Published in final edited form as:

J Res Adolesc. 2014 June 1; 24(2): 322–336. doi:10.1111/jora.12055.

Antisocial Behavior Trajectories and Social Victimization Within and Between School Years in Early Adolescence

John M. Light,

Oregon Research Institute

Julie C. Rusby,

Oregon Research Institute

Kimberley M. Nies, and

Oregon Research Institute

Tom A. B. Snijders

Oxford University

Abstract

Antisocial behavior typically increases during early adolescence, but the possibility of seasonal variation has not been examined. In this study, trajectories of antisocial behavior were estimated for early adolescent boys and girls. Data were obtained from a 3-year longitudinal study of 11 middle schools in the western U.S. ($n = 5,742$), with assessments completed four times per academic year. Antisocial behavior increased steadily throughout 6th grade, but beginning in 7th grade for boys and 8th grade for girls, it declined during the school year. Significant increases between grades 6–7 and 7–8 were found for both genders. Trajectories varied by contextual and individual-level social victimization and gender. Implications for theoretical development and future studies are discussed.

Antisocial behavior—delinquency, rule-breaking, and aggressive conduct—has been studied longitudinally in adolescent populations for decades (e.g., Jessor & Jessor, 1977; Klein, 1997). Steady increases in antisocial behavior have been found from age 12 to about age 15 or 16 in community samples (Jessor & Jessor, 1977; Loeber & Burke, 2011; Nagin & Tremblay, 1999; Patterson & Yoerger, 2002). This pattern of change has been attributed to a concomitant increase in negative and oppositional relationships with adults, particularly parents (Dishion, French, & Patterson, 1995) and teachers (Kerr, Stattin, Biesecker, Ferrer-Wreder, 2003; Mahoney, Stattin, & Lord, 2004), leading to premature autonomy (Dishion, Nelson, & Bullock, 2004; Reid, Patterson, & Snyder, 2000) and increasing antisocial peer affiliation (Dishion, Patterson, & Griesler, 1994; Lacourse, Nagin, Tremblay, Vitaro, & Claes, 2003;). Extant theories of antisocial behavior typically address change occurring on multi-year time scales--“early adolescence”, “mid-adolescence”, and so on, largely ignoring shorter-term change. Yet for most early adolescents in the US and Europe, there is a natural rhythm within each year: the school year, and the summer break. Developmentally relevant

transitions may tend to occur during or between these periods. In this study, we empirically examined seasonal change in antisocial behavior among middle school youth, separating change between school years from change within them. Systematic seasonal change would suggest a need for theoretical refinements that explain which mechanisms of change apply at different times of the year.

The Benefit of Estimating Trajectories with Frequent Assessments

Trajectories are within-individual, model-based estimates of temporal change in some variable of interest, inferred from multiple longitudinal observations (Duncan, Duncan, & Strycker, 2006). The more observations, the better the opportunity to link *patterns of change* in behavior to antecedents, such as peer affiliations and quality of relationships with peers (Chan & Poulin, 2007). Additionally, different change patterns may be found for different adolescent populations, such as gender and age groups. Change patterns and their predictors can provide important clues regarding change mechanisms and thus also the critical components and optimal timing of prevention strategies.

Monotonically upward trajectories constrain possible mechanisms of antisocial change. If change is driven by exogenous conditions, these conditions must be homogeneous on the same time scale. Change could also be endogenously generated, suggesting a self-reinforcing feedback loop. For instance, increased antisocial behavior may lead to personal and environmental changes making misbehavior more socially rewarding (Rodkin, Farmer, Pearl & Van Acker, 2006) especially in the company of particular peers who reinforce further increases (e.g., Dishion et al., 1994; Dishion, Nelson, Winter, & Bullock, 2004). Evidence of periodic or seasonal change, however, within a year would suggest time-embedded social contexts that create differential risk patterns at different times (Albert & Steinberg, 2011; Dishion et al., 2004; Lewis, 2004; Steglich, Snijders, & Pearson, 2010).

We develop a multilevel latent growth model (Laird & Ware, 1982; Snijders & Bosker, 2012) from a longitudinal study of middle school youth, ages approximately 12-14, featuring four observations per academic year for up to three full years. This design allows investigation of seasonal change in antisocial behavior during this critical developmental stage. Latent growth models describe time trajectories in terms of intercept (average over time) and slope (change over time) effects within and between school years. We focus primarily on slope effects, with the objective of providing a better empirical context for evaluating change mechanisms and their causal time scales (Collins & Graham, 2002; Gregson, 2011; LeBlanc, Swisher, Vitaro, & Tremblay, 2008).

School and Grade Transitions in Early Adolescence

Transitions between grades may be particularly risky periods for increases in behavior problems such as antisocial behavior. Participation in structured activities tends to be protective (Mahoney, 2000; Persson, Kerr, & Stattin, 2007; Osgood, Wilson, O'Malley, Bachman, & Johnston, 1996). For most U.S. youth, there is a 12 week summer break when school is not in session. Whereas some young adolescents may be involved in structured, supervised activities during this period (e.g. sports, summer jobs), many are not (Laird & Marrero, 2011). Seasonal risk for behavior problems has scarcely been studied, despite the

known risk for summertime academic retrenchment (e.g., Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Osgood and colleagues' (1996) "routine activity" perspective on criminal offending proposes that behavioral problems arise opportunistically, e.g., when supervision is lower and youths' daily routines may involve riskier locations and affiliations, as is likely during summer break. Parente, Sheppard, and Mahoney (2012) found that indeed participation in organized activities over the summer predicted better emotional well-being and fewer externalizing behavior problems the following school year. Parental monitoring reduces risk of behavioral problems (Bohnert, Anthony, & Breslau, 2012; Li, Stanton, & Feigelman, 2007; Véronneau & Dishion, 2011; Vitaro, Brendgen, & Tremblay, 2000), but monitoring is more difficult during summer: typically youth have more unstructured time, whereas parents' time demands are often unchanged. Further, youth may affiliate with different peers—possibly higher-risk peers—during these unstructured periods (Catalano & Hawkins, 1996). Dishion and Medici Skaggs (2000), in a rare study of short-term behavioral change, found that month-to-month variation in substance use was correlated with monthly exposure to deviant peers. Thus, antisocial behavior may increase more in the summer than during the school year.

A similar prediction is provided by Pellegrini (2002), who has argued that interpersonal aggression, specifically, may be especially likely following disruptions in school social ecologies, as a way to establish status relationships. This includes the transition to middle school, and the start of each new school year (Pellegrini, 2010). The effect is thought to result from establishing priority access to desirable other-sex peers, a scarce resource. This perspective leads to expect an increase in antisocial behavior from one year to the next, but with the change taking place at the beginning of each school year.

Thus routine activity theory suggests that antisocial behavior should tend to increase more over the summer than during the school year, while status competition theory implies that it should increase as school resumes each fall. Both predict a larger increase in antisocial behavior between school years than within school years (Hypothesis 1).

Social Victimization: Individual and Contextual

Victimization by peers in the form of physical or social aggression is an important social environment-related predictor of concurrent and prospective antisocial behavior (Begle et al., 2011; Rusby, Forrester, Biglan, & Metzler, 2005). This relationship may be mediated by the tendency for victimized youth to be socially rejected by more popular peers (Pellegrini & Van Ryzin, 2011), leaving only less popular and more deviant peers as potential friends (Hawkins, Catalano, & Miller, 1992; Patterson, Reid, & Dishion, 1992) who subsequently model and support antisocial behaviors (Dishion et al., 1994; Light & Dishion, 2007).

Recent research attention has focused on social victimization: attacks directed at the victim's social relationships such as gossip and social exclusion (Begle et al., 2011; Coie, 2004; Sullivan, Farrell, & Kliewer, 2006). Social victimization is more common than physical victimization and is experienced roughly equally by both boys and girls (Prinstein, Boergers, & Vernberg, 2001). Adolescent victims often respond aggressively and exhibit both internalizing and externalizing behavior problems (Wassdorp & Bradshaw, 2011).

Associations have also been found between social aggression and delinquency and substance use in youth attending urban middle schools (Sullivan et al., 2006). These studies have linked social aggression-based victimization and antisocial behavior prospectively, but the effect of social victimization on antisocial trajectories has not been examined. We expected to find greater increases (slope) in antisocial behavior for youth who experience more individually-directed social victimization (ISV) (Hypothesis 2).

In addition, the prevalence and visibility of social victimization in social environments (Juvonen & Cadigan, 2002; Rodkin & Gest, 2011; Rulison, Gest, Loken, & Welsh, 2010), which we term contextual social victimization (CSV), can have a major impact on *collective norms* of approval and acceptance of such behavior (Cialdini, Reno, & Kallgren, 1990; Juvonen & Cadigan, 2002; Paluck & Sheperd, 2012; Sentse, Scholte, Salmivalli & Voeten, 2007), supporting and perpetuating it. Moreover, normatively-acceptable victimization (e.g. as part of competition for social status; Faris & Ennett, 2012) may legitimate other forms of aggression and antisociality. This suggests a positive effect of CSV on antisocial growth (Hypothesis 3). Finally, though Kärnä, Voeten, Poskiparta and Salmivalli (2010) found that the most vulnerable and defenseless youth are disproportionately victimized in high-victimization social contexts (Hodges, Malone & Perry, 1997), Huitsing, Veenstra, Sainio & Salmivalli (2012), applying a “social misfit” attributional model (Weiner, 1986; Wright, Giammarino & Parad, 1986), found that ISV did not affect individual psychological adjustment as negatively in environments where victimization was more typical and normative. This might imply less reactive externalizing on the part of victims, but it could also facilitate externalizing as part of competition for social status even—or especially—among lower-status, victimized youth. Thus the effect of a high CSV environment on high ISV youth was treated as an exploratory hypothesis (Hypothesis 4).

Gender, Victimization, and Antisocial Trajectories

Although some studies have found few gender differences in predictors of antisocial behavior (Javdani, Sadeh, & Verona, 2011; Mrug & Windle, 2009), others have found later onset in antisocial behavior for girls (Silverthorn & Frick, 1999), and different childhood (Bierman, Bruschi, Domitrovich, Fang & Miller-Johnson, 2004; Tremblay et al., 1992; Wangby, Bergman, & Magnusson, 1999) and peer-related (Rulison et al., 2010; Tolan & Thomas, 1995) risk factors. Regarding social victimization specifically, Galen and Underwood (1997) found that girls experience ISV as more subjectively hurtful than boys do. Further, Rulison et al. (2010) found that affiliating with aggressive peers was associated with more victimization for girls. These results suggest the ISV may lead to more reactive antisocial behavior for girls (Hypothesis 5). Also Rulison and colleagues reported that, whereas both boys and girls were more aggressive when affiliating with aggressive peers, these girls were more disliked, victimized, and reported lower self-worth, but the boys actually reported *better* adjustment than boys who did not affiliate with aggressive peers. This indicates that girls may be more negatively affected than boys by high CSV environments as well (Hypothesis 6). Finally though, because Rulison et al. did not examine the specific response of male vs. female victims who affiliate with aggressive peers, there is little basis for making a prediction for gender moderation of ISV in high CSV environments.

The same equivocal arguments are relevant as for the non-moderated ISV by CSV effect from Hypothesis 4. Thus this effect is also treated as exploratory (Hypothesis 7).

Method

Participants

Of sixteen middle schools originally recruited for participation in the *School Social Environments* study, located in suburban and rural communities in the western United States, fourteen participated for at least one year, and eleven fully implemented four surveys in each year. These eleven schools comprised the analysis sample for this study, ten of which included grades 6, 7, and 8, and one grades 7 and 8 only. The analysis utilized twelve waves of data (four per school year) in four middle schools (Group 1) and eight waves in another seven middle schools that began participation the following year (Group 2). As an indicator of student SES, schools averaged 69% eligibility for free lunches, compared to regional averages of less than 50%. All schools had been exposed to the school-wide Positive Behavioral Intervention and Support program (PBIS) (Horner et al., 2009; Sugai & Horner, 2006), to some extent, ranging from full consultation with data-based feedback to a one-day workshop.

All students in grades 6 (if the school had a grade 6), 7, or 8 were eligible. Parents could exempt their teenager from participation. Of the 6,631 students enrolled at participating schools, 320 (4.8%) were exempted without completing any assessments, whereas 139 (2.1%) were exempted after completing one or more assessments. An additional 430 students (6.5%) were enrolled and survey-eligible at one time or another during these periods, but never completed a survey, yielding a final sample of 5,742 participants (48.4% boys, 51.6% girls), each of whom completed an average of 4.56 surveys or a subject-level participation rate of 86.6%. Compensation for students involved being entered in year-end prize lotteries for gift cards of up to \$15. Mean ages (and standard deviations) for participants were 11.98 (0.44) for 6th graders, 12.99 (0.45) for 7th graders, and 13.98 (0.45) for 8th graders. Other descriptive statistics are shown in Table 1.

Assessment Procedures

Assessments were conducted four times each school year, approximately 70–90 days apart. Students completed an online questionnaire, in English or Spanish, in a school computer lab under staff supervision. Assessments required 8–10 minutes, with younger students and first-time participants requiring the most time. Students could opt out of participation at any time during the survey, without penalty, by clicking a button. Demographics were obtained at each student's first assessment, including gender, race, and ethnicity (Table 1).

The analysis data set consisted primarily of by-design incomplete observations of students (Enders, 2010), a consequence of surveying entire school populations for 3 full academic years. Defining a cohort as a school-specific set of students in the same grade at the same time, the analysis examined 46 distinct cohorts nested within the 11 schools. Ten of these cohorts were in 6th grade when their school began participation, and were followed for the maximum 3-year observation window, as they progressed through 8th grade, including up to

12 waves. In the sample, 5.1% of the participants were in such cohorts, whereas most were in partially-observed cohorts: 24.2% were in grade 6-7 cohorts, 27.1% were in grade 7-8 cohorts, 19.7% in grade 6 only, 1.9% in grade 7 only, and 22.0% in grade 8 only.

Measures

Time—Models included two measures of time: quarter within school year, and grade. Both were coded as orthogonal polynomials to facilitate examination of nonlinear change, and because they are centered at zero, which facilitates interpretation of effects (Snijders & Bosker, 2012).

Antisocial behavior—We used the antisocial behavior scale from the Oregon Healthy Teens Survey (Biglan, Metzler, & Ary, 1994) ($\alpha = .82$ in our sample), which includes self-reports of lying to parents, vandalism, violence toward another student, verbal abuse of another student, skipping school, and staying out late without permission. Substance use is not included. Item responses on a 0–5 scale (*never to more than 20 times* in the past month) were averaged and rounded to the nearest integer on a 0–10 scale, allowing consistency with dynamic network analyses being conducted on the data, for which such scoring is preferred (Ripley, Snijders & Preciado, 2012). Results reported below were not sensitive to this transformation.

Social victimization—This construct was measured from youth reports on the frequency they experienced social aggression in school from peers, measured by 6 questions that addressed threatened and actual social exclusion, encouragement of exclusion by others, and being the object of negative gossip and lies. Responses included eight frequency categories, from *never in the past month* to *more than 10 times a day*. Item responses were averaged and rounded to the nearest integer on a 0–10 scale. This measure has good reliability ($\alpha = .89$) and was associated with middle school youths' deviant peer affiliation and problem behavior in school (Rusby, Crowley, Sprague, & Biglan, 2009). We used the first (baseline) measure available for each participant as the individual social victimization (ISV) predictor, as there is evidence that individual victim status is established early in adolescence, and is quite stable subsequently (Bellmore & Cillessen, 2010). Also we found significant and substantial clustering within individuals (intraclass correlation (ICC) = .49), suggesting that treating it as a fixed predictor is reasonable. Baseline contextual social victimization (CSV) was obtained by taking ISV averages for each cohort on the first occasion that the cohort was assessed. Grade cohorts have been shown to exhibit distinctive patterns with regard to many types of behaviors, including antisocial behavior (Smolkowski, Biglan, Dent, & Seeley, 2006). Further, average ISV clustered significantly within cohorts ($t=2.12$, $p<.05$), providing a basis for using CSV as a predictor. This approach treats the victimization measures as predictors of antisocial trajectories, rather than just correlates.

Missing Data

Data in this study were missing primarily for one of three reasons. The most frequent was by design: complete (12 wave) assessments were not available for members of most cohorts because their school was not participating in the study for at least 1 year of the period they were attending (e.g., members of a 6th grade cohort that did not arrive at the school until

Year 2 of the study). Next most frequent was wave-specific missingness, typically absence from school, or simply deciding not to participate. Finally, 5% of students formally opted out of the study by sending us opt-out postcards, though a few of these individuals participated in one or more assessments before doing so. Modeling was carried out on the available data using maximum likelihood estimation under the assumption that these mechanisms were missing at random (MAR; Rubin, 1987).

Analysis Strategy

Trajectory models were estimated using MLWIN v2.22 (Rasbash, Charlton, Browne, Healy, & Cameron, 2009). Models were structured as observations (waves) within individuals within cohorts (Levels 1, 2, and 3, respectively), so the random part of each model included three primary error terms, one for each level. Fixed effects were specified as:

$$A_{ijk} = \beta_{0ijk} \mathbf{1} + \beta_{1ijk} Q_{ijk} + \beta_{2ijk} G_{ijk} + [\text{covariates}] + [\text{interactions}] \quad (1)$$

where A is antisocial behavior, $\mathbf{1}$ is an $i \times j$ -length vector of 1's (the intercept term), Q is quarter within school year (1, 2, 3, or 4) to which the observation applies, and G is grade to which the observation applies (6, 7, or 8). Main or interaction effects containing one or more time-related terms (quarter or grade), are considered slope effects, and describe change in antisocial behavior over time. Other effects are intercept effects, and describe non-time-varying averages.

Three Models

A 3-level structure with cohorts at Level 3 rather than schools subsumed between-school variance, consistent with findings from other studies (e.g. Smolkowski et al., 2006). Further, the larger number of cohorts (46, vs. 11 schools) permitted cohort-level predictors.

A variance components model (Model 1) provided an empirical basis for the model's hierarchy structure, and values for calculating explained variance and ICCs. A minimal trajectory model (Model 2), containing only an intercept, gender, slope effects of quarter and grade, and random terms, provided average trajectories for grades 6-8 separately by gender.

Model 3 added ISV and CSV to the time and gender predictors. Because higher-order interaction terms require lower-order constituent terms to facilitate model interpretation (e.g. if $A \times B \times C$ is included, $A \times B$, $A \times C$, and $B \times C$ should be also; Snijders & Bosker, 2012), we started with a saturated model (up to a 5-way interaction, quarter $\times$ grade $\times$ gender $\times$ ISV $\times$ CSV) and eliminated the highest-order nonsignificant interaction terms sequentially to arrive at the final model. This strategy ensured that any significant effects would be included. There is added risk of committing type I errors in decisions to include higher-order interactions, but some risk is appropriate for exploratory goals.

The covariance matrix of the vector of longitudinal measurements was estimated by freeing all time-related slope variances and covariances and keeping those that were statistically significant (Snijders & Bosker, 2012). Model residuals were graphically checked for normality. Though some departure was observed, the analysis was appropriate given the large sample size and the general robustness of multilevel models with regard to normality

assumptions (Gelman & Hill, 2007). Alternative models assuming negative binomial and Poisson distributions confirmed this conclusion.

Interpreting predictions from the potentially complex model implied by our hypotheses can be difficult, as many involve several parameters (Gelman & Hill, 2007). Graphs of Model predictions were thus constructed for selected combinations of parameters (Figures 1 and 2) to aid in interpretation. Post hoc Wald tests (Snijders & Bosker, 2012) examined multiparameter differences.

Results

Descriptive Overview

Table 2 shows the means and standard deviations of antisocial behavior and social victimization for the sample at each wave and the average across waves. Antisocial behavior was on average relatively low, and whereas clustering within schools was evident, most clustering resided within school-specific grade cohorts. Girls reported less antisocial behavior than boys ($p < .001$). ISV was also relatively low (the overall average was less than 1, on a 0–10 scale), but clustered within individuals ($ICC = 0.55, p < .001$). There was also significant variation in average ISV between cohorts ($ICC = 0.03, p = .03$), but no average gender differences.

Multilevel models are presented in Table 3. Model 1 included variance components only. About 52% of the variance in antisocial behavior occurred across waves within students (level 1), 36% was between waves (level 2), and the remainder, about 12%, was between cohorts (level 3).

Model 2—Trajectories of Antisocial Behavior by Gender

Model 2 antisocial trajectories by gender across 12 waves, with time represented by four quarters within each of grades 6, 7, and 8 are shown in Figure 1. A sawtooth pattern is evident, i.e., declines in antisocial behavior during the academic year contrasting with increases between the end of one year and the beginning of the next. Because this pattern results from two significant slope interactions (grade by quarter and grade by gender), it emerges at the end of 6th grade for boys and the end of 7th grade for girls (see Table 3). These results are consistent with Hypothesis 1, though the within-school-year decline was not anticipated. Also, consistent with prior research, a positive effect of grade (0.14, $p < .001$) indicated that average antisocial behavior increases across grades 6–8, and the intercept effect of gender (0.43) showed that boys' average antisocial behavior was greater than for girls at equivalent grade levels.

Model 3—Trajectories by Gender and Social Victimization

Model 3 added baseline ISV and CSV as predictors, as well as higher-order interactions (Table 3). The graphs in Figure 2 show the net effects of all significant predictors and interactions on antisocial trajectories.

Model 3 explained more variance at both the individual and cohort levels: 46% of the residual cohort-level variance in antisocial behavior (vs. 23% in Model 2), and 37% of the

student-level variance (vs. 11% in Model 2). Generally, effects common to Model 2 were approximately the same. No slope-related interactions of gender with either social victimization measure were found, contrary to Hypotheses 5- 6.

Baseline ISV and CSV each predicted higher average antisocial behavior intercepts (β 's were 0.45 and 0.46, respectively, $p < .001$). In addition, there was a positive interaction between ISV and CSV (0.15, $p = .02$) on the intercept, indicating higher average antisocial behavior is predicted for more socially victimized individuals in higher-victimization cohorts.

Slope-related results involving social victimization were more complicated than suggested by Hypotheses 2-4. ISV was negatively related to both between-year (grade) and within-year (quarter) slopes, contrary to Hypothesis 2, whereas CSV was positively related to grade slope, consistent with Hypothesis 3, but unrelated to quarter slope. Also the grade by ISV by CSV interaction was negative (exploratory Hypothesis 4), and this interaction was not moderated by gender (exploratory Hypothesis 7). Along with the negative grade by ISV by CSV intercept effect, the model predicts higher antisocial behavior in 6th grade among higher ISV youth, but this difference shrank over time, especially in high-CSV cohorts, and was only partially offset within school years by the positive quarter by ISV by CSV effect (0.097, $p = .01$). Also, because predictors were mean-centered, more victimized individuals in low-victimization cohorts would have relatively larger increases in antisocial behavior by grade, given the earlier-noted negative grade by ISV by CSV interaction.

These somewhat complex, contingent results, graphed in Figure 2, form a more coherent narrative than might be expected, which we explain in the discussion section. Several features of these trajectories were addressed with multiparameter Wald tests. The between-year *jump* in antisocial behavior is increasingly pronounced for higher values of ISV and CSV, alone and in combination. For both boys ($\chi^2(1) = 34.9$) and girls ($\chi^2(1) = 13.6$) the grades 7–8 difference was statistically significant ($p < .001$) with ISV and CSV at their sample means. The grade 6–7 difference was significant for boys under the same assumptions ($\chi^2(1) = 6.0$, $p = .02$) but not for girls ($\chi^2(1) = 0.0$, $p = .80$). In fact, the grade 6–7 jump is not significant for girls at any paired values of ISV and CSV observed in the sample.

Figures 2a and 2b also show a within-school-year decline in antisocial behavior under some conditions. The decline is significant ($p < .001$) during 8th grade for both boys ($\chi^2(1) = 44.5$) and girls ($\chi^2(1) = 20.9$) when ISV and CSV assume sample mean values. It is also significant at these values for boys ($\chi^2(1) = 7.5$, $p = .01$) during 7th grade but not for girls ($\chi^2(1) = 0.0$, $p = .46$). In 7th grade, with CSV at the sample mean, within-year antisocial behavior declines significantly for girls whose ISV is above 0.56 standard deviations ($\chi^2(1) > 3.5$, the $\alpha = .05$ cutoff).

Post Hoc Analyses

The antisocial behavior measure included three items that referred specifically to behavior while at school: hitting, pushing, or fighting another student, calling another student names or saying mean thing, and skipping school. The other three (damaging property, staying out at night without permission, and lying to parents about your whereabouts) were not school-

specific. We created subscales from these two sets of items, reasoning that a between-grade tendency for increased antisocial behavior confined to the school behavior subscale tended to favor the status competition explanation, whereas if only the non-school-specific behaviors showed between-grade increase, the routine activities explanation would be more plausible. Versions of Model 2 were run using each subscale. A distinctive pattern of between-year increase followed by within-year decline was found for the non-school subscale, but not (except for boys going from 7th to 8th grade) for the school-only subscale. Because this is a post hoc analysis and neither of these “subscales” is a validated instrument (though the items in each did correlate at about .70), these results should be interpreted with caution.

Discussion

Our results are consistent with prior findings showing increasing average antisocial behavior from ages 12–14 (Jessor & Jessor, 1977; Nagin & Tremblay, 1999), but the increase was not monotonic—growth was positive between school years, but negative during the school year. The higher age-specific average antisocial behavior among boys compared to girls is also found in extant research (e.g., Hartung & Widiger, 1998; Javdani et al., 2011; LeBlanc et al., 2008).

Non-monotonic Growth

Although average antisocial behavior showed a non-monotonic pattern of increase and decline over the years of middle school, our data could not identify precisely when these increases occurred, nor address potential reasons directly; however, the most likely periods appear to be summertime, or the early part of the school year, or both. Supporting the summer-change hypothesis, extant theory (e.g. Dishion et al., 1994) and research (e.g. Baerveldt, Volker & Van Rossem, 2008; Light & Dishion, 2007) have found that deviant peer affiliation is a risk factor for antisocial behavior, and such affiliation may be more common during the summer. Instead of spending most of their time with same-grade peers while in school, young adolescents may have more opportunities to associate with older adolescents, for instance in locations frequented by a mix of ages (parks, malls, at home or friends' homes). Older youth are more likely to model antisocial behavior and to treat such behavior as “cool” (Rodkin et al., 2006), creating social situations where younger adolescents are encouraged to try out new behaviors, as a way to gain social status (Allen, Porter, McFarland, Marsh, & McElhaney, 2005; Pellegrini et al., 2010).

The routine activities perspective supports this narrative. Studies have found more behavioral problems among youth involved in unstructured activities (Mahoney, 2000; Persson et al., 2007), but a protective effect of participation in adult-supervised, prosocial after-school programs (Fleming et al., 2008). Such programs are not always available, especially in rural or poorer areas communities during the summer. Also as we noted earlier, antisocial behavior is attenuated by, parental supervision, monitoring, and knowledge of their adolescent's activities are protective factors for antisocial behaviors (Brown & Bakken, 2011; Dishion, Nelson, & Kavanagh, 2003; Véronneau & Dishion, 2010), which is more difficult during the summer.

However, the status competition hypothesis (Pellegrini, 2002) should not be ignored. Post hoc analyses provided some contrary evidence for this view, finding that the increase in behavior problems between grades was observed mainly in non-school-related behaviors. However, a definitive study would minimally require both summer and school year behavioral measures. Further, the status competition model receives some indirect support from victimization effects, discussed further below.

School-Year Decline

The sawtooth growth pattern evident in Figures 1 and 2 began in 6th grade for boys, but in 7th grade for girls. Interestingly, aside from this 1 year lag, change patterns for boys and girls are remarkably similar. Perhaps the within-year decline in antisocial behavior reflects a sharper return to an acceptable behavioral standard on the part of the worst-behaved youth. This could result from more attention being paid to them by school staff. Alternatively, aggression or antisocial behavior used as a tactic to gain social status at the beginning of each school year (Allen et al., 2005; Moody, Brynildsen, Osgood, Feinberg, & Gest, 2011) should attenuate as the year progresses and the status hierarchy stabilizes (Pellegrini, 2010).

Gender Differences

Although intercept differences showed that boys reported more antisocial behavior than girls at any given grade level, the only slope-related gender difference was a slightly sharper decline in antisocial behavior during the school year among boys. Growth in antisocial behavior between grades did not differ by gender, and though ISV and CSV moderated antisocial growth, gender did not moderate these effects either. On the whole, these results are consistent with previous findings that boys onset to antisocial behavior earlier than girls (Silverthorn & Frick, 1999), but once onset has occurred, growth patterns are similar.

Social Victimization

Previous studies have found associations between victimization and antisocial behavior (Dodge, Coie, & Lynam, 2006; Dodge et al., 2003; Rusby, et al., 2005; Trentacosta & Shaw, 2009). Expanding on these findings, we found somewhat complicated slope and intercept effects involving interactions among ISV, CSV, grade, and quarter. The net result of these various effects are shown in Figure 2. Because gender differences are largely absent, we can focus on either boys or girls, noting that (a) antisocial behavior intercepts and slopes are greater in higher CSV cohorts, but (b) growth is limited to lower ISV individuals. Also (c) higher ISV predicts a higher antisocial behavior intercept at the first quarter in grade 6, but (d) the difference narrows throughout middle school, essentially vanishing by the last quarter in grade 8, regardless of CSV. However (e) spring-fall “jumps” in antisocial behavior are most pronounced for higher ISV students in *low* CSV cohorts.

Despite the complex interactions involved, these findings are consistent with some previous research. The general tendency for more antisocial behavior in the higher ISV students (a) may reflect a greater tendency for defensive aggression (Dodge & Coie, 1987; Warren, Schoppelrey, Moberg and McDonald, 2005), whereas the similar tendency for higher CSV cohorts (c) could also reflect more acceptance of interpersonal aggression and other forms of misbehavior generally. Pellegrini's status competition hypothesis, discussed earlier,

additionally predicts the timing of peaks in antisocial behavior. The first occurs at the transition from elementary school to middle school, consistent with (c) (Pellegrini, 2002). Moreover, antisociality is predicted to decline across middle school as status competition lessens. We find such a pattern (d), but only among the most highly victimized boys and girls (roughly, the top 10-12 percent).

Finally, we see additional “jumps” in antisocial behavior that may possibly be occurring at the start of each new school year, and this is also predicted by the status competition hypothesis (Pellegrini, 2010). Indeed, nearly all the overall growth in antisocial behavior throughout middle school occurs in these jumps. Importantly though, the jumps are primarily characteristic of higher ISV students in lower CSV cohorts, per (e). Recent research on the perception and effect of injunctive norms (Juvonen & Cadigan, 2002; Paluck & Sheperd, 2012), suggests that prevalence affects students’ sense of the acceptability of social victimization. From 7th grade on, high ISV youth in high CSV cohorts may withdraw from the annual status competition, because the high *but more normative* victimization they experience in 6th grade gives rise to internal attributions (“The problem is me”), convincing them to accept lower status as appropriate or inevitable (Huisman et al., 2012; Kärnä et al., 2010). Other youth, more inclined to external attributions, may rejoin the fray every fall. This argument could explain (b) and (e).

Limitations

Given the relatively large number of assessments per school year, the decline in antisocial behavior within school years could have been related to response burden. However we found no significant correlation between number of assessments completed and antisocial behavior; the assessments themselves were brief (5-10 minutes for nearly all participants), and analyses of other problems during the school year, e.g., alcohol and tobacco use, did not show similar patterns. Whereas the period between spring and fall assessments was about 6 weeks longer than others, the difference seems insufficient to explain differential survey fatigue effects. Also, there was no significant increase in average nonresponse to antisocial items in the survey over the school year.

Although trajectory modeling is a useful descriptive tool, reciprocal relationships cannot be represented; predictors must be exogenous. Yet in all probability, there is a reciprocal relationship between antisocial behavior and victimization (Pellegrini & Van Ryzin, 2011). Using initial individual and contextual victimization as trajectory predictors provides a convenient first approximation to understanding these interrelated patterns of change, but models that can represent reciprocal change are preferable (Oud, 2007; Snijders, van de Bunt, & Steglich, 2010).

Finally, like most multi-school studies, our sample is essentially a convenience sample, and cannot be formally generalized to a broader population. It remains to be seen whether these results replicate.

Future directions

By focusing on seasonal change in antisocial behavior, we have identified more complicated trajectories than are typically found in the literature to date. We have also described several mechanisms that might explain our results: the routine activities hypothesis (more prevalent unstructured and unsupervised activities with peers during the summer break) and the status competition hypothesis. Our data did not address these alternatives directly, therefore at this point we conclude that either--or indeed both, as they are not mutually exclusive--could be true. Nevertheless, our analysis suggests a potentially fruitful direction for future research. Studies that observe early adolescent antisocial behavior just before and then during summer break, shortly after school starts up again each fall, and also later in the school year can pinpoint when these changes take place, a major predictive difference between the routine activities and status competition arguments. It may also be useful to differentiate between interpersonal aggression (social or physical) and other forms of behavior typically classified as "antisocial", such as vandalism, theft, and disobeying adults. These classes of behaviors are known to be correlated (e.g. Jessor & Jessor, 1977) but may nevertheless accelerate for different reasons and, concomitantly, at different times.

If the results of this investigation are borne out by subsequent work, and if any of the theoretical alternatives we have discussed are replicated, the practical import could be considerable. Interventions could be devised to address the specific risks implied by each mechanism, and could be timed to coincide with predicted periods of heightened risk. This type of focused design represents something of a gold standard for interventions (Collins, Murphy, & Bierman, 2003), and would be expected to improve outcomes.

Acknowledgments

We would like to thank the students and teachers who participated in the School Social Environment (SSE) study for making this work possible. SSE was supported by Award Number R01HD052887 from the Eunice Kennedy Shriver National Institute Of Child Health & Human Development (John M. Light, Principal Investigator). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Eunice Kennedy Shriver National Institute Of Child Health & Human Development or the National Institutes of Health. We also express our appreciation to Susan Long for assistance with manuscript preparation and editing, and to René Veenstra, Jan Kornelis Dijkstra, and three anonymous reviewers for their helpful comments. Any errors or oversights remain the responsibility of the authors.

This research was supported by grant 5 R01 HD052887 from the National Institute on Child Health and Human Development, National Institutes of Health.

References

- Albert D, Steinberg L. Judgment and decision making in adolescence. *Journal of Research on Adolescence*. 2011; 21:211–224. doi:10.1111/j.1532-7795.2010.00724.x.
- Allen JP, Porter MR, McFarland FC, Marsh P, McElhaney KB. The two faces of adolescents' success with peers: Adolescent popularity, social adaptation, and deviant behavior. *Child Development*. 2005; 76:747–760. doi:10.1111/j.1467-8624.2005.00875.x. [PubMed: 15892790]
- Baerveldt CA, Volker B, Van Rossem R. Revisiting selection and influence: an inquiry into the friendship networks of high school students and their association with delinquency. *Canadian Journal of Criminology and Criminal Justice*. 2008; 50:559–587. *Canadian Journal of Criminology and Criminal Justice*, 50, 559-587.
- Begle AM, Hanson RF, Danielson CK, McCart MR, Ruggiero KJ, Amstadter AB, Kilpatrick DG. Longitudinal pathways of victimization, substance use, and delinquency: Findings from the

- National Survey of Adolescents. Addictive Behaviors. 2011; 36:682–689. doi:10.1016/j.addbeh.2010.12.026. [PubMed: 21377805]
- Bellmore A, Cillessen AH. Reciprocal influences of victimization, perceived social preference, and self-concept in adolescence. *Self and Identity*. 2010; 5:209–229.
- Bierman, KL.; Bruschi, C.; Domitrovich, C.; Fang, GY.; Miller-Johnson, S.; The Conduct Problems Prevention Research Group. Early disruptive behaviors associated with emerging antisocial behavior among girls.. In: Bierman, KL.; Putallaz, M., editors. *Duke series in child development and public policy. Aggression, antisocial behavior, and violence among girls: A developmental perspective*. Guilford; New York, NY: 2004. p. 137-161.
- Biglan A, Metzler CW, Ary DV. Increasing prevalence of successful children: The case for community intervention research. *Behavior Analysis*. 1994; 17:335–351. doi:10.1007/BF01858012.
- Bohnert KM, Anthony JC, Breslau N. Parental monitoring at age 11 and subsequent onset of cannabis use up to age 17: Results from a prospective study. *Journal of Studies on Alcohol & Drugs*. 2012; 73:173–177. [PubMed: 22333324]
- Brown BB, Bakken JP. Parenting and peer relationships: Reinvigorating research on family-peer linkages in adolescence. *Journal of Research on Adolescence*. 2011; 21:153–165. doi:10.1111/j.1532-7795.2010.00720.x.
- Chan A, Poulin F. Monthly changes in the composition of friendship networks in early adolescence. *Merrill-Palmer Quarterly*. 2007; 53:578–602. doi:10.1353/mpq.2008.0000.
- Cialdini RB, Reno RR, Kallgren CA. A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*. 1990; 58:1015–1026. doi:10.1037//0022-3514.58.6.1015.
- Coie, JD. The impact of negative social experience on the development of antisocial behavior.. In: Kupersmidt, JB.; Dodge, KA., editors. *Peer relations in childhood: From development to intervention to public policy*. American Psychological Association; Washington, DC: 2004. p. 243-267.
- Collins LM, Graham JW. The effect of the timing and spacing of observations in longitudinal studies of tobacco and other drug use: temporal design considerations. *Drug and Alcohol Dependence*. 2002; 68(Suppl. 1):S85–S96. doi:10.1016/S0376-8716(02)00217-X. [PubMed: 12324177]
- Collins LM, Murphy SA, Bierman KL. A conceptual framework for adaptive preventive interventions. *Prevention Science*. 2004; 5:185–196. doi:10.1023/B:PREV.0000037641.26017.00. [PubMed: 15470938]
- Cooper H, Nye B, Charlton K, Lindsay J, Greathouse S. The effects of summer vacation on achievement test scores: A narrative and meta-analytic review. *Review of Educational Research*. 1996; 66:227–268. doi:10.3102/00346543066003227.
- Colvin G, Sugai G, Good RH, Lee Y. Using active supervision and precorrection to improve transition behaviors in an elementary school. *School Psychology Quarterly*. 1997; 12:344–363.
- Dishion, TJ.; French, DC.; Patterson, GR. The development and ecology of antisocial behavior.. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental psychopathology, Vol. 2: Risk, disorder, and adaptation*. Wiley; New York, NY: 1995. p. 421-471.
- Dishion TJ, Medici Skaggs N. An ecological analysis of monthly “bursts” in early adolescent substance use. *Applied Development Science*. 2000; 4(2):89–97.
- Dishion TJ, Nelson SN, Bullock BM. Premature adolescent autonomy: Parent disengagement and deviant peer process in the amplification of problem behavior. [Special issue: Families, peers and contexts as multiple determinants of adolescent problem behavior]. *Journal on Adolescence*. 2004; 27:515–530. doi:10.1016/j.adolescence.2004.06.005.
- Dishion TJ, Nelson SE, Kavanagh K. The Family Check-Up with high-risk young adolescents: Preventing early-onset substance use by parent monitoring. *Behavior Therapy*. 2003; 34:553–571. doi:10.1016/S0005-7894(03)80035-7.
- Dishion TJ, Nelson SE, Winter CE, Bullock BM. Adolescent friendship as a dynamic system: entropy and deviance in the etiology and course of male antisocial behavior. *Journal of Abnormal Child Psychology*. 2004; 32:651–663. doi:10.1023/B:JACP.0000047213.31812.21. [PubMed: 15648531]

- Dishion, TJ.; Patterson, GR.; Griesler, PC. Peer adaptations in the development of antisocial behavior: A confluence model.. In: Huesmann, LR., editor. *Aggressive behavior: Current perspectives*. Plenum; New York, NY: 1994. p. 61-95.
- Dodge KA, Coie JD. Social-information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology*. 1987; 53:1146–1158. doi: 10.1037//0022-3514.53.6.1146. [PubMed: 3694454]
- Dodge, KA.; Coie, JD.; Lynam, D. Aggression and antisocial behavior in youth.. In: Eisenbert, N., editor. *Handbook of child psychology*, 6th ed.: Vol 3. Social, emotional, and personality development. Wiley; New York, NY: 2006. p. 719-788.
- Dodge KA, Lansford JE, Burks VS, Bates JE, Pettit GS, Fontaine R, Price JM. Peer rejection and social information-processing factors in the development of aggressive behavior problems in children. *Child Development*. 2003; 74:374–393. doi:10.1111/1467-8624.7402004. [PubMed: 12705561]
- Duncan, TE.; Duncan, SC.; Strycker, LA. An introduction to latent variable growth curve modeling: Concepts, issues, and applications. Erlbaum; Mahwah, NJ: 2006.
- Enders, CK. *Applied missing data analysis*. Guilford Press; New York, NY: 2010.
- Faris R, Ennett S. Adolescent aggression: The role of peer group status motives, peer aggression, and group characteristics. *Social Networks*. 2012; 34:371–378. [PubMed: 25152562]
- Fleming CB, Catalano RF, Mazza JJ, Brown EC, Haggerty KP, Harachi TW. After-school activities, misbehavior in school, and delinquency from the end of elementary school through the beginning of high school: A test of social development model hypotheses. *Journal of Early Adolescence*. 2008; 28:277–303. doi:10.1177/0272431607313589.
- Gelman, A.; Hill, J. *Data analysis using regression and multilevel/hierarchical models*. Cambridge University Press; Cambridge, UK: 2007.
- Gregson, RAM. Principles of time series analysis.. In: Guastello, SJ.; Gregson, RAM., editors. *Nonlinear dynamical systems analysis for the behavioral sciences using real data*. CRC Press; Boca Raton, FL: 2011. p. 17-31.
- Hartung CM, Widiger TA. Gender differences in the diagnosis of mental disorders: Conclusions and controversies of the DSM–IV. *Psychological Bulletin*. 1998; 123:260–278. doi: 10.1037/0033-2909.123.3.260. [PubMed: 9602559]
- Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin*. 1992; 112:64–105. doi:10.1037//0033-2909.112.1.64. [PubMed: 1529040]
- Hodges EVE, Malone MJ, Perry DG. Individual risk and social risk as interacting determinants of victimization in the peer group. *Developmental Psychology*. 1997; 33:1032–1039. [PubMed: 9383625]
- Horner RH, Sugai G, Smolkowski K, Eber L, Nakasato J, Todd AW. A randomized, wait-list controlled effectiveness trial assessing school-wide positive behavior support in elementary schools. *Journal of Positive Behavior Interventions*. 2009; 11:133–144. doi: 10.1177/1098300709332067.
- Huitsing G, Veenstra R, Sainio M, Salmivalli C. “It must be me” or “It could be them?”: The impact of the social network position of bullies and victims on victims’ adjustment. *Social Networks*. 2012; 34:379–386.
- Javdani S, Sadeh N, Verona E. Expanding our lens: Female pathways to antisocial behavior in adolescence and adulthood. *Clinical Psychology Review*. 2011; 31:1324–1348. doi:10.1016/j.cpr.2011.09.002. [PubMed: 22001339]
- Jessor, R.; Jessor, SL. *Problem behavior and psychosocial development: A longitudinal study of youth*. Academic; New York, NY: 1977.
- Juvonen, J.; Cadigan, J. Social determinants of public behavior of middle school youth: Perceived peer norms and need to be accepted.. In: Pajares, F.; Urdan, T., editors. *Adolescence and education: Vol. 2. Academic motivation of adolescents*. Information Age; Greenwich, CT: 2002. p. 277-297.
- Kärnä A, Voeten M, Poskiparta E, Salmivalli C. Vulnerable children in varying class contexts: Bystanders’ behaviors moderate the effects of risk factors on victimization. *Merrill-Palmer Quarterly*. 2010; 56:261–282.

- Kerr, M.; Stattin, H.; Biesecker, G.; Ferrer-Wreder, L. Relationships with parents and peers in adolescence.. In: Lerner, RM.; Easterbrooks, MA.; Mistry, J., editors. *Handbook of psychology: Vol. 6. Developmental psychology*. Wiley; Hoboken, NJ: 2003. p. 395-422.
- Klein JD. The national longitudinal study of adolescent health: Preliminary results, great expectations. *Journal of the American Medical Association*. 1997; 278:864–865. doi:10.1001/jama.278.10.864. [PubMed: 9293997]
- Lacourse E, Nagin D, Tremblay RE, Vitaro F, Claes M. Developmental trajectories of boys' delinquent group membership and facilitation of violent behaviors during adolescence. *Development and Psychopathology*. 2003; 15:183–197. doi:10.1017/S0954579403000105. [PubMed: 12848441]
- Laird NM, Ware JH. Random-effects models for longitudinal data. *Biometrics*. 1982; 38:963–974. [PubMed: 7168798]
- LeBlanc L, Swisher R, Vitaro F, Tremblay RE. High school social climate and antisocial behavior: A 10-year longitudinal and multilevel study. *Journal of Research on Adolescence*. 2008; 18:395–419. doi:10.1111/j.1532-7795.2008.00565.x.
- Lewis MD. Trouble ahead: Predicting antisocial trajectories with dynamic systems concepts and methods. *Journal of Abnormal Child Psychology*. 2004; 32:665–671. doi:10.1023/B:JACP.0000047214.03516.8b. [PubMed: 15648532]
- Li X, Stanton B, Feigelman S. Impact of perceived parental monitoring on adolescent risk behavior over 4 years. *Journal of Adolescent Health*. 2007; 27:49–56. [PubMed: 10867352]
- Light JM, Dishion TJ. Early adolescent antisocial behavior and peer rejection: A dynamic test of a developmental process. *New Directions for Child and Adolescent Development*. 2007; 118:77–90. doi:10.1002/ed.202. [PubMed: 18157876]
- Loeber R, Burke JD. Developmental pathways in juvenile externalizing and internalizing problems. *Journal of Research on Adolescence*. 2011; 21:34–46. doi:10.1111/j.1532-7795.2010.00713.x. [PubMed: 22468115]
- Mahoney JL. School extracurricular activity participation as a moderator in the development of antisocial patterns. *Child Development*. 2000; 71:502–516. doi:10.1111/1467-8624.00160. [PubMed: 10834480]
- Mahoney JL, Stattin H, Lord H. Unstructured youth recreation centre participation and antisocial behaviour development: Selection influences and the moderating role of antisocial peers. *International Journal of Behavioral Development*. 2004; 28:553–560. doi: 10.1080/01650250444000270.
- Moody J, Brynildsen WD, Osgood DW, Feinberg ME, Gest S. Popularity trajectories and substance use in early adolescence. *Social Networks*. 2011; 33:101–112. doi:10.1016/j.socnet.2010.10.001. [PubMed: 21765588]
- Mrug S, Windle M. Moderators of negative peer influence on early adolescent externalizing behaviors. *Journal of Early Adolescence*. 2009; 29:518–540. doi:10.1177/0272431608324473.
- Nagin DS, Tremblay RE. Trajectories of boys' physical aggression, opposition, and hyperactivity on the path to physically violent and nonviolent juvenile delinquency. *Child Development*. 1999; 70:1181–1196. doi:10.1111/1467-8624.00086. [PubMed: 10546339]
- Osgood DW, Wilson JK, O'Malley PM, Bachman JG, Johnston LD. Routine activities and individual deviant behavior. *American Sociological Review*. 1996; 61:635–655. doi:10.2307/2096397.
- Oud, JHL. Continuous time modeling of reciprocal relationships in the cross-lagged panel design. Erlbaum; Mahwah, NJ: 2007.
- Paluck, EL.; Shepherd, H. The salience of social referents: A field experiment on collective norms and harassment behavior in a school social network. Advance online publication.. *Journal of Personality and Social Psychology*. 2012. <http://dx.doi.org/10.1037/a0030015>
- Parente ME, Sheppard A, Mahoney JL. Parental knowledge as a mediator of the relation between adolescent summer care arrangement configurations and adjustment the following school year. *Applied Developmental Science*. 2012; 16:84–97. doi:10.1080/10888691.2012.667341.
- Patterson, GR.; Reid, JB.; Dishion, TJ. *Antisocial boys: A social interactional approach*. Vol. 4. Castalia; Eugene, OR: 1992.

- Patterson, GR.; Yoerger, K. A developmental model for early- and late-onset delinquency.. In: Reid, JB.; Patterson, GR.; Snyder, J., editors. *Antisocial behavior in children and adolescents: A developmental analysis and model for intervention*. American Psychological Association; Washington, DC: 2002. p. 147-172.
- Pellegrini AD. Affiliative and aggressive dimensions of dominance and possible functions during early adolescence. *Aggression and Violent Behavior*. 2002; 7:21–31.
- Pellegrini, AD.; Long, JD.; Solberg, D.; Roseth, C.; Dupuis, D.; Bohn, C.; Hickey, M. *Handbook of Bullying in Schools: An International Perspective*. Routledge; New York: 2010. Bullying and social status during school transitions; p. 199-210.
- Pellegrini, AD.; Van Ryzin, MJ. Part of the problem and part of the solution: The role of peers in bullying, dominance, and victimization during the transition from primary school to secondary school.. In: Espelage, DL.; Swearer, SM., editors. *Bullying in North American schools*. 2nd ed.. Routledge; New York, NY: 2011. p. 91-100.
- Persson A, Kerr M, Stattin H. Staying in or moving away from structured activities: Explanations involving parents and peers. *Developmental Psychology*. 2007; 43:197–207. doi: 10.1037/0012-1649.43.1.197. [PubMed: 17201519]
- Rasbash, J.; Charlton, C.; Browne, WJ.; Healy, M.; Cameron, B. *A user's guide to MLwIN v2.10*. Centre for Multilevel Modelling, University of Bristol; Bristol, UK: 2009.
- Reid, JB.; Patterson, GR.; Snyder, J., editors. *Antisocial behavior in children and adolescents: A developmental analysis and model for intervention*. American Psychological Association; Washington, D.C.: 2000.
- Ripley, RM.; Snijders, TAB.; Preciado, P. *Manual for RSiena*. Department of Statistics, Nuffield College; Oxford, UK: 2012.
- Rodkin PC, Farmer TW, Pearl R, Van Acker RM. They're cool: Social status and peer group supports for aggressive boys and girls. *Social Development*. 2006; 15:175–204. doi:10.1111/j.1467-9507.2006.00336.x.
- Rodkin, PC.; Gest, SD. Teaching practices, classroom peer ecologies, and bullying behaviors among schoolchildren.. In: Espelage, DL.; Swearer, SM., editors. *Bullying in North American schools*. 2nd ed.. Routledge; New York, NY: 2011. p. 75-90.
- Rubin, DB. *Multiple imputation for nonresponse in surveys*. Wiley; New York, NY: 1987.
- Rulison KL, Gest SD, Loken E, Welsh JA. Rejection, feeling bad, and being hurt: Using multilevel modeling to clarify the link between peer group aggression and adjustment. *Journal of Adolescence*. 2010; 33:787–800. doi:10.1016/j.adolescence.2010.07.005. [PubMed: 20832107]
- Rusby, JC.; Crowley, R.; Sprague, J.; Biglan, A. Relational and overt aggression among peers in middle school settings: Behavior correlates and school level predictors.. In: Rusby, JC., editor. *Relational and physical aggression among peers in school settings: Associations and predictor of problem behaviors in middle childhood and early adolescence; Symposium conducted at the 17th Annual Meeting of the Society for Prevention Research; Washington, DC. 2009, May; (Chair)*
- Rusby JC, Forrester KK, Biglan A, Metzler CW. Relationships between peer harassment and adolescent problem behaviors. *Journal of Early Adolescence*. 2005; 25:453–477. doi: 10.1177/0272431605279837.
- Senste M, Scholte R, Salmivalli C, Voeten M. Person-group dissimilarity in involvement in bullying and its relation with social status. *Journal of Abnormal Child Psychology*. 2007; 35:1009–1019. [PubMed: 17588201]
- 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]
- Smolkowski K, Biglan A, Dent C, Seeley J. The multilevel structure of four adolescent problems. *Prevention Science*. 2006; 7:239–256. doi:10.1007/s1121-006-0034-5. [PubMed: 16773454]
- Snijders, TAB.; Bosker, RJ. *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. 2nd ed. Sage; Thousand Oaks, CA: 2012.
- Snijders TAB, van de Bunt GG, Steglich CEG. Introduction to stochastic actor-based models for network dynamics. *Social Networks*. 2010; 32:44–60. doi:10.1016/j.socnet.2009.02.004.

- Steglich CEG, Snijders TAB, Pearson M. Dynamic networks and behavior: Separating selection from influence. *Sociological Methodology*. 2010; 40:329–393. doi:10.1111/j.1467-9531.2010.01225.x.
- Sugai G, Horner R. A promising approach for expanding and sustaining the implementation of school-wide positive behavior support. *School Psychology Review*. 2006; 35:245–259.
- Sullivan TN, Farrell AD, Kliewer W. Peer victimization in early adolescence: Association between physical and relational victimization and drug use, aggression, and delinquent behaviors among urban middle school students. *Development and Psychopathology*. 2006; 18:119–137. doi: 10.1017/S095457940606007X. [PubMed: 16478555]
- Tolan P, Thomas P. The implications of age of onset for delinquency risk II: Longitudinal data. *Journal of Abnormal Child Psychology*. 1995; 23:157–181. doi:10.1007/BF01447087. [PubMed: 7642832]
- Tremblay RE, Masse B, Perron D, Leblanc M, Schwartzman AE, Ledingham JE. Early disruptive behavior, poor school achievement, delinquent behavior, and delinquent personality: Longitudinal analyses. *Journal of Consulting and Clinical Psychology*. 1992; 60(1):64–72. doi: 10.1037/0022-006X.60.1.64. [PubMed: 1556287]
- Trentacosta CJ, Shaw DS. Emotional self-regulation, peer rejection, and antisocial behavior: Developmental associations from early childhood to early adolescence. *Journal of Applied Developmental Psychology*. 2009; 30:356–365. doi:10.1016/j.appdev.2008.12.016. [PubMed: 20161105]
- Vitaro F, Brendgen M, Tremblay RE. Influence of deviant friends on delinquency: Searching for moderator variables. *Journal of Abnormal Child Psychology*. 2000; 28:313–325. doi:10.1023/A:1005188108461. [PubMed: 10949957]
- Véronneau MH, Dishion TJ. Predicting change in early adolescent problem behavior in the middle school years: A mesosystemic perspective on parenting and peer experiences. *Journal of Abnormal Child Psychology*. 2010; 38:1125–1137. doi:10.1007/s10802-010-9431-0. [PubMed: 20532814]
- Wangby M, Bergman LR, Magnusson D. Development of adjustment problems in girls: What syndromes emerge? *Child Development*. 1999; 70:678–699. doi:10.1111/1467-8624.00049. [PubMed: 10368915]

Figure 1.
Predicted Trajectories of Antisocial Behavior by Gender

a. Contextual Social Victimization = -1.0σ b. Contextual Social Victimization = $+1.0\sigma$ **Figure 2. Predicted Trajectories of Antisocial Behavior by Gender, Contextual and Individual Social Victimization**

Contextual and individual social victimization are calculated at the first available assessment for each cohort, and for each individual. σ is used to represent “standard deviation units” for the applicable measure.

Characteristics of Analysis Sample

Table 1

School ^a	Waves participated	Average enrollment	Average ineligible	Average surveyed	Overall response rate	Female	White	African American	Latino	Asian	Native American	Other race/ethnicity
1	12	408	31	294	77.8%	55.2%	61.5%	5.0%	17.6%	3.6%	11.5%	16.6%
2	12	211	15	168	85.7%	45.6%	78.3%	2.2%	9.4%	1.5%	11.2%	10.9%
3	12	147	18	95	73.5%	46.2%	77.7%	1.1%	3.6%	0.0%	5.6%	19.9%
4	12	129	7	100	81.6%	48.0%	80.2%	1.6%	2.6%	1.5%	17.5%	24.8%
5	8	685	13	501	74.6%	53.9%	70.6%	0.5%	12.0%	1.5%	9.3%	12.8%
9	8	448	33	343	82.6%	51.5%	69.0%	2.4%	6.8%	2.7%	14.4%	16.8%
10	8	244	13	180	77.8%	54.8%	67.5%	4.3%	7.8%	2.8%	14.5%	18.3%
11	8	700	59	532	82.9%	49.2%	51.9%	2.8%	37.6%	3.5%	7.0%	9.9%
12	8	574	39	399	74.4%	50.9%	15.1%	2.5%	70.3%	1.1%	1.3%	14.1%
13 ^b	8	228	9	194	88.5%	46.3%	72.0%	1.6%	7.4%	2.5%	13.7%	20.7%
14	8	360	33	304	93.2%	56.8%	62.3%	1.3%	21.4%	6.4%	5.5%	12.2%
School average	--	352	23	264	80.3%	51.6%	60.0%	2.4%	22.8%	2.7%	9.4%	14.6%

^aSchools 6 and 8 did not provide at least 2 full years (8 waves) of data; the response rate of school 7 was low during its 2nd year of participation due to a miscommunication about student eligibility.

^bSchool enrolls grades 7–8 only.

Table 2

Behavior Measures by Wave

	Antisocial behavior (<i>SD</i>)	Social victimization (<i>SD</i>)
Cohort baseline ^a	1.53 (1.89)	1.00 (1.49)
Wave 1	1.72 (1.98)	1.05 (1.52)
Wave 2	1.66 (1.95)	1.05 (1.59)
Wave 3	1.66 (2.00)	1.09 (1.69)
Wave 4	1.46 (1.95)	1.06 (1.77)
Wave 5	1.25 (1.76)	0.83 (1.46)
Wave 6	1.27 (1.76)	0.85 (1.53)
Wave 7	1.29 (1.77)	0.84 (1.48)
Wave 8	1.31 (1.81)	0.93 (1.66)
Wave 9	1.49 (2.05)	1.00 (1.79)
Wave 10	1.34 (1.98)	0.95 (1.72)
Wave 11	1.42 (1.91)	0.97 (1.69)
Wave 12	1.30 (1.92)	1.02 (1.90)
Wave average	1.45 (1.89)	0.96 (1.61)

^a Average of all cohorts for their first wave of participation in the study.

Table 3

Multilevel Models of Antisocial Behavior

	Model 1 Null model ^a	Model 2 Trajectory × gender	R ²	Model 3 Fully conditional trajectory	R ²
Intercept	1.665 (0.028) ***	1.432 (0.034) ***		1.362 (0.028) ***	
Fixed effects--intercept					
Grade		0.140 (0.039) ***		0.126 (0.027) ***	
Quarter		0.021 (0.021)		0.016 (0.021)	
Gender (male)		0.422 (0.044) ***		0.446 (0.037) ***	
Contextual baseline social victimization				0.461 (0.081) ***	
Individual baseline social victimization				0.454 (0.018) ***	
Contextual baseline social victimization × individual baseline social victimization				0.147 (0.060) ***	
Fixed effects--slope					
Grade × quarter		-0.125 (0.026) ***		-0.133 (0.027) ***	
Grade × contextual baseline social victimization				0.275 (0.097) **	
Grade × individual baseline social victimization				-0.087 (0.020) ***	
Quarter × gender (male)		-0.061 (0.031) *		-0.064 (0.031) *	
Quarter × contextual baseline social victimization				0.005 (0.055)	
Quarter × individual baseline social victimization				-0.075 (0.011) ***	
Grade × contextual baseline social victimization × individual baseline social victimization				-0.229 (0.070) **	
Quarter × contextual baseline social victimization × individual baseline social victimization				0.097 (0.037) **	
Random effects					
L1 Residual (wave) intercept	1.372 (0.014) ***	1.187 (0.014) ***	0.12	1.195 (0.014) ***	0.30
L2 Residual (individual) intercept	2.017 (0.057) ***	1.879 (0.060) ***	0.11	1.350 (0.054) ***	0.37
Grade		1.148 (0.070) ***		0.945 (0.060) ***	
Quarter		1.131 (0.024) ***		0.126 (0.024) ***	

	Model 1 Null model ^a	Model 2 Trajectory × gender	Model 3 Fully conditional trajectory	R ²
Intercept × grade		*** 0.366 (0.038)	*** 0.397 (0.034)	***
Intercept × quarter		*** 0.108 (0.025)	*** 0.182 (0.023)	***
Intercept × gender (male)			*** 0.384 (0.034)	***
Int × individual baseline social victimization			*** 0.345 (0.023)	***
Grade × quarter		*** 0.147 (0.027)	*** 0.114 (0.025)	***
Grade × individual baseline social victimization			*** -0.116 (0.031)	***
Quarter × individual baseline social victimization			* -0.049 (0.020)	*
L3 Residual (cohort) intercept	*** 0.466 (0.057)	*** 0.328 (0.051)	*** 0.154 (0.030)	*** 0.46

^aModel uses observations for which complete data on all measured variables were available (L1: 25,393; L2: 5,611; L3: 46).

* $p < .05$.

** $p < .01$.

*** $p < .001$.