adult outcomes, which could be damaged if antisocial behavior patterns persist (Moffitt, 1993; Moffitt et al., 1996). Our findings also suggested that risk levels tend to worsen over time for chronically stressed youth; this implies that the experience of chronic stress elevates the potential for antisocial behavior to develop via multiple sources of risk. However, results also imply that youth who develop positive connections and good coping skills, likely through sustained efforts by adults in their lives, may escape this risk. Additionally, some sex differences emerged with relevance to subtype differences, providing support for sex-specific intervention tactics.

Interestingly, these findings indicate that family dysfunction, executive functioning, and academic competency may not be the most reliable factors for clearly distinguishing between conduct disorder subtypes, as previously proposed (Moffitt, 1993; Moffitt et al., 2002; Patterson et al., 1989). In addition, our results support the notion that age-of-onset provides information about the duration of conduct problems but it alone does not adequately characterize key differences in the subtypes or provide a sufficient basis for informed intervention. As suggested here, assessment based on differences in risk and protective factors or symptoms would likely provide additional meaningful clinical information to further specify these interventions (Burt et al., 2011). Also, research on the chronicity of problems and spillover into multiple domains of interference would help elucidate the long-term differences in LCP vs. AL behavior patterns. However, age-of-onset may still help providers illuminate and track rises and falls in patterns of antisocial behavior based on the emergence of new stressors or intensifying of chronic stressors.

These findings should be considered in creating cost-effective programs that target conduct disorder, perhaps with a focus on levels of risk or chronicity of problems rather than risk and protective factor presentations separated by subtype. Early and maximally effective intervention is particularly critical for high-risk youth who, like our participants, are affected by chronic stress. The most likely method for accessing youth not being served by clinic-based interventions would be to target them through existing individual (e.g., guidance counseling) or family services (e.g., community mental health centers). Given the level of interference caused by chronic stress, these agencies are encouraged to seek brief, simple, and cost-effective techniques that would be beneficial for early intervention. LCP youth may benefit from exploring after-school activities that would connect them with positive peers, improve their attitude about school, and teach them positive ways to cope with risky impulses. AL youth may benefit from academic support, family therapy, and training to improve problem-solving skills. Stressed youth without conduct problems would still benefit from being taught coping skills and being encouraged to pursue positive goals through strong connections with supportive others. Overall, our results indicate that while chronic stress elevates the risk of developing conduct problems, these difficulties are not inevitable

given early and targeted intervention, which will be enhanced by further research focused directly on chronically stressed populations.

Acknowledgments

This research was funded in part by grants from the National Institute on Drug Abuse (K01-00434, P50-05605, R41-022127) and the Pennsylvania State University Children, Youth, and Families Consortium.

Additionally, the authors wish to disclose a conflict of interest: Ty A. Ridenour's spouse owns the copyright to the ALEXSA, which was used in this study.

References

- Armstrong TD, Costello EJ. Community studies on adolescent substance use, abuse, or dependence and psychiatric comorbidity. *Journal of Consulting and Clinical Psychology*. 2002; 70(6):1224–1239. DOI: 10.1037/0022-006X.70.6.1224 [PubMed: 12472299]
- Barker ED, Maughan B. Differentiating early-onset persistent versus childhood-limited conduct problem youth. *American Journal of Psychiatry*. 2009; 166(8):900–908. DOI: 10.1176/appi.ajp.2009.08121770 [PubMed: 19570930]
- Boyes ME, Hasking PA, Martin G. Adverse life experience and psychological distress in adolescence: Moderating and mediating effects of emotion regulation and rumination. *Stress and Health*. 2015; 32(4):402–410. DOI: 10.1002/smi.2635 [PubMed: 25764473]
- Burt SA, Donnellan MB, Iacono WG, McGue M. Age-of-onset or behavioral subtypes? A prospective comparison of two approaches to characterizing the heterogeneity within antisocial behavior. *Journal of Abnormal Child Psychology*. 2011; 39(5):633–644. DOI: 10.1007/s10802-011-9491-9 [PubMed: 21298333]
- Chilenski SM, Ridenour TA, Whitworth-Bequette A, Caldwell L. Testing the link between free time and adolescent delinquency and substance use. *Journal of Negro Education*. 2015; 84:401–415.
- Cicchetti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment*. 1994; 6:284–290. DOI: 10.1037/1040-3590.6.4.284
- Coie, JD., Dodge, KA. Aggression and antisocial behavior. In: Damon, W., Eisenberg, N., editors. *Handbook of child psychology: Social, emotional, and personality development*. 5th. Vol. 3. New York: Wiley; 1998. p. 779-862.
- Deater-Deckard K, Wang Z, Chen N, Bell MA. Maternal executive function, harsh parenting, and child conduct problems. *Journal of Child Psychology and Psychiatry*. 2012; 53(10):1084–1091. DOI: 10.1111/j.1469-7610.2012.02582.x [PubMed: 22764829]
- Evans GW, Kim P. Childhood poverty, chronic stress, self-regulation, and coping. *Child Development Perspectives*. 2012; 7(1):43–48. DOI: 10.1111/cdep.12013
- Fergusson DM, Woodward LJ. Educational, psychosocial, and sexual outcomes of girls with conduct problems in early adolescence. *Journal of Child Psychology and Psychiatry*. 2000; 41(6):779–792. DOI: 10.1111/1469-7610.00665 [PubMed: 11039690]
- Hipwell AE, Loeber R. Do we know which interventions are effective for disruptive and delinquent girls? *Clinical Child and Family Psychology Review*. 2006; 9(3/4):221–255. DOI: 10.1007/s10567-006-0012-2 [PubMed: 17139554]
- Keenan K, Loeber R, Green S. Conduct disorder in girls: A review of the literature. *Child Clinical and Family Psychology Review*. 1999; 2(1):3–19.
- Keenan K, Shaw D. Developmental and social influences on young girls' early problem behavior. *Psychological Bulletin*. 1997; 121(1):95–113. DOI: 10.1037/0033-2909.121.1.95 [PubMed: 9000893]
- Lahey BB, Loeber R, Burke J, Rathouz PJ. Adolescent outcomes of childhood conduct disorder among clinic-referred boys: Predictors of improvement. *Journal of Abnormal Child Psychology*. 2002; 30(4):333–348. [PubMed: 12108765]

- Lahey BB, Loeber R, Quay HC, Applegate B, Shaffer D, Waldman I, Bird HR. Validity of DSM-IV subtypes of conduct disorder based on age of onset. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1998; 37(4):435–442. DOI: 10.1097/00004583-199804000-00022 [PubMed: 9549965]
- Lahey BB, Schwab-Stone M, Goodman SH, Waldman ID, Canino G, Miller TL, Jensen PS. Age and gender differences in oppositional behavior and conduct problems: A cross-sectional household study of middle childhood and adolescence. *Journal of Abnormal Psychology*. 2000; 109(3):488–503. DOI: 10.1037/0021-843X.109.3.488 [PubMed: 11016118]
- Larsson B, Fossum S, Clifford G, Drugli MB, Handegård BH, Mørch WT. Treatment of oppositional defiant and conduct problems in young Norwegian children: Results of a randomized controlled trial. *European Child and Adolescent Psychiatry*. 2009; 18(1):42–52. DOI: 10.1007/s00787-008-0702-z [PubMed: 18563473]
- Lev-Wiesel R, Sternberg R. Victimized at home revictimized by peers: Domestic child abuse a risk factor for social rejection. *Child and Adolescent Social Work Journals*. 2012; 29(3):203–220. DOI: 10.1007/s10560-012-0258-0
- Madden PA, Bucholz KK, Todorov AA, Grant JD, Heath AC. The assessment of peer selection and peer environmental influences on behavior using pairs of siblings or twins. *Twin Research*. 2002; 5:38–43. [PubMed: 11893280]
- Mager W, Milich R, Harris MJ, Howard A. Intervention groups for adolescents with conduct problems: Is aggregation harmful or helpful? *Journal of Abnormal Child Psychology*. 2005; 33(3):349–362. DOI: 10.1007/s10802-005-3572-6 [PubMed: 15957562]
- Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*. 1993; 100(4):674–701. DOI: 10.1037/0033-295X.100.4.674 [PubMed: 8255953]
- Moffitt TE, Caspi A. Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Development & Psychopathology*. 2001; 13:355–375. DOI: 10.1017/S0954579401002097 [PubMed: 11393651]
- Moffitt TE, Caspi A, Dickson N, Silva P, Stanton W. Childhood-onset versus adolescent-onset antisocial conduct problems in males: Natural history from ages 3 to 18 years. *Development and Psychopathology*. 1996; 8:399–424. DOI: 10.1017/S0954579400007161
- Moffitt TE, Caspi A, Harrington H, Milne BE. Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. *Developmental and Psychopathology*. 2002; 14:179–207. DOI: 10.1017/S0954579402001104
- Moffitt TE, Arseneault L, Jaffee SR, Kim-Cohen J, Koenen KC, Odgers CL, Viding E. Research review: DSM-V conduct disorder: Research needs for an evidence base. *Journal of Child Psychology and Psychiatry*. 2008; 49(1):3–33. DOI: 10.1111/j.1469-7610.2007.01823.x [PubMed: 18181878]
- Morgan-Lopez AA, Fals-Stewart W. Analytic modeling longitudinal data from rolling therapy groups with membership turnover. *Journal of Consulting and Clinical Psychology*. 2007; 75:580–593. [PubMed: 17663612]
- Muscatello MRA, Scimeca G, Pandolfo G, Micò U, Romeo VM, Mallamace D, Bruno A. Executive functions and basic symptoms in adolescent antisocial behavior: A cross-sectional study on an Italian sample of late-onset offenders. *Comprehensive Psychiatry*. 2014; 55:631–638. DOI: 10.1016/j.comppsy.2013.11.015 [PubMed: 24405775]
- Patterson GR, DeBaryshe BD, Ramsey E. A developmental perspective on antisocial behavior. *American Psychologist*. 1989; 44(2):329–335. DOI: 10.1037/0003-066X.44.2.329 [PubMed: 2653143]
- Ridenour TA, Clark DB, Cottler LB. The illustration-based *Assessment of Liability and EXposure to Substance Use and Antisocial Behavior* for children. *The American Journal of Drug and Alcohol Abuse*. 2009; 32:242–252.
- Ridenour TA, Cottler LB, Robins LN, Compton WM, Spitznagel EL, Cunningham-Williams RM. Test of the plausibility of adolescent substance use playing a causal role in developing adulthood antisocial behavior. *Journal of Abnormal Psychology*. 2002; 111:144–155. [PubMed: 11866167]

- Ridenour TA, Feinberg ME. Using correlational analyses to improve prevention strategies based on survey data from youth. *Evaluation and Program Planning*. 2007; 30:36–44. DOI: 10.1016/j.evalproplan.2006.10.007 [PubMed: 17410278]
- Ridenour TA, Meyer-Chilenski S, Reid EE. Developmental momentum toward substance dependence: Natural histories and pliability of risk factors in youth experiencing chronic stress. *Drug and Alcohol Dependence*. 2012; 123S:S87–S98. DOI: 10.1016/j.drugalcdep.2011.12.016
- Ridenour TA, Minnes S, Maldonado-Molina MM, Clark DB, Tarter RE, Reynolds MD. Psychometrics and cross-cultural comparisons of the illustration-based assessment of liability and exposure to substance use and antisocial behavior for children. *Open Journal of Family Studies*. 2011; 4(Suppl 1-M2):17–26. DOI: 10.2174/1874922401104010017
- Robins LN, Price RK. Adult disorders predicted by childhood conduct problems: Results from the NIMH Epidemiologic Catchment Area project. *Psychiatry: Interpersonal and Biological Processes*. 1991; 54(2):116–132.
- Roy J. Modeling longitudinal data with nonignorable dropouts using a latent dropout class model. *Biometrics*. 2003; 59:829–836. <http://dx.doi.org/10.1111/j.0006-341X.2003.00097.x>. [PubMed: 14969461]
- Sanford M, Boyle MH, Szatmari P, Offord DR, Jamieson E, Spinner M. Age-of-onset classification of conduct disorder: Reliability and validity in a prospective cohort study. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1999; 38(8):992–999. DOI: 10.1097/00004583-199908000-00015 [PubMed: 10434491]
- Silverthorn P, Frick PJ. Developmental pathways to antisocial behavior: The delayed-onset pathway in girls. *Development and Psychopathology*. 1999; 11:101–126. DOI: 10.1017/S0954579499001972 [PubMed: 10208358]
- Spangler T, Gazelle H. Anxious solitude, unsociability and peer exclusion in middle childhood: A multitrait-multimethod matrix. *Social Development*. 2009; 18:833–856. <http://dx.doi.org/10.1111/j.1467-9507.2008.00517.x>.
- Sun SS, Schubert CM, Chumlea WC, Roche AF, Kulin HE, Lee PA, Ryan AS. National estimates of the timing of sexual maturation and racial differences among U.S. children. *Pediatrics*. 2002; 110(5):911–919. [PubMed: 12415029]
- Tibbetts SG, Piquero AR. The influence of gender, low birth weight, and disadvantaged environment in predicting early onset of offending: A test of Moffitt's interactional hypothesis. *Criminology*. 1999; 37(4):843–877. DOI: 10.1111/j.1745-9125.1999.tb00507.x
- Wadsworth ME. Development of maladaptive coping: A functional adaptation to chronic, uncontrollable stress. *Child Development Perspectives*. 2015; 9(2):96–100. DOI: 10.1111/cdep.12112 [PubMed: 26019717]

Highlights

- This study examined clinical utility of age-of-onset in conduct disorder diagnosis.
- A sample of chronically stressed youth provided data via computerized assessment.
- We suggest age-of-onset is inadequate on its own for distinguishing the subtypes.
- Sex differences were noted, but sex-specific diagnoses were not suggested.
- Implications for effective intervention with high-risk youth are discussed.

Figure 1.

Results of mixed models trajectory analysis for conduct disorder criteria. Note: The statistical model was $\text{Conduct Disorder Criteria} = 4.01 - 0.75(\text{Age}) + 0.04(\text{Age}^2) - 0.06(\text{Female}) + 0.36(\text{AB Type}) + 0.07(\text{Age} * \text{AB Type}) + 0.36(\text{Female} * \text{AB Type})$.

(a)

(b)

Figure 2.

Results of mixed model trajectory analyses for (a) friends' conduct disorder criteria and (b) peer pressure susceptibility. Note: The statistical model for (a) was Friend's Conduct Disorder Criteria = $0.37 + 0.12(\text{Female}) + 2.52(\text{AB Type}) - 0.42(\text{Age} * \text{AB Type}) + 0.02(\text{Age}^2 * \text{AB Type})$. The statistical model for (b) was Peer Pressure Susceptibility = $1.64 - 0.30(\text{Age}) + 0.01(\text{Age}^2) - 0.01(\text{AB Type}) + 0.002(\text{Age}^2 * \text{AB Type})$.

(a)

(b)

Figure 3.

Results of mixed model trajectory analyses for (a) academic competency and (b) school commitment. Note: The statistical model for (a) was Academic Competency = $3.19 - 0.07(\text{AB Type}) - 0.02(\text{Age})$. The statistical model for (b) was School Commitment = $0.35 + 0.31(\text{Age}) - 0.01(\text{Age}^2) + 0.07(\text{AB Type}) - 0.002(\text{Age}^2 * \text{AB Type})$.

Figure 4.

Results of mixed model trajectory analyses for (a) anger coping, (b) distractibility, and (c) impulsivity. Note: The statistical model for (a) was $\text{Anger Coping} = 1.00 + 0.42(\text{Age}) + 0.49(\text{AB Type}) - 0.02(\text{Age} * \text{AB Type})$. The statistical model for (b) was $\text{Distractibility} = 0.46 + 0.04(\text{Age}) - 0.08(\text{Female}) + 0.27(\text{AB Type})$. The statistical model for (c) was $\text{Impulsivity} = 0.85 + 0.02(\text{Age}) + 0.21(\text{AB Type})$.

(a)

(b)

Figure 5.

Results of mixed model trajectory analyses for (a) planning and concentration and (b) problem solving. Note: The statistical model for (a) was Planning and Concentration = $2.58 - 0.05(\text{Age}) - 0.20(\text{AB Type})$. The statistical model for (b) was Problem Solving = $1.85 - 0.21(\text{Age}) - 0.05(\text{Female}) + 0.27(\text{AB Type}) - 0.04(\text{Age} * \text{AB Type})$.

Figure 6.

Results of mixed model trajectory analysis for family conflict. Note: The statistical model was $\text{Family Conflict} = 0.35 - 0.09(\text{Age}) + 0.005(\text{Age}^2) + 0.05(\text{Female}) + 0.10(\text{AB Type})$.

Figure 7.

Results of mixed model trajectory analysis for parental monitoring. Note: The statistical model was Parental Monitoring = $-0.23 + 0.46(\text{Age}) - 0.02(\text{age}^2) - 0.001 (\text{Age}^2 * \text{AB Type})$.

Table 1

Comparisons between LCP, AL and Non-AB Subgroups at Entry into the Study

Risk Factor	LCP (n=364)	AL (n=121)	Non-AB (n=451)	Familywise p-value *
Gender (male)	70.3% ^{A,B}	37.2% ^A	37.7% ^B	<.0001
Age *	9.66 (1.11) ^{A,B}	11.21 (1.44) ^A	11.20 (1.89) ^B	<.0001
Free School Lunch	60.1%	57.8%	56.2%	.54
Receiving Special Education	32.4%	23.7%	31.9%	.18
Lives with 2 Biological Parents	40.4%	34.7%	38.1%	.52
Social Contagion Domain				
Friends' Conduct Disorder Criteria *	1.23 (1.27) ^{A,B}	.57 (.94) ^A	.44 (.82) ^B	<.0001
Peer Pressure Susceptibility *	.48 (.67) ^{A,B}	.28 (.43) ^A	.20 (.29) ^B	<.0001
School Protection Domain				
Academic Competency	2.88 (.52) ^A	2.87 (.54) ^B	3.00 (.48) ^{A,B}	.0015
School Commitment	1.85 (.80) ^A	2.00 (.69)	2.08 (.74) ^A	<.0001
Disinhibition Domain				
Anger Coping *	2.05 (.71) ^{A,B}	1.59 (.44) ^A	1.48 (.43) ^B	<.0001
Distractibility *	1.38 (.75) ^{A,B}	1.11 (.65) ^{A,C}	.91 (.65) ^{B,C}	<.0001
Impulsivity	1.42 (.70) ^{A,B}	1.15 (.64) ^A	1.05 (.68) ^B	<.0001
Self Management Domain				
Planning & Concentration	1.67 (.54) ^{A,B}	1.86 (.53) ^{A,C}	1.98 (.52) ^{B,C}	<.0001
Problem Solving	1.55 (.59)	1.49 (.58) ^A	1.64 (.65) ^A	.0227
Family Discord Domain				
Family Conflict *	.25 (.29) ^A	.30 (.32) ^B	.43 (.33) ^{A,B}	<.0001
Parent Fortification Domain				
Parental Monitoring	2.11 (.70) ^A	2.28 (.63) ^B	2.34 (.67) ^{A,B}	<.0001

Note: Corresponding alphabetic superscripts indicate which subgroups differed statistically ($p < .01$) on a specific variable.* Familywise p-value was computed using Welch's test due to significant heterogeneity of variance between subgroups ($p < .01$).

Table 2

Pearson Correlations Among Study Characteristics at Entry into the Study

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	1.0											
2. Friends' Conduct Disorder Criteria*	-.19 ^B	1.0										
3. Peer Pressure Susceptibility*	-.06	.27 ^B	1.0									
4. Academic Competency	-.07	.01	-.08 ^A	1.0								
5. School Commitment	.05	-.14 ^B	-.31 ^B	.23 ^B	1.0							
6. Anger Coping*	-.12 ^B	.27 ^B	.37 ^B	-.13 ^B	-.21 ^B	1.0						
7. Distractibility*	.03	.11 ^B	.24 ^B	-.36 ^B	-.22 ^B	.47 ^B	1.0					
8. Impulsivity	.01	.18 ^B	.13 ^B	-.07	-.11 ^B	.44 ^B	.45 ^B	1.0				
9. Planning & Concentration	-.01	-.15 ^B	-.36 ^B	.30 ^B	.34 ^B	-.36 ^B	-.44 ^B	1.0	-.23 ^B			
10. Problem Solving	-.14 ^B	-.02	-.18 ^B	.16 ^B	.17 ^B	-.07 ^A	-.17 ^B	.02	.37 ^B	1.0		
11. Family Conflict*	-.07	.24 ^B	.15 ^B	-.11 ^A	-.10 ^A	.29 ^B	.25 ^B	.21 ^B	-.23 ^B	-.06	1.0	
12. Parental Monitoring	.09 ^A	-.16 ^B	-.22 ^B	.20 ^B	.22 ^B	-.23 ^B	-.22 ^B	-.11 ^B	.21 ^B	.20 ^B	-.16 ^B	1.0

Note: Column numbers correspond to the characteristics listed in rows.

^A = $p < .05$.^B = $p < .01$.

Table 3
Example Fit-to-data Results for Model Building: Results for Conduct Disorder Criteria

Model addition as fixed effect, sequentially	AIC	BIC	-2 log likelihood	df	Comparison model	χ^2 , df	p-value
1. Intercept, age, age ² , ar(1) error covariance	12095.7	12128.4	12083.7	8	—	—	—
2. Add gender	11794.3	11832.2	11780.3	9	1	303.4, 1	<.0001
3. Add AB Type	7043.6	7077.3	7029.6	10	2	4750.7, 1	<.0001
4. Add Age*AB Type	7035.0	7073.6	7019.0	11	3	10.6, 1	<.01
5. Add Sex*AB Type	7021.7	7065.1	7003.7	12	4	15.3	<.0001

Note: AIC = Akaike's Information Criterion in which lower values indicate better fit to the data. BIC = Bayesian Information Criterion in which lower values indicate better fit to the data. χ^2 , also termed the likelihood-ratio test, consists of the difference between two nested models' -2 log likelihood and compared to the χ^2 distribution using the difference in models' df. Random intercepts and linear age slopes were included.