Developmental Pathways to Antisocial Behavior in Early-Adolescence:

Examining Changes in Aggression and Peer Exclusion through Childhood

by

Idean Ettekal

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Graduate Supervisory Committee:

Gary W. Ladd, Chair
Natalie D. Eggum
Marilyn S. Thompson

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ABSTRACT

This study examined the influence of childhood aggression, peer exclusion and associating with deviant peers on the development of antisocial behavior in early adolescence. To gain a stronger understanding of how these factors are associated with antisocial behavior and delinquency, multiple alternative pathways were examined based on additive, mediation and incidental models. A parallel process growth model was specified to assess whether early childhood aggression and peer exclusion (in 1st grade) and intra-individual increases in aggressive behaviors and exclusion through childhood (grades 1 to 6) are predictive of associating with deviant peers (in 7th grade) and antisocial behavior (in 8th grade). Based on a sample of 383 children (193 girls and 190 boys), results showed the strongest support for an additive effects model in which early childhood aggression, increases in aggression, increases in peer exclusion and associating with more deviant peers all predicted antisocial behavior. These findings have implications for how children's psychological adjustment is impacted by their behavioral propensities and peer relational context and the importance of examining developmental processes within and between children over time.

Dedicated to Hossein, Jaleh and Yashar.

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Introduction

The development of children's antisocial behavior has been an area of interest for scholars in a variety of disciplines. In an effort to better understand the causes of antisocial behavior, and how different factors influence its development through childhood, researchers have made efforts to integrate findings from different disciplines (see Dodge & Pettit, 2003). Children's behavioral propensities and peer relations are two areas of research in which investigators have examined the development of antisocial behavior. Childhood behavioral propensities have been linked with psychological adjustment in adolescence and adulthood (Caspi, Elder, & Bem, 1987). One behavioral propensity in childhood that has consistently been associated with antisocial behavior in adolescence is aggression (see Coie & Dodge, 1998; Deater-Deckard, Dodge, Bates, & Pettit, 1998; Hymel, Rubin, Rowden, & LeMare, 1990; Miller-Johnson, Coie, Maumary-Gremaud, Lochman, & Terry, 1999; Ollendick, Weist, Borden, & Green, 1992). In addition to studying aggression, researchers have examined how adverse peer relations, such as peer rejection and exclusion, are associated with children's adjustment (for reviews see Kupersmidt, Coie, & Dodge, 1990; Ladd, 2003; 2005; Parker & Asher, 1987). As children enter adolescence, associating with deviant peers is another peer contextual factor that has also been associated with higher rates of antisocial behavior (Patterson & Dishion, 1985; Simons, Wu, Conger, & Lorenz, 1994).

There are several forms of aggression that appear to be most common in childhood. Among these forms, the most commonly studied forms of aggression are physical and verbal aggression, which are also the focus of the present study. Examples of verbal aggression include, but are not limited to, teasing, yelling, screaming, arguing, and threatening behaviors. Examples of physical aggression include hitting, bullying and fighting behaviors. One of the aims of the present study was to examine how childhood aggression is associated with the development of other forms of antisocial behavior in adolescence. Given this aim, it seems important to elaborate on the distinction of these constructs. For the purposes of this study, antisocial behavior refers to a broader array of problem behaviors including stealing, substance use, delinquency, and school related problems (e.g., truancy). One of the primary aims of this study was to examine how the intra-individual changes (i.e., increases) in aggression through childhood are predictive of broader and conceptually distinct forms of antisocial behavior in adolescence.

A second aim of this study was to examine the role of the peer context, and how changes in peer exclusion through childhood are associated with antisocial behavior in early-adolescence. While much of the previous research on children's peer relations has been on peer rejection, the focus of the present study is on peer exclusion, a construct that is conceptually similar to peer rejection, but also distinct in several ways. Peer rejection has typically been measured by the degree to which children are disliked by peers (see Parker & Asher, 1987). In

many of the studies in which peer rejection has been examined, investigators have utilized peer report methods which ask children to either nominate classmates they dislike or to rate their classmates on how much they like to play or hang-out with them. These ratings or nominations are then aggregated to create a composite score which operationalizes peer rejection as the extent to which children are disliked by classmates (i.e., children who receive low average ratings or relatively high numbers of negative nominations from classmates). Based on this operationalization of peer rejection, it can be more accurately conceptualized as an attitudinal construct.

It would be expected that children who are disliked by members of their peer group are more at risk for also being excluded by peers. Rather than an attitudinal construct, exclusion refers to behaviors that peers direct toward individuals that serve the purpose of limiting or preventing the individual's participation in social interaction or activities. Thus, peer exclusion can be conceptualized as a form of peer rejection, but one that is manifested and measured behaviorally rather than attitudinally. Investigators who have attempted to measure peer exclusion have typically used behavioral indicators such as the extent to which a child is ignored and excluded from classroom or playground activities, or the extent to which other children actively refuse to let a child play or hang out with them (see Ladd, Herald-Brown, & Andrews, 2009). Further, it is possible that, from a child's perspective, peers' exclusionary behaviors are more

direct or transparent indicators of rejection than are peers' attitudes (i.e., feelings of dislike that reside in the minds of peers).

The present study examines behavioral forms of peer rejection and thus the term *peer exclusion* is used to make this distinction apparent. Presumably, much of the previous research which has focused on peer rejection as an attitudinal construct is relevant to review in this study and informs the hypotheses made about the effects of peer exclusion. One of the goals of the current study is to contribute to extant research on the long-term effects of peer exclusion, a behavioral construct that has received much less attention compared to attitudinal measures of children's peer rejection. If rejection impacts children negatively and plays a role in the development of maladjustment, then it may be the case that—in tests of this hypothesis—stronger findings will be obtained when behavioral (peer exclusion) rather than attitudinal measures are used as indicators of peer rejection.

Antecedents of Adolescent Antisocial Behavior: Childhood Peer Exclusion and Aggression

One of the reasons researchers have been interested in studying peer exclusion is because of its association with the development of antisocial behavior. Patterson and colleagues (1989) developed a theoretical model which identified several factors that may act as precursors to adolescent antisocial behavior. In their causal model, early childhood aggression predicts higher rates of peer rejection which in turn is associated with an increased likelihood of associating with deviant peers. Associating with deviant peers is a significant risk

factor for antisocial behavior. Researchers have found that rejected children are more likely to associate with deviant peer groups (Dishion, 1990; Dishion, Patterson, Stoolmiller, & Skinner, 1991). One possible explanation for this finding is that children who are not accepted within more normative peer groups are more likely to associate with deviant peer groups in which they are more readily accepted. There is also evidence of homophily, a tendency for children to gravitate towards other children with similar interests and behaviors (Kandel, 1978; Snyder, Dishion, & Patterson, 1986). Thus, selection processes might lead children who are excluded to associate with other excluded children (Bagwell, Coie, Terry, & Lochman, 2000). It is in the deviant peer group context that excluded children are more at risk for antisocial behavior. Children who associate with deviant peers and are excluded from more normative peer groups are less likely to experience prosocial forms of socialization that occur within normative peer groups and are more likely to be exposed to a peer context which encourages or reinforces antisocial behavior.

A similar process to the one explained above might also help explain the association between childhood aggression and the development of more serious forms of antisocial behavior. For instance, processes related to homophily and selection can also be used to explain findings which show that aggressive children are more likely to associate with other aggressive children (Cairns, Cairns, Neckerman, Gest, & Gariepy, 1988; for a review see Deptula & Cohen, 2004). Moreover aggressive behaviors are more likely to be viewed negatively by

normative peer groups and increase the likelihood that aggressive children will associate with deviant peers. Aggressive children who associate with aggressive peers are more likely to continue acting aggressively, and it is possible that this aggressive behavior is less likely to desist and more likely to develop into more severe forms of antisocial behavior and delinquency (Loeber & Dishion, 1983; Loeber & Stouthamer-Loeber, 1998; Moffitt, 1993). It has been suggested that aggressive children who associate with other aggressive children use positive reinforcement to shape and model their behaviors after each other, a process referred to as *deviancy training* (Dishion, Spracklen, Andrews, & Patterson, 1996; Snyder, Reid, & Patterson, 2003). Deviancy training is one explanation for why children who associate with deviant peer groups are more likely to have higher levels of delinquency (Dishion, McCord, & Poulin, 1999; Elliott, Huizinga, & Ageton, 1985; Patterson & Dishion, 1985).

Early studies on aggression and peer rejection found that these two factors were correlated and often co-occurred (Bierman, Smoot, & Aumiller, 1993; Cillessen, van Ijzendoorn, van Lieshout, & Hartup, 1992; Coie & Kupersmidt, 1983; Dodge, 1983; Ladd, Price, & Hart, 1988; Newcomb, Bukowski, & Pattee, 1993). However, researchers also found that not all children who were rejected by peers behaved aggressively (Bierman et al., 1993). For instance, there was support for two possible types of rejected children, aggressive-rejected children and withdrawn-rejected children (French, 1988). Children who exhibited withdrawn behaviors tended to have low levels of aggression. These findings suggested that

rejected children were behaviorally heterogeneous. In addition, about half of aggressive children were found to be rejected by peers (Cillessen et al., 1992; Coie, Dodge, Terry, & Wright, 1991). Thus, although aggression increased the likelihood of peer rejection, not all aggressive children are rejected (Bierman et al., 1993). These findings are important to consider because they suggest that although peer rejection and aggression are often substantially correlated, they are distinct constructs which may have independent effects on children's adjustment (see Bierman & Wargo, 1995).

Exactly how aggression and peer rejection jointly contribute to maladjustment warrants further investigation, and investigators have developed alternative models to help explain these associations. In the causal model developed by Patterson and colleagues (1989) which was described earlier, peer rejection and associating with deviant peers act as mediators which link early childhood aggression with adolescent antisocial behavior. An alternative explanation is that the effects of aggression and peer exclusion on antisocial behavior are additive. Additive effects models are based on the premise that children who are aggressive and excluded through childhood are more likely to experience the cumulative effects of risk exposure which increase the likelihood of maladjustment (Coie et al., 1993; Deater-Deckard et al., 1998; Ialongo, Vaden-Kiernan, & Kellam, 1998; Ladd, 2006). Additive effects models imply that both exclusion and aggression independently predict antisocial behavior and that these effects are over and above the effects of the other factor (i.e., controlling for the

effects of the other factor). In other words, such a model implies that antisocial behavior in adolescence is not solely predicted by children's behavioral propensities, but that children's negative peer relations also influence the likelihood that children will commit antisocial behavior. Indeed, person by environment models (Ladd, 2006; Magnusson & Stattin, 1998) would suggest that children's behavioral propensities and peer relational context jointly influence developmental pathways.

Investigators who have examined additive effects models of aggression and peer rejection on antisocial behavior have found support for this hypothesis. This approach is promising in that it allows researchers to determine whether relational factors (e.g., peer rejection or peer exclusion) or behavioral propensities (e.g., aggression) are stronger predictors of later maladjustment and exactly how these factors are related. In addition, this approach may also provide support for child by environment models which suggest that children's outcomes are more accurately explained by the unique contribution of individual and environmental factors than by either alone (see Ladd, 2003, 2006; Ladd & Burgess, 2001). A study conducted by Ladd (2006) found support for this premise by examining the effects of aggression and peer rejection on children's externalizing behaviors between kindergarten and grade 6. In the results, aggression and peer rejection independently contributed to increases in externalizing behaviors and the presence of both risk factors was more detrimental than either risk factor alone. In another study, the authors found that aggression and peer rejection in grade 3 contributed

independently to externalizing and internalizing problems and school-related adjustment problems in grade 6 (Coie, Lochman, Terry, & Hyman, 1992). Compared to children who were either rejected or aggressive, or neither, children who were both aggressive and rejected were considerably more likely to have scholastic adjustment problems several years later.

However, there are also findings which have produced mixed results in support of an additive effects hypothesis. In fact, some researchers have suggested that aggression is a stronger predictor of maladjustment than peer rejection, and that peer rejection is a consequence of aggression (i.e., an incidental model; see Dodge, 1983; Kupersmidt & Coie, 1990; Parker & Asher, 1987). This argument suggests that peer rejection alone does not predict maladjustment, but rather is a manifestation of an underlying deficit in children (e.g., aggression) that would explain its apparent association with later problem behaviors (see Woodward & Fergusson, 1999). A study by Kupersmidt and Coie (1990) found that aggression measured in grade 5 was a predictor of adolescent delinquency and dropping out of high school measured in grade 12. However, peer rejection was not found to provide a unique contribution to either delinquency or dropping out of school. A study conducted by Vitaro and colleagues (2007) found that children's disruptive behaviors and their friends' disruptive behaviors, but not peer rejection, predicted adolescent delinquency.

In summary, investigators have identified three alternative hypotheses which explain the associations between aggression, peer exclusion, deviant peers

and antisocial behavior. Whereas the incidental model argues that children's underlying behavioral problems (i.e., aggression) are most responsible for their subsequent maladjustment (i.e., antisocial behavior), the additive effects model argues that peer exclusion predicts antisocial behavior over and above the effects of childhood aggression. On the other hand, the causal model suggests that there is a mediated pathway from early childhood aggression to peer exclusion, which in turn predicts associating with deviant peers, which in turn predicts antisocial behavior. One of the primary objectives of the present study was to develop a model which allows for an examination of each of these alternative hypotheses.

Many of the studies that have examined how childhood aggression and peer rejection are predictors of adolescent maladjustment have used longitudinal designs where the predictor variable (e.g., aggression or peer rejection) is measured at one time point in childhood, and the outcome variable (e.g., antisocial behavior) is measured at a later time point. Based on this design, researchers infer that the predictor variable which occurs at an earlier time point increases the likelihood of the outcome measured at a later time point. Although these types of prospective longitudinal designs are an improvement from cross-sectional studies, they also have certain limitations. This type of research design does not allow for accurate measurement of the intra-individual continuity (or discontinuity) of the predictor variable over time. Rather, it is either assumed that the predictor variable is stable and continuous and for that reason increases the likelihood of the measured outcome at a later time point, or a second assumption

may be that regardless of the stability of the predictor variable, it has a long-lasting effect. That is, even if the predictor variable changes over time, its presence at an earlier time point increases the likelihood of an outcome at a later time point. Although both of these assumptions seem plausible, few studies have attempted to test these assumptions to determine if either is more valid.

In order to address some of these limitations, some investigators have used a different approach to measuring predictor variables and their association to later outcomes which utilize a more person-oriented design that examines within-individual variations (see Duncan & Duncan, 2004; Preacher, Wichman, MacCallum, & Briggs, 2008). One approach is to measure a variable repeatedly over time and examine whether this variable is stable and continuous or changing levels within individuals over time. Latent growth curve analysis is one method that investigators have used to examine a variable's intra-individual stability. This approach would allow an investigator to examine an individual's developmental trajectory on a given variable longitudinally and how changes in that variable over time are associated with later outcomes. One of the primary aims of the present study was to examine how intra-individual changes in childhood peer exclusion and aggression increase the likelihood of antisocial behavior as children enter adolescence. There have not been any prior studies which have used a parallel process growth model (i.e., a model that examines growth processes of two factors at the same time) to simultaneously examine the intra-individual changes

in childhood aggression and peer exclusion and how these factors jointly contribute to adolescent antisocial behavior.

The Present Study

Considering that aggression and peer exclusion are factors that may develop in children over long periods of time and occur throughout the childhood years, it may be beneficial for researchers to examine these factors from more of a developmental perspective focusing on how these factors change within individuals over time. Moreover, researchers can then test whether these intra-individual changes have an impact on children's adjustment as they enter adolescence. One of the primary goals of this study was to use latent growth curve analyses in order to measure both starting levels (i.e., intercept) and intra-individual changes (i.e. slope) in childhood aggression and peer exclusion. This approach differentiates if starting levels (in 1st grade) of aggression and peer exclusion or within-individual changes in aggression and peer exclusion (i.e., increases in aggressive behavior and more frequent exclusion through childhood, from grades 1 to 6) predict early-adolescent antisocial behavior (in grade 8).

Although existing research has consistently established links between aggression, peer rejection and adjustment problems, this study will examine whether growth processes, that is increases in aggression or peer exclusion over time, are predictive of later maladjustment controlling for starting levels of these factors. Thus, in addition to examining the starting levels of aggression and peer exclusion, the design of this study will provide greater insight into how adolescent

adjustment can be predicted by analyzing growth processes (i.e., changes in aggression and peer exclusion) through childhood and leading up to adolescence. Chronic stress models would imply that increasing exposure to a risk factor over time could increase the likelihood that a risk factor is associated with a later outcome. However, whether changes in aggression and peer exclusion over time are predictive of antisocial behavior has not been tested empirically. From a risk-exposure perspective, it would be reasonable to expect that children who experience increasing levels of a risk factor over time may be more susceptible to the outcomes that are associated with that risk, even if they initially had low levels of risk. Based on this perspective, one hypothesis is that increases in aggression and peer exclusion over time are associated with higher levels of antisocial behavior.

In addition to examining how increases in aggression and peer exclusion through childhood are hypothesized to be associated with antisocial behavior, a secondary aim of this study was to examine three alternative hypotheses pertaining to the development and antecedents of antisocial behavior. More specifically, a model was specified to empirically examine additive, incidental and mediated effects. Figure 1 illustrates the different paths that were specified for each of these hypothetical models. To simplify the presentation of these alternative models, the mediation model is illustrated separately from the additive and incidental models, but in the analyses, one model was specified which included both mediated and additive effects. Results from prior research have

produced mixed findings and investigators have found support for each of these models. The goal of the present study was to contribute to this debate and examine this topic from a developmental perspective by using longitudinal growth curve analysis to model individual children's growth trajectories. Finally, exploratory analyses were also conducted to assess whether these processes are similar for boys and girls.

Method

Participants

Data for this study were gathered as part of a larger longitudinal project conducted in the Midwestern United States. A total sample of 383 children were used in the present analyses. The sample consists of 193 girls (50.4%) and 190 boys (49.6%). Consent was first obtained from school administrators of participating school districts. Written parental consent was obtained for each child participating in the study, and children's assent was obtained. Of the families initially recruited to participate, 95% voluntarily agreed to be part of the study.

The sample included European American children (77.8%), African American children (17.8%), and children from Hispanic, mixed race, or other (4.4%) backgrounds. The sample also represented children from a wide range of socioeconomic backgrounds: 36.8% of the children lived in families with an annual household income less than $20,000, 30.6% had an annual household income greater than $20,000 and less than $40,000, and the remaining 32.6% had household incomes over $40,000.

Procedure

For the purposes of the present study, data from participants, teachers and parents were used. Data were collected annually during the spring of each school year from grade 1 through grade 8 (8 years). Participants answered self-report measures about their problem behaviors and association with deviant peer groups in grades 7 and 8. Teachers completed measures on children's aggression and peer exclusion from grades 1 through 6 and reported on participants' antisocial behavior in grade 8. Parents provided demographic information about their children and completed measures about their children's antisocial behavior in grade 8.

Measures

Aggression. The 7-item Aggressive Behavior subscale of the Child Behavior Scale (Ladd et al., 2009; Ladd & Profilet, 1996) was used. This measure has been found to be developmentally valid and reliable for children between the ages of 5 and 13 years old (see Ladd et al., 2009) and demonstrated adequate internal consistency within the current sample (Cronbach's alpha ranged from .90 to .92). Teachers rated each item on a 3-point Likert-type scale (1 = "*doesn't apply,*" 2 = "*applies sometimes*" and 3 = "*certainly applies*"). Examples of items included: "Fights with other children," "Bullies other children," "Kicks, bites, or hits other children," "Aggressive child," "Taunts and teases other children," "Threatens other children," and "Argues with peers." An aggressive behavior scale score was calculated by averaging teachers' ratings across the items.

Peer exclusion. The 7-item Excluded by Peers subscale of the Child Behavior Scale (Ladd et al., 2009; Ladd & Profilet, 1996) was used. This measure has been found to be developmentally valid and reliable for children between the ages of 5 and 13 years old (see Ladd et al., 2009) and demonstrated adequate internal consistency within the current sample (Cronbach's alpha ranged from .91 to .95). Teachers rated each item on a 3-point Likert-type scale (1 = "*doesn't apply,*" 2 = "*applies sometimes*" and 3 = "*certainly applies*"). Examples of items included, "Peers refuse to let this child play with them," "Excluded from peers' activities," "Is ignored by peers," and "Ridiculed by peers." A peer exclusion scale score was calculated by averaging teachers' ratings across the items.

Antisocial behavior. A multi-informant latent construct of antisocial behavior in grade 8 was computed by using parent-, teacher- and self-reports. The mean of each of these subscales from the multiple informants were entered as the indicators of the latent construct. The Delinquent Behavior subscale of the Achenbach Youth Self Report (YSR; Achenbach, 1991a) was used to assess self-reports of children's delinquency (Cronbach's alpha = .81). The Delinquent Behavior subscale includes 11 items and uses a 3-point Likert-type scale (1 = "*not true,*" 2 = "*somewhat or sometimes true*" and 3 = "*very true or often true*"). Examples of items are "I lie or cheat," "I run away from home," "I set fires," "I steal at home," "I steal outside the home," "I cut classes or skip school," and "I use alcohol or drugs for nonmedical purposes." The Delinquent Behavior subscale of the Achenbach Child Behavior Checklist (CBCL; Achenbach, 1991b) is an 11-

item parent-report measure of children's delinquent behavior (Cronbach's alpha = .77). A 3-point Likert-type scale is used (1 = "*not true*" to 3 = "*very true or often true*"). Items are comparable to the YSR. The 9-item Delinquent Behavior subscale of the Teachers Report Form (TRF; Achenbach, 1991c) was used to assess teacher-reports of children's delinquency (Cronbach's alpha = .85) on items comparable to the YSR and CBCL. Teachers rated each item on a 3-point Likert-type scale (1 = "*not true*" and 3 = "*very true or often true*").

Associating with deviant peers. To assess the extent that children associate with deviant peers, a 24-item Risky Behaviors of Peers (Eccles & Barber, 1990) self-report scale was used (Cronbach's alpha = .91). Children were asked to report about their close friends in the past year and examples of items included: "How many of your friends skipped a day of school?" "How many of your friends got drunk?" "How many of your friends got suspended from school?" "How many of your friends stole something worth more than $50?" "How many of your friends stayed out all night without their parents' permission?" A 5-point Likert-type scale (1 = "*none*" to 5 = "*almost all*") was used.

Data Analysis Plan

Linear growth models were used to examine the growth in aggression and peer exclusion over time. Growth models were specified using a structural equation modeling (SEM) framework in Mplus version 5.1 (Muthén & Muthén, 2008). In all of the linear growth models used in subsequent analyses, mean

scores were used as the manifest indicators for each latent growth factor (i.e., as the indicators for the intercept and slope latent variables). These mean scores were based on teacher reports collected annually between grades 1 to 6. The means of the manifest indicators were constrained to equal zero. To specify a latent intercept factor, all factor loadings between the latent intercept factor and manifest indicators were constrained to equal one. The latent slope factor was specified to measure linear growth over equally spaced time intervals with factor loadings equal to 0, 1, 2, 3, 4, and 5 for grades 1 through 6, respectively. Thus, based on these specifications, the latent intercept factor was the estimated score for children in 1st grade and the latent slope factor measured yearly growth rates (i.e., changes over time). The covariance between the latent intercept and slope factors was also specified. Residual variances of the manifest indicators were not constrained to be equal and were allowed to be freely estimated at each time point.

In addition to specifying separate linear growth models for aggression and peer exclusion, a parallel process growth model was also specified by combining the aggression and peer exclusion growth models. In the parallel process growth model, the specifications for the growth parameters were identical to the specifications for the separate linear growth models. Additionally, the within time residual covariances between teacher reports of aggression and exclusion were also estimated.

For each of these models, model fit was assessed using the root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), and chi-square statistic. It has been suggested that an RMSEA < .08 (< .06), and SRMR <. 08 (< .05) reflect models with adequate (good) fit to the observed data (Hu & Bentler, 1999). However, it should also be noted that these cut-off criteria reflect adequate fit for SEM models based on the covariance structure. It is less clear whether similar cutoff criteria should be used for assessing the model fit of latent growth models which also incorporate a mean structure (see Wu, West, & Taylor, 2009). Although model fit indices are reported for each of the models described in subsequent analyses, these values should be interpreted cautiously.

After ensuring that each of these models converged and had adequate fit to the observed data, the means and variances of each of the latent growth factors were examined. To test the substantive questions of interest in this study, it was imperative that there be between-person variability in the aggression and exclusion growth factors (i.e., significant intercept and slope variances for each of the aggression and exclusion factors).

In the models which included mediated paths, the distribution of the product method was used to test for mediation (PRODCLIN; see MacKinnon, Lockwood, & Williams, 2004). The PRODCLIN program (see MacKinnon, Fritz, Williams, & Lockwood, 2007) requires users to input the values of the raw regression coefficients and standard errors for *a* (i.e., the path between the

independent variable and the mediator) and for *b* (i.e., the path between the mediator and the dependent variable). The PRODCLIN program then computes confidence limits which account for the non-normally distributed product of the *a* and *b* paths. If the 95% confidence limits do not include zero, there is empirical support for a mediated effect. Compared to other methods for testing mediation effects (e.g., Sobel test, resampling methods) simulation studies have found that the distribution of the product method has accurate Type I error rates and confidence limits (see MacKinnon et al., 2004).

In the mediation models described below, a latent variable measuring children's associations with deviant peers was also specified. In order to specify this latent variable, three parcels were created based on the original 24-item scale. The *item-to-construct balance* approach described by Little and colleagues (2002) was used to determine which items to parcel together. This approach consists of first conducting a one-factor exploratory factor analysis (EFA) in order to determine the factor loadings for each individual item. Based on these factor loadings, items were alternately assigned to different parcels. In this case, the three time items with the highest factor loadings were each assigned to alternate parcels. Then the next three items with the fourth, fifth, and sixth highest factor loadings were alternately assigned to the three parcels in an inverted order (i.e., the parcel which included the item with highest factor loading also included the item with the sixth highest factor loading; the parcel with the second highest factor loading included the item with the fifth highest factor loading; the third

parcel included the items with the third and fourth highest factor loadings). This approach was used until all 24 items were assigned to one of the three parcels, and thus each parcel consisted of eight items. These three parcels were then used as the manifest indicators for the latent variable. This approach is recommended because these parcels are more likely to meet assumptions of normality compared to individual items, and this approach allows for a more parsimonious structural model with fewer parameters to estimate (see Bandalos, 2002; Little, Cunningham, Shahar, & Widaman, 2002; Nasser & Wisenbaker, 2003).

Finally, multiple-group analysis was performed to test for differences between boys and girls. To test whether differences between boys and girls were statistically significant, an approach was used similar to one described by Preacher and colleagues (2008). Based on this approach, an unconstrained model (in which all parameters were estimated separately for boys and girls) was compared to a set of restricted models (in which equality constraints were imposed on the same parameter for boys and for girls). The constrained and unconstrained models were then compared using a chi-square difference test. If this test was statistically significant, then the equality constraints resulted in a decrease in model fit, suggesting that there are differences between boys and girls on the constrained parameter. If the chi-square difference test was non-significant, then constraining the parameter to be equal for boys and girls did not result in worse model fit and it could be concluded that there was not a statistically significant difference between boys and girls.

In summary, the first aim of this study was to examine whether children who become more aggressive or excluded as they get older have higher levels of antisocial behavior in early adolescence. The second aim of this study was to test a series of mediation models to assess whether initial levels and/or growth in aggression and exclusion over time increase the likelihood that children associate with deviant peers, which in turn predicts children's antisocial behavior. The third objective of this study was to develop a model which tested multiple pathways to antisocial behavior. Finally, the fourth aim of this study was to examine whether there are gender differences between boys and girls.

Results

Preliminary and Missing Data Analyses

Table 1 presents the bivariate correlations, means, standard deviations, ranges, and percent of missing data for each of the aggression, peer exclusion, associating with deviant peers, and antisocial behavior measures used in subsequent analyses. Teacher reports of children's aggression and peer exclusion were collected annually from 1st grade to 6th grade. Children provided self-report data about their associations with deviant peers in 7th grade and antisocial behavior was assessed in 8th grade by teacher-, parent- and self-reports. In the SEM models, a multi-informant latent variable was specified for antisocial behavior based on the mean scores of parent-, teacher-, and self-reports. The use of multi-informant data in this study aimed to reduce shared method variance.

As expected, repeated measures of aggression were moderately correlated with each other (r = .36 to r = .66) and were higher for adjacent time waves. Repeated measures of peer exclusion were also moderately correlated with each other (r = .24 to r = .60) and higher for adjacent time waves. Correlations among the aggression and peer exclusion measures ranged from low to moderately high (r = .09 to r = .58). Within time correlations between aggression and peer exclusion (r = .36 to r = .58) were higher compared to when they were measured at different time points and in general correlations decreased with greater time lags. Measures of antisocial behavior and aggression were low to moderately correlated (r = .10 to r = .37), and the strength of these correlations indicates that these constructs measure distinct forms of adjustment in children. The correlations among the peer exclusion and antisocial behavior measures were low (r = .05 to r = .22), and associating with deviant peers was moderately correlated with antisocial behavior (r = .33 to r = .50).

Preliminary analyses also included the examination of missing data on each of the measures used in this study. Given the longitudinal nature of this study, participant attrition increased with the passage of time, with only .2% (n = 1) missing data for grade 1 assessments. For measures of antisocial behavior collected in 8th grade, the proportion of missing data ranged from 9.4% to 14.4% for parent-, self-, and teacher-reports. In order to include the entire sample in this study and not remove any cases due to missing data, full information maximum likelihood (FIML) estimation was used in all subsequent analyses reported below.

Simulation studies have found that this estimation procedure provides unbiased estimates and standard errors when assumptions of missing at random (MAR) data are met (see Enders, 2010).

Linear Growth Models

Aggression. Before addressing the substantive questions of interest, the first aim of this study was to determine whether childhood aggression can be examined using latent growth curve analysis. The linear growth model for aggression had adequate fit, χ^2 (df = 16) = 32.82, $p < .01$, RMSEA = .052, SRMR = .058. Descriptive statistics for this model (means, variances, standard deviations, and standard errors) are presented in Table 2. The mean of the aggression intercept factor was 1.24, the average estimated aggression score for children in 1st grade. The statistically significant variance of the aggression intercept factor indicates variability in children's starting levels of aggression in 1st grade (σ^2 = .1, $p < .001$). As expected, the non-significant p-value for the mean of the aggression slope factor (M = -.003, p = .45) indicates that on average, there was no growth in aggression over time. However, there was individual variability in aggression slopes, as indicated by the statistically significant variance of the aggression slope factor (σ^2 = .002, $p < .001$). In other words, the children in this sample showed variability in their aggression growth trajectories. The aggression intercept and aggression slope factors were also found to be significantly negatively correlated (r = -.39, $p < .001$).

Peer Exclusion. In addition to specifying a latent growth curve model for childhood aggression, an identical approach was used to separately examine changes in peer exclusion through childhood. The model fit for this linear growth model was acceptable, χ^2 (16) = 57.94, $p < .001$, RMSEA = .083, SRMR = .085. Descriptive statistics (means, variances, standard deviations, and standard errors) for this model are presented in Table 2. The mean of the exclusion intercept factor was 1.17, the average estimated exclusion score for children in 1st grade. The statistically significant variance of the exclusion intercept factor indicates variability in children's starting levels of exclusion in 1st grade ($\sigma^2 = .049$, $p < .001$). The statistically significant and positive mean of the exclusion slope factor ($M = .030$, $p < .001$) indicates that over time, on average, children experienced a small increase in peer exclusion. The statistically significant variance of the exclusion slope factor indicates that there was individual level variability in children's exclusion growth trajectories ($\sigma^2 = .004$, $p < .001$). The exclusion intercept and exclusion slope factors were not found to be significantly correlated ($r = .06$, $p = .66$).

Structural Models

Do children who become more aggressive or excluded through childhood have higher levels of antisocial behavior in early adolescence?

After the properties of the aggression and peer exclusion latent growth models were examined independently and found to converge and adequately fit the observed data, a series of structural models were specified to empirically examine

the substantive research questions of this study. The first objective of this study was to examine whether initial levels (i.e., intercept factors) and increases in aggression and peer exclusion through childhood (i.e., slope factors) are predictive of antisocial behavior in 8th grade. In other words, are children who are aggressive in 1st grade more likely to have higher levels of antisocial behavior in 8th grade? Are children who are becoming more aggressive through grade school more likely to have higher levels of antisocial behavior in middle school? Are children who are excluded by their peers in 1st grade more likely to have higher levels of antisocial behavior in 8th grade? Do children who become more excluded by their peers as they progress through grade school have higher rates of antisocial behavior in middle school?

In order to address each of these four research questions, separate latent growth curve models were specified to test for the independent effects of aggression and exclusion on antisocial behavior (see Table 3). Both the aggression and exclusion models had adequate fit, χ^2 (32) = 78.05, $p < .001$, RMSEA = .061, SRMR = .050 for aggression model, and χ^2 (32) = 72.24, $p < .001$, RMSEA = .057, SRMR = .067, for exclusion model. Aggression in 1st grade predicted children's antisocial behavior in 8th grade ($\beta = .54$, $p < .001$). Moreover, children who were becoming more aggressive through childhood also had higher levels of antisocial behavior in 8th grade ($\beta = .34$, $p < .001$). Peer exclusion in 1st grade was also associated with antisocial behavior in 8th grade ($\beta = .22$, $p = .01$). There was also a positive association for children who were becoming more

excluded through childhood to have higher levels of antisocial behavior, but this association was not statistically significant (β = .16, p = .10).

Do deviant peers mediate the association between aggression or exclusion and antisocial behavior? After determining that both of the aggression factors (i.e., intercept and slope) and one of the exclusion factors (i.e., intercept) were significantly predictive of antisocial behavior, the next objective of this study was to examine whether associating with more deviant peers mediates the link between each of the aggression and exclusion growth factors and antisocial behavior. In these models, a latent construct representing the degree to which children associate with deviant peers was added. To test these associations, a set of models were specified which examined the effects of aggression and peer exclusion independently (see Figure 2).

The meditation model for aggression had adequate fit, χ^2 (56) = 147.13, p < .001, RMSEA = .065, SRMR = .058 (see top portion of Figure 2). The results indicated that higher levels of aggression in 1st grade predicted that children would associate with more deviant peers in 7th grade (β = .20, p = .001; see Table 3). However, there was no relation between aggression growth trajectories and associating with deviant peers. As expected, associating with deviant peers in 7th grade predicted higher levels of antisocial behavior in 8th grade (β = .56, p < .001). Even after controlling for the association between deviant peers and antisocial behavior, higher levels of aggression in 1st grade predicted antisocial behavior (β = .42, p < .001). Additionally, children who were becoming more

aggressive through childhood had higher levels of antisocial behavior in 8th grade, even after controlling for the effects of associating with deviant peers and baseline levels of aggression ($\beta = .40$, $p < .001$). To test whether associating with deviant peers mediated the relation between the aggression intercept and antisocial behavior, the distribution of the product method was used to compute 95% confidence limits around the mediated effect (see MacKinnon et al., 2004). The findings showed that associating with deviant peers partially mediated the relation between aggression in 1st grade and antisocial behavior in 8th grade, 95% CI [.04, .19].

A second model was specified which tested the associations between the exclusion growth factors, associating with deviant peers and antisocial behavior. This model had adequate fit, χ^2 (56) = 136.78, $p < .001$, RMSEA = .061, SRMR = .064 (see bottom portion of Figure 2). The results showed there was a positive, but statistically non-significant, association between the exclusion intercept and associating with deviant peers (see Table 3; $\beta = .13$, $p = .09$). Somewhat surprisingly, peer exclusion in 1st grade was no longer a statistically significant predictor of antisocial behavior in 8th grade once associating with deviant peers was included in the model ($\beta = .13$, $p = .10$). Mediation analyses did not find that associating with deviant peers mediated the relation between exclusion in 1st grade and antisocial behavior in 8th grade, 95% CI [-.02, .23]. Additionally, there was not a significant relation between increases in exclusion (i.e., the exclusion slope) and associating with deviant peers. However, after associating with deviant

peers was added to the model, the direct effect from the exclusion slope to antisocial behavior became statistically significant. In other words, after controlling for the effects of associating with deviant peers, children who had become more excluded through childhood had higher levels of antisocial behavior in 8th grade (β = .20, p = .02).

Are there multiple pathways to antisocial behavior in early adolescence? The next objective of this study was to assess a model which included multiple alternative pathways to antisocial behavior in early adolescence. In line with this objective, the model presented in Figure 3 is a parallel process growth model which combines the aggression and peer exclusion growth factors into one model. More specifically, this model tested for both mediated (i.e., indirect) effects and for additive effects. To test for mediation, this model included paths from aggression to peer exclusion, which in turn predicted associating with deviant peers, which in turn predicted antisocial behavior (i.e., aggression intercept → exclusion intercept → associating with deviant peers → antisocial behavior; aggression intercept → exclusion slope → associating with deviant peers → antisocial behavior; see top portion of Figure 1).

Additive effects were also tested by including the direct effects between the aggression and exclusion growth factors with antisocial behavior (i.e., aggression intercept → antisocial behavior; aggression slope → antisocial behavior; exclusion intercept → antisocial behavior; exclusion slope → antisocial behavior; see bottom portion of Figure 1). By including paths for both mediation

and additive effects in one model, it was possible to determine which of these effects, if either, explained the associations between these variables.

This model appeared to have adequate fit, χ^2 (132) = 301.62, $p < .001$, RMSEA = .058, SRMR = .061. The results showed that there was a strong association between the aggression intercept and the exclusion intercept ($\beta = .73$, $p < .001$). However, peer exclusion in 1st grade did not predict associating with deviant peers or antisocial behavior. Thus, there was not support for a mediated effect through peer exclusion in 1st grade. Additionally, aggression in 1st grade was not associated with increases in peer exclusion, and increases in peer exclusion were not predictive of associating with deviant peers. Thus, there was not support for a mediated effect through increases in peer exclusion. In all, there was evidence of one mediated effect, from aggression in 1st grade to associating with deviant peers, which in turn predicted antisocial behavior, 95% CI [.01, .29]. This finding corroborated the results from the independent aggression and peer exclusion models shown in Figure 2. In summary, there was no evidence of mediation through either of the peer exclusion growth factors, but there was support for a mediated effect from 1st grade aggression to associating with more deviant peers which in turn predicted antisocial behavior.

In addition to testing for mediated effects, this model also included direct effects from each of the aggression and peer exclusion growth factors to deviant peers and to antisocial behavior in order to examine additive effects. Additionally, there was a direct effect between deviant peers and antisocial behavior. The

results indicated that aggression in 1st grade predicted antisocial behavior in 8th grade, even after controlling for the effects of deviant peers, peer exclusion and increases in aggression ($\beta = .53$, $p < .001$). Children who became more aggressive over time had higher levels of antisocial behavior, even after controlling for baseline levels of aggression in 1st grade, deviant peers, and peer exclusion ($\beta = .39$, $p < .001$). Associating with deviant peers was strongly predictive of antisocial behavior, even after controlling for aggression and peer exclusion ($\beta = .59$, $p < .001$). Finally, children who became more excluded over time had higher levels of antisocial behavior even after controlling for aggression and deviant peers ($\beta = .20$, $p = .04$). Thus, there appeared to be an additive effect in which children who became more excluded over time had higher levels of antisocial behavior, and this effect accounted for variability in antisocial behavior over and above the effects of early aggressive behaviors, growth in aggressive behaviors, and associating with deviant peers.

Are the associations among exclusion, aggression, deviant peers and antisocial behavior similar for boys and girls? The final goal of this study was to assess whether the structural model illustrated in Figure 3 was comparable for boys and girls. Before examining differences in the structural paths, a series of models were specified to test for measurement invariance between groups. First, a configural invariance model was specified in which all factor loadings and intercepts were allowed to be estimated for boys and girls (i.e., no constraints were imposed on the factor loadings or intercepts). In this model, constraints for

the growth factors (i.e., the aggression and exclusion intercept and slope latent variables) were specified in the same manner as in the combined model for boys and girls. However, the factor loadings and intercepts of the manifest indicators for the associating with deviant peers and antisocial behavior constructs were allowed to be estimated for boys and girls separately. The configural invariance model appeared to have adequate fit, χ^2 (264) = 542.65, $p < .001$, RMSEA = .074, SRMR = .075.

A second model was then specified to test for weak factorial invariance. In the weak factorial invariance model, the factor loadings were constrained to be equal between groups, but the intercepts were allowed to be estimated separately for boys and girls. The weak invariance model appeared to have adequate fit, χ^2 (268) = 551.65, $p < .001$, RMSEA = .074, SRMR = .079. A nested model chi-square difference test comparing the configural and the weak invariance models was statistically non-significant, $\Delta\chi^2$ ($\Delta df = 4$) = 9.00, $p = .061$. This non-significant test indicated that adding constraints to impose weak factorial invariance did not reduce the overall model fit, and thus, there was evidence for weak factorial invariance.

After testing for weak factorial invariance, a third model was specified which tested for strong factorial invariance. In this model, both the factor loadings and the intercepts were constrained to be equal between groups. The strong invariance model appeared to have adequate fit, χ^2 (272) = 554.23, $p < .001$, RMSEA = .074, SRMR = .079. A nested model chi-square difference test

comparing the weak and strong invariance models was statistically non-significant, $\Delta\chi^2$ ($\Delta df = 4$) = 2.58, $p = .63$, indicating that the overall model fit was not reduced by imposing these additional constraints. Thus, there was statistical support for strong factorial invariance and this model was used as the comparison model in subsequent analyses comparing gender differences in the structural paths.

To determine whether the path coefficients in this model were different for boys and girls, a fourth model was specified in which all the path coefficients were constrained to be equal between groups in addition to the constraints imposed for strong factorial invariance. Specifying these additional constraints appeared to reduce the overall model fit, χ^2 (283) = 574.30, $p < .001$, RMSEA = .073, SRMR = .091. A nested model chi-square difference test comparing this model with the strong invariance model was statistically significant, $\Delta\chi^2$ ($\Delta df = 11$) = 20.07, $p = .04$, indicating that imposing these additional constraints on the path coefficients resulted in worse model fit.

Additional analyses were then performed to assess which of the path coefficients were statistically different between boys and girls. A series of models were specified that constrained one path coefficient at a time to be equal for boys and girls. If this constraint led to a decrease in model fit, based on a significant chi-square difference test with one degree of freedom (because only one constraint was imposed at a time), then it could be concluded that boys and girls had different parameter estimates for that particular path coefficient. The results

of these model comparisons are presented in Table 4. Of the 11 path estimates that were estimated in the model shown in Figure 3, only one was significantly different for boys and girls. Constraining the path from the aggression intercept to the exclusion intercept resulted in a significant decline in model fit, $\Delta\chi^2$ ($\Delta df = 1$) = 9.10, $p = .003$. In the unconstrained model, the effect of the aggression intercept on the exclusion intercept appeared stronger for girls than for boys ($b = .73$, $p < .001$, and $b = .43$, $p < .001$, respectively). Other than this one path, constraining all other path estimates to be equal for boys and girls did not result in a decline in model fit.

Discussion

The results of this study contribute to existing developmental research on the antecedents of antisocial behavior in early adolescence. Unlike many of the previous studies which have investigated this topic, this study used a novel design by integrating both person-oriented and variable-centered approaches to examining the antecedents of antisocial behavior. The results of this study illustrate the potential contributions of examining developmental processes from an intra-individual perspective, and how children's behavioral propensities and experiences within their peer group change over time. In many studies, measuring correlations between variables essentially compares children's rank order in comparison to other children. These types of correlational studies do not allow investigators to examine intra-individual developmental processes. Considering that childhood development is inherently a process of change within individuals,

the use of longitudinal growth modeling to examine children's developmental trajectories seems worthwhile and promising. Indeed, the results of this study would suggest that these intra-individual changes and increases in behaving aggressively and experiencing higher rates of peer exclusion are strong predictors of adolescent maladjustment.

The first objective of this study was to examine the unique predictive contributions of childhood aggression and peer exclusion on antisocial behavior in early adolescence. More specifically, analyses were conducted to assess whether early childhood aggression (in 1st grade) and increases in childhood aggression (from 1st grade to 6th grade) are predictive of antisocial behavior in early adolescence (during 8th grade). The results found that both of these factors predicted antisocial behavior and accounted for a sizable 27% of the variability in antisocial behavior in 8th grade. As expected, children who had higher levels of aggression in early childhood were more likely to have higher levels of antisocial behavior roughly seven years later. This finding is in line with other studies which have found that individual's behavioral propensities in childhood are associated with their adjustment in adolescence and even into adulthood (Caspi et al., 1987; Huesmann, Eron, Lefkowitz, & Walder, 1984).

Even after controlling for early levels of aggressive behavior, children who became more aggressive over time were significantly more likely to have higher levels of antisocial behavior in early adolescence. This finding appears to be a rather novel contribution of this investigation to prior research. By using

latent growth modeling, this study was able to examine how changes in aggressive behaviors within individuals impact their adjustment. Although aggression appears to be a fairly stable behavior in many children, the findings of this study would suggest that for some children, it is not uncommon to become more aggressive, and these increases in aggression are strongly associated with higher rates of antisocial behavior in adolescence. Interestingly, there was also a negative correlation between the aggression intercept and aggression slope factors. In other words, children who had lower levels of aggression in first grade tended to have aggression slopes which were increasing more over time. In general, the children who had higher levels of aggression in first grade were not the ones who were becoming more aggressive over time.

Conceptually these findings are significant because they contribute to existing knowledge on how aggression is associated with antisocial behavior. For some children who exhibit aggressive behaviors early on in childhood, these early aggressive behavioral propensities impact their adjustment years later as they are entering adolescence. These children are what Patterson and colleagues (1989) refer to as *early-starters* or children who exhibit risk factors for antisocial behavior at early ages. However, Patterson and colleagues also argue that some children follow a *late-starter* pathway to antisocial behavior. Late-starters are children who do not exhibit the risk factors for antisocial behavior early on in childhood, but start to develop the risk factors for antisocial behavior later on in childhood. Indeed, the findings of this study support this premise by showing that

children who did not have high levels of aggression in first grade, but became more aggressive through childhood, were also more likely to have higher rates of antisocial behavior in adolescence. From a prevention standpoint, a low level of aggression in early childhood is not sufficient in preventing antisocial behavior in adolescence. Preventing increases in aggressive behavior through childhood also appears to be an important factor in reducing antisocial behavior in adolescence.

Increases in aggression as children get older, and physical forms of aggression in particular, is alarming because of the ability for children to harm their peers in altercations given their physical maturation. As the consequences of physical aggression become more serious, children who are becoming more aggressive in middle or late childhood are more likely to experience more severe sanctions from their peers, parents and teachers for acting out aggressively. Moreover, as children get older, aggression becomes a less developmentally normative and socially acceptable behavior. Thus, children who are becoming more aggressive over time are actually deviating more from social norms and their behaviors are becoming more atypical. Considering this reasoning, it seems important to examine growth trajectories, and in particular increases in aggression over time, because it reflects a tendency for children to shift from more normative to less normative behavior as they are getting older. This tendency for some children to behave in less developmentally normative ways might partially explain why children who are becoming more aggressive over time are also more likely to have higher levels of antisocial behavior as they enter adolescence.

After examining the unique effects of aggression on antisocial behavior, the next aim of this study was to examine the unique effects of peer exclusion on antisocial behavior. More specifically, analyses were conducted to assess whether early childhood peer exclusion (in 1st grade) and increases in peer exclusion (from 1st grade to 6th grade) are predictive of antisocial behavior in early adolescence (in 8th grade). Together, these factors accounted for 8% of the variability in antisocial behavior in 8th grade, a considerable, but much smaller proportion of variance than was accounted for by examining the effects of aggression. The results showed that children who were excluded in 1st grade were more likely to have higher rates of antisocial behavior in 8th grade. There was also a positive association between increases in peer exclusion and antisocial behavior, but this association was not statistically significant. This finding was unexpected, and contrary to one of the initial hypotheses of this study that children who become more excluded over time are more likely to have higher levels of antisocial behavior. Interestingly, in subsequent models that will be discussed later in this section, after adding other factors to the model, this effect reached statistical significance at $p < .05$.

The finding that children who were excluded more in 1st grade had higher levels of antisocial behavior approximately seven years later in 8th grade is noteworthy and there are several possible explanations for this finding. It is possible that early experiences of peer exclusion in childhood have strong and lasting effects on children's adjustment. One plausible explanation is that

experiences of peer exclusion often coincide with other forms of peer maltreatment and abuse. Children who are excluded and maltreated could be more likely to experience several forms of maladjustment including increases in antisocial behavior. Additionally, children who are excluded might engage in antisocial behavior as a means of acting out and in reaction to peer maltreatment and the stresses associated with being treated negatively by peers. An alternative explanation based on the incidental model is that the association between peer rejection and antisocial behavior could be explained by rejected children's aggressive behavioral propensities. In other words, the association between early childhood exclusion and antisocial behavior is the result of aggressive behavioral propensities which often co-occur with being excluded.

An alternative mechanism that might link peer exclusion with antisocial behavior is associating with deviant peers. It is possible that children who are excluded are less likely to have access to normative peer groups and more likely to associate with deviant peers, which in turn increases their likelihood for antisocial behavior. Separate models were run to examine whether deviant peers mediate the association between either the aggression or exclusion growth factors and antisocial behavior. If in fact children who are more excluded by their peers are more likely to associate with deviant peers, then it might be expected that one of the exclusion growth factors would be predictive of associating with deviant peers. However, the results of this study did not find support for this hypothesis. Although there was a positive relation between being excluded in 1st grade and

associating with deviant peers in 7th grade, this effect was not statistically significant. Additionally, there was no association between increases in peer exclusion over time and deviant peers. These findings are consistent with results from other studies which have found that peer rejection was not associated with deviant peer involvement, after controlling for children's behavioral propensities (e.g., Barnow et al., 2005; Fergusson, Woodward, & Horwood, 1999; Laird, Jordan, Dodge, Pettit, & Bates, 2001).

There are several possible explanations for why this association was not found. First, it might be the case that excluded children are less accepted by their peers, have fewer friends, and are more likely to display withdrawn behaviors. If this is the case, then excluded children might be less likely to associate with either normative or deviant peers. A second possible explanation could be more of a methodological issue. It is possible that there would have been a stronger predictive association between peer exclusion and deviant peers if the deviant peer measure would have included items which ask children whether their friends are also excluded. This association would have been more consistent with prior work that has shown that rejected children tend to associate with other rejected peers (Bagwell et al., 2000).

Another methodological issue that might help explain this lack of association between peer exclusion and deviant peers is that the peer exclusion measure is a classroom based measure reported on by the child's teacher. In this respect, it is possible that some children who teachers perceive are being excluded

by their classmates could actually have friends in other classes or outside of school. If this is the case, then these children are not actually experiencing the potentially negative effects of peer exclusion in settings outside of their classes, and this might underestimate the effects of peer exclusion on children's adjustment and the likelihood that they associate with deviant peers. One direction for future research would be to address these methodological limitations and examine peer exclusion more broadly in settings outside of classrooms.

After including the deviant peers construct into the model, one unexpected result was that the direct effect of the exclusion slope factor on antisocial behavior became statistically significant. In other words, after controlling for the effects of peer exclusion in 1st grade and associating with deviant peers in 7th grade, children who became more excluded in childhood (from 1st grade to 6th grade) had higher levels of antisocial behavior in 8th grade. This finding implies that there may be different pathways to antisocial behavior. It could be the case that peer exclusion does not necessarily lead to associating with more deviant peers, which then predicts antisocial behavior (i.e., a mediated model), but rather that becoming more excluded over time predicts antisocial behavior over and above the effects of associating with deviant peers (i.e., an additive effect).

The findings of this study also seem to indicate that children's early behavioral propensities are a stronger predictor of associating with deviant peers than are early peer relational processes. In the separate model which examined the aggression growth factors, associating with deviant peers and antisocial behavior,

the results showed that aggression in 1st grade predicted whether children associate with more deviant peers in 7th grade. Mediation analyses indicated that the link between aggression in 1st grade and antisocial behavior in 8th grade was partially mediated by associating with deviant peers. Thus, it could be the case that children who are aggressive early on in childhood are more likely to select peer groups which reinforce their aggressive behaviors, and provide a context in which these children can develop other types of antisocial behaviors through socialization and modeling.

After examining the independent effects of the aggression and peer exclusion growth factors on associating with deviant peers and antisocial behavior, a final model was specified to further explore multiple potential pathways to antisocial behavior. This model provided an empirical means of testing several alternative hypotheses about the processes which explain how children's early behavioral propensities and peer relational experiences influence their adolescent adjustment. More specifically, this model examined three alternative hypotheses.

One hypothesis that has been argued by some investigators is that the association between peer exclusion and antisocial behavior is an incidental one (see Parker & Asher, 1987). The premise for the incidental hypothesis is that there is an underlying behavioral deficit in children that continues to influence their adjustment as they get older, and that the association between peer exclusion and antisocial behavior is a spurious one. Stated differently, peer exclusion is a

consequence of aggression and if children who are aggressive are more likely to be excluded, then the association between peer exclusion and antisocial behavior could be explained by excluded children's underlying aggressive behavior.

A second hypothesis is that there is a causal or mediated pathway in which early aggressive behaviors predict that children will be excluded, and that this exclusion predicts associating with deviant peers, which in turn predicts antisocial behavior (see Parker & Asher, 1987; Patterson et al., 1989). The premise for this hypothesis is that children's early behavioral propensities influence the responses and reactions they get from their peers, and negative experiences within the peer group influence children's subsequent development. Based on this hypothesis, there is not a direct effect between children's early behavioral propensities and adolescent adjustment.

Yet, a third hypothesis is that there is an additive effect occurring in which both behavioral propensities and peer relational experiences influence children's adjustment (see Ladd, 2006). Based on this hypothesis, aggression, peer exclusion and associating with deviant peers all predict antisocial behavior, controlling for the effects of the other predictors. Unlike the incidental hypothesis, the additive effects hypothesis would argue that peer exclusion predicts antisocial behavior over and above the effects of aggression.

Interestingly, the final model found some support for each of these hypotheses. For instance, in the separate peer exclusion model, peer exclusion in 1st grade significantly predicted antisocial behavior. When the aggression and

peer exclusion growth factors were combined in the final model, this association was no longer found, thus providing evidence in favor of an incidental model. However, although it appeared that early childhood exclusion was incidentally associated with antisocial behavior, children who became *more* excluded through childhood had higher levels of antisocial behavior even after controlling for the effects of early aggression and increases in aggression. This finding supports an additive effects hypothesis. Moreover, there was no association between early aggressive behaviors and increases in peer exclusion, which might imply that becoming more excluded over time is not a consequence of acting aggressively, and that there are other risk factors which might explain why some children are becoming more excluded as they get older. Not only is becoming more excluded in childhood not associated with early aggressive behaviors, but it also provided a unique predictive contribution to antisocial behavior that was not accounted for by either of the aggression growth factors or associating with deviant peers. Finally, there was limited support for mediation, from 1st grade aggression, to associating with deviant peers to antisocial behavior, but there was not mediation through either of the peer exclusion factors.

Considering that four of the five predictor variables (i.e., aggression intercept, aggression slope, exclusion slope, and associating with deviant peers) were significantly associated with antisocial behavior and together accounted for 60% of its total variance, there seems to be the strongest support for an additive effects hypothesis. Although it was unexpected that there would be no association

between the peer exclusion factors and deviant peers, both increases in peer exclusion over time and associating with deviant peers uniquely predicted antisocial behavior, controlling for the effects of aggression. This finding might imply that each of these factors is associated with antisocial behavior in distinct ways. Whereas associating with deviant peers provides an opportunity for children to learn and model antisocial behavior, being excluded by peers and experiencing the maltreatment that is likely to coincide with exclusion might influence children to act out and behave antisocially.

Limitations and Directions for Future Research

Although this study makes some interesting contributions to extant research on the development of antisocial behavior, there are several limitations that should be noted. First, although the findings of this study implicate the importance of children's behavioral propensities and their peer relational context in understanding the development of antisocial behavior, there are other factors not included in this model that also appear to influence the development of antisocial behavior. For instance, in the causal model described by Patterson and colleagues (1989), the authors argue that children's early behavioral propensities are influenced by parenting (e.g., harsh and inconsistent discipline and poor parental monitoring). Furthermore, the authors also argue that associating with deviant peers is influenced by children's academic problems. Dodge and Pettit (2003) propose a biopsychosocial model of the development of antisocial behavior in which they argue that biological predispositions are another factor

that should be examined by researchers interested in studying the development of antisocial behavior. Indeed, it is likely that these factors also contribute to antisocial behavior and future studies should seek to examine comprehensive models that integrate these factors in order to gain a better understanding of how these factors each contribute to antisocial behavior and how they interact with one another.

There were several methodological limitations that should also be noted. In this study, aggression and peer exclusion were measured from teacher reports that were collected annually. One limitation of this approach is that there may be shared method variance in that the same informant is reporting on a child's aggressive behaviors and the extent to which the same child is excluded by peers. This study attempted to reduce shared method variance by also including self reports for associating with deviant peers and self and parent reports for antisocial behavior. Similarly, using multi-informant measures for aggression and peer exclusion would have added to the strength of this model.

Another limitation of using only teacher reports for aggression and peer exclusion is that this model assumed factorial invariance over time and this assumption could not be tested. Linear growth models which only use one manifest indicator at each time point must assume that there is factorial invariance and there is no method to test this assumption. By using a latent variable approach, based on multiple indicators of aggression and peer exclusion at each grade level, assumptions of factorial invariance could have been tested. Future

studies which incorporate multiple-informants would be able to address these issues related to shared method variance and factorial invariance and can provide more confident results.

Nonetheless this study contributes to extant research on the childhood behavioral and relational antecedents to adolescent antisocial behavior. By using a parallel process growth modeling design to examine multiple alternative pathways to antisocial behavior, this study tested different hypotheses (i.e., incidental, additive, causal models) about how both behavioral and peer relational mechanisms impact children's adjustment. Additionally, this approach allowed for an examination of intra-individual processes and changes in children's behaviors and peer experiences through childhood that appeared to have a significant impact on subsequent adjustment.

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Table 1

Bivariate Correlations, Descriptive Statistics and Missing Data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Agg (G1)	-															
2. Agg (G2)	.58***	-														
3. Agg (G3)	.58***	.66***	-													
4. Agg (G4)	.50***	.53***	.59***	-												
5. Agg (G5)	.36***	.44***	.47***	.55***	-											
6. Agg (G6)	.44***	.47***	.48***	.51***	.51***	-										
7. Exc (G1)	.58***	.31***	.36***	.38***	.09	.24***	-									
8. Exc (G2)	.28***	.47***	.37***	.34***	.13*	.29***	.31***	-								
9. Exc (G3)	.34***	.35***	.48***	.33***	.16**	.24***	.33***	.55***	-							
10. Exc (G4)	.24***	.25***	.33***	.48***	.21***	.28***	.29***	.51***	.51***	-						
11. Exc (G5)	.25***	.23***	.22***	.26***	.36***	.31***	.24***	.41***	.39***	.51***	-					
12. Exc (G6)	.21***	.21***	.23***	.26***	.24***	.43***	.26***	.40***	.43***	.50***	.60***	-				
13. ASB-TR (G8)	.24***	.25***	.19**	.25***	.39***	.22***	.04	.10	.12*	.09	.12*	.10	-			
14. ASB-PR (G8)	.23***	.29***	.23***	.25***	.28***	.37***	.13*	.22***	.20***	.13*	.17**	.21***	.58***	-		
15. ASB-SR (G8)	.21***	.13*	.18**	.10	.16**	.17*	.06	.08	.07	.05	.05	.06	.44***	.39***	-	
16. ADP (G7)	.17***	.20***	.20***	.15**	.18**	.03	.12*	.10	.09	.04	.07	.07	.39***	.33***	.50***	-
M	1.24	1.24	1.23	1.23	1.25	1.21	1.16	1.22	1.22	1.26	1.28	1.28	1.28	1.16	1.32	2.04
SD	0.38	0.41	0.39	0.40	0.42	0.38	0.32	0.42	0.42	0.48	0.47	0.47	0.40	0.21	0.29	0.63
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.08
Maximum	3.00	3.00	3.00	3.00	3.00	2.86	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.27	2.55	4.54
% Missing	0.26	0.26	2.87	6.53	9.92	9.40	0.26	0.26	3.13	6.79	9.40	9.40	14.36	13.05	9.40	4.18

Note. Agg = Aggression. Exc = Exclusion. ASB = Antisocial behavior. ADP = Associating with deviant peers. TR = Teacher report. PR = Parent report. SR = Self report. G = Grade. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 2

Descriptive Statistics for Aggression and Peer Exclusion Growth Models

	M	*SE*	σ^2*(SD)*	*SE*
Aggression				
Intercept	1.240***	.019	.100(.32)***	.010
Slope	-0.003	.004	.002(.04)***	.001
Exclusion				
Intercept	1.170***	.016	.049(.22)***	.007
Slope	0.027***	.005	.004(.06)***	.001

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

Structural Models with Aggression and Peer Exclusion Growth Factors Predicting Deviant Peers and Antisocial Behavior

	Deviant Peers		Antisocial Behavior		
	β	*SE*	β	*SE*	R^2
Without mediation					
Aggression model[a]					.27
Intercept			.54***	.064	
Slope			.34***	.096	
Exclusion model[a]					.08
Intercept			.22*	.087	
Slope			.16	.093	
With Mediation					
Aggression model					.55
Intercept	.20**	.060	.42***	.066	
Slope	-.13	.093	.40***	.088	
Deviant peers			.56***	.059	
Exclusion model					.43
Intercept	.13	.075	.13	.080	
Slope	-.08	.084	.20*	.083	
Deviant peers			.61***	.055	

[a] Models with this superscript do not include associating with deviant peers, the mediator variable.

* $p < .05$. ** $p < .01$. *** $p < .001$.

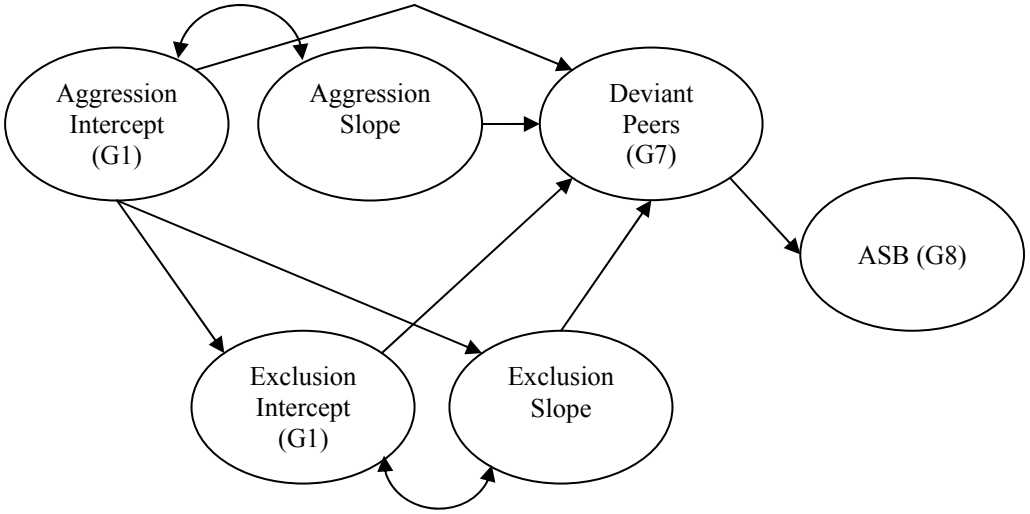
Table 4

Tests of Relative Model Fit after Imposing Constraints on Path Coefficients for Multiple-Group Models of Boys and Girls

	χ^2	*df*	Δdf	$\Delta\chi^2$	*p*
Configural Model	542.65	264			
Weak Invariance Model	551.65	268	4	9.00	.06
Strong Invariance Model	554.23	272	4	2.58	.63
Fully Constrained Model	574.30	283	11	20.07	.04
Path Constrained:[a]					
Agg Int → Exc Int	563.33	273	1	9.10	<.01
Agg Int → Exc Slp	554.91	273	1	0.69	.41
Exc Slp → ADP	554.98	273	1	0.76	.38
Exc Int → ADP	554.75	273	1	0.53	.47
Agg Int → ADP	554.47	273	1	0.24	.62
Agg Slp → ADP	554.47	273	1	1.90	.17
Exc Slp → ASB	554.40	273	1	0.18	.68
Exc Int → ASB	554.23	273	1	0.00	.96
Agg Int → ASB	554.24	273	1	0.02	.90
Agg Slp → ASB	555.01	273	1	0.78	.38
ADP → ASB	556.44	273	1	2.21	.14

[a] Each of the models with one constrained path coefficient were compared with the strong invariance model resulting in a chi-square difference test with one degree of freedom. ADP = Associating with Deviant Peers. Agg = Aggression. ASB = Antisocial Behavior. Exc = Exclusion. Inc = Intercept. Slp = Slope.

Mediation Model:



Additive and Incidental Models:

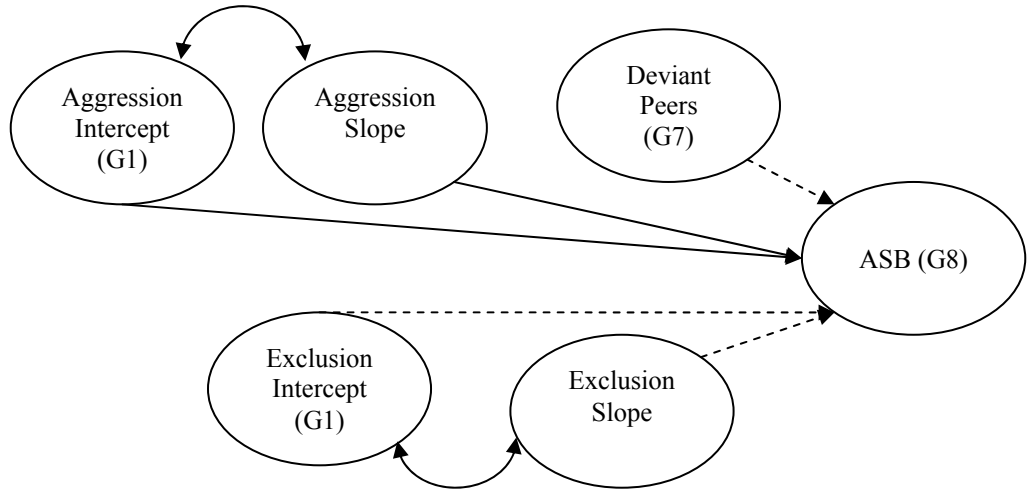


Figure 1. Conceptual models depicting alternative pathways to antisocial behavior. In the bottom figure, dashed lines represent estimated paths for the additive model, but not for the incidental model, and solid lines represent estimated paths for both the additive and incidental models. To simplify the presentation of these hypothetical models, the mediation model is illustrated separately from the additive and incidental models, but in the analyses, one model was specified which included both mediated and additive effects. G = Grade.

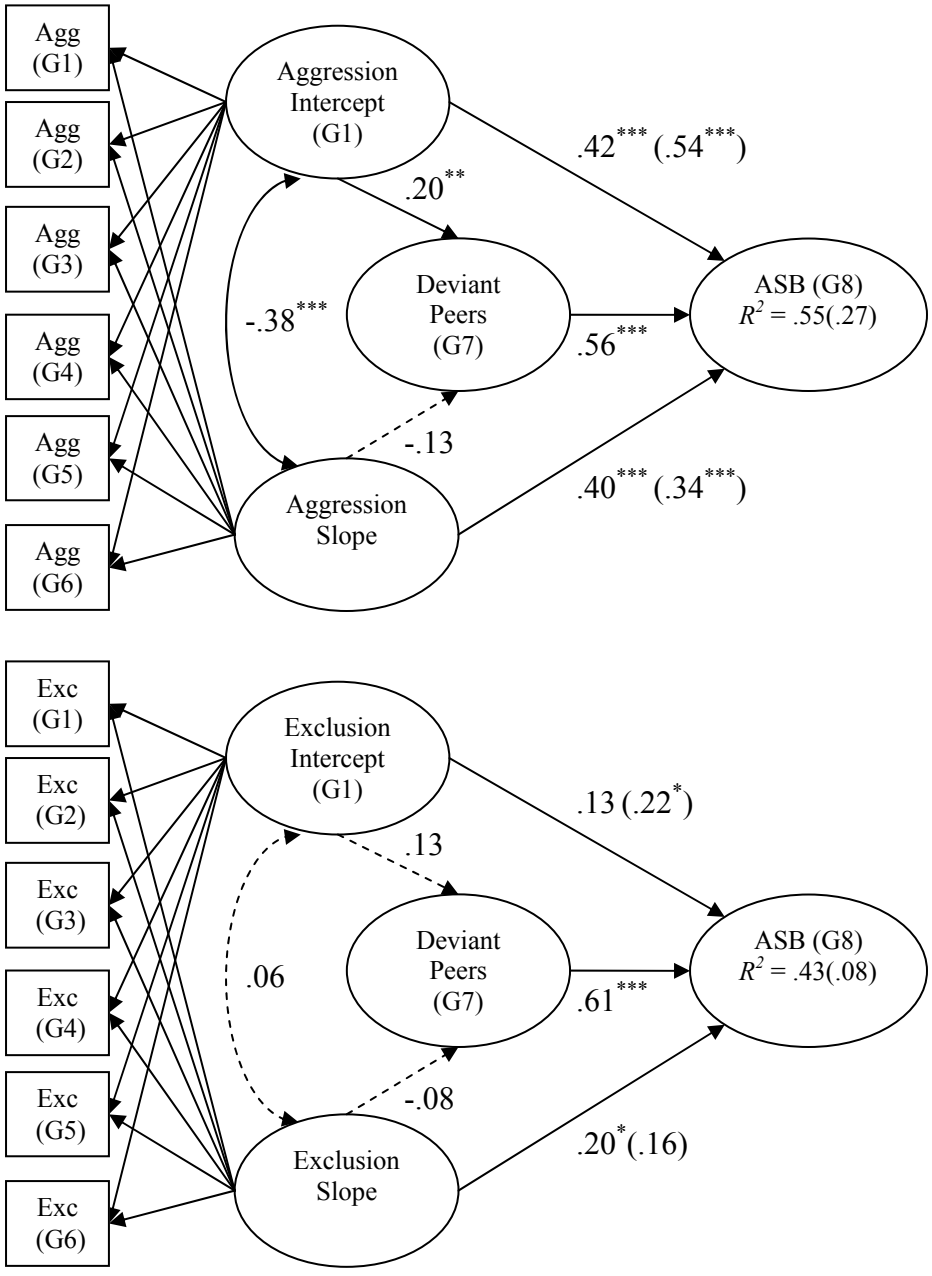


Figure 2. Standardized path coefficients for aggression and peer exclusion growth factors predicting deviant peers and antisocial behavior. Estimates in the parentheses are when associating with deviant peers was not included in the model. Agg = Aggression. Exc = Exclusion. G = Grade. ASB = Antisocial Behavior. Dashed lines are estimated paths that were non-significant at $p < .05$. *$p < .05$. **$p < .01$. ***$p < .001$.

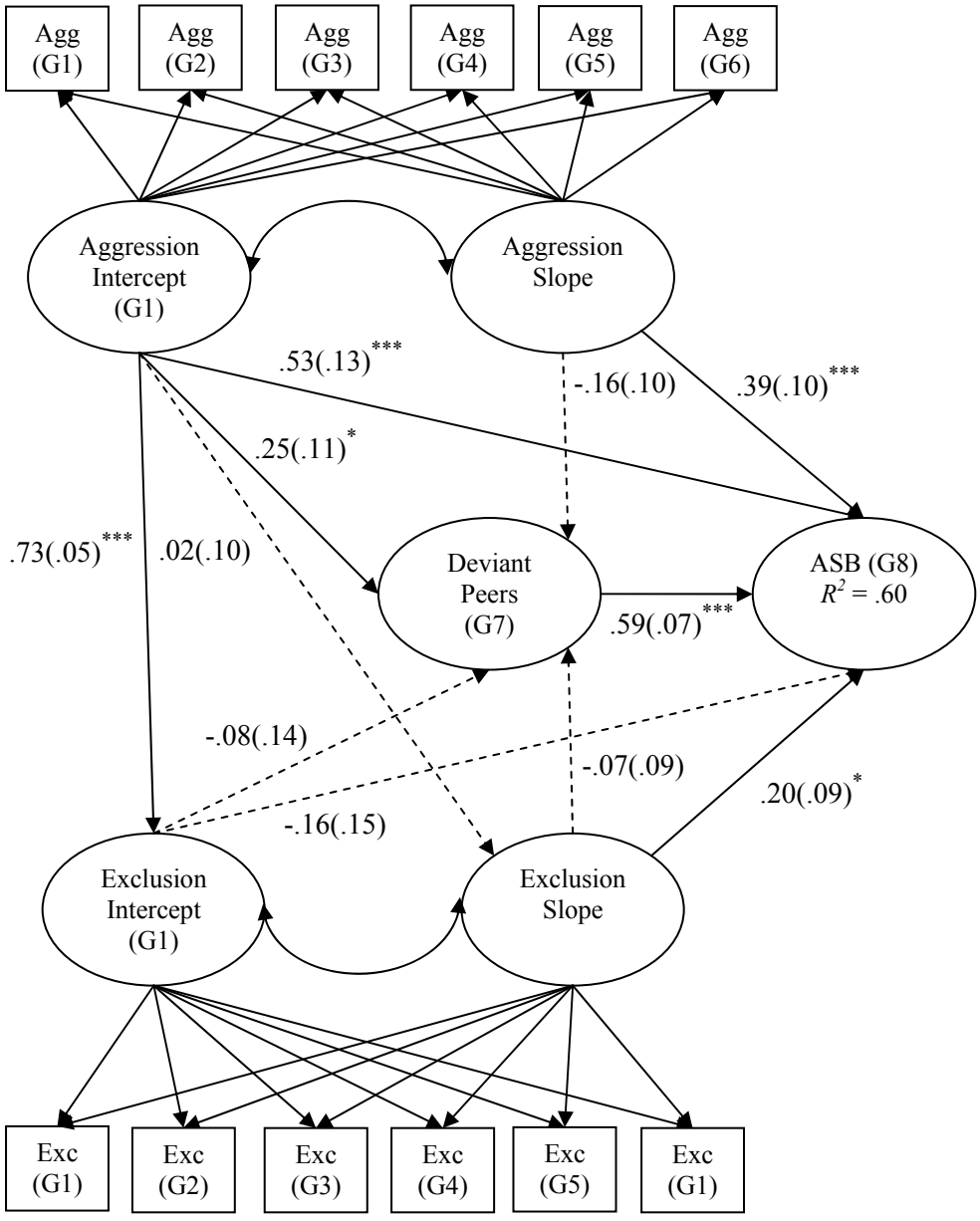


Figure 3. Standardized path coefficients (and standard errors) for structural model testing for mediation and additive effects. Agg = Aggression. Exc = Exclusion. G = Grade. ASB = Antisocial Behavior. Dashed lines represent estimated paths that were non-significant at $p < .05$.
*$p < .05$. ***$p < .001$.