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DEVELOPMENTAL TRAJECTORIES OF PHYSICAL AND  
RELATIONAL AGGRESSION AND THEIR RELATION TO DELINQUENCY  
AND SUBSTANCE USE IN ADOLESCENCE

A thesis submitted in partial fulfillment of the requirements for the degree of Master of  
Science in Psychology at Virginia Commonwealth University.

by

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## Abstract

# DEVELOPMENTAL TRAJECTORIES OF PHYSICAL AND RELATIONAL AGGRESSION AND THEIR RELATION TO DELINQUENCY AND SUBSTANCE USE IN ADOLESCENCE

By Denicia K. Titchner

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science at Virginia Commonwealth University.

Virginia Commonwealth University, 2010

Major Director: Albert D. Farrell, PhD

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Although researchers studying adolescent aggression have proposed a conceptual distinction between physical and relational aggression, there is contradictory evidence regarding the degree to which they differ in their trajectories and relations to other outcomes. This study explored the importance of differentiating between these two forms of aggression based on comparisons of their trajectories, relation with each other, impact on delinquency and substance use, and gender differences. Data were collected as part of the Multisite Violence Prevention Project, conducted at 19 middle schools from four sites with a predominantly low-income, minority sample of students ( $N = 2,822$ ). Growth curves showed significant linear increases and quadratic trends for physical and relational aggression. Boys and girls had similar shaped trajectories, but boys reported significantly higher levels of physical aggression than girls. Bivariate latent growth curve models and autoregressive models

suggested that physical aggression was a stronger predictor of externalizing difficulties than relational aggression.

## Developmental Trajectories of Physical and Relational Aggression and Their Relation to Delinquency and Substance Use in Adolescence

Adolescence has been identified as a period of increased risk for negative social and behavioral outcomes (US Department of Health and Human Services [USDHHS], 2001). Youth violence and aggressive behavior are the second leading cause of death and are responsible for over 720,000 injuries in youth between the ages of 10 and 24 in the United States (CDC, 2008). These rates are the highest among youth worldwide (USDHHS, 2001). Middle school students engage in a significant amount of aggression as reflected in surveys indicating that 30% of students between sixth and tenth grades reported moderate to frequent involvement in bullying, either as a bully (13%), victim (11%), or both (6%), with the highest rates occurring between the sixth through eighth grades (Nansel et al., 2001). During adolescence the frequency of aggression and delinquency peak and become increasingly problematic (Dryfoos, 1990; Roughman, 1981).

Aggression during adolescence has been linked to a variety of negative outcomes, such as harmful life trajectories of antisocial behavior and maladaptive psychological functioning (Coie & Dodge, 1998). Research has revealed strong relations between violence and drug abuse (Elliot, Huizinga, & Menard, 1989; USDHHS, 2001) and delinquency (Crick, Ostrov, & Werner, 2006). There is evidence to suggest that aggression precedes these problem behaviors. For example, a previous study indicated that the frequency of aggression during the sixth grade predicted subsequent changes in both delinquent behavior and drug use, but that delinquent behavior and drug use in the sixth grade did not predict subsequent levels of aggression (Farrell, Sullivan, Esposito, & Meyer, 2005). High rates of middle

school aggression have also been found to predict delinquency and substance use in the ninth grade (Harachi et al., 2006).

The prevalence and negative consequences of adolescent aggression underscore the need for a clear understanding of the different forms aggression can take, how they develop over time, and how each impacts negative outcomes. This knowledge could inform the development of interventions by identifying specific types of aggression that need to be addressed and the most appropriate targets and optimum timing of interventions. Researchers have differentiated between two forms of aggression, physical and relational aggression, based on the unique behaviors and intent associated with each type. Physical aggression has been defined as physical behaviors that are directed at individuals with the intent to harm them, and includes behaviors such as pushing and kicking (Coie & Dodge, 1998). Relational aggression has been defined as using the removal or threat of removal of relationships in order to harm, and included behaviors like spreading rumors and excluding a peer from an activity (Murray-Close, Ostrov, & Crick, 2007). Past research findings have been inconsistent as to whether the same adolescents engage in high levels of both types of aggression or if distinct groups of adolescents engage in each form. The strong relation between these two forms of aggression is supported by studies reporting correlations between self-reported physical and relational aggression as high as .75 (Crick, Casas, & Ku, 1999). Conversely, other researchers have concluded that they are distinct based on findings from factor analyses (Bartlett, 2003; Crick & Grotpeter, 1995; Shahim, 2006).

Physical and relational aggression may also differ in how each develops over time. Longitudinal studies have examined the trajectory of physical aggression with most studies focusing on childhood. Their findings have suggested that physical aggression either remains

stable (e.g. Broidy et al., 2003; Zimmer-Gembeck, Geiger, & Crick, 2005) or declines throughout childhood (e.g. Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Tremblay et al., 1996). Studies examining patterns in trajectories of physical aggression have consistently found that boys with higher levels of chronic physical aggression maintained these levels in adolescence, but rates for boys in the overall sample decreased during adolescence (Broidy et al., 2003). Less work has been done to examine the trajectories of relational aggression. Those studies that have been done have shown conflicting findings including both increases (e.g. Tiet, Wasserman, Loeber, McReynolds, & Miller, 2001; Xie, Farmer, & Cairns, 2003) and decreases (Pellegrini & Long, 2003) in rates of relational aggression during the course of middle school. One consistent finding is that relational aggression tends to peak during middle school.

The trajectories for physical and relational aggression during adolescence may differ by gender. Most studies have suggested that boys have higher rates of physical aggression (Bartlett, 2003), whereas girls tend to have higher rates of relational aggression (Bartlett, 2003; Crick & Grotpeter, 1995). Other studies, however, have found that boys have higher rates of both overt and relational aggression than do girls (Henington, Hughes, Cavell, & Thompson, 1998; Shahim, 2006). Studies examining gender differences in the trajectories of aggression have found that boys report higher rates than girls of overall aggression (Quinsey, Skilling, Lalumiere, & Craig, 2004). Boys' higher rates of aggression compared to girls start at school entry and persist into adulthood with the exception of the peripubertal period for girls, during which gender differences decline in the general population. Clarifying the different findings across gender is further complicated by the fact that research on physical aggression has often focused on boys whereas most relational aggression research has

focused on girls. Looking at gender differences is critical when examining whether physical and relational aggression are distinct constructs as the trajectories of each type of aggression may differ based upon gender.

Both physical and relational aggression have been found to be related to negative outcomes in adolescents, but outcomes have varied depending upon the type of aggression studied. Physical aggression has been related to both externalizing and internalizing difficulties, whereas relational aggression has most frequently been related to internalizing difficulties. Physical aggression has been associated with specific adverse outcomes, such as poor adjustment (Pullatz et al., 2007), alcohol and drug use (Piko, Kersztes, & Pluhar, 2006; Pulkkinen & Pitkaenen, 1993; Schmidt, 2004; Unger, Sussman, & Dent, 2003), and delinquency (Broidy et al., 2003; Haapasalo & Tremblay, 1994; Nagin, Barker, Lacourse, & Tremblay, 2008; Pulkkinen & Pitkaenen, 1993). Relational aggression has been related to adjustment difficulties (Crick & Grotpeter, 1995), and psychopathology (Crick & Zahn-Waxler, 2003), especially internalizing problems (Crick, 1995; Crick & Grotpeter, 1995). Several studies have also found relations between relational aggression and both delinquency (Crick et al., 2006; Marsee, 2007) and substance use (Rodgers, 2001; Skara et al., 2008). Previous studies of ethnically diverse samples of boys and girls found that fourth and fifth graders reported physical aggression as more wrong and harmful than relational aggression (Murray-Close, Crick, & Galotti, 2006). Additionally, physical aggression was more strongly related to maladjustment, such as low academic competence, in seventh graders (Xie, Cairns, et al., 2002) when compared to relational aggression.

There is also evidence to suggest that outcomes for each type of aggression may vary by gender. Boys consistently demonstrate more externalizing outcomes whereas girls

demonstrate more internalizing outcomes related to overall aggressive (Letcher, Smart, Sanson, & Toumbourou, 2009) and physically aggressive (Moretti & Odgers, 2006) behavior. Additionally, girls who engage in relational aggression demonstrate poorer outcomes and are more distressed by relational difficulties than are boys (Crick, 1995; Rudolph & Hammen, 1999). Conversely, research on physical aggression has more frequently focused on assessing this construct in boys rather than in girls (Broidy et al., 2003). Moreover, adverse outcomes related to physical aggression are more consistently reported by boys than girls when compared within the same study (Skara et al., 2008).

Establishing whether physical and relational aggression have distinct impacts on adverse outcomes has important implications for determining whether both types of aggression need to be addressed in interventions. Much less is known about the association between relational aggression and externalizing difficulties, such as delinquency and substance use compared with physical aggression and externalizing difficulties. Moreover, it is especially critical to compare the relations between physical and relational aggression and delinquency and substance use within the same study. The present study was designed to build upon and make an important contribution to the literature by clarifying the similarity and differences between physical and relational aggression. First, this study examined the patterns of physical and relational aggression throughout middle school, including their relation with one another and their impact on delinquency and substance use. This study also examined whether the patterns and rates of each type of aggression vary by gender. Developing a clear description of these patterns will help inform the development of prevention programs for aggression. This knowledge will clarify whether prevention



programs need to address both types of aggression due to unique growth patterns or impact on adverse outcomes.

The present study was designed to address limitations of previous research that may have been responsible for the conflicting findings regarding similarities and differences between physical and relational aggression. Differences in findings across previous studies, such as conflicting aggression trajectories, may have been due to differences in sample characteristics. Many previous studies have focused on fairly homogenous samples with primarily Caucasian (e.g. Crick et al., 2006; Joussemet et al., 2008) or African American (e.g. Xie et al., 2003) participants. In some cases important sample characteristics such as ethnicity have not been identified (Burton, Hafetz, & Henninger, 2007). Another limitation is that many studies examining aggression have focused on adolescents displaying high rates of aggression, rather than those more representative of the general middle school population (e.g. Fite, Colder, Lochman, and Wells, 2008; Tiet et al., 2001). There has also been a tendency for studies to focus on younger samples of elementary school aged participants (e.g. Crick & Grotpeter, 1995; Putallaz et al., 2007) without following them into middle school, therefore missing changes that may occur following the transition to adolescence in middle school. These sampling strategies limit the generalization of results, and differences in sampling may partially explain the conflicting results found across studies within the current literature. The current study will address these limitations by including a diverse ethnic and geographic sample of participants, selected to be representative of the population in their school.

Previous research has also been limited by focusing exclusively on boys or girls and on the form of aggression considered most relevant to that sample. For example, previous

studies have often focused on physical aggression in boys (e.g. Brame, Nagin, & Tremblay, 2001, Nagin & Tremblay, 1999) or relational and physical aggression in girls (e.g. Putallaz et al., 2007; Xie et al., 2003). This has prevented analyses of similarities and differences between male and female adolescents, or trajectories of physical and relational aggression, and their relation to adverse consequences within the same sample and study. This study builds upon the previous literature by allowing the direct comparison of physical and relational aggression for boys and girls within the same study to clarify similarities and differences across constructs.

The use of cross-sectional designs has also been a limitation in previous studies of relational aggression, and studies that have examined the negative consequences of both types of aggression. Longitudinal studies focusing on both childhood and adolescence have generally examined overt, rather than relational forms of aggression (Coie & Dodge, 1998). Additionally, many previous studies examining aggression and negative outcomes have conducted cross-sectional analyses that established the co-occurrence of aggression with the outcome (e.g. Putallaz et al., 2007), but limit the ability to draw more causal conclusions. Many of the studies that have used a longitudinal approach have included only two Waves of data (e.g. Suarez, 2002). Multiple Waves of data are needed to examine trajectories of aggression and to determine whether these trajectories impact negative outcomes during middle school. This study addressed these limitations and added to the literature by examining the trajectory of both relational and physical aggression and their relation to delinquency and drug use, over multiple time points throughout middle school.

The following literature review provides an overview of the prevalence of aggression, especially physical aggression, among adolescents. Next, it examines the similarities and

differences between the constructs of physical and relational aggression through defining their behaviors and intent and describing their frequencies and trajectories in adolescents. The review then describes gender differences in the rates and trajectories of physical and relational aggression found in the current literature. Finally, the literature review examines whether physical and relational aggression are distinct constructs by describing how each similarly or differentially impacts adverse outcomes, specifically focusing on delinquency and substance use.

### **Review of the Literature**

This section reviews the literature on physical and relational aggression and whether they are distinct constructs or part of a unidimensional construct of overall aggression. In order to examine the similarity of these constructs, research is presented examining the frequency of physical and relational aggression, their growth trajectories during adolescence, and their impact on and relation with delinquent behavior and drug use. Additionally, literature on gender differences in the development and impact of physical and relational aggression is presented.

### **Prevalence of Adolescent Aggression**

Adolescence has been identified as a period of increased risk for negative social and behavioral outcomes due to biological, psychological, social, and developmental changes (USDHHS, 2001). During adolescence aggression peaks and becomes an increasingly significant problem for adolescents (Dryfoos, 1990; Roughman, 1981). This section documents the high prevalence of adolescent aggressive behavior, especially physical aggression, as the current literature has primarily focused on describing the prevalence of this

specific form of aggression. The high prevalence rates of aggression demonstrate the importance of examining this construct in adolescents.

According to the Centers for Disease Control and Prevention (CDC), youth violence and aggressive behavior in the United States is a significant problem. It represents the second leading cause of death and is responsible for over 720,000 violence-related injuries for individuals between the ages of 10 and 24 (CDC, 2008). In 2005, 36% of American high school students described being in a physical fight in the past 12 months with 14% of students fighting on school property, and 19% having carried a weapon in the previous month (CDC, 2006). Forty-three percent of high school freshmen described hitting another student in the past 6 months (Kingery, McCoy-Simandle, & Clayton, 1997; Saner and Ellickson, 1996). Furthermore, approximately 30% of students between the sixth and tenth grades reported being involved in bullying, either as a bully (13%), victim (11%), or both (6%), with the highest rates occurring between the sixth through eighth grades (Nansel et al., 2001). As early as 1997, high rates of aggression were found with 16 to 20% of high school students reporting carrying a gun, knife, or club, and approximately 33 to 50% reporting physically fighting one or more times in the month prior to the survey (Maguire & Pastore, 1999). The prevalence rates of youth violence in the US are the highest rates among youth worldwide (USDHHS, 2001). The problem of youth violence is also reflected in the arrests for murder of youth under 18 years of age that increased by 3% in 2006 (FBI, 2007). It is important to note that self-reports of aggression and youth violence are often considered more valid as the National Crime Victimization Survey revealed that 58% of serious violent crimes are never reported to the police and therefore are not reflected in the violence statistics (Snyder & Sickmund, 1999). Therefore, these high national statistics may be

underestimations, underscoring the importance of addressing the prevalent problem of youth aggression.

Aggression is also a significant symptom for several disorders within the Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association, 1994) that have high prevalence rates among adolescents. For example, aggression is a frequent symptom of oppositional defiant disorder and conduct disorder, both disruptive behavior disorders, and of attention deficit hyperactivity disorder, a neurobehavioral developmental disorder (Crystal, Ostrander, Chen, & August, 2001). A recent survey found noteworthy lifetime prevalence estimates for these disorders within the US of 10% for oppositional defiant disorder, 11% for conduct disorder, 8% for intermittent explosive disorder, and 27% for any impulse control disorder among individuals 18 to 25 years old (Kessler et al., 2005). In school-age children, oppositional defiant disorder and conduct disorder have prevalence estimates as high as 25%. These rates are especially problematic as the prevalence of youth violence and disorders with symptoms of adolescent aggression are increasing over time. One study found that the number of adolescents with severe conduct problems more than doubled from 1974 to 1999 (Collisaw, Maughan, Goodman, & Pickles, 2004). These high rates demonstrate the prevalence and significance of adolescent aggression and the need for further research to fully describe the development and impact of these behaviors.

It is important to consider whether both male and female adolescents have high rates of aggression, or whether one gender is driving the aggression statistics. Previous research has reported conflicting gender patterns, wherein boys exhibit higher rates of aggression than girls or boys and girls demonstrate comparable levels of aggression. An analysis of a variety

of studies found a significant difference and moderate effect-size in the comparison of overall levels of aggression across all studies with boys as more aggressive than girls (Quinsey et al., 2004). Farrell and colleagues (2005) also found that boys and girls differed in their initial levels of aggression, but their rates of change did not vary over time, with girls consistently lower than boys in both an urban and rural sample of 1,617 ethnically diverse middle school students. These studies both described boys as demonstrating significantly higher rates of aggression than girls.

In contrast, other studies have demonstrated similar levels of aggression between male and female adolescents. One possible explanation for these inconsistent findings is whether relational aggression, a form of aggression that causes harm to relationships or social status, is included in the overall aggression levels. In much of the previous literature male adolescents often display higher levels of physical aggression, such as violent crimes and fights. Recent research has demonstrated that female adolescents may demonstrate comparable levels of aggression when relational aggression is included (Crick & Rose, 2000). Additionally, various studies have found that it is the proportional use of physical versus relational aggression rather than the overall frequency of aggressive behaviors that varies based on gender. Girls are more likely to use relational aggression than physical aggression (Crick, 1995; Crick & Grotpeter, 1995; Henington et al., 1998; Loukas, Paulos, & Robinson, 2005). Boys, however differ from girls by using the two types of aggression more equally (Cillesse & Mayeus, 2004; Nelson, Robinson, & Hart, 2005; Tomada & Schneider, 1997). Alternatively, Moretti and Odgers (2006) have suggested that boys and girls have similar rates of aggression because that the gap between the frequency of aggressive behavior in adolescent girls and boys has decreased over the past two decades. These conflicting

results highlight the importance of examining gender with different forms of aggression. In addition, despite varying differences based on gender, overall both male and female adolescents show high prevalence rates of aggression.

### **Physical Versus Relational Aggression**

Researchers have noted important distinctions between different forms of aggression. In general, aggression has been defined as behavior suggestive of anger or irritation with the intention of an individual or group to harm others, which can be done verbally, physically, or interpersonally, and often leads to injury of another individual or their property (Archer & Coyne, 2005; Brook, Rosenberg, Brook, Balka, & Meade, 2004; Davis, Sheeber, Hops, & Tildesley, 2000). Examples of aggression include yelling, hitting, gossiping, or arguments (Davis et al., 2000). This general definition, however, is very broad and cannot capture the nuances and specific components behind varying aggressive behaviors and their intent.

Aggression is a complex behavior with various subtypes, such as proactive, reactive, and verbal, and many of the aggression subtypes are distinguished based upon the method of harm used or the intended goal of the aggressive behavior (Crick & Grotpeter, 1995). Two specific types of aggression are physical and relational aggression. Physical aggression has been defined as physical behaviors that are directed at individuals with the intent to harm them, such as pushing or kicking (Coie & Dodge, 1998). With physical aggression the cause of harm is actual or threatened physical damage (Geiger, Zimmer-Gembeck, & Crick, 2004). In contrast, relational aggression has been defined as using the removal or threat of removal of relationships in order to harm others' relationships or feelings or acceptance, friendship or group inclusion, or as a form of retaliation (Crick et al., 1999a; Crick & Grotpeter, 1995; Murray-Close et al., 2007). This type of aggression entails harm to other individuals by

damaging their social relationship and includes behaviors like gossiping, spreading rumors, ignoring, and directly or secretly excluding a peer from an activity and includes both confrontational and non-confrontational behaviors (Crick et al., 1999a; Crick & Grotpeter, 1995). These types of aggression are distinct constructs based on their specific behaviors and intent, but past research has shown discrepancies as to whether different youth engage in each type of aggressive behavior or whether the same adolescents are engaging in both types of aggression.

Some of the previous literature supports viewing physical and relational aggression as parallel and highly related constructs, where despite difference in behaviors and intent, similar levels of physical and relational aggression are reported. Research has demonstrated the strong relation between self-reported physical and relational aggression through correlations as high as .75 (Crick et al., 1999a). One study found high correlations between relational and physical aggression for third grade boys and girls ( $r = .80$  and  $.64$ , respectively), and for fourth grade boys and girls ( $r = .72$  and  $r = .56$ , respectively) (Crick et al., 2006). The same study also demonstrated that rates of relational aggression for third graders were associated with later rates of physical aggression during fourth grade. Additionally, rates of physical aggression for third graders were significantly related to rates of relational aggression for fourth graders. One study demonstrated significant covariation between physical and relational aggression regardless of gender, but this relation was especially strong for boys (Suarez, 2002). Chesney-Lind, Morash, and Irwin (2007) reviewed the youth aggression literature and concluded that the current empirical literature does not support the notion of relational aggression as a distinct aggressive type and that relational aggression should be considered as equivalent to physical aggression, violence, or bullying.



Research has also supported viewing relational and physical aggression as distinct types of aggression (Bartlett, 2003; Crick & Grotpeter, 1995; Shahim, 2006) despite their strong correlations with one another. Factor analytic studies have found support for distinct factors representing relational and physical aggression. These have included studies examining Iranian children in first through fifth grades (Shahim, 2006), fifth and sixth graders in Montreal, Canada (Bartlett, 2003), a Canadian nationally representative sample of 12 to 18 year olds (George, 2003), and German adolescents in the fifth through tenth grades (Little, Jones, Henrich, & Hawley, 2003). These results from a variety of demographic samples provide support for viewing physical and relational aggression as distinct constructs. Overall, studies have demonstrated conflicting findings with some providing support for physical and relational aggression as distinct factors and others reporting high correlations between the two types of aggression. This discrepancy demonstrates the necessity of establishing whether physical and relational aggression are similar or distinct.

Gender differences in physical and relational aggression frequently support studying physical and relational aggression as distinct constructs. Research that has focused solely on physical aggression has found that boys tend to engage in higher rates of physical aggression than do girls (e.g. Henington et al., 1998; Shahim, 2006; Skara et al., 2008). For example, a study of 134 university students demonstrated that men reported higher levels of physical aggression than did women (Burton et al., 2007). Similarly, boys were found to be more physically aggressive than girls in a study of 228 boys and 80 girls from ages four to eighteen years in a high-risk sample that was 54% African American and considered a high-risk sample (Tiet et al., 2001) and in a study of 962 12 through 18 year olds (George, 2003). This is a clear pattern of gender differences in physical aggression, compared to the conflicting

findings described previously regarding gender differences in overall aggression. These findings support viewing physical and relational aggression separately to obtain a clearer picture.

The findings for studies examining gender differences in the frequency of relational aggression have been less consistent than those investigating physical aggression. Boys have demonstrated lower, similar, or higher frequencies of relational aggression than girls depending upon the study. For example, some studies have found that girls are significantly more relationally aggressive than boys. Xie and colleagues (2003) found that conflicts among girls were more likely to involve direct relational aggression than conflict among boys in the seventh grade at primarily African American schools. Another study found that girls were more relationally aggressive, after controlling for physical aggression, in a sample of 357 fifth and sixth graders from the suburbs of Montreal Canada (Bartlett, 2003). A study of relational aggression in a sample of 556, 55% female, 60% Hispanic, ninth through twelfth graders found that girls used a higher proportion of relationally aggressive behaviors than did boys (Prinstein, Boergers, & Vernberg, 2001), and a study of 491 primarily Caucasian fourth through sixth graders found that despite similar overall levels of aggression, girls were more relationally aggressive (Crick & Grotpeter, 1995).

Conversely, other studies have demonstrated similar rates of relational aggression in male and female adolescents (e.g. Juliano, Werner, & Cassidy, 2006) or found higher rates of relational aggression for boys than for girls (e.g. Henington et al., 1998). In a study of 2,064 high school students, 52% male, 62% Hispanic, and ages ranging from 13 to 19, girls demonstrated levels of relational aggression that were comparable to boys. Similarly, Goldstein and Tisak (2004) did not find gender differences in the frequency of relational

aggression in a primarily white sample of 292 adolescents from ages 12 to 22 years. A study of 2,064 high school students, 53% male, 62% Hispanic, and 62% living with both parents, found that female and male adolescents participated in similar levels of relational aggression at baseline (Skara et al., 2008). Prinstein and colleagues (2001) also found that boys and girls reported similar levels of relational aggression in a sample of 556 ninth through twelfth graders (55% female, 60% Hispanic). Several studies have found higher rates of relational aggression in boys than girls. Boys were found to be higher on relational aggression in a study of first through fifth grade Iranian children (Shahim, 2006). Whereas the majority of the literature has found that girls had higher rates of relational aggression than boys, or found that boys and girls have equal rates of relational aggression, a conclusive pattern of gender differences in relational aggression has not been found across studies.

Each of these possible patterns of gender differences in relational aggression has theoretical support. Girls' higher rates of relational aggression can be explained by the greater importance and value that girls tend to place on interpersonal relationships. Researchers have consistently stated that girls are more social, with more emotions and trust in their peer relationships than boys (Block, 1983; MacCoby, 1990). Another possible explanation for the discrepancies in the rates of relational aggression for boys and girls is the influence of age. The studies that found similar rates of relational aggression for boys and girls had older samples than those that found gender differences. It has been noted that as children grow older peer groups become more mixed by gender. Qualitative changes in peer groups may explain why relational aggression did not differ as much in the slightly older samples than in samples of middle school students (Prinstein et al., 2001). One study proposed that gender differences in physical and relational aggression were due to boys' and

girls' intent in using different types of aggression. The researchers proposed that for girls dominance motivations negatively predicted physical and positively predicted relational aggression (Bartlett, 2003). Researchers have also proposed that boys' motivations change over time from being more concerned about protecting their territory to establishing peer groups that will carry out common goals, and that this change impacts their levels of aggressive behavior (Maccoby, 2004).

The findings from previous studies demonstrate that although the empirical literature is clear on gender differences in physical aggression, gender differences in relational aggression are not clear. The differing gender patterns in the frequency of physical and relational aggression demonstrate that these constructs need to be examined separately to establish whether and how male and female adolescents differ in their frequency of aggression. Drawing clear conclusions from the existing literature is complicated by the fact that research on physical aggression has often focused on boys whereas most relational aggression research has focused on girls. By not including boys and girls and both forms of aggression within the same study, the relation between gender and rates of aggression over time are not consistently examined. Many studies use cross sectional methodology in examining differences in the frequencies of each type of aggression or only examine the frequencies at one or two time points, rather than examining gender differences in the trajectories of each type of aggression over time. Studies examining gender differences in the trajectories of aggression have found that boys report higher rates of overall aggression that may start at school entry and persist into adulthood (Quinsey et al., 2004). The exception of this pattern is the peripubertal period for girls, when girls become more physically developed than boys and gender differences in aggression rates decline. This study adds to the previous

literature by examining gender differences in both physical and relational aggression throughout middle school and helping to clarify the mixed results on male and female adolescents' use of relational aggression.

### **Developmental Trajectories**

A clearer understanding of similarities and differences in physical and relational aggression also requires considering how rates of each form of aggression change over time. The conflicting results from studies examining the correlation between and factor analyses of physical and relational aggression have all been cross-sectional evaluations of the similarities and differences of physical and relational aggression. The following section examines the trajectories and frequencies of physical and relational aggression for children and adolescents found in the literature in order to examine how physical and relational aggression change across development.

Studies examining the trajectories of overall aggression have found that rates increase throughout childhood and level off and decrease towards the end of middle school. Hipwell and colleagues (2002) followed girls from five to eight years old and found that both parents and teachers reported higher rates of disruptive behavior in older girls than in younger girls. A study by Farrell and colleagues (2005) examined older children and found that the frequencies of aggression increased from sixth through seventh grades, leveled off, and decreased somewhat at the beginning of eighth grade in students representing two distinct populations, a 96% African American and low socioeconomic status (SES) sample of 667 students at three urban middle schools and a more ethnically diverse sample of 950 students at four rural middle schools. These studies suggest that general aggression increases throughout childhood and early adolescence, but levels off towards the end of middle school.

Although the overall trajectories and descriptions of aggression are informative, such studies do not address the possibility that aggression is a multifaceted construct that may include distinct subtypes that differ in their trajectories.

**Physical Aggression.** Studies examining the frequency and development of physical aggression have mostly focused on boys and childhood, rather than on male and female adolescents. Most of the studies have found somewhat consistent findings depending on the age and severity of physical aggression in the groups measured. Trajectories of physical aggression have demonstrated a continuation and stability of higher levels of physically aggressive behaviors over time. For example, in one prospective study of six diverse sites Broidy and colleagues (2003) followed boys starting at birth or five to seven years depending on the site, and found that among boys there was continuity in problem behavior from childhood to adolescence that was especially strong when the early behaviors were physical aggression. Zimmer-Gembeck and colleagues (2005) also noted a moderate stability of physical aggression in a three year prospective study of 456 children, primarily Caucasian (74%) from third to sixth grades. Two related studies found that a small percentage of highly physically aggressive children demonstrated a more stable level of physical aggression that continued from childhood to adolescence, despite different trajectories found for youth who had lower levels of physical aggression (Brame et al., 2001; Cote et al., 2006). These studies consistently suggest stable levels of physical aggression for those children that start engaging in these behaviors at an early age. These results support the early starter model of children who exhibit aggressive behaviors early and continue to exhibit these behaviors across time (Conduct Problems Prevention Research Group, 2002).

Studies of more general populations have also demonstrated a decline in physical aggression during the first ten years with the largest drop occurring during the transition from early to middle childhood (Tremblay et al., 1996). The Broidy et al. (2003) study found stability of physical aggression for highly aggressive boys, but also found that for those displaying moderate levels of aggression there was a decline in physical aggression throughout childhood and adolescence. Cote and colleagues (2006) followed a nationally representative sample of 10,658 Canadian children over six years in a longitudinal study of ten cohorts from approximately ages two to eleven years old and found that one-sixth of the children exhibited a pattern of more frequent and stable use of physical aggression, but that the typical pattern of physical aggression was one of occasional frequency that declined over time. Brame and colleagues (2001) studied a sample of 1,161 low SES Caucasian Canadian boys at ages six, ten, eleven, twelve, and thirteen and found stability in physical aggression for boys who were physically aggressive in childhood, but also found a transition to a relatively low level of adolescent physical aggression for boys with lower initial levels of physical aggression. Suarez (2002) found that the overall use of physical aggression during conflicts significantly decreased from the first to seventh grade, despite an increase in rates of physical aggression from ages five to seven in a sample of 161 children rated on physical aggression through behavioral observations and peer nominations. Similarly, Xie and colleagues (2003) found that physical aggression rates decreased from 50% in first grade to 38% in seventh grade, in a sample of 489 participants (220 boys; 99% African American).

These reports of declining trajectories differ from the previously discussed results that suggested stability for aggressive behaviors, especially in highly aggressive youth. These differences could be due to the inclusion of samples representing larger age ranges that were

not restricted to physically aggressive early starters. Youth who show increases in physical aggression early in childhood, especially boys, may start to show decreases in aggression as impulsivity drops off, and they are able to regulate their emotions better and are consequently less likely to react aggressively to perceived insults or threats from other boys (Coie & Dodge, 1998). As boys grow and gain muscle, fighting may also be more likely to lead to injury, therefore making physical aggression less appealing. As their language abilities mature, boys may also be less likely to engage in physical aggression and more likely to choose verbal alternatives (Piel, 1990). Additionally, as boys age they may become less concerned with being aggressive in order to let others know they are willing to protect their territory, such as personal space and possessions (Maccoby, 2004). Instead, male adolescents may be more likely to establish coalitions so that goals common to a group can be carried out. A study that examined younger children at around six years of age noted that boys start participating in coordinated group activity at a younger age than do girls (Benenson, Apostolaris, & Parnass, 1997).

Previous research has also focused on examining subgroup differences in trajectories of physical aggression. Two research studies examining trajectories of physical aggression in children found two similar subgroups in both studies. The first study assessed a sample of 1,037 boys (low SES, primarily Caucasian) in kindergarten and followed them annually until they were 10 to 15 years old and found four developmental trajectories of physical aggression: 1) no difficulties with physical aggression, 2) moderate levels of physical aggression over a short time period, 3) high levels of physical aggression over a short time period, and 4) a pattern of persistent problems with physical aggression (Nagin & Tremblay, 1999). A second study examined a predominantly Caucasian sample of 1,508 male and



female adolescents from ages 6 to 12 where 83% of children lived with both biological parents and the majority of the students were from middle class families, and found similar trajectories for all of the subgroups described above with the exception of the chronically physically aggressive group (Joussemet et al., 2008). In this study 33% of participants did not report physical aggression across the study, 45% reported a stable trajectory of low levels of aggression, 16% depicted moderate levels of aggression with a gradual decline throughout the study, and 6% had a trajectory of high levels of aggression that also slowly declined from 6 to 12 years. Both studies consistently found children with low or moderate levels of aggression that demonstrated a slight decrease over time. Differences between these studies, however, were in the existence of a low aggression group and whether the high aggression group demonstrated stability with chronic problems or a decline over time. Moreover, research has previously described youth engaging in both early-onset and adolescent-onset aggression. Early-onset aggression is related to more severe aggression and a stable pattern of aggressive behaviors from early youth through adulthood (Moffitt, 1993). Adolescent-onset aggression, however, develops during middle to late adolescence and discontinues during development into young adulthood (Moffitt & Caspi, 2001). These studies demonstrate a combination of the previously discussed results by incorporating early starter chronically aggressive youth, nonaggressive youth, and adolescent onset aggressive youth who show decline over time as they become less impulsive.

The literature examining gender differences in physical aggression trajectories has shown similar frequencies of physical aggression for boys and girls earlier in childhood although boys become more physically aggressive over time than girls. One study of a primarily African American sample in the first, fourth, and seventh grades found that in the

first and fourth grades conflicts between boys and conflicts between girls included equal rates of physical aggression, but that in seventh grade girls were less likely to include physical aggression in their conflicts than were boys (Xie et al., 2003). In the previously described study by Joussemet and colleagues (2008) gender was consistently related to subgroup trajectories. For example, 18% of boys and 48% of girls were on a trajectory of no physical aggression and 11% of boys and 1% of girls were on a trajectory of high levels of physical aggression that slowly declined from 6 to 12 years of age, consistently demonstrating boys as engaging in higher levels of physical aggression compared to girls.

The increasing gender gap in rates of physical aggression over time may occur for multiple reasons. First, it has been suggested that between fourth and seventh grades, there is a drop off in physical aggression for girls primarily in their conflicts with boys, and their overall conflict with other girls consistently remains low (Cairns, Cairns, Neckerman, Ferguson, & Garipey, 1989). Additionally, as girls enter adolescence their focus may shift towards how they look and fashion as they become more interested in the opposite sex (Maccoby, 2004). This increased interest in appearance conflicts with getting involved in physical fights. It is important to note that some statistics suggest that girls are closing the gender gap in more overt aggression, such as girls' arrests increasing 28% for serious violent offenses and 78% for "other assaults" between 1991 and 2000 whereas boys' arrests decreased by 3% (Federal Bureau of Investigation, 2001). Chesney-Lind and Belknap (2004), however, state that these statistics are misleading and suggest that instead of this gap closing, the increase in frequency of physical aggression for girls is a function of changing laws. For example, many schools institute zero tolerance policies for any form of youth-on-youth violence, where even minor physical aggression is punished.

Future research needs to describe the developmental growth curve of physical aggression during middle school by examining changes through more frequent assessments. Research also needs to incorporate more diverse samples and examine gender differences in physical aggression throughout middle school to identify whether boys demonstrate higher levels of physical aggression than girls.

**Relational Aggression.** Some researchers have suggested a possible difference between physical and relational aggression trajectories, especially in adolescence, based on the growing importance of peers as youth progress from childhood to adolescence. Earlier in their development children do not place the same value on peers, but as they mature, adolescents' increased cognition and importance of relationships allow relational aggression to become more problematic and effective. Research has shown conflicting results for developmental changes in the frequency of relational aggression.

Studies examining relational aggression throughout elementary school have found differing trajectories that are either stable or increasing. One study examining a diverse sample of 385 fourth grade students of low to moderate SES (27% African American, 35% European American) found that relational aggression was common for elementary school girls and increased throughout the fourth grade in a linear fashion (Murray-Close et al., 2007). Another study also found an increase for all youth, especially girls, by the end of fifth grade that was thought to be due to improved prefrontal functioning during this time that facilitates selecting victims, getting others to conspire, and escaping adult detection (Chen, Price, Drabick, & Duey, 2007). Lastly, one study found that relational aggression did not significantly increase from first to fourth grades in a sample of 489 participants (220 boys) that was over 99% African American (Xie et al., 2003). In the majority of studies relational

aggression increased throughout elementary school, except for the study with only male participants. This discrepancy supports the notion that relational aggression increases as peer relationships become more important, especially for girls, who tend to be more social and invest more emotions and trust into their peer relationships (Block, 1983; MacCoby, 1990).

Studies examining relational aggression trajectories throughout adolescence and middle school have also primarily found increasing trajectories of relational aggression, with the exception of one study that demonstrated an overall decrease during middle school. Xie and colleagues (2003) found reports of overall low levels of relational aggression with a significant increase in the frequency of relationally aggressive behaviors from the fourth to seventh grades, where female-to-female conflicts were more likely to involve relational aggression than were male-to-male conflicts. Tiet and colleagues (2001) examined maternal reports of conduct problems in a high-risk sample of boys and girls, 54% African American, from ages 4 to 18 years, and found that relational aggression and impulsivity peaked during early adolescence. On the other hand, Pellegrini and Long (2003) found that relationally aggressive behaviors among adolescents decreased from sixth to eighth grade. The latter study did find, however, that aggression peaked at the start of middle school before declining. These studies suggest that relational aggression increases and peaks as peer relationships become more critical, and subsequently decreases. These studies, however, do not demonstrate a consistent time when relational aggression peaks, such as the beginning of middle school versus later in middle school.

There are several possible explanations for why relational aggression peaks and starts to decrease during middle school. One explanation is that adolescents gain higher level thinking skills, such as coping skills that no longer require the same aggressive response

(Crick, Ostrov, Appleyard, Jansen, & Casas, 2004). Meanwhile adolescents' social information processing, perspective-taking, and emotional competence abilities improve, and these characteristics have been suggested as important cognitive factors associated with rates of relational aggression. Researchers have proposed that these skills interact with relational aggression through the theory of mind, which describes the ability to attribute mental states, such as beliefs, and intents, to themselves and others (Hughes & Leekam, 2004).

Researchers have suggested that as the theory of mind develops, it will result in either increased social harmony or an increased ability to deceive and manipulate others. The literature evaluating the association between relational aggression and social information processing has empirically supported both hypotheses. For example, studies have found a positive relation where increased social information processing skills predicted increased relational aggression (Andreou, 2006). On the other hand, research has demonstrated that poor social information processing skills are related to increased relational aggression (Crick, Grotpeter, & Bigbee, 2002). The development of these skills during middle school may explain the initial peak and then decrease of relational aggression during middle school. Youth may initially use their increased skills of perspective taking and social information processing skills to manipulate others and hurt others through relational aggression, but as the skills further develop, such as through empathetic concern, relationally aggressive behaviors decrease.

Overall rates of relational aggression may also decrease over time based on a change in the gender composition of peer groups. Xie and colleagues (2003) found that it was primarily female-to-female conflicts that involved increased levels of relational aggression,

and as youths age their peer groups become more mixed by gender (Prinstein et al., 2001), and therefore female to female relationships and conflicts become less prevalent.

Research describing the trajectory of relational aggression is limited and not clear on the time period when levels of relational aggression stop increasing, and may be complicated by possible gender differences. For example, Xie and colleagues (2003) found that the only decrease in rates of relational aggression occurred during elementary school, but this was based on an entirely male sample. Suarez (2002) found that boys, five to seven years old, demonstrated higher rates of both relational and physical aggression than did girls based on behavioral observations and peer nominations. Additionally they found different trajectories of relational aggression for boys and girls. Relational aggression increased for boys from ages five to seven, but decreased for girls during the same time period. This decrease in relational aggression for girls differs from previously described literature, but may be due to measuring relational aggression through behavioral observations rather than student reports. It is possible that the behavioral observations did not accurately assess relational aggression, as this type of aggression is naturally more subtle and less readily noticed by outside observers.

In contrast to the previously discussed studies, other studies have found an increase in relational aggression for girls, such that girls become more relationally aggressive than boys. One study found that relational aggression increased over time and across grade for girls, such that girls were more relationally aggressive than were boys (Counts-Allan, Dunkel, Drew, David-Feron, & Kistner, 2007). Similarly, a three year prospective study of 456 adolescents, with a sample that was 74% Caucasian, assessed third to sixth graders and found that in the sixth grade boys were more physically aggressive and girls were more relationally

aggressive (Zimmer-Gembeck et al., 2005). This gender difference in relational aggression was not present in the third grade, and the study found a stable trajectory of physical aggression for both genders. Although this literature provides insight into the development of relational aggression, the studies had several limitations. These included measuring change from first through seventh grades by only assessing in first, fourth, and seventh grades. It is important to determine whether both genders are engaging in relational aggression or whether girls have higher frequencies of behaviors that are driving the trajectories. Theory supports viewing girls as more relationally aggressive as they are more concerned about both their own and others' relationships (Maccoby, 2004). Additionally, they are more sophisticated in their knowledge of others' relationships and social ties, and therefore are more able to manipulate or threaten these relationships if they find it worthwhile.

**Comparison of Trajectories.** The current literature suggests that both physical and relational aggression increase throughout childhood followed by a decline later in adolescence, but it is unclear whether these types of aggression peak at the same point. Additionally, examining gender differences in physical and relational aggression may clarify these trajectories by establishing whether male and female adolescents are similar or different on each type of aggression. The notion that physical and relational aggression have distinct trajectories is suggested by Bioecological theory. Adolescence is a critical transition period in development and therefore is a highly appropriate time to examine the development and pattern of physical and relational aggression. According to Bronfenbrenner and Ceci's (1994) bioecological model, "human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects and symbols in its immediate environment (p. 572)." One

example of these processes is the interaction between adolescents and their peers. As children mature, the opinions, values, and beliefs of their peers and these relationships become more important, whereas relationships with their parents become less crucial (Baumrind, 1987; Holmbeck, 1994). Beginning in early adolescence, youth increasingly conform to the established values and standards of their peers as a means of solidifying their social status and identifying with their peer group (Baumrind, 1987). This conformity can put adolescents at risk for an adolescent-onset pattern of aggression.

Previous research on aggression has described two patterns of development. The first is early-onset aggression, a pattern that develops early in life, beginning as young as 3 years, and persisting as the child develops. Early-onset aggression is associated with more severe aggression during adolescence and often develops into a stable pattern and criminality in adulthood (Moffitt, 1993; Moffitt, Caspi, Dickson, Silva, & Stanton, 1996). In contrast, adolescent-onset aggression develops during middle to late adolescence, often in middle school, and discontinues as the individual develops into a young adult. Youth with adolescent-onset aggression often display similar delinquent behaviors to those youth who developed childhood conduct disorder despite the more temporary nature of the aggressive behaviors and distinct causes (Moffitt & Caspi, 2001). For example, youth with both child- and adolescent-onset aggression may display aggressive behaviors, but a lack of neurodevelopmental vulnerabilities often exists with early-onset aggression. A longitudinal study of fifth to ninth grade adolescents, who had been rated as having the highest frequency of aggression, demonstrated peaks in proactive and reactive aggression in the sixth grade that then declined (Fite et al., 2008), therefore demonstrating the increase of aggression as these processes become central for adolescents.



Major risk factors for adolescent-onset aggression are delinquent peers and early maturation. Youth who associate with more delinquent peers are more likely to act aggressively during adolescence, and youth who mature and develop before their peers are also more likely to act aggressively. Werner and Crick (2004) have described this as a risk factor for girls for relational aggression, such that girls who befriend relationally aggressive peers become increasingly relationally aggressive themselves between the third and fourth grades. For physical aggression, boys and girls who befriend physically aggressive peers demonstrate increases in physical aggression during the same time period. Moffitt (1993) suggested that early maturing boys and girls may also engage in adolescent-onset aggression and delinquent behavior as they attempt to close the “maturity gap.” This gap occurs as youth who biologically mature early are not afforded social maturity or adult social status. In order to bridge this gap, early-maturing youth engage in aggressive and delinquent behaviors that allow them to increase their feelings of autonomy, independence, and freedom from their parent’s control. These results and theoretical differences demonstrate the need for further research to examine the longitudinal development of physically and relationally aggressive behaviors over this critical time period.

In order to compare physical and relational aggression trajectories for boys and girls, it is critical that these constructs be measured at multiple time points within the same study. This allows for a clear comparison of when physically and relationally aggressive behaviors peak for boys and girls, and a more direct comparison of physical and relational aggression and whether these forms of aggression have similar or distinct developmental trajectories.

Future research needs to provide a clear comparison of when physically and relationally aggressive behaviors peak for boys and girls in comparison to one another. In

order to make the comparison of physical and relational aggression, these constructs need to be measured within the same study at multiple time points throughout middle school. This will allow an examination of when the rates of aggressive behaviors change from increasing to decreasing. These comparisons are necessary in order to clarify whether physical and relational aggression have similar or distinct developmental trajectories for youth, and therefore need to be addressed at similar or different times in interventions.

### **Aggression and Adverse Outcomes**

**Physical Aggression.** Research has also examined whether the long term consequences of physical and relational aggression are similar or distinct. Studies examining physical aggression have consistently demonstrated its relation to a variety of adverse outcomes, including externalizing and internalizing difficulties. Rates of depression, suicidal thoughts, suicide attempts, and suicide itself are all higher in children diagnosed with conduct disorder, which includes components of physical aggression (Shaffer et al., 1996). Research has also found that physical aggression has negative outcomes for girls, such as poorer adjustment and a socially unskillful behavioral profile in elementary school students (Pullatz et al., 2007). Physical aggression has also been related to less education, self-reported delinquency, and alcohol use at age 26 when predicted from physical aggression at age 14, especially when compared to other forms of aggression (Pulkkinen & Pitkaenen, 1993). This significant impact of physical aggression appears related to its impact on school adjustment problems whereas other types of aggression, such as verbal aggression, are more an expression of energy or strong temperament. The energy and strong temperament characteristics that are associated with verbal aggression may demonstrate increased language and communication abilities that when combined with anger become expressed in a

verbally aggressive manner. These characteristics of communication, energy, and strong temperament can all be considered positive qualities that lead to further academic achievements. Physical aggression, on the other hand, was not associated with these potentially positive characteristics. In addition, Bartlett (2003) found an association between physical aggression and victimization whereby fifth and sixth grade boys and girls received higher ratings on physical victimization when they were also physically aggressive. Another study examining seventh grade students found that physical aggression predicted the development of maladjustment, such as low academic competence, low popularity, and low affiliation, in late adolescence and early adulthood (Xie, Swift, Cairns, & Cairns, 2002). This literature demonstrates a consistent pattern of physical aggression's impact on both externalizing and internalizing negative outcomes.

Studies examining gender differences in the impact of physical aggression have found that physical aggression in boys is related to more externalizing behaviors and physical aggression in girls is related to more internalizing behaviors. One study found that physically aggressive boys are more likely than girls to be victims of physical aggression themselves and physically aggressive girls are more likely to suffer from depression than boys (Moretti & Odgers, 2006). This gender difference in the types of outcomes experienced by boys and girls demonstrates the need for examining gender differences when evaluating the impact of physical aggression.

***Delinquency.*** Research on physical aggression has demonstrated a very strong link with delinquent behavior, a negative externalizing outcome, at ages varying from elementary through high school. It is important to note, however, that the majority of these studies have only examined boys. A prospective study including six diverse sites, including a

homogeneous, low SES, white sample from Montreal, Canada and a low SES sample that was approximately 50% African American from Pittsburgh, followed boys starting at birth for five to seven years, and found that chronic physical aggression during elementary school increased the risk for both continued physical violence and other forms of delinquency, when controlling for other disruptive behaviors (Broidy et al., 2003). Similarly, Haapasalo and Tremblay (1994) found that a high frequency of fighting from kindergarten through age 12 was associated with high self-reported delinquency from 10 to 14 years of age in a homogeneous sample of white boys of low SES backgrounds. Another study found that the frequency of physical aggression from 6 to 13 years predicted violent delinquencies from ages 13 to 17, depending on preexisting vulnerabilities (Nagin et al., 2008). Lastly, Nagin and Tremblay (1999) found that a chronic trajectory of physically aggressive behavior led to delinquency, including physical violence and more serious delinquent acts in a homogenous white sample of 1,037 boys from a low SES background who were assessed from ages 6 to 15. Although the majority of this research has focused on younger boys, the research demonstrates a clear pattern of physical aggression's association with and prediction of delinquent behavior.

***Substance Use.*** Research has also demonstrated a strong connection between physical aggression and drug use. Skara and colleagues (2008) found that after controlling for relational aggression, baseline drug use, and demographics, baseline physical aggression predicted alcohol use one year later for male students, but not for female students in a sample of 2,064 high school students who were 13 to 19 years old, 53% male, 62% Hispanic, and mostly lived in two parent families (62%). A second study found that in boys, physical aggression was a predictor of substance use and other health–risk behaviors (Piko et al.,

2006). Unger and colleagues (2003) found that engaging in physical aggression was associated with higher risk for use of cigarettes, alcohol, marijuana, and other drugs. Lastly, a study examining 309 children followed from ages 4 to 18 found that both the initial level and change in levels of physical aggression were unique predictors of later adolescent health risk behaviors, including substance use (Timmermans, van Lier, & Koot, 2008). For example, the level of status violations predicted later smoking and soft drug use, such as marijuana and hashish. Of all externalizing problem behaviors measured during the study, physical aggression was the best predictor of adolescent substance use from childhood onwards. These results demonstrate a clear link between physical aggression and substance use, especially for boys.

**Relational Aggression.** Relational aggression has also been found to be related to adjustment difficulties and internalizing problems. Crick and colleagues (1999b), in reviewing the empirical literature, found that social-psychological adjustment problems have been associated with relational aggression. Relational aggression has been related to adjustment difficulties (Crick & Grotpeter, 1995), psychopathology (Crick & Zahn-Waxler, 2003), and internalizing problems (Crick, 1995; Crick & Grotpeter, 1995) which were stronger for girls than for boys (Crick & Zahn-Waxler, 2003). Marsee (2007) found that relational aggression accounted for unique variance in predicting unemotional and coldhearted traits in detained girls from ages 12 to 18, even after controlling for variance predicted by physical aggression. Murray-Close and colleagues (2007) found that relational aggression and internalizing symptoms were related throughout analysis in a diverse sample of fourth grade students. Lastly, a study of ninth through twelfth grade adolescents found that relational aggression uniquely predicted externalizing problems (Prinstein et al., 2001).

Previous research on gender differences and the impact of relational aggression have found that girls who engage in relational aggression have poorer outcomes and are more distressed by relational difficulties than are boys. For example, girls exposed to relational difficulties have reported being more cognitively disoriented and described the events as more stressful and emotionally problematic than did boys (Crick, 1995; Crick et al., 2002; Leadbeater, Kuperminc, Blatt, & Hertzog, 1999; Rudolph & Hammen, 1999). Another study of high school students found that relational aggression was associated with externalizing behavior for girls only (Pristein et al., 2001). In contrast, a more recent study found that the relation between relational aggression and internalizing symptoms was equally strong for boys and girls (Murray-Close et al., 2007). Previous literature demonstrates a clear link between relational aggression and internalizing problems, especially for girls, but the conflicting findings of the most recent study demonstrate the importance of evaluating whether the impact of relationally aggressive behavior on boys may be changing over time.

***Delinquency.*** Much less research has been conducted examining the relation between relational aggression and delinquency than with physical aggression and delinquency, but those studies that have examined this relation found a pattern similar to the pattern for physical aggression. Marsee (2007) found that both self-reported and observed relational aggression were linked to higher rates of self-reported delinquency in a sample of 58 incarcerated girls from the ages of 12 to 18, where the sample was 78% African American,. In addition, Crick and colleagues (2006) found that when controlling for physical aggression, relationally aggressive third graders were more likely than non-relationally aggressive students to display both increased aggression and delinquency a year later in a sample of 224 third and fourth graders, 50% female and 60% European American, from non disadvantaged

backgrounds. Although there is limited research examining this issue, the link between relational aggression and delinquency has been demonstrated in elementary age students and adolescent incarcerated girls. Further work is clearly needed to examine this relation in a more representative sample of adolescents.

***Substance Use.*** Similar to the literature on delinquency, there is less research examining the association between relational aggression and drug use than with physical aggression, but similar relations have also been found. For example, Rodgers (2001) found an association between relational aggression and substance use. Skara and colleagues (2008) controlled for physical aggression, baseline drug use, and demographics, and found that relational aggression predicted cigarette and marijuana use in female students, but not male students in a sample (53% male, 62% Hispanic) comprised of 2,064 high school students where 62% of the sample lived with both parents. Relational aggression predicted later alcohol and hard drug use equally, regardless of gender. Despite the small amount of literature on this association, both studies found a significant relation between substance use and relational aggression.

**Comparison of Outcomes for Physical and Relational Aggression.** The previously discussed studies suggest that both physical and relational aggression have been associated with adverse outcomes, but physical aggression's impact on externalizing disorders, such as delinquent behavior and drug use, has been examined more frequently. Early antisocial behavior, which incorporates physical aggression, is the best predictor of later delinquency, with early onset of aggression appearing to be the most important social behavior characteristic in predicting delinquent behavior prior to age 13 (U.S. Department of Justice [USDJ], 2003). This relation may be due to early physically aggressive behaviors setting a

pattern of oppositional rule violation that is also common in later more serious delinquent behaviors. Support for the underlying development of oppositional behavior that starts with physical aggression and leads to delinquency and drug use is supported by a study of boys from 6 to 15 years of age that demonstrated chronic physical aggression and oppositional behavior trajectories led to delinquency (Nagin & Tremblay, 1999). Additionally, impulsivity can be characteristic of youth who continue to engage in physical aggression in middle school, and is another individual characteristic that can predict later delinquent behavior (USDJ, 2003).

Research directly comparing outcomes for physical and relational aggression have consistently found that physical aggression led to more negative outcomes than relational aggression. One study of a sample (52% African American) of 1,397 fourth grade elementary students found that physical aggression had negative outcomes related to adjustment for girls whereas relational aggression did not have the same negative outcomes (Pullatz et al., 2007). Murray-Close and colleagues (2006) found that a diverse population of fourth and fifth graders rated physical aggression as more wrong and harmful than relational aggression. Lastly, a study examining a sample of 475 seventh grade participants, approximately half girls and 30% African American, found that physical aggression rather than relational aggression primarily predicted the development of maladjustment, such as low academic competence, low popularity, and low affiliation, in late adolescence and early adulthood (Xie, Cairns, et al., 2002). Two of these studies, however, were limited to elementary school children, therefore missing the critical ages where influence shifts from family to peers. This shift of the importance of peer relationships occurs around ages 12 to 14, when interactions and approval from peers become increasingly important to youth (Bronfenbrenner, 1997). As



these studies occurred prior to this transition, it is possible that relational aggression, which specifically targets peer relationships, would not have as much of an impact on adverse outcomes on younger children. Later in adolescence, when this shift occurs, relational aggression may produce adverse negative outcomes equal to or more significant than physical aggression.

Physical aggression has been strongly related to delinquent behavior and substance use, but this relation has been demonstrated much more consistently with boys. This gender distinction fits the pattern described above wherein boys demonstrate more externalizing outcomes and girls demonstrate more internalizing outcomes related to aggressive behavior. This pattern has been found throughout the literature, such as in a study that examined internalizing and externalizing trajectories from 3 to 15 years that noted externalizing problems were more important for boys, and temperamental reactivity was more critical for girls (Letcher et al., 2009). This gender difference may be partially explained by the fact that boys make up after a fight more quickly than do girls, and therefore conflicts impact the girls with more long term consequences (Lagerspetz, Bjorkqvist, & Peltonen, 1998). The increased length of impact may also be due to the increased concern and importance of peer relationships for girls (Maccoby, 2004). Aggression has mostly been shown to lead to internalizing problems for girls, but it is important to investigate whether fighting also leads to externalizing problems. Whereas there have been few studies examining this question, relational aggression has been linked to delinquency and drug use, but results are limited to very specific populations. Although relational aggression has demonstrated more negative outcomes for girls, the impact of engaging in relational aggression may be dependent upon the type of outcome examined, with outcomes differing for less severe behaviors, like

cigarette use, but showing similar effects on more severe outcomes, such as hard drug use. These results are further complicated as many of the previously described studies reporting adverse outcomes for physical and relational aggression included only boys or girls. It is also difficult to meaningfully compare physical and relational aggression due to no comparable metric, as the behaviors for each form of aggression are qualitatively different and therefore the same rates of physical aggression may be meaningfully different from the same rates of relational aggression (Maccoby, 2004). Therefore, increased frequency of a particular type of aggression may not be as important if its impact on negative outcomes is not significant. Further work needs to evaluate the impact of each type of aggression to see whether they are distinct, due to the limitations of previous research and difficulty in comparing rates of each form of aggression.

Although there is abundant research on the effects of physical aggression, in general, and on the effects of relational aggression and internalizing disorders, few studies have examined relations between relational aggression and externalizing outcomes, such as delinquent behavior and drug use. Research needs to further examine these relations, including the relation between each type of aggression and externalizing outcomes. Negative outcomes also need to be examined separately for boys and girls based on the literature showing gender differences in the relations between physical and relational aggression and consequences. Lastly, research needs to allow for the direct comparison of physical and aggression to see not only if each type of aggression impacts delinquent behavior and drug use, but whether the type of impact made by physical and relational aggression differ.

## Statement of the Problem

Previous research has found mixed results regarding the relations between physical and relational aggression and the extent to which they uniquely predict problematic outcomes. Studies have often examined these constructs in homogeneous samples with limited age ranges using cross-sectional designs. Moreover, many studies examining aggression's negative consequences have restricted their focus to either physical or relational aggression, with samples limited to male or female participants, making it difficult to determine gender differences in the patterns of findings for each form of aggression. These differences in study design may be partly responsible for the conflicting findings in the current literature. The present study attempted to address these limitations by using a more normative sample of boys and girls that was assessed on multiple occasions throughout middle school, a time period that has been less frequently examined in previous studies.

Obtaining an accurate depiction of the patterns of physical and relational aggression throughout middle school, how the two forms of aggression relate to one another, and their impact on delinquency and substance use is important in order to have a clear understanding of the etiology and consequences of physical and relational aggression. Additionally, as prevention programs for aggression are developed, a central question is whether different strategies need to be used to address each form of aggression. It is important to determine whether the same individuals should be targeted in prevention programs for both types of aggression or whether distinct youth are engaging in each type of aggression.

One limitation of previous research is that many studies have examined only boys or girls or focused on either relational or physical aggression. This limitation may in part explain the conflicting findings across studies because gender has been found to have a

strong impact on both the trajectories and associated outcomes of physical and relational aggression. Much of the early empirical literature included a male sample and only focused on physical aggression (Brame et al., 2001; Haapasalo & Tremblay, 1994; Nagin & Tremblay, 1999). Other studies that examined both boys and girls often had disproportionate representation of one gender, exemplified by a study that measured aggression in 228 boys versus 80 girls (Tiet et al., 2001). Although the earlier research focused on measuring physical aggression in boys only, recent literature has focused on the evaluation of relational aggression with a female only population (Marsee, 2007; Putallaz et al., 2007; Xie et al., 2003; Xie, Cairns, et al., 2002). Similar to the research assessing boys, research focusing only on girls has also examined only one type of aggression, exemplified by a review of the research with samples of African American girls and their physically aggressive behavior (Miller-Johnson, Moore, Underwood, & Coie, 2005) or girls and relational aggression only (e.g., Rodgers, 2001; Yoon, Barton, & Taiariol, 2004).

Many studies have also selected samples of adolescents that were rated high on aggression, rather than more normative samples of youth. For example, in examining trajectories of proactive and reactive aggression, Fite and colleagues (2008) restricted their sample to adolescents in the upper one-third on a measure of aggression. Tiet and colleagues (2001) similarly studied a high-risk sample of boys and girls who were judged to be higher than their peers on aggression. Marsee (2007) restricted her study of aggressive behavior in girls to a sample of girls who had been incarcerated in juvenile detention centers. Although it may be important to target highly aggressive youth for interventions, they represent a small proportion of youth and adolescents. Selecting youth who are elevated on aggression, especially prior to and during the transition from childhood to adolescence, may result in a

sample that over-represents participants with early-onset aggression. The distinction between highly-aggressive and typical youth is important as highly-aggressive youth may represent early-onset aggression which may reflect a distinct developmental trajectory. Moreover, it is possible that by selecting only adolescents with increased levels of aggression these studies were less likely to detect adverse outcomes and relations due to the restricted range of aggressive behaviors. These studies may thus have failed to identify important relations between aggressive behaviors and other important outcomes.

An additional limitation of previous studies has been their use of fairly homogeneous samples, in terms of race and ethnicity. Many previous studies have focused mostly on Caucasian children (Adler & Adler, 1998; Brame et al., 2001; Crick et al., 2006; Crick & Grotpeter, 1995; Haapasalo & Tremblay, 1994; Joussemet et al., 2008; Lagerspetz & Bjo`rkqvist, 1994; Nagin & Tremblay, 1999). Moreover, many are based on the same data sets or similar populations within the same setting. This results in an overrepresentation of specific populations within the literature. Additionally, those studies that have included minority samples have largely been limited to African American participants (e.g. Xie et al., 2003). In some cases sample characteristics such as ethnicity have not been identified (Burton et al., 2007).

The limited focus on samples that include minority participants is particularly problematic given theoretical and demonstrated ethnic and racial differences in aggression. Although overall the research examining ethnic and racial differences in aggression is limited, research that has examined ethnic and racial differences in aggression has found differences. For example, research examining aggression in elementary school children found that African American children are higher on peer nominations of both overt and relational

aggression than are European American children (David & Kistner, 2000; Osterman et al., 1994). Research has also indicated that race may interact with gender, such that there are smaller gender differences in the use of overt and relational aggression among African American adolescents than among European adolescents (Underwood, 2003). Underwood suggested that girls' proportionally higher rates of relational aggression are due to socialization that keeps them from outwardly expressing their anger or confronting conflicts, thus discouraging the use of more overt aggression. This process encourages girls to use less direct forms of aggression, such as relational aggression, where the perpetrator's identity is often hidden and the behavior is more covert. Researchers have proposed that African American families socialize their children in less gender-specific ways than European American families, so that gender neutrality is the norm, and African American girls consequently tend to be more assertive, strong, and independent (Hill & Sprague, 1999; Peters, 1988). Unfortunately, much of the research on aggression has been conducted with white middle class adolescents, so it is difficult to determine whether this theory has empirical support.

Previous literature describing aggression trajectories and their consequences have largely focused on high risk or low SES samples (e.g. Brame et al., 2001; Broidy et al., 2003; Hapassalo & Tremblay; 1994, Nagin & Tremblay; 1999; Tiet et al., 2001). Fewer studies have used samples that are primarily middle class or not disadvantaged (e.g. Crick et al., 2006; Joussemet et al., 2008). Even more concerning is that many studies do not describe the SES of their sample (e.g. Bartlett, 2003; Burton et al., 2007; Goldstein & Tisak, 2004; Prinstein et al., 2001; Skara et al., 2008), making it difficult to determine the population they reflect. SES is an important sample characteristic that can greatly impact an investigation's

results depending on whether the sample contains participants with a range of SES or a homogenous sample with a limited range of SES. For example, a study examining teacher- and parent-reported disruptive behaviors found that girls who lived in disadvantaged neighborhoods were more likely to score high on these behaviors (Hipwell et al., 2002). Previous research that has specifically examined the relation between SES and aggression found that children from low SES backgrounds are more likely to be overtly aggressive than children from higher SES environments (Coie & Dodge, 1998). An additional study found higher levels of physical aggression among low SES inner-city African American middle-school girls than previous studies with similar protocols that examined African American girls from rural and suburban areas (Xie et al., 2003; Xie, Cairns, & Cairns, 2002).

An additional limitation in previous studies examining relational aggression is that their focus has been on elementary-age children. These studies may miss important developmental changes in adolescence that distinguish relational aggression from physical aggression, such as the increasing importance of peers. Ostrov and Crick (2006) described the many early childhood studies that have provided critical information on relational aggression in their review of the research developments on relational aggression, but did not review the developments in research focusing on adolescents. For example, studies of relational aggression have included participants in the first through fifth grades (Shahim, 2006), fourth grade (Putallaz et al., 2007), fourth through sixth grades (Crick & Grotpeter, 1995), fifth and sixth grade (Bartlett, 2003), and first and seventh grades (Suarez, 2002). These studies exemplify the focus on describing relational aggression in elementary school and up to seventh grade, but not describing its development or impact in middle school. The lack of research on middle school adolescents is critical as research examining trajectories in

elementary school show stability or an increase in levels of aggression. Relational aggression may continue to increase and be more salient in middle school because of the developmental milestones during that period, such as the increase in importance of friendships and in the cognitive ability to carry about more covert and harmful relationally aggressive behaviors (Yoon et al., 2004).

Relational aggression as a whole has been less frequently studied, which makes comparing its development and outcomes with physical aggression more difficult. Yoon and colleagues (2004) described the need for a greater understanding of relational aggression, especially in its development and environmental contexts. Other researchers have also described the limited empirical literature examining relational aggression, as most previous longitudinal research to date has focused on physical and overt forms of aggressive behaviors (Coie & Dodge, 1998; Miller-Johnson et al., 2005). This limitation is especially true with research on minority populations where more subtle forms of aggression, such as relational aggression, have often been neglected for African American girls (Miller-Johnson et al., 2005).

The cross-sectional methodology used in much of the literature makes it difficult for researchers to demonstrate a temporal relation between aggression and other problems, and instead has only demonstrated their co-occurrence (Chesney-Lind et al., 2007). For example, Putallaz and colleagues (2007) examined physical and relational aggression in multiple settings using a single wave of data for fourth graders. Moreover, many longitudinal studies have been limited to two waves, rather than repeated measurement throughout the time period of interest. One study examining the growth of physical aggression from first to seventh grades measured aggression at the beginning of first grade and at the end of seventh



grade (Suarez, 2002). The limited number of waves makes it difficult to describe when the actual change occurred during longer periods of time, especially when the time period involves major transitions, such as from elementary to middle school. The present study addressed these limitations by examining data at the fall of sixth grade and spring of sixth, seventh, and eighth grades, to more clearly describe the development of aggression and potentially establish temporal relations between changes in physical or relational aggression and delinquent behavior and drug abuse.

This study addressed the previously described sample and methodological limitations by using a large, diverse sample with a significant percentage of African American, European American, and Hispanic participants that was representative of middle school students at four diverse sites and populations (e.g., this study's sample varied in SES). This diverse sample helped ensure that potential covariance in relations between physical and relational aggression was captured if they demonstrated distinct trajectories in a more representative sample that included adolescents of varying levels of aggression, rather than just chronic aggressive behavior. This also ensured that the aggression trajectories and their impact on delinquency and drug use were not being driven by specific ethnic or cultural differences within a more limited sample. This study addressed limitations from previous studies by including a sample of both male and female adolescents while examining both types of aggression concurrently, thus allowing for a direct comparison of the trajectories of physical and relational aggression and their relation to later delinquent behavior and substance use in boys and girls. Gender differences were examined to determine whether different levels of aggression found in previous research, such as girls having higher rates of relational aggression, are due to overall gender differences in levels of aggressive behavior or

different growth patterns, such that boys may have a slower increase in relationally aggressive behavior over time.

The present study also used longitudinal methodology that included data from the beginning to end of middle school, providing a basis for determining when during this important period of development physically and relationally aggressive behaviors peak for boys and girls. These results further clarified whether physical and relational aggression had similar or distinct developmental trajectories for youth, and therefore need to be addressed at similar or different times in interventions. Moreover, this study investigated whether changes in either type of aggression precede and contribute to changes in delinquency and substance use, and if physical or relational aggression was a better predictor of these outcomes. These results helped clarify how similar or distinct physical and relational aggression are for a normative sample of middle school adolescents.

Based on the current empirical literature, this study had four main hypotheses. First, it was hypothesized that there would be an overall decline in physical aggression from sixth to eighth grades. Previous studies have found an overall decrease in physical aggression during adolescence for the general population of youth with low to moderate levels of aggression, but have not examined the more specific pattern during middle school (Brame et al., 2001; Broidy et al., 2003; Cote et al., 2006; Suarez, 2002; Tremblay et al., 1996; Xie et al., 2003).

Second, it was hypothesized that there would be an increase in relational aggression in sixth grade followed by a decline through the eighth grade. Research has described a peak in relational aggression during adolescence that likely occurs at the beginning of middle school followed by an overall decrease of relational aggression (Pellegrini & Long, 2003; Tiet et al., 2001; Xie et al., 2003).

Third, it was hypothesized that the frequencies of both physical and relational aggression at Wave 1 would be associated with subsequent increases in delinquency and substance use. The current literature has reported a link between physical and relational aggression and delinquency and drug use, but has not described when the impact occurs (Crick et al., 2006; Haapasalo & Tremblay, 1994; Skara et al., 2008; Timmermans et al., 2008) and therefore it was not clear when during middle school physical and relational aggression would be predictive of delinquency and drug use.

Finally, it was hypothesized that the frequencies of physical and relational aggression would vary by gender. It was hypothesized that boys would have a higher frequency of physical aggression than girls as demonstrated consistently in previous research (e.g., Henington et al., 1998; Shahim, 2006). It was also hypothesized that girls would have a higher frequency of relational aggression than boys. Although there are mixed findings regarding gender differences in the frequency of relational aggression, the majority of previous studies examining aggression in adolescents have suggested that girls have a higher frequency of relational aggression than boys (e.g., Crick & Grotpeter, 1995; Xie et al., 2003). Specific directional hypotheses regarding gender differences in the trajectories of physical and relational aggression along with their impact on later delinquency and substance use were not made as the literature has reported gender differences in both the trajectories and associated outcomes of relational aggression and physical aggression, but this pattern is not clear due to inconsistent findings and study limitations (e.g., homogeneous sample, examining only boys or girls or focusing on either relational or physical aggression). This study was exploratory in determining if there are gender differences and the direction of these differences in these trajectories and their influences.

## Method

### Settings

The data used for this study were originally collected as a part of the Multisite Violence Prevention Project (MVPP, 2004b) that was conducted by universities in four sites. The goal of MVPP was to evaluate universal and selective violence prevention programs for middle school students. The four participating sites were selected based on their capacity to carry out a large scale project, ability to build and maintain positive relationships with schools and community groups, and their commitment to and experience with collaborative research.

The four sites were Durham, North Carolina, Richmond, Virginia, Northeastern Georgia, and Chicago, Illinois. Both Durham and Richmond included eight middle schools that represented nearly all the public middle schools located within those cities. Northeastern Georgia included nine middle schools, three urban and six rural. Chicago included twelve schools that consisted of kindergarten through eighth grade students, and were chosen based on the size of the school, and where the student body was comprised of at least 75% of the students residing within school district boundaries. Table 1 describes the overall characteristics of schools and demographics at each site selected for the study (MVPP, 2004b). For the MVPP study, schools were randomly assigned to one of four conditions, no-intervention control, universal intervention, selective intervention, and combined universal and selective interventions.

Table 1.

*Description of School and Student Characteristics at Each Site*

| Demographics                                   | North Carolina | Georgia | Illinois | Virginia |
|--|----------------|---------|----------|----------|
| Number of Middle Schools                       | 8              | 9       | 12       | 8        |
| Grade Levels at School                         | 6-8            | 6-8     | K-8      | 6-8      |
| Average Number of Sixth-Graders at each School | 241            | 239     | 70       | 236      |
| % African American                             | 66             | 34      | 46       | 84       |
| % Hispanic                                     | 5              | 12      | 48       | 6        |
| % Caucasian                                    | 26             | 55      | 16       | 9        |
| % Eligible for Federal Lunch Program           | 42             | 47      | 96       | 75       |
| % Community Poverty                            | 17             | 26      | 31       | 37       |
| % Juvenile Arrests at Site for Violent Crimes  | 47             | 74      | 63       | 69       |
| % High School Dropout Rate                     | 2              | 9       | 17       | 3        |

Thirty-seven schools were selected for the MVPP study and these schools served a high percentage of low-income, minority students. Of these schools, nineteen schools were selected that did not receive the universal intervention. Approximately 64% of the overall sample was eligible for free or reduced price lunch, with the lowest rate at 42% for Durham, NC. Three of the four sites had community poverty rates much higher than the 16% community poverty percentage for the United States. Similarly, the four sites had juvenile arrest rates for violent crimes higher than the 43% rate for the United States (MVPP, 2004b).

### **Participants**

Participants were two cohorts of students randomly selected to represent the population at those students entering the sixth grade in the fall of 2001 and 2002 at each school. Students in self-contained classrooms were excluded from the study because the intervention had not been designed to address their needs. Approximately 100 students were selected at each school. Of the original 7,364 students selected to participate, data were collected from 5,625. This represented an average participation rate of 76% across sites,

ranging from 71 to 83% across sites. Parental consent and student assent were obtained for all participants. Of the 5,625 participants only those participants attending schools not assigned to the universal intervention were used for this study, resulting in a sample of 2,822. Within this final sample 49% were male, 48% of students identified themselves as African American, 18% as White, 22% as Hispanic, 1% as American Indian or Alaska Native, 1% as Asian, 8% as multiracial, and 2% as another race. Regarding family structure, 87% of students reported living with their mother, 46% living with their father, 17% with a step-parent, 18% with a grandmother, 7% with a grandfather, 11% with an aunt or uncle, and 25% with other relatives or friends. Most of the time (69%) students reported having an adult male in the home.

### **Procedures**

All procedures were approved by the institutional review boards of each university and the CDC. Consent and assent forms were sent home with students. At three of the sites where it was permitted, participating students were given a \$5 gift card to Walmart or the movies for returning their consent forms whether or not they agreed to participate in the study.

Students completed measures assessing a variety of risk factors and outcomes targeted by the interventions. Data were collected at the fall of the sixth and the spring of sixth, seventh, and eighth grades, allowing for the measurement and analysis of problem behaviors at multiple time points throughout middle school. For Cohort 2, data were also collected at the beginning of the seventh grade. Data were collected using a computer-assisted survey interview. Students heard audio clips through headphones while the survey items appeared on the computer screen. The survey was programmed to prompt respondents

to re-enter their response if they entered a value outside the logical range for that question. Students could not leave a response blank, but could decline to answer by typing “R”. This ensured that items were not skipped unintentionally. Small groups of students (3:1, students to research staff) completed the measures in a testing area outside of their classroom. Prior to starting the measures, student ID and gender were entered into the computer and students given instructions that were standardized across sites. After students completed the interview they were compensated with a gift card. The survey took an average of 41 minutes (SD=14.7 minutes) to complete.

## **Measures**

### **Adolescent Aggression, Delinquency, and Drug Use: Problem Behavior**

**Frequency Scale (PBFS).** (Farrell, Kung, White, & Valois, 2000). This self-report measure consists of 44-items divided into seven scales that assess the frequency of problem behaviors including aggression (physical, non-physical, and relational), victimization (overt and relational), drug use, and delinquency. The PBFS used in this study was adapted from a compilation of separate measures (Farrell et al., 2000), including seven items from the Center for Disease Control’s Youth Risk Survey (Kolbe, Kann, & Collins, 1993) used to measure physical aggression. Sample items include, “Thrown something at someone to hurt them,” and “Hit or slapped another kid.” Six items representing relational aggression were based on Crick and Bigbee (1998). Samples include, “Spread a false rumor about someone,” and “Left another kid out on purpose when it was time to do an activity.” The delinquency scale consisted of eight items, including six items based on Jessor and Jessor’s (1977) Attitudes Toward Deviance Scale. Sample items for the delinquency scale include, “Been on suspension,” and “Cheated on a test.” The drug use scale focused on gateway drugs, such as

cigarettes, beer, wine, hard liquor, and marijuana (Kandel, 1975). Sample items for the drug use scale include, “Been drunk,” and “Smoked cigarettes.” Respondents were asked to indicate how frequently they engaged in each behavior in the 30 days prior to the survey on a six-point scale ranging from 1 (*Never*) to 6 (*20 or more times*). A high score represents a higher level of problematic behavior. Internal consistency was measured during the fall of 2001 with Cohort 1. Cronbach’s alphas were .80 for physical aggression, .72 for relational aggression, .76 for delinquent behavior, and .84 for drug use.

Table 2 reports the correlations among the scales used in this study using Wave 1 data from Cohort 1 (MVPP, 2004a). A confirmatory factor analysis tested three competing models of aggression: (a) a four-factor model in which each scale represented a distinct factor, (b) two three-factor models that merged nonphysical aggression with physical or relational aggression, and (c) a single-factor model in which all aggression scales were merged together. The model with separate factors for each type of aggression demonstrated the best overall fit (e.g. RMSEA) and greatest parsimony thus supporting the calculation of separate scores for physical and relational aggression.

Table 2.

*Intercorrelations among Problem Behavior Frequency Scales from the 1<sup>st</sup> Wave of Cohort 1*

| Scale                 | Physical Aggression | Relational Aggression | Delinquency |
|-----------------------|---------------------|-----------------------|-------------|
| Physical Aggression   | -                   |                       |             |
| Relational Aggression | .70                 | -                     |             |
| Delinquency           | .67                 | .59                   | -           |
| Drug Use              | .51                 | .42                   | .64         |

**Student Demographics.** Students completed a measure to identify their race, ethnicity, and their relations with individuals living in their home (MVPP, 2006). Students



responded 0 (*No*) or 1 (*Yes*) for each of the demographic questions, with the exception that Hispanic ethnicity was coded as 0 (*Yes*) or 1 (*No*).

## **Analyses**

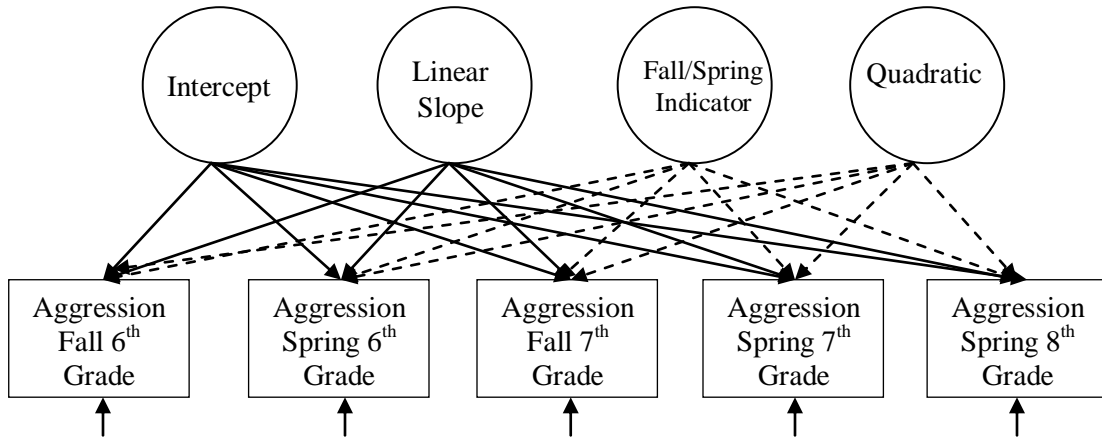
Descriptive statistics were calculated to examine the distribution properties of each scale and to identify any outliers. Correlations within each wave were analyzed to determine the relation between physical and relational aggression and the relations of each type of aggression with delinquency and drug use. Growth trajectories for physical and relational aggression, delinquency, and substance use were estimated with latent growth models. In addition, cross-lagged causal paths for time-specific repeated measures were examined (Curran & Bollen, 2001). Growth models allowed the examination of both within and between construct differences and determined whether the continuous underlying developmental trajectories of physical and relational aggression were related to each other or were distinct, and how each construct was related to changes in delinquency and substance use. Model using cross-lagged paths allowed the examination of the influence between observed repeated time-adjacent measures across constructs. Using models that examined both growth trajectories and time-specific influences allowed for a comprehensive estimate of the relation between physical and relational aggression, and their impact on delinquency and drug use.

The models were estimated using Mplus software. Full information maximum likelihood estimation was used to handle missing data. This approach uses all available data to evaluate parameter estimates and does not exclude subjects with missing data (Kline, 2005), as it assumes that data are missing at random. This approach reduces the potential sampling bias that can occur with other approaches, such as listwise deletion, which excludes

participants with any missing data (Farrell et al., 2005). Fit indices used to evaluate the model included chi-square, the comparative fit index (CFI; Bentler, 1990), and the root mean square error of approximation (RMSEA). A good fit for the model was considered when  $\chi^2/df < 2.0$ ,  $CFI \geq .95$ , and  $RMSEA \leq .08$  (Tabachnick & Fidell, 2001). An adjusted chi-square statistic, which was therefore equivalent to the Yuan-Bentler test statistic, was used to account for using maximum likelihood estimation. In order to calculate the adjusted chi-square statistic, the chi-square value was multiplied by a correction factor for that specific model. When comparing models using the chi-square difference test, in addition to adjusting the chi-square values using the correction factor, the degrees of freedom for both models were also adjusted using a fraction that consisted of the difference between the degrees of freedom multiplied by the correction factor, which was then divided by the difference of the original degrees of freedom. The Bayesian information criterion (BIC) was used to compare models and see how well each model predicted the observed data, while favoring a more parsimonious model. Once the best fitting model was established for each set of analyses, multiple group growth models were examined for girls and boys, starting with unconstrained models and evaluating whether the fit decreased if parameters were constrained to be equal for boys and girls.

Univariate latent growth models were used to estimate the average underlying growth trajectory for adolescents on physical aggression, relational aggression, delinquency, and drug use, using observed repeated measures in order to examine change in these constructs over time (Curran & Bollen, 2001; Curran, Stice, & Chassin, 1997). These models modeled change in each construct as a construct of latent intercept and slope parameters and time-specific influences on the construct, therefore representing change in the trajectories over

each of the five assessments (see Figure 1). Linear, fall and spring indicators, and quadratic effects of time were examined to see if each growth curve was significantly improved by adding each term.



*Figure 1.* Example of Univariate Latent Growth Models. The dashed line indicates that these terms were tested to see whether they should be included in the final model.

After establishing the best fitting univariate growth models, bivariate growth models were used to examine relations between growth parameters across constructs (see Figure 2). The bivariate models made it possible to examine how the trajectories and intercepts were related across variables (Curran & Bollen, 2001). Structural parameters were estimated so that the intercept of each construct predicted the slope factor of the other construct.

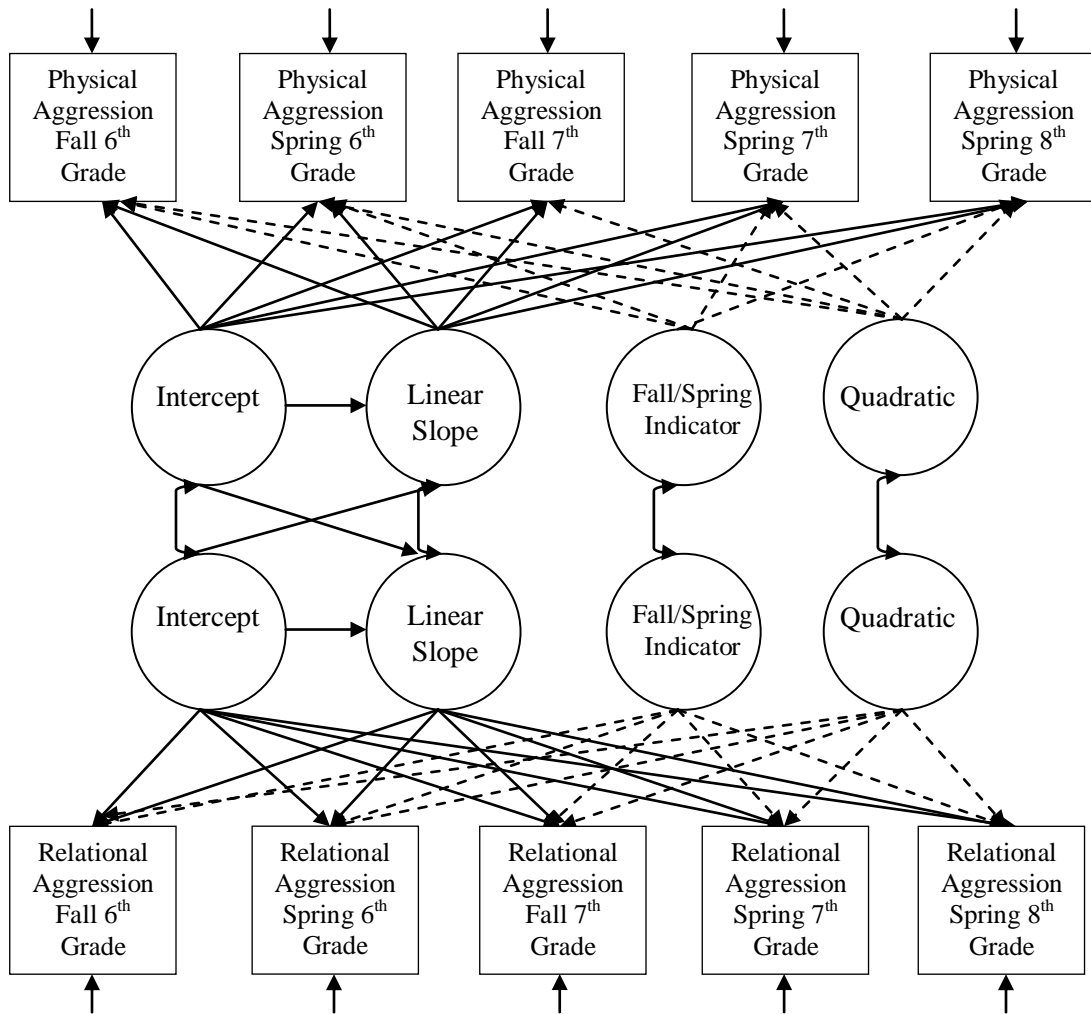


Figure 2. Example of Bivariate Latent Growth Models. The dashed line indicates that these terms may or may not be included in the final model. Correlations between error terms for manifest variables within each wave were included in the model, but are not shown in the figure.

Time-specific influences between the observed repeated measures were examined through cross-lagged paths for each of the models to observe how the frequency of each construct at one time-point influenced both its own frequency and the frequency of the other construct of interest at the next wave (Curran & Bollen, 2001; see Figure 3). The focus of the cross-lagged path models in comparison to the previous models is on measuring the influence between observed repeated time-adjacent measures across constructs rather than the latent factors underlying the trajectories.

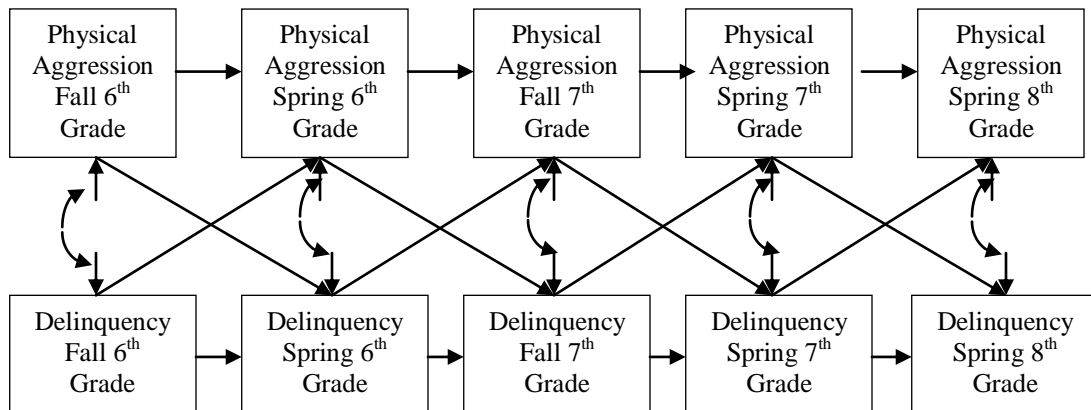


Figure 3. Example of Autoregressive Cross-lagged Path Model.

Overall, this comprehensive approach allowed not only a determination of the trajectories of each of these critical constructs throughout middle school, but also an examination of both the influence of the underlying growth trajectories on the other constructs as well as the influence from the time-specific measure of the other construct. This approach provided multiple methods of examining whether physical and relational aggression were distinct constructs, both through how they related to each other in the above models, and how they similarly or distinctly influenced delinquency and drug use.

## Results

### Preliminary Analyses

Means and standard deviations for all scales used in the present study are reported in Table 3. Ratings of aggression, delinquency, and drug use ranged from 1 to 6, where higher scores indicate higher frequency of the behaviors. Mean levels of all measures increased from the fall to the spring during the sixth and seventh grades. Physical and relational aggression either decreased or remained stable from the spring of sixth grade to the fall of seventh grade and from the spring of seventh grade to the spring of eighth grade. Reports of delinquency and drug use both increased somewhat throughout middle school. Boys

consistently exhibited higher sample means than girls on all measures at each wave of data collection.

Table 3.

*Means and Standard Deviations for All Scales at Each Wave by Gender*

| Scale                     | Mean (SD)   | Mean (SD)   | Mean (SD)   | Mean (SD)   | Mean (SD)   |
|---------------------------|-------------|-------------|-------------|-------------|-------------|
|                           | Fall-6th    | Spring-6th  | Fall-7th    | Spring-7th  | Spring-8th  |
| Girls ( <i>N</i> = 1,447) |             |             |             |             |             |
| Physical Aggression       | 1.43 (0.56) | 1.58 (0.72) | 1.57 (0.71) | 1.66 (0.77) | 1.67 (0.76) |
| Relational Aggression     | 1.50 (0.60) | 1.63 (0.77) | 1.54 (0.68) | 1.60 (0.73) | 1.55 (0.66) |
| Delinquency               | 1.16 (0.30) | 1.22 (0.42) | 1.24 (0.51) | 1.28 (0.50) | 1.30 (0.48) |
| Drug Use                  | 1.10 (0.33) | 1.18 (0.49) | 1.27 (0.69) | 1.32 (0.75) | 1.38 (0.76) |
| Boys ( <i>N</i> = 1,375)  |             |             |             |             |             |
| Physical Aggression       | 1.67 (0.77) | 1.82 (0.88) | 1.81 (0.94) | 1.88 (0.93) | 1.86 (0.87) |
| Relational Aggression     | 1.59 (0.67) | 1.68 (0.77) | 1.67 (0.81) | 1.69 (0.80) | 1.65 (0.73) |
| Delinquency               | 1.29 (0.51) | 1.37 (0.61) | 1.38 (0.64) | 1.42 (0.66) | 1.43 (0.64) |
| Drug Use                  | 1.17 (0.52) | 1.25 (0.66) | 1.29 (0.72) | 1.35 (0.77) | 1.44 (0.90) |

Correlations between physical and relational aggression and between each type of aggression and delinquency and drug use at each wave are reported in Table 4. The correlations were evaluated using standards set by Pallant (2007). Correlations between .10 and .29 in absolute value were considered *small*, those between .30 and .49 were considered *medium*, and those above .50 were considered *large*. There were significant positive correlations among all measures within each wave. Correlations between physical aggression, relational aggression, and delinquency were in the large range ( $r_s = .56$  to  $.72$ ; see Table 4). Correlations between drug use and both forms of aggression were medium to large ( $r_s = .41$  to  $.69$ ). Correlations between physical and relational aggression within each wave ranged from,  $r = .62$  to  $.72$ . Physical aggression was positively correlated with delinquency,  $r = .65$  to  $.70$  and with drug use,  $r = .50$  to  $.54$ . Relational aggression was also positively correlated with delinquency,  $r = .56$  to  $.62$  and with drug use,  $r = .41$  to  $.47$ .

Table 4.

*Correlations Among Problem Behavior Frequency Scales Within Each Wave*

| Scale                       | PAG   | RAG   | DEL   |
|-----------------------------|-------|-------|-------|
| Fall-6th Grade              |       |       |       |
| Physical Aggression (PAG)   | -     |       |       |
| Relational Aggression (RAG) | .70** | -     |       |
| Delinquency (DEL)           | .69** | .62** | -     |
| Drug Use (DRG)              | .54** | .47** | .65** |
| Spring-6th Grade            |       |       |       |
| Physical Aggression         | -     |       |       |
| Relational Aggression       | .72** | -     |       |
| Delinquency                 | .69** | .60** | -     |
| Drug Use                    | .53** | .43** | .64** |
| Fall-7th Grade              |       |       |       |
| Physical Aggression         | -     |       |       |
| Relational Aggression       | .70** | -     |       |
| Delinquency                 | .70** | .60** | -     |
| Drug Use                    | .50** | .42** | .64** |
| Spring-7th Grade            |       |       |       |
| Physical Aggression         | -     |       |       |
| Relational Aggression       | .69** | -     |       |
| Delinquency                 | .65** | .62** | -     |
| Drug Use                    | .51** | .45*  | .68** |
| Spring-8th Grade            |       |       |       |
| Physical Aggression         | -     |       |       |
| Relational Aggression       | .62** | -     |       |
| Delinquency                 | .65** | .56** | -     |
| Drug Use                    | .53** | .41** | .69** |

Note.  $N = 2,822$ .

\* $p < .05$ . \*\* $p < .001$ .

### Univariate Latent Growth Models

Growth curve models of physical aggression, relational aggression, delinquency, and drug use were run separately for girls and boys to determine whether their trajectories could be explained by similar sets of parameters. The following models were compared: (a) a linear model that included an intercept and linear slope; (b) a quadratic model that included an intercept, linear slope, and quadratic function; (c) a fall-spring model that included an intercept, linear slope, and fall-spring indicator; and (d) a combined model that included an

intercept, linear slope, quadratic function, and fall-spring indicator. For each model the intercept represented Wave 1.

For each construct, the addition of a quadratic trend to the linear model resulted in a significant improvement in model fit. The addition of the fall/spring indicator to both the linear model and the model including a quadratic trend resulted in a variance covariance matrix that was not positive definite. Accordingly, the quadratic growth model was retained for girls and boys within each construct and all models were a good fit for the data. Using the best fitting model, multiple group growth models for each construct were examined to compare models for girls and boys. Unconstrained models in which parameters were estimated separately for girls and boys were compared to models in which sets of parameters were constrained across gender.

**Physical Aggression.** The fit indices for univariate latent growth models of physical aggression are presented in Table 5 for girls and boys. For both girls and boys the addition of a quadratic trend to the linear model resulted in a significant improvement in the model fit (Girls  $\Delta\chi^2(4, N = 1,447) = 109.20, p < .05, \Delta BIC = 158$ ; Boys  $\Delta\chi^2(4, N = 1,375) = 79.37, p < .05, \Delta BIC = 100$ ) and fit the data well (girls: CFI = .99; RMSEA = .04, and boys: CFI = .98; RMSEA = .05).



Table 5.

*Physical Aggression Univariate Latent Growth Model Fit Indices for Girls' and Boys' Models*

| Model                 | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|-----------------------|----|----------|--------|------|-------|
| Girls ( $N = 1,447$ ) |    |          |        |      |       |
| Linear                | 10 | 223.99** | 9,368  | 0.87 | 0.09  |
| Quadratic             | 6  | 37.31*   | 9,211  | 0.99 | 0.04  |
| Boys ( $N = 1,375$ )  |    |          |        |      |       |
| Linear                | 10 | 137.56** | 11,004 | 0.89 | 0.08  |
| Quadratic             | 6  | 39.92*   | 10,904 | 0.98 | 0.05  |

*Note.* Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

Multigroup analyses were conducted to compare unconstrained models that estimated parameters separately for girls and boys to models in which these parameters were constrained to the same values for girls and boys (see Table 6). The unconstrained model fit the data significantly better than the model that constrained the intercept, the linear, and the quadratic trend across gender ( $\Delta\chi^2(3, N = 2,821) = 96.91, p < .001, \Delta\text{BIC} = 73$ ). Comparison of the unconstrained model to models in which all but one of the growth parameters were constrained indicated that a model in which girls and boys had different intercepts, but identical linear and quadratic terms did not significantly differ from the unconstrained model,  $\Delta\chi^2(2, N = 2,821) = 3.20, p > .05, \Delta\text{BIC} = 13$ . The intercepts were not significantly correlated with the linear or quadratic factors ( $p > .05$ ), but the linear and quadratic factors were highly negatively correlated ( $r_s = -.96$  and  $-.89, p < .001$  for girls and boys, respectively). Supporting the hypothesis, within this model boys had a significantly higher intercept or frequency of physical aggression than girls. Physical aggression significantly increased from the fall of sixth and seventh grades to the spring of sixth and seventh grades for both girls and boys (see Figure 4). Physical aggression had significant linear ( $\beta = 0.25, \text{SE} = .02, z = 11.13, p < .001$ ) and

quadratic ( $B = -0.07$ ,  $SE = .01$ ,  $z = -7.42$ ,  $p < .001$ ) trends. Physical aggression remained fairly stable from the spring of sixth grade to the fall of seventh grade and from the spring of seventh grade to the spring of eighth grade. Contradictory to the hypothesis, there was an increase in physical aggression from fall of the sixth grade to spring of the eighth grade.

Table 6.

*Fit Indices for Multi-group Physical Aggression Univariate Latent Growth Models*

| Model  | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|--|----|----------|--------|------|-------|
| Constrained intercept, linear, & quadratic   | 15 | 177.20** | 20,207 | 0.95 | 0.07  |
| Unconstrained intercept                      | 14 | 83.70**  | 20,121 | 0.98 | 0.05  |
| Unconstrained linear                         | 14 | 172.14** | 20,210 | 0.95 | 0.07  |
| Unconstrained quadratic                      | 14 | 175.59** | 20,213 | 0.95 | 0.07  |
| Unconstrained intercept, linear, & quadratic | 12 | 80.29**  | 20,134 | 0.98 | 0.04  |

Note.  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

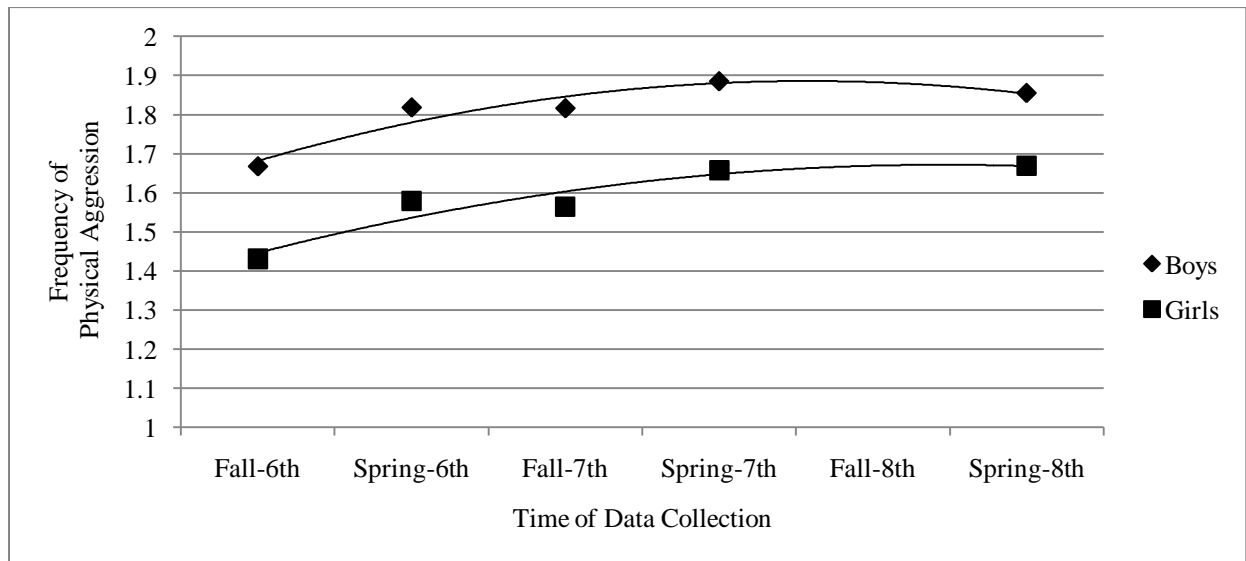


Figure 4. Univariate latent growth model for physical aggression and observed means of the frequency of relational aggression at each wave of data collection for girls and boys.

**Relational Aggression.** The fit indices for univariate latent growth models of relational aggression are presented in Table 7. The addition of a quadratic trend to the linear

model resulted in a significant improvement in the model fit (Girls  $\Delta\chi^2(4, N = 1,447) = 54.91$ ,  $p < .05$ ,  $\Delta\text{BIC} = 97$ ; Boys  $\Delta\chi^2(4, N = 1,375) = 62.79$ ,  $p < .05$ ,  $\Delta\text{BIC} = 69$ ) and was a good fit for the data (girls: CFI = .97, RMSEA = .04; boys: CFI = .97, RMSEA = .04).

Table 7.

*Relational Aggression Univariate Latent Growth Model Fit Indices for Girls' and Boys' Models*

| Model                 | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|-----------------------|----|----------|--------|------|-------|
| Girls ( $N = 1,447$ ) |    |          |        |      |       |
| Linear                | 10 | 191.31** | 9,607  | 0.89 | 0.07  |
| Quadratic             | 6  | 65.06*   | 9,510  | 0.97 | 0.04  |
| Boys ( $N = 1,375$ )  |    |          |        |      |       |
| Linear                | 10 | 137.56** | 10,088 | 0.87 | 0.07  |
| Quadratic             | 6  | 39.92*   | 10,019 | 0.97 | 0.04  |

*Note.* Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

Freeing the parameters for girls and boys (see Table 8) did not significantly improve the fit ( $\Delta\chi^2(3, N = 2,821) = 21.88$ ,  $p < .01$ ,  $\Delta\text{BIC} = 1$ ). The constrained model was therefore retained. The intercepts were not significantly correlated with the linear or quadratic factors ( $p > .05$ ), but the linear and quadratic factors were highly negatively correlated ( $r_s = -.93$  and  $-.91$ ,  $p < .001$  for girls and boys, respectively). Relational aggression significantly increased from the fall to the spring during the sixth and seventh, but decreased from the spring of sixth grade to the fall of seventh grade and again from the spring of seventh grade to the spring of eighth grade grades (see Figure 5). Relational aggression had significant linear ( $B = 0.15$ ,  $SE = .02$ ,  $z = 6.62$ ,  $p < .001$ ) and quadratic ( $B = -0.06$ ,  $SE = .01$ ,  $z = -6.15$ ,  $p < .001$ ) trends. Compared with the physical aggression latent growth curve, the relational aggression growth curves had a similar quadratic mean, but the linear mean for physical aggression was higher than it was for relational aggression. As hypothesized there was an increase in relational

aggression during the sixth grade followed by a decline through eighth grade. Contradictory to the hypothesis, girls did not have a significantly higher intercept or frequency of relational aggression than boys.

Table 8.

*Fit Indices for Multi-group Relational Aggression Univariate Latent Growth Models*

| Model         | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---------------|----|----------|--------|------|-------|
| Constrained   | 15 | 57.08**  | 19,548 | 0.96 | 0.05  |
| Unconstrained | 12 | 41.32**  | 19,549 | 0.95 | 0.04  |

Note.  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

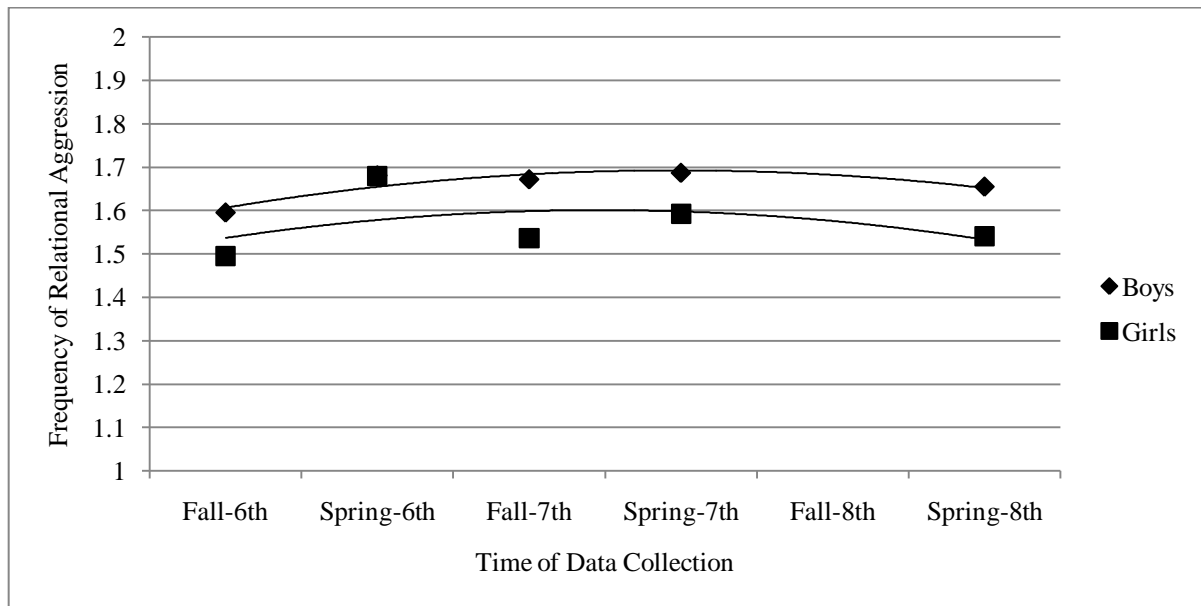


Figure 5. Relational aggression univariate latent growth model trajectories and observed means of the frequency of relational aggression at each wave of data collection for girls and boys.

**Delinquency.** For both girls and boys the addition of a quadratic trend to the linear model of delinquency (see Table 9) significantly improved the model fit (Girls  $\Delta\chi^2(4, N = 1,447) = 73.81, p < .05, \Delta BIC = 121$ ; Boys  $\Delta\chi^2(3, N = 1,375) = 29.86, p < .05, \Delta BIC = 76$ ) and fit for the data well (girls: CFI = 1.00; RMSEA = .00, and boys: CFI = .95; RMSEA = .04).

Because estimation of delinquency at Wave 6 resulted in a residual covariance matrix that

was not positive definite for boys, the variance of delinquency at Wave 6 was constrained to 0.

Table 9.

*Delinquency Univariate Latent Growth Model Fit Indices for Girls' and Boys' Models*

| Model                 | Df | $\chi^2$ | BIC   | CFI  | RMSEA |
|-----------------------|----|----------|-------|------|-------|
| Girls ( $N = 1,447$ ) |    |          |       |      |       |
| Linear                | 10 | 160.85** | 4,304 | 0.88 | 0.05  |
| Quadratic             | 6  | 10.41    | 4,183 | 1.00 | 0.00  |
| Boys ( $N = 1,375$ )  |    |          |       |      |       |
| Linear                | 10 | 257.91** | 7,786 | 0.86 | 0.06  |
| Quadratic             | 7  | 59.90*   | 7,710 | 0.95 | 0.04  |

*Note.* Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

An unconstrained model that estimated parameters separately for girls and boys fit the data significantly better than a model in which these parameters were constrained to the same values for girls and boys ( $\Delta\chi^2(3, 2,821) = 86.37, p < .001, \Delta BIC = 62$ ; see Table 10). Comparison of the unconstrained model to models in which all but one of the growth parameters were constrained indicated that a model in which girls and boys had different intercepts, but identical linear and quadratic terms did not significantly differ from the unconstrained model,  $\Delta\chi^2(2, 2,821) = .55, p > .05, \Delta BIC = 16$ . Within this model, the intercepts were not significantly correlated with the linear or quadratic factors ( $p > .05$ ), but the linear and quadratic factors were highly negatively correlated ( $r_s = -.92$  and  $-.90, p < .001$  for girls and boys, respectively). Within this model boys had a significantly higher intercept than girls. Delinquency significantly increased at each wave of data collection, but the rate of increase decelerated in the spring of seventh grade (see Figure 6). Delinquency had significant linear ( $B = 0.12, SE = .02, z = 8.03, p < .001$ ) and quadratic ( $B = -0.03, SE = .01, z = -4.27, p < .001$ ) trends.

Table 10.

| <i>Fit Indices for Multi-group Delinquency Univariate Latent Growth Models</i> |    |          |        |      |       |
|--|----|----------|--------|------|-------|
| Model  | df | $\chi^2$ | BIC    | CFI  | RMSEA |
| Constrained intercept, linear, & quadratic                                     | 16 | 158.22** | 11,975 | 0.94 | 0.04  |
| Unconstrained intercept  | 15 | 72.40**  | 11,897 | 0.99 | 0.02  |
| Unconstrained linear   | 15 | 146.29** | 11,971 | 0.95 | 0.04  |
| Unconstrained quadratic  | 15 | 151.88** | 11,977 | 0.95 | 0.04  |
| Unconstrained intercept, linear, & quadratic                                   | 13 | 71.85**  | 11,913 | 0.99 | 0.02  |

Note.  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

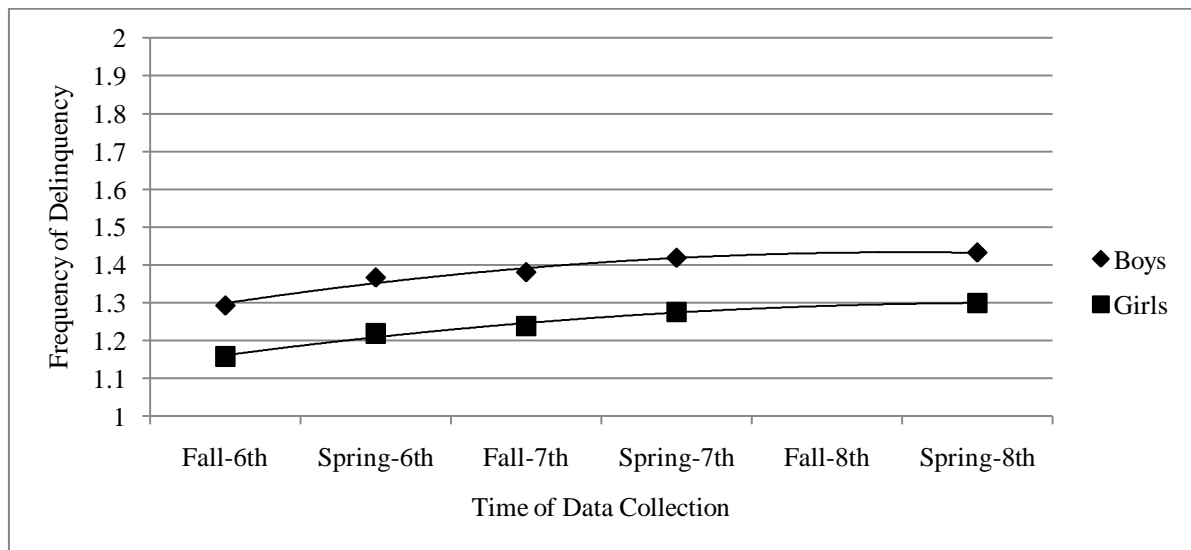


Figure 6. Delinquency univariate latent growth model trajectories for girls and boys and observed means of the frequency of relational aggression at each wave of data collection.

**Drug Use.** For both girls and boys the addition of a quadratic trend to the linear model significantly improved the fit (Girls  $\Delta\chi^2(3, N = 1,447) = 30.69, p < .05, \Delta BIC = 92$ ; Boys  $\Delta\chi^2(4, N = 1,375) = 15.39, p < .05, \Delta BIC = 25$ ) and was a good fit for the data (girls: CFI = .97; RMSEA = .03, and boys: CFI = .97; RMSEA = .03, see Table 11). Because estimation of drug use at Wave 6 resulted in a residual covariance matrix that was not positive definite, the variance of delinquency at Wave 6 was constrained to 0.

Table 11.

*Drug Use Univariate Latent Growth Model Fit Indices for Girls' and Boys' Models*

| Model                 | df | $\chi^2$ | BIC   | CFI  | RMSEA |
|-----------------------|----|----------|-------|------|-------|
| Girls ( $N = 1,447$ ) |    |          |       |      |       |
| Linear                | 10 | 159.25** | 7,037 | 0.87 | 0.05  |
| Quadratic             | 7  | 45.21*   | 6,945 | 0.97 | 0.03  |
| Boys ( $N = 1,375$ )  |    |          |       |      |       |
| Linear                | 10 | 92.64**  | 9,106 | 0.92 | 0.04  |
| Quadratic             | 6  | 39.09*   | 9,081 | 0.97 | 0.03  |

*Note.* Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

Freeing the parameters for girls and boys (see Table 12) did not result in a significantly better fit ( $\Delta\chi^2(3, N = 2,821) = 102.25, p < .001, \Delta\text{BIC} = 5$ ). The model that constrained the intercept, linear trend, and quadratic trend to be the same for girls and boys was therefore retained. The intercepts were not significantly correlated with the linear or quadratic factors ( $p > .05$ ), but the linear and quadratic factors were highly negatively correlated ( $r_s = -.90$  and  $-.86, p < .001$  for girls and boys, respectively). Because the last wave of data resulted in a covariance matrix that was not positive definite for girls, the Wave 6 variance for girls was constrained to the estimate for boys. Drug use significantly increased from the fall of sixth to the spring of eighth grade with a deceleration of the increase at each subsequent wave (see Figure 7). Drug use had significant linear ( $B = 0.17, SE = .02, z = 9.54, p < .001$ ) and quadratic ( $B = -0.02, SE = .01, z = -2.88, p < .001$ ) trends.

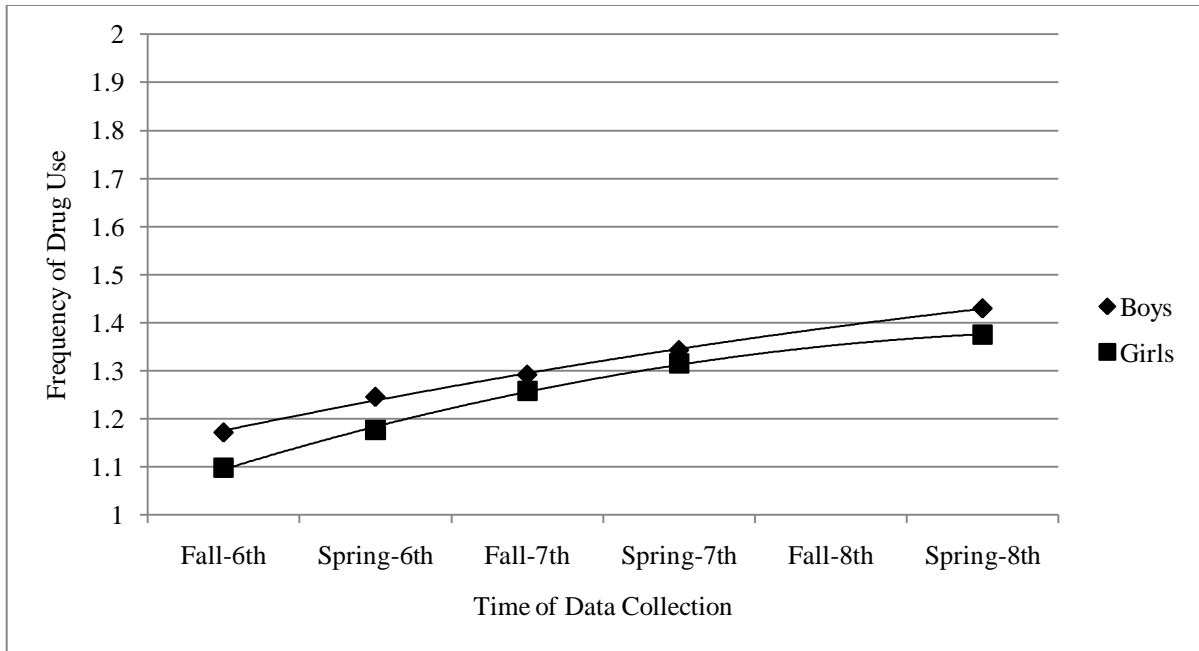
Table 12.

*Fit Indices for Multi-group Drug Use Univariate Latent Growth Models*

| Model         | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---------------|----|----------|--------|------|-------|
| Constrained   | 16 | 130.42** | 16,066 | 0.94 | 0.04  |
| Unconstrained | 13 | 111.47** | 16,072 | 0.95 | 0.04  |

*Note.*  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .



*Figure 7.* Drug use univariate latent growth model trajectories for girls and boys and observed means of the frequency of relational aggression at each wave of data collection.

### **Bivariate Latent Growth Models**

Bivariate latent growth models were used to examine relations between intercepts and trajectories across constructs (see Figure 8). Based on the best fitting univariate latent growth curves, the bivariate models included an intercept, linear slope, and quadratic function for each variable. The intercepts, linear slopes, and quadratic terms were allowed to correlate across variables. Within each variable, the quadratic terms were correlated with intercepts and linear slopes. The measurement errors for observed variables within each wave were also correlated. Consistent with the univariate models, the residual variances of delinquency and drug use at Wave 6 were constrained. Gender differences were examined by comparing an unconstrained model and models that constrained the following sets of parameters across girls and boys: (a) a model that constrained paths from intercepts to linear slopes of each variable, and (b) a model that constrained paths from intercepts to linear slopes of each variable and cross-variable correlations between intercepts and linear slopes.



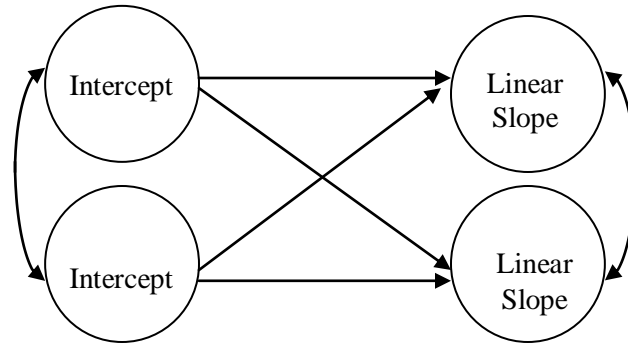


Figure 8. Sample of patterns of relations among latent variables in the bivariate latent growth model. Model also included quadratic terms that were correlated with all other growth parameters and correlations between measurement errors within each wave, which are not shown to reduce the complexity of the figure.

**Relations between Physical and Relational Aggression.** A bivariate latent growth model that constrained paths from intercepts to linear slopes of physical and relational aggression and cross-variable correlations between the intercepts and between the linear slopes across gender, was a good fit for the data (CFI = 0.99; RMSEA = 0.03; see Table 13). Although the unconstrained model fit significantly better ( $\Delta\chi^2(6, N = 2,821) = 18.92, p < .05$ ), the model that constrained paths from intercepts to linear slopes of each variable and cross-variable correlations between the intercepts and the linear slopes appeared more appropriate based on the lower value of the BIC ( $\Delta\text{BIC} = 10$ ) suggesting that there was not strong support for gender differences in the paths from intercepts to linear slopes and cross-variable correlations between intercepts and linear slopes.

Table 13.

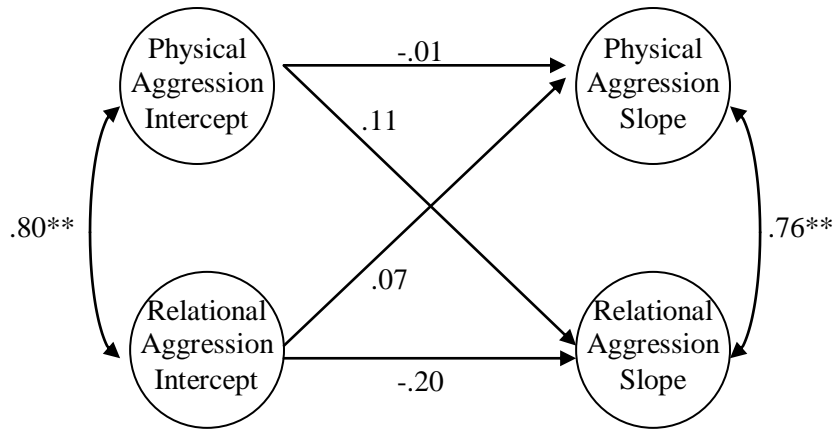
*Physical and Relational Aggression Bivariate Latent Growth Model Fit Indices for Models with Parameters Constrained and Unconstrained Across Gender*

| Model   | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---|----|----------|--------|------|-------|
| Constrained paths & growth parameter correlations | 57 | 240.93** | 34,521 | 0.99 | 0.03  |
| Unconstrained                                     | 51 | 203.12** | 34,531 | 0.99 | 0.03  |

Note.  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

The paths between the intercepts and slopes for physical and relational aggression were not significant indicating that the frequency of each type of aggression in the fall of sixth grade did not predict the degree of linear change in either type of aggression (see Figure 9). The correlations between intercepts ( $r = .80, p < .001$ ), slopes ( $r = .76, p < .001$ ), and quadratic terms ( $r = .65, p < .001$  for girls;  $r = .88, p < .001$  for boys) were all significant. This indicates that an adolescent's initial level and pattern of change over time tended to show a similar pattern for both physical and relational aggression. The correlations between the observed repeated measures within each wave were all significant for girls and boys ( $r_s = .37$  to  $.80, p < .01$ ), except for the last wave of data collection in the spring of eighth grade, which was not significant for boys. This indicates that changes in each form of aggression not predicted by the growth model tended to co-vary over time.



**Figure 9.** Physical and Relational Aggression Bivariate Latent Growth Model. Values are standardized path coefficients and correlations based on the means and standard deviations for girls. Model also included quadratic terms that were correlated with all other growth parameters and correlations between measurement errors within each wave, which are not shown to reduce the complexity of the figure.  $*p < .05, **p < .001$ .

**Relations of Physical and Relational Aggression with Delinquency.** A similar series of bivariate latent growth curve models were used to examine relations between the trajectories of physical and relational aggression with delinquency. Fit indices for the bivariate

latent growth curve model of relations between physical aggression and delinquency are reported in Table 14. The model that constrained paths from intercepts to linear slopes of each variable across gender, but not the cross-variable correlations between the intercepts and between the linear slopes was a good fit for the data (CFI=0.99; RMSEA=0.02) and was selected based upon comparisons of BICs over the unconstrained ( $\Delta\chi^2(4, N = 2,821) = 0.98, p > .05; \Delta\text{BIC} = 29$ ) and more constrained ( $\Delta\chi^2(2, N = 2,821) = 27.69, p < .05; \Delta\text{BIC} = 71$ ) models. These findings suggest that there were significant gender differences in the cross-variable correlations between intercepts and linear slopes for each model. The paths and correlations between the intercepts and linear slopes for physical aggression and delinquency are reported in Figure 10. Contrary to the hypotheses, the physical aggression intercept did not predict changes in delinquency, nor did the delinquency intercept predict changes in physical aggression. Growth parameters were highly related across these two measures based on correlations between the intercepts ( $r = .71, p < .001$  for girls;  $r = .77, p < .001$  for boys), the linear slopes ( $r = .53, p < .001$  for girls;  $r = .79, p < .001$  for boys), and the quadratic terms ( $r = .53, p < .001$  for girls;  $r = .79, p < .001$  for boys). Boys consistently had higher correlations between relational aggression and delinquency than did girls. In other words, the overall level of physical aggression was related to the overall level of delinquency and the pattern of change in these two variables covaried over time. These relations across constructs differed for girls and boys, such that there were stronger correlations between the intercepts, the linear slopes, and the quadratic terms for boys than for girls. Girls and boys did not differ in the influence of intercepts on the linear slopes of each variable, such that neither intercept significantly predicted the linear slope of either variable.

Table 14.

*Physical Aggression and Delinquency Bivariate Latent Growth Model Fit Indices for Models with Parameters Constrained and Unconstrained Across Gender*

| Model   | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---|----|----------|--------|------|-------|
| Constrained paths & growth parameter correlations | 57 | 288.44** | 27,563 | 0.98 | 0.03  |
| Constrained paths only                            | 55 | 201.13*  | 27,492 | 0.99 | 0.02  |
| Unconstrained                                     | 51 | 198.89*  | 27,521 | 0.99 | 0.02  |

Note.  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

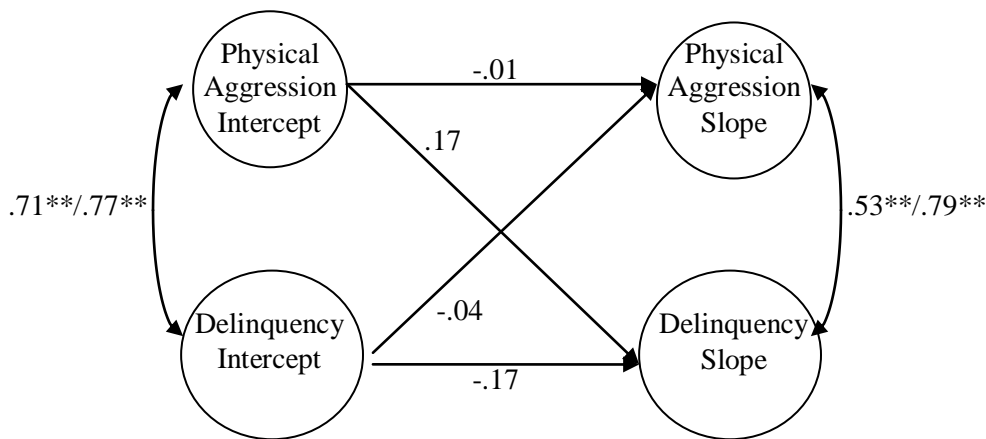


Figure 10. Physical Aggression and Delinquency Bivariate Latent Growth Model. Values are standardized path coefficients based on the means and standard deviations for girls. Values not constrained to be equal for girls and boys are reported girls/boys. Model also included quadratic terms that were correlated with all other growth parameters and correlations between measurement errors within each wave, which are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

Fit indices for a bivariate latent growth curve model of relations between relational aggression and delinquency are reported in Table 15. The partially constrained model that constrained paths from intercepts to linear slopes of each variable across gender, but did not constrain the cross-variable correlations between the intercepts and between the linear slopes was a good fit for the data (CFI=0.99; RMSEA=0.03) and was selected based upon comparisons of BICs over the unconstrained ( $\Delta\chi^2(4, N = 2,821) = 5.44, p > .05$ ;  $\Delta\text{BIC} = 21$ )

and more constrained ( $\Delta\chi^2(2, N = 2,821) = 9.70, p < .05; \Delta\text{BIC} = 20$ ) models. These findings suggest that there were significant gender differences in the cross-variable correlations between intercepts and linear slopes for each model.

Contrary to the hypotheses, the relational aggression intercept did not predict changes in delinquency (see Figure 11), nor did the delinquency intercept predict changes in relational aggression. Growth parameters were highly related across these two measures based on correlations between the intercepts ( $r = .66, p < .001$  for girls;  $r = .71, p < .001$  for boys), the linear slopes ( $r = .49, p < .001$  for girls;  $r = .64, p < .001$  for boys), and the quadratic terms ( $r = .31, p > .05$  for girls;  $r = .73, p < .001$  for boys). Boys consistently demonstrated higher correlations between relational aggression and delinquency than did girls. As with physical aggression, the overall level of relational aggression was significantly related to the level of delinquency as was the pattern of change in these two variables over time. These relations differed for girls and boys, but for both intercepts did not significantly predict the linear slopes of either variable. Because the intercepts of physical aggression, relational aggression, and delinquency did not predict the linear slopes, these constructs were not combined into a more complex model to examine the unique influence of each form of aggression.

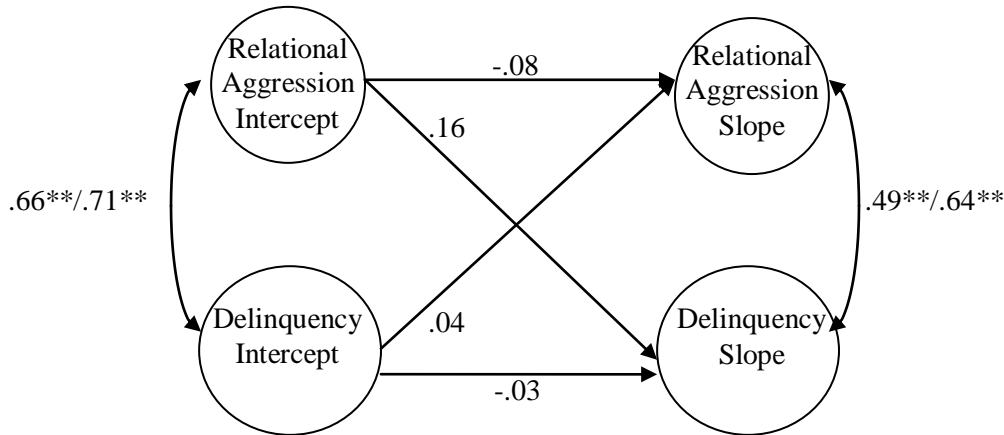
Table 15.

*Relational Aggression and Delinquency Bivariate Latent Growth Model Fit Indices for Models with Parameters Constrained and Unconstrained Across Gender*

| Model   | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---|----|----------|--------|------|-------|
| Constrained paths & growth parameter correlations | 58 | 292.50** | 27,859 | 0.98 | 0.03  |
| Constrained paths only                            | 56 | 256.54*  | 27,839 | 0.99 | 0.03  |
| Unconstrained                                     | 52 | 245.43*  | 27,860 | 0.99 | 0.03  |

*Note.*  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .



*Figure 11. Relational Aggression and Delinquency Bivariate Latent Growth Model.* Values are standardized path coefficients based on the means and standard deviations for girls. Values not constrained to be equal for girls and boys are reported girls/boys. Model also included quadratic terms that were correlated with all other growth parameters and correlations between measurement errors within each wave, which are not shown to reduce the complexity of the figure.  
 \* $p < .05$ , \*\* $p < .001$ .

**Relations of Physical and Relational Aggression with Drug Use.** Bivariate latent growth curve models were also used to examine relations among trajectories of physical and relational aggression and drug use. The initial unconstrained model resulted in a covariance matrix that was not positive definite based on the quadratic function, which was likely due to the strong relation between the linear and quadratic functions, and accordingly all analyses constrained the variance of the quadratic function to zero. Fit indices for a bivariate latent growth curve model of relations between physical aggression and drug use are reported in Table 16. The model that constrained paths from intercepts to linear slopes of each variable across gender, but not the cross-variable correlations between the intercepts and between the linear slopes was a good fit for the data ( $CFI=0.93$ ;  $RMSEA=0.05$ ). Although the unconstrained model fit significantly better ( $\Delta\chi^2(6, N = 2,822) = 14.58, p < .05$ ), the more parsimonious partially constrained model appeared more appropriate based on the lower value of the BIC ( $\Delta BIC = 22$ ). The partially constrained model fit significantly better than a more

constrained model that also constrained the correlations between the intercepts and the slopes ( $\Delta\chi^2(2, N = 2,822) = 10.67, p < .05; \Delta\text{BIC} = 32$ ). These findings suggest that there were significant gender differences in the cross-variable correlations across intercepts and across linear slopes for each model, but that girls and boys did not differ in the influence of intercepts on the linear slopes of each variable. The paths and correlations between the intercepts and linear slopes for physical aggression and drug use are reported in Figure 12. As hypothesized, the physical aggression intercept significantly predicted the linear slopes for physical aggression and drug use such that a higher overall frequency of physical aggression was predictive of a greater increase throughout middle school of physical aggression ( $\beta = .11, p < .05$ ) and a steeper slope for drug use ( $\beta = .35, p < .001$ ). The drug use intercept also significantly predicted the linear slopes for physical aggression and drug use, but opposite of the direction hypothesized such that a lower overall frequency of drug use was predictive of a greater increase of physical aggression ( $\beta = -.08, p < .001$ ) and a greater increase of drug use throughout middle school ( $\beta = -.19, p < .05$ ). Growth parameters were related across these two measures based on correlations between the intercepts ( $r = .48, p < .001$  for girls;  $r = .58, p < .001$  for boys) and linear slopes ( $r = .41, p < .001$  for girls;  $r = .42, p < .001$  for boys). In other words, the frequency of physical aggression in the fall of sixth grade was related to the frequency of drug use and the pattern of subsequent changes in these two variables covaried over time.

Table 16.

*Physical Aggression and Drug Use Bivariate Latent Growth Model Fit Indices for Models with Parameters Constrained and Unconstrained Across Gender*

| Model   | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---|----|----------|--------|------|-------|
| Constrained paths & growth parameter correlations | 82 | 753.39** | 34,150 | 0.92 | 0.05  |
| Constrained paths only                            | 80 | 705.25** | 34,118 | 0.93 | 0.05  |
| Unconstrained                                     | 74 | 679.62** | 34,140 | 0.93 | 0.05  |

Note.  $N = 2,822$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

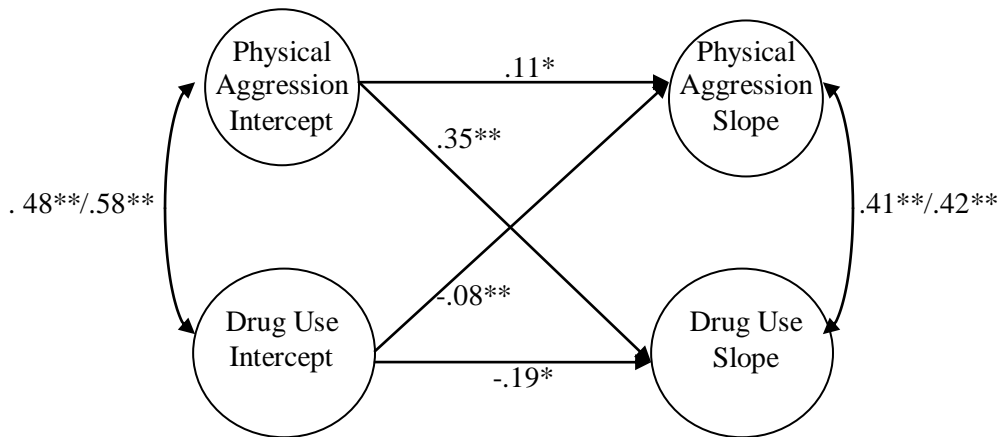


Figure 12. Physical Aggression and Drug Use Bivariate Latent Growth Model.

Values are standardized path coefficients based on the means and standard deviations for girls. Values not constrained to be equal for girls and boys are reported girls/boys. Model also included quadratic terms that were correlated with all other growth parameters and correlations between measurement errors within each wave, which are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

Fit indices for a bivariate latent growth curve model of relations between relational aggression and drug use are reported in Table 17. The partially constrained model that constrained paths from intercepts to linear slopes of each variable across gender, but not the cross-variable correlations between the intercepts and between the linear slopes was a good fit for the data (CFI=0.91; RMSEA=0.04) and was selected based upon comparisons of BICs over the unconstrained ( $\Delta\chi^2(4, N = 2,822) = 8.91, p > .05; \Delta BIC = 18$ ) and more constrained



( $\Delta\chi^2(2, N = 2,822) = 9.03, p < .05; \Delta\text{BIC} = 22$ ) models. These findings suggest that as with physical aggression there were significant gender differences in the cross-variable correlations between intercepts and linear slopes, but girls and boys did not differ in the influence of intercepts on the linear slopes of each variable.

As hypothesized, both the relational aggression and drug use intercepts significantly predicted the linear slope for relational aggression (see Figure 13), but the relations were opposite of the predicted direction such that a lower frequency of relational aggression in the fall of sixth grade was predictive of a greater increase throughout middle school of relational aggression ( $\beta = -.21, p < .05$ ) as was a lower frequency of drug use in the fall of sixth grade ( $\beta = -.13, p < .05$ ). Relational aggression and drug use intercepts significantly predicted drug use such that a higher frequency of relational aggression in the fall of sixth grade was predictive of a steeper slope for drug use in the hypothesized direction ( $\beta = .18, p < .001$ ). In contrast, a lower frequency of drug use in the fall of sixth grade was predictive of a greater increase of drug use throughout middle school ( $\beta = -.16, p < .05$ ). Growth parameters were highly related across these two measures based on correlations between the intercepts ( $r = .43, p < .001$  for girls;  $r = .57, p < .001$  for boys) and linear slopes ( $r = .37, p < .001$  for girls;  $r = .49, p < .001$  for boys). Again, as with physical aggression, the overall frequency of relational aggression was related to the frequency of drug use as was the pattern of changes in these two variables over time.

Table 17.

*Relational Aggression and Drug Use Bivariate Latent Growth Model Fit Indices for Models with Parameters Constrained and Unconstrained Across Gender*

| Model   | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|---|----|----------|--------|------|-------|
| Constrained paths & growth parameter correlations | 81 | 292.50** | 34,189 | 0.91 | 0.04  |
| Constrained paths only                            | 79 | 256.54*  | 34,167 | 0.91 | 0.04  |
| Unconstrained                                     | 75 | 245.43*  | 34,186 | 0.91 | 0.04  |

Note.  $N = 2,822$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

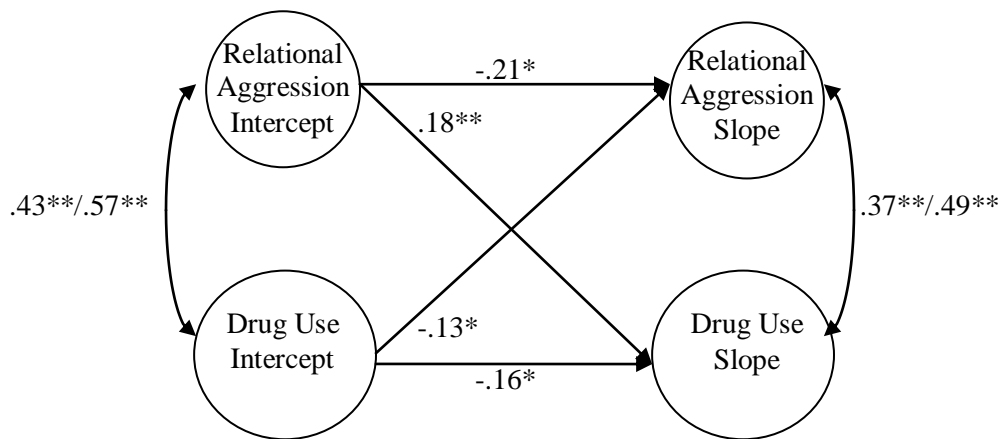


Figure 13. Relational Aggression and Drug Use Bivariate Latent Growth Model.

Values are standardized path coefficients based on the means and standard deviations for girls. Values not constrained to be equal for girls and boys are reported girls/boys. Model also included quadratic terms that were correlated with all other growth parameters and correlations between measurement errors within each wave, which are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

The individual bivariate models examining the influence of physical and relational aggression on drug use were combined to examine each type of aggression's unique influence on drug use while controlling for the other form of aggression (see Table 18 for fit indices). The unconstrained model was a good fit for the model (CFI = .96; RMSEA = .04), and fit significantly better than a model that constrained paths from intercepts to linear slopes of each variable across gender ( $\Delta\chi^2(16, N = 2,822) = 139.01, p < .05$ ;  $\Delta\text{BIC} = 12$ ) and a model that

constrained paths from intercepts to linear slopes of each variable across gender ( $\Delta\chi^2(10, N = 2,822) = 79.8, p < .05; \Delta BIC < 1$ ). As hypothesized, the relations between the intercepts and slopes for physical and relational aggression and drug use differed by gender unlike the findings in the individual bivariate models.

Table 18.

*Physical Aggression, Relational Aggression, and Drug Use Latent Growth Model Fit Indices for Models with Parameters Constrained and Unconstrained Across Gender*

| Model   | df  | $\chi^2$   | BIC    | CFI  | RMSEA |
|---|-----|------------|--------|------|-------|
| Constrained paths & growth parameter correlations | 174 | 1,064.29** | 48,333 | 0.96 | 0.04  |
| Constrained paths only                            | 168 | 1,005.08** | 48,321 | 0.96 | 0.04  |
| Unconstrained                                     | 158 | 925.28**   | 48,321 | 0.96 | 0.04  |

*Note.*  $N = 2,822$ ; Chi-square adjusted for maximum likelihood. df, degrees of freedom;  $\chi^2$ , Chi-Square; CFI, comparative fit index; RMSEA, root mean square error of approximation; BIC, Bayes' information criterion.

\* $p < .05$ , \*\* $p < .001$

The paths and correlations between the intercepts and linear slopes for physical and relational aggression and drug use are reported in Table 19. As hypothesized, examining the unique influence of the intercept on each variable while controlling for the influence of the other variables, the physical aggression intercept significantly predicted the linear slope of drug use (girls:  $\beta = .32, p < .001$ ; boys:  $\beta = .49, p < .05$ ). Contrary to the hypothesis, the intercept of relational aggression was not significantly associated with the linear slope of drug use. In other words a higher frequency of physical aggression in the fall of sixth grade was predictive of a greater slope for drug use while controlling for the influence of relational aggression, but the frequency of relational aggression in the fall of sixth grade was no longer predictive of the pattern of subsequent changes in drug use after controlling for physical aggression.

Table 19.

*Standardized Path Coefficients linking Physical Aggression, Relational Aggression & Drug Use*

| Parameter                          | Girls  | Boys |
|------------------------------------|--------|------|
| Drug Use Intercept →Phys Agg Slope | -.12   | -.14 |
| Phys Agg Intercept →Phys Agg Slope | .08    | -.33 |
| Rel Agg Intercept →Phys Agg Slope  | -.02   | .31  |
| Drug Use Intercept →Rel Agg Slope  | -.04   | -.23 |
| Phys Agg Intercept →Rel Agg Slope  | -.06   | -.10 |
| Rel Agg Intercept →Rel Agg Slope   | -.24   | -.04 |
| Drug Use Intercept →Drug Use Slope | -.22** | -.23 |
| Phys Agg Intercept →Drug Use Slope | .32**  | .49* |
| Rel Agg Intercept →Drug Use Slope  | -.02   | -.20 |

*Note.*  $N = 2,821$ ; The intercept represents the frequency of the variable in the fall of the sixth grade. Phys Agg = Physical Aggression; Rel Agg = Relational Aggression.

\* $p < .05$ , \*\* $p < .01$ .

### Autoregressive Models

Autoregressive models were also used to examine the relations between physical and relational aggression and their influence on delinquency and drug use. Whereas the bivariate latent growth models modeled the influence of the intercept or frequency of each type of aggression on the overall trajectories representing change in delinquency and drug use over time, the autoregressive models examined time-specific relations between each form of aggression with delinquency and drug use. The time-specific influences between the observed repeated measures indicated how the frequency of each measure at one wave influenced both its own subsequent frequency and changes in the frequency of the other measure of interest between waves. For each pair of constructs the following models were compared, an unconstrained model and models that constrained the following sets of parameters across girls and boys: (a) the direct paths of each construct on its subsequent frequency, (b) the cross-lagged paths of each construct on changes in the frequency of the other construct of interest, and (c) all paths.

**Relations between Physical and Relational Aggression.** Although the unconstrained model fit the data significantly better based on the  $\chi^2$  ( $\Delta\chi^2(16, N = 2,821) = 72.96, p < .05$ ) all four models had similar fit indices and the BIC favored the more parsimonious model that constrained direct and cross-lagged paths (see Table 20) ( $\Delta\text{BICs} = 10, 43, 54$ ). The model that constrained both direct and cross-lagged paths was a good fit for the data (CFI = .95; RMSEA = .06).

Table 20.

*Model fit for Physical Aggression and Relational Aggression Autoregressive Model*

| Model                          | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|--------------------------------|----|----------|--------|------|-------|
| All paths constrained          | 64 | 673.40** | 34,898 | 0.95 | 0.06  |
| Constrained direct paths       | 56 | 652.58** | 34,941 | 0.95 | 0.06  |
| Constrained cross-lagged paths | 56 | 619.31** | 34,908 | 0.95 | 0.06  |
| Unconstrained                  | 48 | 600.44** | 34,952 | 0.95 | 0.06  |

*Note.*  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

The direct and cross-lagged paths between physical aggression and relational aggression are reported in Figure 14. As expected, both the frequency of physical aggression and the frequency of relational aggression significantly predicted changes in their own subsequent frequency at each wave ( $\beta\text{s} = .44$  to  $.70, p < .001$ ). In addition, physical aggression significantly predicted subsequent changes in relational aggression at each wave ( $\beta\text{s} = .07$  to  $.14, p < .05$ ). In contrast, relational aggression significantly predicted subsequent changes in physical aggression only at the second and fifth wave of data collection ( $\beta\text{s} = .15$  and  $.08$ , respectively,  $p < .05$ ). In other words, the frequency of physical aggression was consistently related to changes in relational aggression while relational aggression appeared to only be related to changes in physical aggression at the beginning and end of middle school. All correlations between residual variances of physical and relational aggression with each wave of

data collection were significant ( $r_s = .47$  to  $.69$  for girls and  $r_s = .54$  to  $.71$  for boys,  $p < .001$ ) indicating strong relations between measures of each form of aggression within each wave.

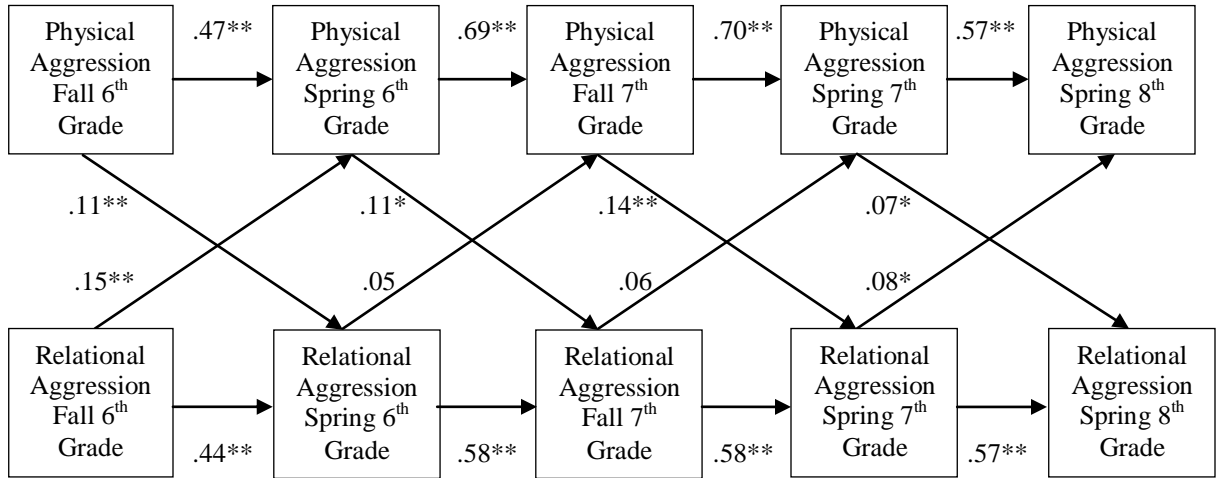


Figure 14. Physical & Relational Aggression Autoregressive Model.

Values are standardized path coefficients based on the means and standard deviations for girls. Model also included correlations between the remaining variance of each construct at each observed data point, but are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

**Relations of Physical and Relational Aggression with Delinquency.** A similar series of autoregressive models was used to examine time-specific relations through cross-lagged paths for physical and relational aggression with delinquency. Fit indices for the autoregressive models of relations between physical aggression and delinquency are reported in Table 21. A model that constrained both direct and cross-lagged paths was a good fit for the data (CFI = .95; RMSEA = .05) and was selected based upon comparisons of BICs over models constraining various sets of parameters described previously ( $\Delta\chi^2(8, N = 2,821) = 20.69, 37.46, p > .05; \Delta\text{BICs} = 26, 43$ ) and the unconstrained model ( $\Delta\chi^2(16, N = 2,821) = 52.77, p > .05; \Delta\text{BIC} = 74$ ).

Table 21.

*Model fit for Physical Aggression and Delinquency Autoregressive Model*

| Model                          | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|--------------------------------|----|----------|--------|------|-------|
| All paths constrained          | 64 | 568.54** | 27,787 | 0.95 | 0.05  |
| Constrained direct paths       | 56 | 547.85** | 27,830 | 0.95 | 0.05  |
| Constrained cross-lagged paths | 56 | 531.08** | 27,814 | 0.95 | 0.05  |
| Unconstrained                  | 48 | 515.77** | 27,862 | 0.95 | 0.06  |

*Note.*  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

The direct and cross-lagged paths between physical aggression and delinquency are reported in Figure 15. As expected, both the frequency of physical aggression and the frequency of delinquency significantly predicted subsequent changes in their own frequency at each wave ( $\beta s = .47$  to  $.71$ ,  $p < .001$ ). Physical aggression also significantly predicted subsequent changes in delinquency at each wave ( $\beta s = .09$  to  $.17$ ,  $p < .05$ ). In contrast, delinquency significantly predicted subsequent changes in physical aggression only at the second and fourth waves ( $\beta s = .08$  to  $.12$ ,  $p < .05$ ). These results indicate that physical aggression consistently predicted subsequent changes in delinquency throughout middle school when accounting for the influence of delinquency on subsequent changes in itself. All correlations between residuals for physical aggression and delinquency within each wave were significant ( $r s = .41$  to  $.64$  for girls and  $r s = .54$  to  $.71$  for boys,  $p < .001$ ).

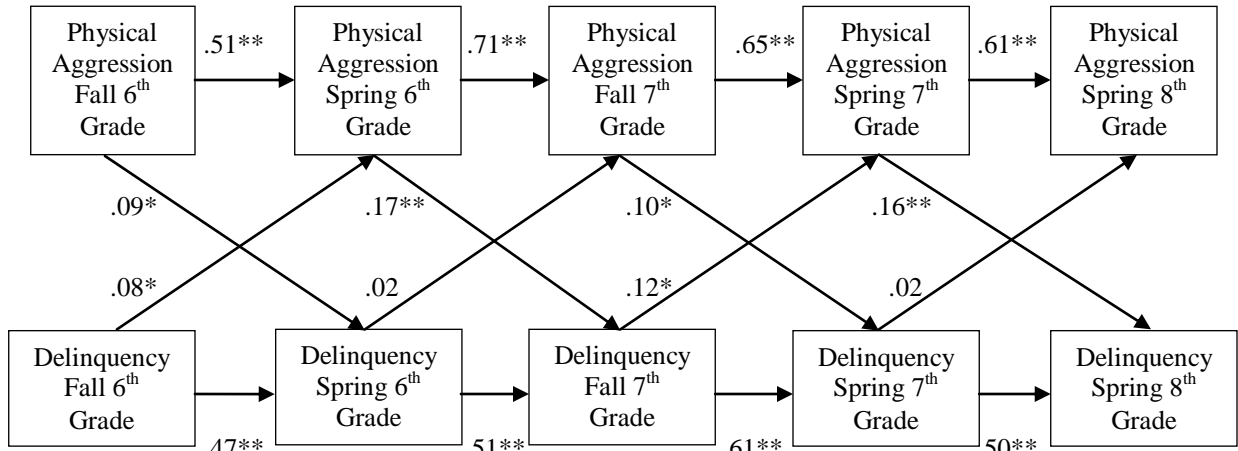


Figure 15. Physical Aggression & Delinquency Autoregressive Model.

Values are standardized path coefficients based on the means and standard deviations for girls. Model also included correlations between the remaining variance of each construct at each observed data point, but are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

Fit indices for an autoregressive model of relations between relational aggression and delinquency are reported in Table 22. The model that constrained direct and cross-lagged paths was a good fit for the data (CFI = .95; RMSEA = .04) and was selected based upon comparisons of BICs over models constraining various sets of parameters described previously ( $\Delta\chi^2(8, N = 2,821) = 17.33, 18.96, p > .05$ ;  $\Delta\text{BICs} = 45, 46$ ) and the unconstrained model ( $\Delta\chi^2(16, N = 2,821) = 32.78, p > .05$ ;  $\Delta\text{BIC} = 94$ ).

Table 22.

*Model fit for Relational Aggression and Delinquency Autoregressive*

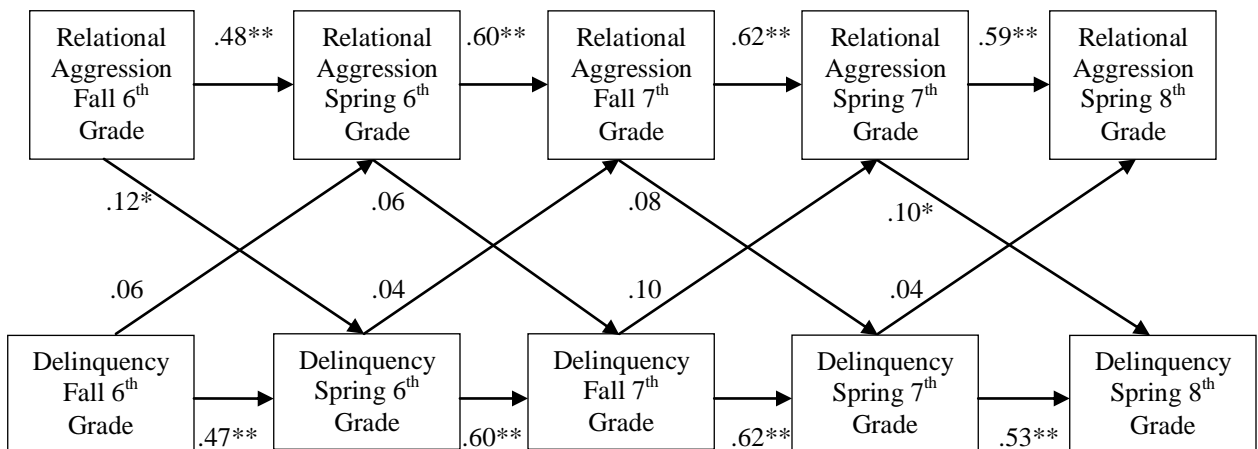
| Model                          | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|--------------------------------|----|----------|--------|------|-------|
| All paths constrained          | 64 | 556.05** | 28,075 | 0.95 | 0.04  |
| Constrained direct paths       | 56 | 538.72** | 28,121 | 0.95 | 0.05  |
| Constrained cross-lagged paths | 56 | 537.09** | 28,120 | 0.94 | 0.05  |
| Unconstrained                  | 48 | 523.27** | 28,169 | 0.94 | 0.05  |

Note.  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .



The direct and cross-lagged paths between relational aggression and delinquency are reported in Figure 16. As expected, both the frequency of relational aggression and the frequency of delinquency significantly predicted subsequent changes in their own frequency at each wave ( $\beta$ s = .47 to .62,  $p < .001$ ). Relational aggression also significantly predicted subsequent changes in delinquency at the second and fifth wave ( $\beta$ s = .12 and .10, respectively,  $p < .05$ ) indicating that relational aggression predicted subsequent changes in delinquency at Wave 2 and Wave 6 when accounting for the influence of delinquency on subsequent changes in itself. In contrast, delinquency did not significantly predict subsequent changes in relational aggression ( $\beta$ s = .04 to .10,  $p > .05$ ). All correlations between residuals for relational aggression and delinquency within each wave of data collection were significant ( $r$ s = .42 to .61 for girls and  $r$ s = .50 to .64 for boys,  $p < .001$ ).



*Figure 16. Relational Aggression & Delinquency Autoregressive Model.* Values are standardized path coefficients based on the means and standard deviations for girls. Model also included correlations between the remaining variance of each construct at each observed data point, but are not shown to reduce the complexity of the figure. \* $p < .05$ , \*\* $p < .001$ .

The individual autoregressive models examining the influence of physical and relational aggression on delinquency were combined to examine each type of aggression's unique time-specific influence on delinquency while controlling for the other form of

aggression (see Table 23). A model that constrained the cross-lagged paths of each construct influencing changes in the frequency of the other construct of interest for girls and boys was selected based upon comparisons of BICs over a model constraining direct paths for girls and boys ( $\Delta\chi^2(4, N = 2,821) = 4.79, p > .05; \Delta\text{BIC} = 36$ ), a model that constrained all paths for girls and boys ( $\Delta\chi^2(28, N = 2,821) = 2,318.84, p < .001; \Delta\text{BIC} = 2,095$ ), and an unconstrained model ( $\Delta\chi^2(16, N = 2,821) = 45.56, p > .05; \Delta\text{BIC} = 81$ ), and was a good fit for the data (CFI = .95; RMSEA = .05). Girls and boys did not differ in the influence of the frequencies of physical and relational aggression on changes in the frequency of delinquency, but did differ in the stability of each form of aggression and delinquency when using a combined model controlling for the influence of the other form of aggression.

Table 23.

*Model fit for Physical Aggression, Relational Aggression, & Delinquency Autoregressive Model*

| Model                          | df  | $\chi^2$   | BIC    | CFI  | RMSEA |
|--------------------------------|-----|------------|--------|------|-------|
| All paths constrained          | 168 | 3,390.98** | 43,845 | 0.81 | 0.08  |
| Constrained cross-lagged paths | 140 | 1,072.14** | 41,750 | 0.95 | 0.05  |
| Constrained direct paths       | 136 | 1,076.93** | 41,786 | 0.95 | 0.05  |
| Unconstrained                  | 124 | 1,026.58** | 41,831 | 0.94 | 0.05  |

*Note.*  $N = 2,821$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

Within the combined model, physical aggression was a somewhat more consistent predictor of delinquency than was relational aggression in that physical aggression predicted both the third and fifth waves of delinquency as hypothesized ( $\beta_s = .12$  to  $.18, p < .001$ ), whereas relational aggression only predicted the third wave of delinquency and in the inverse direction, which is contrary to the hypotheses ( $\beta = -.08, p < .05$ ; see Table 24).

Table 24.

*Standardized Coefficients for the Direct and Cross-lagged Paths in the Physical Aggression, Relational Aggression, & Delinquency Combined Autoregressive Model*

| Predictor             | Delinquency Wave Being Predicted |             |             |             |
|-----------------------|----------------------------------|-------------|-------------|-------------|
|                       | 2                                | 3           | 4           | 5           |
| Physical Aggression   | .02                              | .18**       | .02         | .12**       |
| Relational Aggression | .01                              | -.08*       | .04         | -.01        |
| Delinquency           | .54**/.56**                      | .58**/.63** | .66**/.56** | .55**/.48** |

Values are standardized path coefficients based on the means and standard deviations for girls. Values not constrained to be equal for girls and boys are reported girls/boys.

\* $p < .05$ , \*\* $p < .001$ .

**Relations between Physical and Relational Aggression with Drug Use.** Similar models were used to examine time-specific relations through cross-lagged paths for physical and relational aggression with drug use (see Table 25). A model that constrained both direct and cross-lagged paths was a good fit for the data (CFI = .95; RMSEA = .04) and was selected based upon comparisons of BICs over models constraining various sets of parameters ( $\Delta\chi^2(8, N = 2,822) = 22.06, 56.78, p > .05$ ;  $\Delta\text{BICs} = 7, 41$ ) and the unconstrained model ( $\Delta\chi^2(16, N = 2,822) = 67.35, p > .05$ ;  $\Delta\text{BIC} = 60$ ).

Table 25.

*Model fit for Physical Aggression and Drug Use Autoregressive Model*

| Model                          | df | $\chi^2$ | BIC    | CFI  | RMSEA |
|--------------------------------|----|----------|--------|------|-------|
| All paths constrained          | 64 | 547.63** | 34,087 | 0.95 | 0.04  |
| Constrained direct paths       | 56 | 525.57** | 34,128 | 0.95 | 0.05  |
| Constrained cross-lagged paths | 56 | 490.85** | 34,094 | 0.94 | 0.05  |
| Unconstrained                  | 48 | 480.28** | 34,147 | 0.94 | 0.05  |

Note.  $N = 2,822$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

The direct and cross-lagged paths between physical aggression and drug use are reported in Figure 17. As expected, both the frequency of physical aggression and the frequency of drug use significantly predicted subsequent changes in their own frequency at

each wave ( $\beta_s = .50$  to  $.71$ ,  $p < .001$ ). Physical aggression also significantly predicted subsequent changes in drug use at each wave except the spring of eighth grade ( $\beta_s = .09$  to  $.11$ ,  $p < .05$ ). In contrast, drug use did not significantly predict subsequent changes in physical aggression ( $\beta_s = .01$  to  $.07$ ,  $p > .05$ ). All correlations between residuals for physical aggression and drug use within each wave were significant ( $r_s = .33$  to  $.48$  for girls and  $r_s = .35$  to  $.57$  for boys,  $p < .001$ ).

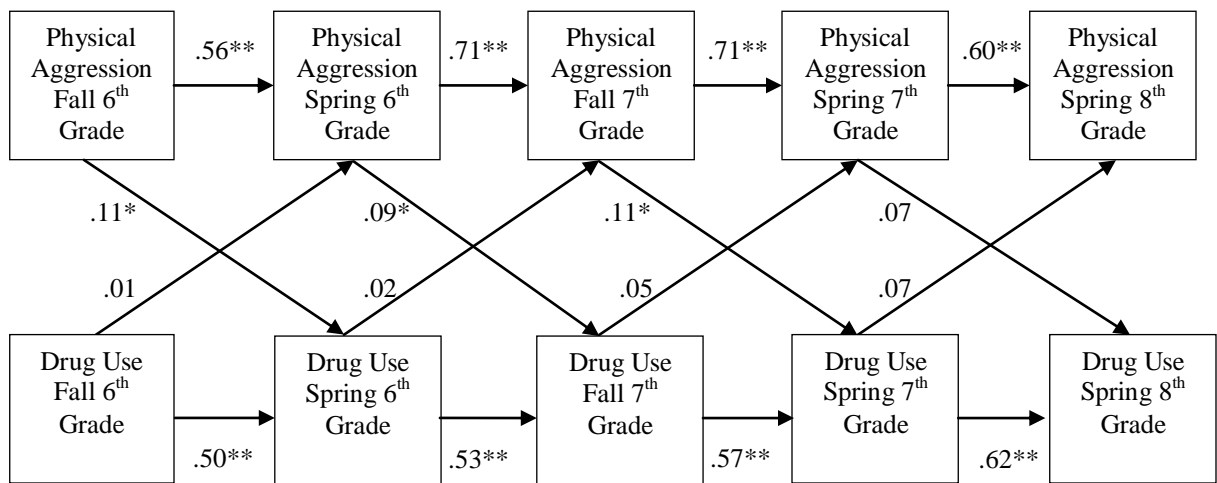


Figure 17. Physical Aggression & Drug Use Autoregressive Model.

Values are standardized path coefficients based on the means and standard deviations for girls. Model also included correlations between the remaining variance of each construct at each observed data point, but are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

Fit indices for an autoregressive model of relations between relational aggression and drug use are reported in Table 26. A model that constrained the direct and cross-lagged paths was a good fit for the data (CFI = .94; RMSEA = .04) and was selected based upon comparisons of BICs over models constraining various sets of parameters described previously ( $\Delta\chi^2(8, N = 2,822) = 0.30, 49.76, p > .05$ ;  $\Delta\text{BICs} = 14, 34$ ) and the unconstrained model ( $\Delta\chi^2(16, N = 2,822) = 66.30, p > .05$ ;  $\Delta\text{BIC} = 61$ ).

Table 26.

| <i>Model fit for Relational Aggression and Drug Use Autoregressive Model</i> |    |          |        |      |       |
|--|----|----------|--------|------|-------|
| Model  | df | $\chi^2$ | BIC    | CFI  | RMSEA |
| All paths constrained  | 64 | 552.59** | 34,170 | 0.94 | 0.04  |
| Constrained direct paths   | 56 | 552.89** | 34,204 | 0.94 | 0.04  |
| Constrained cross-lagged paths   | 56 | 502.83** | 34,183 | 0.93 | 0.05  |
| Unconstrained  | 48 | 486.29** | 34,230 | 0.93 | 0.05  |

Note.  $N = 2,822$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

The direct and cross-lagged paths between relational aggression and drug use are reported in Figure 18. As expected, both the frequency of relational aggression and the frequency of drug use significantly predicted subsequent changes in their own frequency at each wave ( $\beta s = .50$  to  $.67$ ,  $p < .001$ ). Relational aggression also significantly predicted subsequent changes in drug use at the fourth wave ( $\beta = .10$ ,  $p < .05$ ). In contrast, drug use did not significantly predict subsequent changes in relational aggression ( $\beta s = .01$  to  $.05$ ,  $p > .05$ ). All correlations between residuals of relational aggression and drug use within each wave were significant ( $r s = .29$  to  $.40$  for girls and  $r s = .38$  to  $.51$  for boys,  $p < .01$ ).

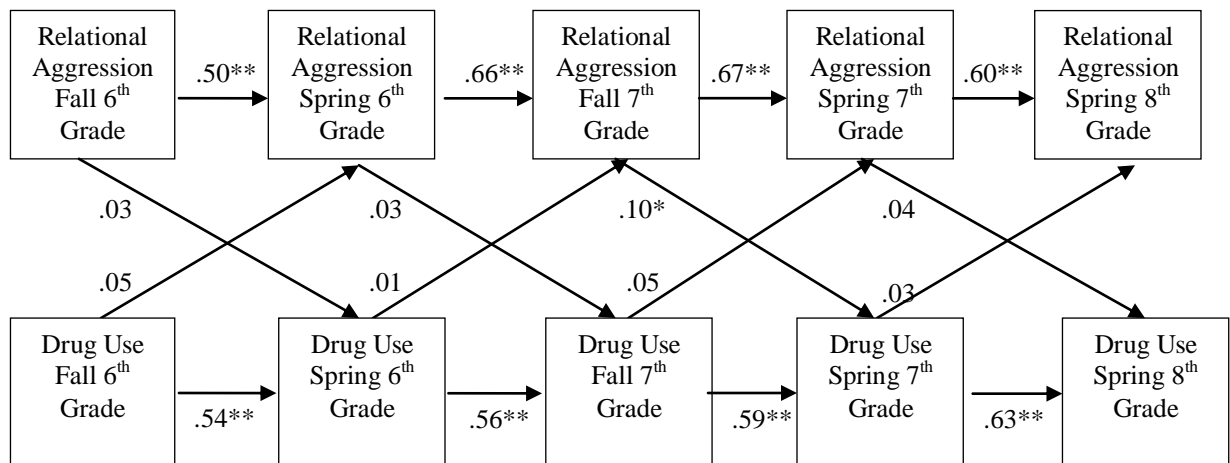


Figure 18. Relational Aggression & Drug Use Autoregressive Model.

Values are standardized path coefficients based on the means and standard deviations for girls. Model also included correlations between the remaining variance of each construct at each observed data point, but are not shown to reduce the complexity of the figure.

\* $p < .05$ , \*\* $p < .001$ .

The individual autoregressive models examining the influence of physical and relational aggression on drug use were combined to examine each type of aggression's unique time-specific influence on drug use while controlling for the other form of aggression (see Table 27 for fit indices). A model that constrained the cross-lagged paths of each construct influencing changes in the frequency of the other construct of interest for girls and boys was selected based upon comparisons of BICs over a model constraining direct paths for girls and boys ( $\Delta\chi^2(4, N = 2,822) = 27.40, p < .01; \Delta\text{BIC} = 60$ ), a model that constrained all paths for girls and boys ( $\Delta\chi^2(28, N = 2,822) = 3,240.68, p < .001; \Delta\text{BIC} = 3,018$ ), and the unconstrained model ( $\Delta\chi^2(16, N = 2,822) = 35.87, p > .05; \Delta\text{BIC} = 91$ ), and was a good fit for the data (CFI = .94; RMSEA = .05). Girls and boys did not differ in the influence of the frequencies of physical and relational aggression on changes in the frequency of drug use, but did differ in the stability of each form of aggression and drug use on the subsequent changes within a combined model controlling for the influence of the other form of aggression.

Table 27.

*Model fit for Physical Aggression, Relational Aggression, & Drug Use Autoregressive Model*

| Model                          | df  | $\chi^2$   | BIC    | CFI  | RMSEA |
|--------------------------------|-----|------------|--------|------|-------|
| All paths constrained          | 168 | 4,321.28** | 51,637 | 0.73 | 0.09  |
| Constrained cross-lagged paths | 140 | 1,080.60** | 48,619 | 0.94 | 0.05  |
| Constrained direct paths       | 136 | 1,108.00** | 48,679 | 0.94 | 0.05  |
| Unconstrained                  | 124 | 1,044.73** | 48,710 | 0.93 | 0.05  |

*Note.*  $N = 2,822$ ; Chi-square adjusted for maximum likelihood. CFI = comparative fit index; RMSEA = root mean square error of approximation; BIC = Bayesian information criterion.

\* $p < .05$ . \*\* $p < .001$ .

The combined model, provided partial support for the hypotheses in that physical aggression was a somewhat consistent predictor of drug use in that it predicted both the second and third waves of drug use ( $\beta_s = .10$  to  $.13, p < .05$ ). In contrast, it did not predict drug use

later in middle school. Findings for relational aggression were not as hypothesized, relational aggression predicted the second wave of drug use, but with a negative coefficient ( $\beta = -.12, p < .001$ ; see Table 28). Drug use predicted physical aggression at the second and fifth waves ( $\beta_s = .05$  and  $.08$ , respectively,  $p < .05$ ), and predicted the frequency of relational aggression at the second wave ( $\beta = .09, p < .05$ ).

Table 28.

*Standardized Coefficients for the Direct and Cross-lagged Paths in the Physical Aggression, Relational Aggression, & Drug Use Combined Autoregressive Model*

| Predictor             | Drug Use Wave Being Predicted |             |             |             |
|-----------------------|-------------------------------|-------------|-------------|-------------|
|                       | 2                             | 3           | 4           | 5           |
| Physical Aggression   | .13**                         | .10*        | .04         | .06         |
| Relational Aggression | -.12**                        | -.06        | .04         | -.03        |
| Drug Use              | .58**/.55**                   | .61**/.64** | .63**/.55** | .66**/.52** |

Values are standardized path coefficients based on the means and standard deviations for girls. Values not constrained to be equal for girls and boys are reported girls/boys.

\* $p < .05$ , \*\* $p < .001$ .

### Discussion

The purpose of this study was to examine the importance of differentiating between physical and relational aggression. Key issues in distinguishing between physical and relational aggression were whether they had distinct trajectories, how they related to each other, whether they predict different outcomes, and how they differ by gender. First, the trajectories of both forms of aggression were compared using univariate latent growth curves for physical and relational aggression. Next, the relations between physical and relational aggression were compared using bivariate latent growth and autoregressive models. Clarification of how physical and relational aggression are associated with changes in delinquency and drug use was examined using bivariate and combined latent growth and autoregressive models. An examination of whether physical and relational aggression differed in these relations across gender was addressed by constraining various parameters of

each model across gender. These analyses were used to determine if there is value in differentiating between these forms of aggression by exploring whether physical and relational aggression are a part of an overall problem behavior syndrome that co-varies over time with each other and delinquency and drug use or whether one form of aggression was a precursor for other problem behaviors. These analyses also examined whether relational aggression fits within a general construct of problematic externalizing behaviors or interacts distinctly from physical aggression.

The study first examined whether physical and relational aggression had distinct trajectories throughout middle school. It was hypothesized that physical aggression would have an overall decline from sixth to eighth grade and that relational aggression would increase at the beginning of sixth grade and subsequently decline through eighth grade. Contrary to this hypothesis, physical aggression increased from sixth to eighth grade, with the rate of growth declining over time. A possible explanation for this finding is that participants were selected from schools that served a high percentage of minority youth from disadvantaged, poverty-stricken neighborhoods with high rates of crime. The results in the present study may therefore reflect the pattern for youth exposed to higher levels of risk for aggression and is consistent with previous research that has found that rates of physical aggression for chronically aggressive youth do not decrease through middle school (Joussemet et al., 2008; Nagin & Tremblay, 1999). Results for relational aggression were more consistent with hypotheses, such that relational aggression peaked during middle school and subsequently declined through eighth grade. This finding is consistent with previous research that demonstrated a peak in relational aggression during adolescence (e.g., Pellegrini & Long, 2003; Tiet et al., 2001; Xie et al., 2003). It also contributes to the current literature by



demonstrating that the peak in relational aggression during middle school may occur during the spring of seventh grade followed by a decline as part of a quadratic trend. A comparison of the trajectories for physical and relational aggression from sixth through eighth indicated that the best fitting growth curve models for both forms of aggression included a quadratic trend and had similar quadratic means. The growth curves for physical and relational aggression differed, however, as the linear mean for physical aggression was higher than it was for relational aggression.

Next, this study examined whether physical aggression and relational aggression were distinct constructs based upon their prediction of changes in one another over time. Findings from the autoregressive models indicated that physical aggression consistently predicted subsequent changes in the frequency of relational aggression, but relational aggression did not consistently predict physical aggression across all waves. In contrast, the frequencies of physical and relational aggression in sixth grade were not predictive of their own subsequent trajectories or the trajectory of the other form of aggression throughout middle school. There were, however, strong correlations between the linear and between the quadratic trends for physical and relational aggression. These findings make an important contribution to the current literature as most studies have primarily focused on evaluating how physical aggression and relational aggression are related in cross-sectional data. This study bridges the conflicting findings of previous research by showing correlations between the forms of aggression and that both forms of aggression covary throughout middle school. This study's findings are consistent with research that has demonstrated significant correlations between physical and relational aggression (e.g., Crick et al., 2006). This study's findings also indicate that physical and relational aggression are either (a) distinct constructs that are not consistently

predictive of changes in one another (e.g., Crick & Grotpeter, 1995; Shahim, 2006), or (b) so highly correlated that relational aggression does not predict changes in physical aggression after controlling for physical aggression's own influence. This study is consistent with previous cross-sectional findings and contributes to the literature by demonstrating that physical and relational aggression covary over time, but are not causally predictive of the pattern of change throughout middle school of the other.

Another focus of this study was on the influence of physical and relational aggression on negative outcomes. Findings partially supported the hypothesis that physical aggression would predict delinquency in that the pattern of relations between physical aggression and subsequent changes in delinquency varied by the model used. Contrary to the hypotheses, in the bivariate models, physical aggression in the fall of sixth grade did not predict the subsequent pattern of change in delinquency. In contrast, the models using cross-lagged paths to examine time-specific relations were consistent with the hypotheses of the present study and previous research (e.g., Haapasalo & Tremblay, 1994). In particular, physical aggression was a consistent predictor of changes in delinquency and these constructs covaried throughout middle school. Although the autoregressive and bivariate models provided discrepant findings as to whether physical aggression predicts changes in delinquency, both models demonstrated that the two constructs are consistently related over time. This study's findings are in agreement with previous studies that have examined the influence of physical aggression on delinquency across a long span of time (e.g., levels of physical aggression from kindergarten through 12 years old were related to delinquency from 10 to 14 years old; Crick et al., 2006; Haapasalo & Tremblay, 1994). Therefore previous research has not pinpointed whether there is a specific time point when physical aggression is most influential

on subsequent delinquency. The findings in the present study suggest that the level of physical aggression in middle school may have a short term effect on delinquency, but physical aggression at the beginning of middle school does not predict subsequent change in the overall trajectory of delinquency. In addition, the correlations between the intercepts of physical aggression and delinquency indicate that adolescents with high levels of physical aggression also report higher levels of delinquency, but this frequency does not cause a deviation from the trajectory the individual is already on.

Less consistent support was found for the hypothesis that relational aggression would predict changes in delinquency in that findings varied depending on the model used. Relational aggression in the fall of sixth grade was not predictive of overall changes in delinquency although the bivariate model displayed an association between the intercepts and slopes of relational aggression and delinquency. There was some association between relational aggression and delinquency when examining time-specific relations, such that relational aggression predicted increases in the frequency of delinquency in the spring of sixth and spring of eighth grades. This is consistent with the majority of previous cross-sectional research, which has found that relational aggression is correlated with delinquency among a sample of similar age youth (Marsee, 2007). Previous longitudinal research has demonstrated that relational aggression predicts changes in delinquency among elementary age youth, but has not been examined in a representative sample of adolescents (e.g., Crick et al., 2006). These findings add to the literature by demonstrating that relational aggression covaries with delinquency in middle school and may be predictive of changes from fall to spring.

This study also explored the unique influence of each form of aggression on delinquency. Neither physical nor relational aggression uniquely predicted the trajectory of delinquency. However, physical and relational aggression were predictive of subsequent changes in delinquency in the fall of seventh and spring of eighth grades. When both forms of aggression were in the model, physical aggression was a more consistent predictor of subsequent increases in delinquency than was relational aggression. These results are consistent with the current literature that has demonstrated a strong influence of physical aggression on delinquency (e.g., Haapasalo & Tremblay, 1994; Nagin et al., 2008) and that physical aggression is uniquely predictive of delinquency when controlling for other disruptive behaviors (Broidy et al., 2003). In addition researchers have indicated that early antisocial behavior, and specifically early-onset aggression, is important in predicting delinquency before age 13 (USDJ, 2003). The present study's findings are consistent with theory that suggests that the underlying development of oppositional behavior starts with physical aggression and leads to delinquency (Nagin & Tremblay, 1999) and that youth who continue to engage in physical aggression in middle school and who engage in later delinquent behavior share impulsivity in common (USDJ, 2003). In contrast, relational aggression did not predict changes in delinquency, which is consistent with literature that has found that physical aggression predicted more negative outcomes than did relational aggression (e.g., Murray-Close et al., 2006; Xie, Cairns, et al., 2002). This study's findings add to the literature by examining these relations in adolescence as previous research that examined both forms of aggression and externalizing problems are scarce and are primarily conducted with elementary age youth.

Next, it was hypothesized that the frequencies of both forms of aggression would be associated with subsequent changes in substance use. Both the autoregressive and bivariate models provided consistent support for the relation between initial levels of physical aggression and subsequent changes in drug use. Within the growth curve models, the physical aggression intercept predicted the overall change in drug use both when examined in models that excluded and controlled for relational aggression. In the autoregressive models, physical aggression predicted changes in drug use earlier in middle school both when examined both within models that excluded and those that controlled for relational aggression. These findings are consistent with the literature, which has found that physical aggression consistently predicts drug use (e.g., Pikeo et al., 2006; Unger et al., 2003), including when controlling for relational aggression (Skara et al., 2008). This suggests that physical aggression is not simply related to drug use, but precedes increases in drug use.

Weaker support was found for the hypothesis that relational aggression would be predictive of changes in substance use. Within the growth curve models the intercept of relational aggression predicted the overall change of drug use when the model did not control for physical aggression, but not after controlling for physical aggression. In the autoregressive models, relational aggression only predicted the frequency of drug use in the spring of seventh grade in models that excluded physical aggression and in the spring of sixth grade for models that included physical aggression. These findings are not consistent with previous studies that have demonstrated an association between relational aggression and drug use. However, it is important to note several limitations of previous studies that have examined this relation. First, the majority of previous studies have been cross-sectional (Rodgers, 2001) or only included female participants (Skara et al., 2008). Therefore, previous

research has not addressed whether relational aggression is related to changes in drug use over time versus simply being related at a specific point and time. This study's findings are consistent with literature that has compared the impact of physical and relational aggression on drug use and found that physical aggression led to more negative outcomes for adolescents than did relational aggression (e.g., Pullatz et al., 2007). This study makes a unique contribution to the current literature by controlling for the other form of aggression when considering the influence of physical and relational aggression on drug use.

This study was also focused on examining whether physical and relational aggression differed in their trajectories and relations with each other and negative outcomes across gender. It was hypothesized that the trajectories for physical and relational aggression would differ by gender, such that boys would have a higher frequency of physical aggression and girls would have a higher frequency of relational aggression. Although boys reported higher levels of physical aggression than did girls (e.g. Henington et al., 1998; Shahim, 2006; Skara et al., 2008), boys and girls reported comparable rates and trajectories of relational aggression. This finding is consistent with some of the previous literature that samples of adolescents rather than elementary age youth (e.g., Prinstein et al., 2001; Skara et al., 2008). These findings suggest that the overall trajectories of physical and relational aggression share a similar shape of change over time across gender; however, boys and girls differ in their rates of physical aggression, but not in their rates of relational aggression.

The present study also addressed whether the influence of physical aggression and relational aggression on delinquency and drug use varied by gender. The majority of paths within the models did not vary by gender, suggesting that these relations are similar for boys and girls during middle school. Previous studies have suggested gender differences in the

outcomes associated with relational aggression and physical aggression (e.g., Letcher et al., 2009). However, several limitations of these previous studies make the pattern of the findings unclear. These limitations include inconsistent findings, such as relational aggression being related to drug use for both boys and girls (Rodgers, 2001) and relational aggression predicting cigarette and marijuana use in females participants only (Skara et al., 2008). Limitations of previous studies also include the use of homogeneous samples, restriction to elementary age youth, examining only boys or girls, and focusing on either relational or physical aggression (e.g., Brame et al., 2001; Haapasalo & Tremblay, 1994; Marsee, 2007). One possible explanation for the lack of gender differences in the present study is that there may be qualitative changes in peer groups as peer groups become mixed by gender during adolescence (Prinstein et al., 2001). Another explanation is that the present study used a sample with a high percentage of minority youth. These youth may demonstrate different gender patterns in regards to aggression than other youth based upon the unique socialization processes of girls. For example, in the African American culture, girls and boys are socialized to be more androgynous due to similar gender roles and beliefs, and therefore girls and boys may have fewer differences in their rates and impact of aggression (Belgrave, 2009). By sampling a high percentage of minority youth, this study may have included girls that were more assertive, strong, and independent causing gender neutrality to be the norm (Hill & Sprague, 1999; Peters, 1988) and thereby decreasing gender differences compared to previous samples that included a lower percentage of majority youth. This study contributes to the literature by addressing previous study's limitations and demonstrating these findings for both boys and girls.

Despite the overall similarities in the trajectories and influence of physical and relational aggression for boys and girls in this study, differences were found in the correlations between intercepts and between slopes across behaviors in the bivariate growth models. Boys, as compared to girls, consistently had higher correlations between the intercepts and between the slopes with models examining the influence of physical and relational aggression on delinquency and drug use. One exception to this finding was the relation between physical aggression and drug use, wherein boys and girls had similar correlations between slopes. These findings suggest that both forms of aggression and delinquency and drug use covary more strongly for boys than for girls. This is consistent with previous studies that have found that physical aggression among boys, as compared to girls, is related to higher levels of externalizing behaviors. In contrast, for girls physical aggression is consistently related to higher levels of internalizing behaviors (e.g., Moretti & Odgers, 2006). Studies examining gender differences in relational aggression have been less consistent. A few studies have found similar findings to the present study such that a stronger relation between relational aggression and externalizing behaviors has been reported for boys than for girls (e.g., Skara et al., 2008). There is both theoretical and empirical support for the notion that girls and boys may both experience negative consequences associated with relational aggression, but the specific effects may vary. For example, researchers have suggested that relational aggression is related to internalizing problems for girls compared to externalizing problems for boys (Crick & Zahn-Waxler, 2003).

Based on this series of findings, this study suggests that physical and relational aggression may represent a similar underlying construct as they are highly related and demonstrate similar associations with negative outcomes, although physical aggression may be



more predictive of later deviant behavior. Physical and relational aggression were found to have similar trajectories, and the frequencies of physical and relational aggression, delinquency, and drug use covaried throughout middle school. In determining whether there is value in differentiating between these forms of aggression, this study attempted to address inconsistent findings from the previous literature and explored whether physical and relational aggression are a part of an overall problem behavior syndrome that co-varies over time with each other and delinquency and drug use or whether one form of aggression was a precursor for other problem behaviors. These findings suggest that youth may be engaging in a cluster of problematic behaviors that are consistent with Jessor's problem behavior theory (1991). Problem behavior theory proposes a syndrome of problem behaviors that includes alcohol use, marijuana and other illicit drug use, general deviant behavior (e.g., delinquent behaviors), and violent acts, which were the constructs specifically examined within this study. The theory suggests that problematic behaviors are frequently positively interrelated and there are organized patterns of problematic behaviors. Findings of the present study are consistent with problem behavior theory, such that Jessor (1991) proposed that involvement in one of problematic behavior increased the probability that youth would be involved in the another problem behavior. The findings in the present study are also supported by research finding that multiple forms of problem behavior are correlated and reflect a single underlying factor (Donovan & Jessor, 1985; Jessor & Jessor, 1977).

These analyses also examined whether relational aggression fits within this general cluster of problematic behaviors. Although the constructs in this study were highly related throughout all analyses, physical aggression was more strongly related to delinquency and drug use than was relational aggression. This suggests that relational aggression may be

related to, but not a central component of, this cluster of problematic behaviors. Previous research has suggested a hierarchical structure of problem behaviors. This includes a higher-order or underlying factor and first-order factors from distinct problem areas (Farrell et al., 2000). This study's findings are consistent with a hierarchical structure where physical and relational aggression may represent distinct problem areas, but are still related through a higher-order factor. Consistent with this theory, relational aggression may be conceptually different than physical aggression, as it is a more normative behavior. Relational aggression may also diversify from physical aggression and other problem behaviors as youth advance from early adolescence to late adolescence and adulthood (McGee & Newcomb, 1992). Combining this study's findings with previous research, physical and relational aggression differ in the primary types of outcomes that they are the most related to (e.g., externalizing versus internalizing difficulties, respectively). For example, previous research has found a stronger relation between relational aggression and internalizing behaviors, as compared to externalizing behaviors, particularly among girls (e.g., Crick & Grotpeter, 1995; Crick & Zahn-Waxler, 2003). This study's findings also suggest that physical aggression may be seen as a more deviant behavior than relational aggression because it has stronger relations with delinquency and drug use than does relational aggression. This, in turn, may lead to more serious consequences because of its impact on externalizing problems on subsequent development.

Finally, the current study used both bivariate latent growth models and autoregressive models to assess the relations between physical and relational aggression and their impact on delinquency and drug use. These models were useful in examining unique questions related to the influence of physical and relational aggression on delinquency and drug use, both through

the examination of the influence of the underlying growth trajectories and time-specific measures of physical and relational aggression on the frequency of delinquency and drug use. In general, the bivariate latent growth models demonstrated a better fit to the observed data. All final models used within this study, however, fit the data well. These findings suggest the utility in using multiple analytic approaches in order to fully understand the relations between variables. For example, in the bivariate models the frequency of physical or relational aggression in the sixth grade did not predict the trajectory of delinquency throughout middle school. In contrast, the autoregressive models indicated that physical and relational aggression were predictive of individual waves of data during middle school.

### **Limitations**

There are several limitations of this study that must be acknowledged. First, this study used a sample of convenience from a larger intervention study. This provided a large and diverse sample. However, there are also several weaknesses with this approach. Whereas the larger MVPP study focused on evaluating violence prevention programs in middle school students, the present study focused on observing, rather than manipulating, physical and relational aggression, delinquency, and substance use. One limitation of using such a sample is the possible impact of the larger intervention on decreasing aggression among the sample. Although the present study excluded participants from schools that received the universal intervention; it did include those schools where a subset of students participated in the targeted intervention. Although the majority of participants in the present study were not included in the targeted intervention, they may have been impacted by the high-risk children included in the targeted intervention. This was in fact a goal of the targeted intervention, which attempted to change school-wide levels of aggression by impacting influential high-

risk youth. For example, because high-risk youth frequently have influence on the learning, acceptance, and maintenance of aggressive behavior by their peers, the targeted intervention aimed to decrease aggression in the targeted participants and also create changes in school-level normative processes (Henry, Farrell, & the Multisite Violence Prevention Project, 2004). Outcome analyses demonstrated that students at the selective intervention schools showed less of an increase on a physical aggression composite and more of a decrease on an aggression scale than control schools (MVPP, 2009), and this demonstrates that the selective intervention may have affected the growth trajectories. Although using participants from schools that received neither the targeted or the universal intervention would have removed the potential influence of the targeted sample, this would decrease the contribution of the present study to the current literature by not utilizing the large and diverse sample. It should, however, be pointed out that few middle schools throughout the country do not have one or more prevention programs in place (Gottfredson, 2001). Such programs are an inevitable part of the experience of middle school students and of any study examining changes in problem behavior over time.

A second limitation of this study is that data were only assessed at the beginning of sixth and seventh grades and then each following spring for middle school, rather than consistently throughout the school year and summer. As aggression levels may vary based on the time of year, often peaking at the end of the school year, the trajectories may describe a higher level of aggression that does not vary as much as what normally occurs throughout a school year. For example, research has suggested that during the school year youth try to imitate their high status aggressive peers and therefore increase throughout the school year in antisocial behavior (Juvonen & Ho, 2008). In addition, patterns of aggression that occur

during the middle of the school year may not be included in the present analyses because no assessment was administered during the middle of the school year. However, this limitation should not minimize the importance of the present study's focus on both the beginning and the end of each year of middle school. Therefore, this study was able to examine change over a greater amount of time rather than focusing on a very accurate trajectory for a shorter time period.

The use of only self-report measures is also a limitation. Kazdin (2003) argued that using self-report measures can blur results because the data are not always reliable and can be subject to social desirability effects. More specifically, the social desirability effect theorizes that adolescents will respond in a manner that will be viewed favorably by others. The social desirability effect could potentially be more pronounced because variables in the present study (aggression, delinquency, and drug use) are often frowned upon by authority figures and can result in punishment. This could potentially lead to students being reactive to the measurement, such that repeated measurement of undesirable behaviors of aggression, delinquency, and drug use could lead youth to report decreased negative behaviors and result in an underreport of the frequencies of these behaviors. Adolescents within this population may also be motivated to appear "tough" for their peers. For example, youth have endorsed using and supporting aggression as a means to maintain a tough image (e.g., Richardson, Huguet, 2001). Triangulation of reporters has been suggested as a way to circumvent these limitations and potential confounds (Kazdin, 2003; Nelson & Quintana, 2005). However, the potential inaccuracy of measurement by other reporters could be a pitfall of using triangulation. For example, Owens, Shute, and Slee (2000) found that teachers reported incomplete and less frequent levels of relationally aggressive behaviors because these

behaviors are often designed to be covert and undetected by others. In addition, Geiger and colleagues (2004) found that both physical and relational aggression could be covert in nature, and this makes it difficult to assess these forms of aggression by means other than self-report. Delinquency and drug use have also been suggested to be examples of a cluster of covert antisocial behaviors including stealing, truancy, and lying. Therefore, these constructs may not be accurately measured when using measurement other than self-report (Loeber & Schmalting, 1985). The present study employed measures to partially ameliorate some of the limitations of the use of only self-report measures. Specifically, the use of CASI helped ensure privacy and anonymity by allowing students to take the measures on a computer that only had a randomized student identification number. This procedure was followed to decrease the likelihood that students would feel the need to report more socially desirable responses. In addition, previous research has validated self-report measures, shown that self-report measures relate to other measures that are not self-report, and provide an efficient method to gather data for a large sample (Kazdin, 2003).

Another limitation of the present study is that using only a computer-based modality of assessment may have decreased the generalization of the results to other modalities that are used to gather information regarding students' aggression, delinquent behavior, and drug use. However, the benefits of using CASI outweighed the possible limit to generalization because it gathered data that was likely to improve the quality of the data. For example, it was noted that students were more attentive using the computer than paper and pencil measures and the computers facilitated a quiet and orderly administration (Miller-Johnson, Sullivan, Simon, & the Multisite Violence Prevention Project, 2003). In addition, it may have also increased the validity of the data because the privacy associated with using the CASI

could be associated with respondents more accurately reporting illicit or risky behaviors. Furthermore, audio clips increased comprehension, particularly for students with reading difficulties (MVPP, 2006). Kazdin (2003) described how computerized assessment allows for more reliable administration, less reactivity to assessment, and elicitation of more information at lower costs, while at the same time demonstrating comparable results to noncomputerized assessments. By using computerized assessment as the modality of measurement, data were able to be collected from a larger sample than may have been possible with alternate measurement modalities, such as observation.

Another limitation is the variability in schools across the four participating sites on a range characteristics such as ethnicity and location. For example, Richmond schools consisted of primarily African American youth, and Northeastern Georgia schools consisted primarily of Caucasian youth. Despite the diversity of the overall sample, the extent to which these characteristics were confounded across the four sites makes it difficult to isolate the effect of any one characteristic. For example, previous studies have reported a relation between race and aggression (e.g., David & Kistner, 2000; Osterman et al., 1994) and interactions between race and gender (Underwood, 2003). Because these characteristics varied across sites, it was not possible to explore how these site differences may have impacted the findings. Specifically, the aggression trajectories and their impact on delinquency could have been compared across the four sites; however, the underlying variable driving potential differences would be unclear because of these differences that varied across sites. For example, the Northeastern Georgia sample a predominantly rural sample with a high percentage of Caucasian participants, and it may be hard to establish which variables account for any observed differences in trajectories across sites. This

restricts the present study from examining how trajectories may vary based on variables like ethnicity. Despite this limitation, the strengths of combining the diverse sites allow the overall trajectories to be more accurate and representative.

An additional limitation of the sample used in the present study is that because it included a disproportionately high percentage of minority students, the findings may not generalize to other adolescents representing other age groups or ethnicities. However, this sample represents a population that is understudied and previous research has emphasized the importance of studying this population (e.g., Hill & Sprague, 1999; Underwood, 2003). One way to address this limitation would be to examine the developmental trajectories of additional age groups, such as including fifth grade students before they transition to middle school. Research has often examined either elementary, middle, or high school, but not the transitions from one to another. For example, this study does not capture the change that occurs in the transition to and from middle school. This study, however, still adds to the current literature by examining the individual trajectories and impact of physical and relational aggression across middle school, which currently has not been evaluated.

A final limitation is not being able to draw clear conclusions regarding the causal relations among the variables examined in this study. Although the focus was on longitudinal relations, the fact that one variable preceded another does not mean that it caused it. It is plausible that the variables in each model were influenced by other variables not examined in this study. For example, physical and relational aggression could be partially predicted by victimization rather than one another. This was supported in a previous study that demonstrated that physical and relational victimization were each uniquely related to physical and relational aggression and delinquent behaviors in a sample of 276



predominately African American eighth graders (Sullivan, Farrell, & Kliewer, 2006). The findings of this study suggest that these behaviors are part of a general cluster of problem behaviors (Jessor, 2001) and therefore it is likely that there are other variables not measured in this study that serve as common risk factors for and are predictive of this cluster of problem behaviors. For example, research examining common risk factors for problem behavior has demonstrated that an association with aggressive peers is predictive of physical aggression, relational aggression, and delinquency when moderated by the child's own level of aggression and the quality of the friendship (Werner, 2001).

### **Implications and Directions for Future Research**

Despite the preceding limitations, this study contributes to the literature by determining that physical and relational aggression are highly related and covary with each other and delinquency and drug use throughout middle school, but physical aggression may have a stronger influence on delinquency and substance use. The results of this study demonstrated that physical and relational aggression were related and covaried throughout middle school by predicting fluctuation in one another, but were not consistent predictors of each other. Similarly, physical and relational aggression predicted fluctuations, but not the trajectory, of delinquency throughout middle school. These findings are consistent with previous research that demonstrated a relation between physical and relational aggression and delinquency (e.g., Broidy et al., 2003; Crick et al., 2006). Physical and relational aggression predicted both the trajectory and subsequent changes in drug use, although only physical aggression uniquely predicted drug use when controlling for relational aggression.

These findings suggest that prevention programs may reduce other problem behaviors by targeting either form of aggression. Youth violence prevention programs targeting

aggression, particularly physical aggression, may not only cause a decrease in that form of aggression, but may also cause a reduction in delinquency and drug use. For example, youth violence prevention programs (e.g., LIFT and Bullying Prevention Program) that target risk and protective factors for physical aggression in middle school (e.g., problem solving, improved school environment) have also found decreases in delinquency (Eddy, Reid, & Fetrow, 2000; Olweus, Limber, & Mihalic, 1998). Similarly, violence prevention programs may reduce the development of drug use which can lead to later antisocial behavior (e.g., Paradise & Cauce, 2003). Based on the findings from the autoregressive models, intervention at any point in middle school may impact the fluctuation of all problematic behaviors within this study. The findings from the bivariate models, however, suggested that prevention and intervention programs that focus on reducing physical aggression at the beginning of middle school may also impact the overall trajectory of drug use, but not delinquency during middle school except to the extent that these programs address shared risk and protective factors. Prevention programs targeting physical aggression prior to or during middle school may also have an impact on subsequent levels of relational aggression, although prevention programs targeting relational aggression will likely indirectly impact changes in physical aggression through changing shared risk factors, but not solely through reducing relational aggression.

This study's findings that physical and relational aggression covary with each other and more consistently predict fluctuations in rather than the trajectory of delinquency and drug use support the use of problem behavior theory as a guide for interventions and prevention programs. For example, rather than targeting a single form of aggression or problematic behavior in an effort to change both that behavior and other problematic behaviors, interventions should focus on decreasing risk factors and promoting protective

factors that are identified as common to this problem behavior system. This theory also suggests that these behaviors are linked through social ecology, as youth frequently engage in these activities together. Interventions would therefore benefit from decreasing the opportunities for youth to engage in this cluster of behaviors, such as promoting after-school programs that might keep youth from engaging in problematic behaviors during the hours when youth are the most likely to engage in criminal activity, such as fighting and drug use (Newman, Fox, Flynn, & Christeson, 2000). Problem behavior theory has also been linked with developmental transitions, where these behaviors are relative to age-graded norms and expectations. Youth who engage in an earlier onset of age-graded or transition behaviors may be more prone to engaging in this cluster of problem behaviors. Similarly, Moffitt (1993) suggested that early maturing youth may be more likely to engage in aggression and delinquent behavior as they attempt to close the “maturity gap.” Therefore, youth who biologically mature early, but do not have social maturity, may try to bridge this gap by engaging in this cluster of problem behaviors that increases their feelings of autonomy and freedom. This theory suggests that violence prevention projects may benefit from incorporating a targeted component to their intervention that identifies participants prior to their engagement in problem behaviors by selecting youth who are transitioning to other mature behaviors. For example, youth who come from single-parent households may be expected to take on more mature responsibilities at home (e.g., cleaning, providing care for younger siblings) (Seltzer, 1994), and these youth may therefore be at greater risk for engaging in these behaviors and should be incorporated in a targeted prevention program.

Although the constructs in this study largely covaried with one another, physical aggression, as compared to relational aggression, was a more consistent predictor of both the

trajectory and time-specific changes in the frequency of drug use and time-specific changes in delinquency. Physical aggression was also a more consistent predictor of fluctuations in relational aggression than vice versa and was a more consistent predictor of changes in delinquency than was relational aggression. These findings suggest that physical aggression may be a more deviant behavior than relational aggression and a unique predictor of later problematic behaviors. This conclusion is supported by literature that has found that physical aggression generally leads to more negative outcomes for adolescents than does relational aggression (e.g., Pullatz et al., 2007). This suggests that it is more important for violence prevention programs to address risk and protective factors related to physical aggression if the intervention's goal is to prevent an antisocial trajectory including subsequent delinquent and externalizing behaviors in middle school.

This study also has implications for the timing of intervention based upon the description of the developmental trajectories of physical and relational aggression through middle school. Consistent with previous studies, this study found that mean levels of both forms of aggression generally increased from the sixth to eighth grade for both boys and girls (e.g. Farrell et al., 2005; Tiet et al., 2001; Xie, Farmer, & Cairns, 2003). This study builds upon previous research by showing that physical and relational aggression develop similarly across middle school and the slope of the increase declines throughout middle school. The conclusions that rates of both forms of aggression peak in the spring of seventh grade imply that interventions may need to occur earlier in middle school. In particular, although violence prevention programs addressing aggression may be influential throughout middle school, these findings suggest the importance of implementing violence prevention programs at the beginning of middle school based on the trajectory of each form of aggression (Farrell, 2008).

Consistent with previous research, this study found that boys demonstrated higher levels of physical aggression than did girls (e.g. Henington et al., 1998; Shahim, 2006; Skara et al., 2008). This suggests that interventions for physical aggression may need to specifically direct resources to impact the high frequency of physical aggression in boys. This study observed that boys and girls demonstrated comparable levels of relational aggression when using a diverse population, which is consistent with some of the previous literature (e.g. Juliano, Werner, & Cassidy, 2006). This suggests that interventions targeting youth at risk for relational aggression will want to be directed at both boys and girls.

This study's findings also have implications for the assessment of physical and relational aggression. Although physical and relational aggression were highly related and covaried throughout the study, they demonstrated unique relations with delinquency and drug use, such as this study's findings of physical aggression's as a stronger predictor of later externalizing behaviors. This suggests that valuable information would be lost by combining these variables into one construct of aggression or problem behaviors despite previous studies that have measured the problem behaviors in this study as one construct (e.g., Williams, Ayers, Abbott, Hawkins, & Catalano, 1996). For example, as physical aggression appears to increase adolescents' risk for the other problem behaviors, it is important to assess it as a distinct construct from relational aggression.

This study's findings also highlight the importance of using multiple methods to assess the relations between constructs. The models addressed different questions in regards to the constructs (e.g., the impact of aggression on the trajectory of externalizing difficulties versus subsequent levels of externalizing difficulties), and they also assessed cross-lagged paths demonstrating a relation between physical and relational aggression and delinquency that was

not found in the bivariate latent growth model. Based upon these results, researchers should consider using both forms of models in longitudinal analyses focused on evaluating how one construct predicts another and the best time to intervene for maximum impact on all constructs of interest. For example, the bivariate latent growth analyses are useful in demonstrating that it is important to intervene early in middle school in order to decrease the initial frequency of aggression. On the other hand, the autoregressive models are useful in examining whether intervening throughout middle school may be effective in impacting the fluctuation of the problematic behaviors throughout middle school, although outcomes may not be as readily impacted at any point in middle school.

Future studies are needed to address the limitations of the current study, as well as to better understand the results found. This study's findings of positively interrelated behaviors during middle school were consistent with problem behavior theory and an underlying construct of problem behavior (Jessor, 1991). Future studies should clarify whether physical and relational aggression represent (a) a single underlying factor (e.g., Donovan & Jessor, 1985, Williams et al., 1996), or (b) if they represent distinct problem areas as a part of a hierarchical structure of problem behaviors that includes an underlying factor and first-order factors from distinct problem areas (e.g., Farrell et al., 2000). Given this study's conclusions regarding the highly interrelated behaviors, future research should also focus on identifying common risk/instigation factors that predict this cluster of behaviors in order to identify when youth may be on a trajectory of being involved in multiple problem behaviors, such as aggression, delinquency, and drug use. This examination of potential risk and protective/control factors should be multifaceted and include the variety of factors suggested by problem behavior theory (Jessor, 1991): (a) models for the aggressive and delinquent and

prosocial behaviors (e.g., modeling by peers; McAlister, Ama, Barroso, Peters, & Kelder, 2000; Shi, 2011), (b) factors that impact adolescents' opportunities to engage in the behaviors (e.g., availability of illegal substances; Kuntsche, 2010), and (c) characteristics of personal and contextual vulnerability or support, such as peer pressure (Chad, Szewdo, Antonishak, Hare, & Allen, 2008) and parental support of school activities (Donnon, 2010). By identifying common risk and protective factors for a trajectory of problematic behavior, future studies will be able to provide a protection/risk model that communities and schools can use to help predict whether youth in that environment will engage in either problem or prosocial clusters of behavior.

Future research is also needed to understand possible ways to successfully intervene and decrease aggression based upon the specific trajectories of physical and relational aggression in middle school found in this study. For example, consistent with previous research, this study found a decrease in both forms of aggression following their peak in the spring of seventh grade. Researchers have suggested possible reasons for decreased aggression during middle school, such as a decrease in impulsivity (Coie & Dodge, 1998) or improved communication skills (Piel, 1990). Understanding whether either of these or new theories of change for aggression are accurate would help inform interventions as to important risk factors or skills to address in order to start a decrease in aggression earlier in middle school.

Future studies should attempt to better understand gender similarities and differences based on this study's findings. Although physical aggression appears to be particularly problematic for boys and boys demonstrated stronger correlations between constructs, overall this study found few gender differences in how physical and relational aggression change over time and impact changes in delinquency and drug use. The lack of gender differences in the

influence of physical and relational aggression indicates that programs focused on promoting positive youth development and preventing a cluster of problematic behaviors will need to address aggression among both genders. Despite these similar predictive patterns for boys and girls, the current literature suggests that the socialization and underlying patterns for aggressive and delinquent behaviors may be different for boys and girls (Zahn-Waxler & Polanichka, 2004), such as the influence of family discord for girls (Davies & Windle, 1997) and deviant peers for boys (Eron, 1992). Future research should examine whether the unique socialization processes that impact the rates of aggressive and externalizing behaviors for boys and girls also impacts how these constructs relate to one another. Understanding whether there are gender differences in how physical and relational aggression develop is important in informing future interventions. For example, findings may suggest whether boys and girls with similar frequencies of these problematic behaviors will need different interventions to address why the aggressive behaviors are occurring.

Future research should also aim to address the limitations of the present study. The bivariate latent growth models demonstrated that the frequencies of physical and relational aggression in the sixth grade were predictive of the trajectory of drug use. It may also be beneficial to assess the pattern and predictive value of each form of aggression during the transition to and from middle school, given the lack of stability of externalizing difficulties during this time period and the significance of the fall of sixth grade as a predictor in this study's models (Fite, Colder, Lochman, & Wells, 2006). For example, future research should examine whether the frequency of physical aggression prior to the transition to middle school is also predictive of a trajectory of drug use when controlling for relational aggression and therefore should impact the timing of interventions. Extending the time period examined to



include transitions to and from middle school would also help determine whether developmental milestones that have been suggested to impact rates of physical and relational aggression in middle school (e.g., the increased cognitive ability to carry out more covert and harmful relationally aggressive behaviors; Yoon et al., 2004) are associated with changes during this transition. Future research may also want to assess these constructs continuously throughout the school year and during the summer because aggression levels may naturally vary based on the time of year. This would allow for the assessment of patterns of aggression that occur throughout the year. Finally, future research should also examine these relations in other samples because this sample included predominately minority students, and an examination of other populations may result in different trajectories or patterns of physical and relational aggression.

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Zimmer-Gembeck, M.J., Geiger, T.C., & Crick, N.R. (2005). Relational and physical aggression, prosocial behavior, and peer relations, Gender moderation and bidirectional associations. *Journal of Early Adolescence*, 25(4), 421-452. doi: 10.1177/0272431605279841

## Vita

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### Educational Background

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August 2007 – Present      **Virginia Commonwealth University**, Richmond, Virginia  
Major: Clinical Psychology  
Specialization: Child Clinical Psychology  
GPA 4.0  
Master's Thesis topic: Developmental Trajectories of Physical and Relational Aggression and Their Relation to Delinquency and Substance Use in Adolescence  
Advisor: Albert Farrell, Ph.D.

August 1999 – May 2003      **College of William and Mary**, Williamsburg, Virginia  
B.A. in Psychology and English  
Cumulative GPA: 3.45  
Psychology GPA: 3.71 Junior/Senior Psychology GPA: 3.95

### Honors and Awards

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2011      VCU Department of Psychology Travel Award

2010      Society for the Advancement of Psychology Travel Award

2009      North America Scholar Consortium Honor Society  
Departmental and Graduate Student Travel Grants for presentation at the Society for Research on Child Development

2001 - present      Golden Key International Honor Society (Graduate, Undergraduate)

2003 – 2005      Apple Award for Excellence in Reading Education

2003      Wrote and received an Educational Reading Grant from Success for All

2001      Psi Chi National Honor Society (Undergraduate)

## Relevant Graduate Coursework

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Research Methods in Clinical Psychology  
General Linear Models I and II  
Principles of Psychological Measurement  
Individual Tests of Intelligence  
Diagnostic and Behavioral Assessment  
Clinical Assessment of Childhood Disorders  
Advanced Child Psychopathology  
Child and Adolescent Psychotherapy  
Developmental Processes

Adult Psychopathology  
Minority Issues in Mental Health  
Biological Basis of Behavior  
Learning and Cognition  
Ethics  
Family Therapy  
Introduction to Clinical Interviewing  
Social Psychology

## Research Experience

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August 2007 – Present

### Research Assistant

Clark-Hill Institute for Positive Youth Development  
Academic Center of Excellence in Youth Violence Prevention  
Virginia Commonwealth University, Richmond, Virginia  
Supervisor: Albert Farrell, Ph.D.

Served as a research assistant on large-scale, grant-funded, community- and school-based research projects on risk and protective factors associated with youth violence and working on improving interventions to prevent youth violence. Responsibilities including coordinating and assisting with the development of novel measures of problem solving and aggressive and prosocial schemas, providing training for and supervising interviewers within middle schools, performing qualitative coding and analyses utilizing a qualitative research computer program on interviews with middle-school students, conducting literature searches for studies and manuscripts, performing quantitative analyses using SPSS, SAS, and MPlus, organizing and updating data sets utilizing statistical software, assisting with IRB submissions and bi-annual grant reviews, and collaborating on manuscripts and presentations.

July 2005 – July 2007

### Research Assistant

Emory Women's Mental Health and Epilepsy Programs  
Departments of Psychiatry and Neurology  
Emory University, Atlanta, Georgia  
Supervisors: Page Pennell, M.D. and Zachary Stowe, M.D.

Served as a research assistant for several large-scale, grant-funded research projects investigating the impact of mental illness, epilepsy, and medication on women's perinatal period and babies' outcome. Responsibilities including serving as the research coordinator for the Epilepsy and Childbirth Project of a NIMH SCOR Grant, writing and assisting with articles for publication in medical and scientific research journals, coordinating and implementing study duplication at Grady Memorial Hospital, administering semi-structured interviews, collecting and processing blood and urine samples as a certified phlebotomist, and assisting in data collection, coding, and analyses. Assisted in the preparation and submission of grant proposals, including being the research coordinator for a TRCBS grant submission.

August 2003 – July 2005

**Literacy Committee 7<sup>th</sup> Grade Chair**  
Kennedy Middle School, Atlanta, Georgia

Served as the 7<sup>th</sup> grade chair of the literacy committee, which was formed to analyze the current problems with students' low reading abilities and suggest research-based methods of improving their reading skills. Responsibilities included developing and implementing a school-wide development plan to improve students' reading and achieve student success, analyzing student data and test scores, and evaluating current reading and educational research.

May 2002 – May 2003

**Student Researcher**  
Independent Psychology Research  
College of William and Mary, Williamsburg, Virginia  
Supervisor: Glenn Shean, Ph.D.

Conducted an independent investigation of depression and interpersonal relationships within college students through examining the development of the relationship between freshmen roommates. Completed an APA style write-up and research proposal.

August – December 2002

**Student Researcher**  
Advanced Research in Personality Theory  
College of William and Mary, Williamsburg, Virginia  
Supervisor: Carolyn Parish, Ph.D.

Designed, conducted, and analyzed an investigation of the relationship of self-esteem, self-monitoring, and the importance of physical attractiveness. Wrote and presented an APA style research paper.

January – May 2000

**Research Assistant**  
Psychology Anger Research  
College of William and Mary, Williamsburg, Virginia  
Supervisor: Michael Griffin, M.A.

Completed research and data collection, data entry, and data analysis for a Masters Student investigating the impact of an audio anger manipulation on college undergraduates.

## **Clinical Experience**

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July 2010 – Present

**Virginia Treatment Center for Children**  
Psychology Practicum Student  
Virginia Commonwealth University Medical Center  
Supervisor: Leslie Kimball-Franck, Ph.D.

Administer individual and family therapy to youth who reside on an acute inpatient unit and their families. Conduct case management to facilitate inpatient treatment and successful discharge from the hospital. Also administer individual outpatient therapy and perform cognitive, psychological, and personality assessments on children and adolescents. Clients of this center represent a broad range of socioeconomic statuses and ethnicities. Includes weekly individual supervision for inpatient and outpatient therapy.

March 2010 – June 2010

**Body Acceptance Intervention**

Group Facilitator

Virginia Commonwealth University

Supervisor: Suzanne Mazzeo, Ph.D.

Serve as a group leader for an empirically supported dissonance-based body acceptance intervention for undergraduate university students focusing on improving body acceptance through psychoeducation, role plays, and discussion. Includes weekly group supervision.

January 2010 – Present

**Virginia's Associated Behavioral Outcomes and Developmental Experts of Virginia (VABODE)**

Outpatient Therapist & Group Facilitator

Richmond, VA

Supervisor: Micah McCreary, Ph.D.

Serve as a group leader for children and adolescents ages 6 to 17 working on Aggression Replacement Training. Also serve as a group leader of parents with youth ages 1 to 15 working on Parent Management Training and Parent-Child Interaction Therapy. Clinical experience also includes individual therapy, family therapy, and conducting psychodiagnostic assessments and writing integrated reports for children and adolescents. Clients of this center represent a broad range of ethnicities and low socioeconomic status. Includes one-to-one supervision and weekly group supervision meetings.

June 2009 – Present

**The Chesterfield-VCU Adaptation of Depression and Anxiety Psychological Treatments for Children Project**

Clinical Interviewer

Virginia Commonwealth University

Supervisor: Michael Southam-Gerow, Ph.D.

Administer and trained to reliability on the Kiddie-Schedule for Affective Disorders and Schizophrenia (KSADS) and associated intake interviews conducted with children and their parents who are being enrolled in multi-focus therapy in a community mental health clinic for children with comorbid internalizing and externalizing disorders.

Fall 2009 – August 2010

**Autism Clinic**

**Center for Psychological Services and Development**

Staff Therapist

Virginia Commonwealth University

Supervisor: Bryce McLeod, Ph.D.

Serve as a staff therapist for the Autism Clinic, which provides empirically supported assessment and treatment serves to children and adolescents with Autism Spectrum Disorders (ASDs) and their families in an outpatient community mental health clinic. Clinical experiences include child and family focused interventions, such as individual therapy for children and parent training. Includes one-to-one supervision and weekly group supervision meetings.

March 2009 – Present

**T.E.E.N.S. Healthy Weight Management Program**  
Behavioral Specialist & Parent Group Leader/Trainer  
Virginia Commonwealth University  
Supervisors: Marilyn Stern, Ph.D. & Suzanne Mazzeo, Ph.D.

Conduct intakes and provide therapy for obese adolescents participating in a multidisciplinary program with their family in order to work towards weight and health goals. Sessions include providing psychological support and promoting and working through behavioral changes, such as exercise and dieting. Also co-lead a bi-monthly group containing the adolescent's parents to provide information and discussion regarding parenting, nutrition, physical activity, difficulties with behavior change for their child, and their own behavior change. Involves training and supervising future parent group leaders. Includes weekly group supervision meetings.

August 2008 – August 2010

**Center for Psychological Services and Development**  
Staff Therapist  
Virginia Commonwealth University  
Supervisors: Bryce McLeod, Ph.D. & Katherine Macie, Ph.D.

Clinical practicum placement in an outpatient community mental health clinic serving a diverse population of children, adolescents, and adults that represent a broad range of socioeconomic statuses and ethnicities. Administered empirically supported treatments to child, adolescent, adult, and family clients. Utilized diagnostic and behavioral assessments to improve and monitor treatment outcomes. Includes weekly one-to-one and group supervision meetings.

September– October 2009

**Intelligence Testing Examiner**  
The Collegiate School  
Richmond, Virginia

Administered the WISC-IV to third grade students as part of the routine intelligence assessment. Provided all third grade teachers at the school with reports and interpretations of students' cognitive abilities.

April 2007

**Group Facilitator for Drug and Alcohol Awareness Night**  
St. Christopher's and St. Catherine's Schools  
Richmond, Virginia

Served as a group facilitator for a group of middle school students and parents. Issues surrounding middle school student's exposure to, understanding of, and approach to drug and alcohol consumption and abuse were discussed.

August 2007 – Present

**Clark-Hill Institute for Positive Youth Development**  
**Academic Center of Excellence in Youth Violence Prevention**  
Clinical Interviewer  
Virginia Commonwealth University, Richmond, Virginia  
Supervisor: Albert Farrell, Ph.D.

Serve as an interviewer for assessments within the Richmond and Chesterfield Public School systems. These interviews are used to develop and evaluate effective violence prevention programs for high-risk adolescents. Clinical experience includes administering semi-structured and unstructured assessments to middle school age adolescents, that include assessments for problem solving skills and social-information processing patterns.

July 2005 – July 2007

**Clinical Interviewer**

Emory Women's Mental Health and Epilepsy Programs  
Departments of Psychiatry and Neurology  
Emory University, Atlanta, Georgia  
Supervisors: Page Pennell, M.D. and Zachary Stowe, M.D.

Conducted a variety of clinical interviews and phone intakes, which determined eligibility for the clinic and research studies. Administered and trained to reliability on the Structured Clinical Interview for DSM-IV, Hamilton Rating Scale for Depression, Mania Rating Scale, Yale-Brown Obsessive Compulsive Scale, Panic Disorder Severity Scale, and other related mood and anxiety assessments. Over 1,100 hours of administering assessments.

May – August 2002

**Shelter House – Family Homeless Shelter**

Summer Intern  
Falls Church, Virginia

Developed and implemented Festival of HOPE for parents and children living at the homeless shelter, which incorporated parent training, support and relaxation for families, and strengthening for family relationships.

September 2001 – May 2002

**Avalon Domestic Abuse Shelter**

Volunteer, Co-leader for group therapy  
College of William and Mary, Williamsburg, Virginia

Co-lead children's group therapy, which was designed to provide psychological support for children who had witnessed and experienced abuse. Volunteered and lead events at the shelter's day care center. This shelter supports a diverse population of women and their children representing a broad range of ethnicities and of low socioeconomic status that often do not have any other support system in leaving an abusive home.

## **Presentations & Publications**

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**Titchner, D.K., & Farrell, A.** (Accepted). *Developmental Trajectories of Physical and Relational Aggression and Their Relation to Delinquency and Substance Use in Adolescence*. Poster presentation at the biennial meeting of the Society for Prevention Research, Washington, D.C.

**Titchner, D.K., Pugh, K.L., Mehari, K.R., & Farrell, A.D.** (2010). *Development and Evaluation of a Measure of Social Problem Solving Skills for Urban Adolescents*. Poster presentation at the 18<sup>th</sup> annual meeting of the Society for Prevention Research, Denver, CO.

- Pugh, K.L., Bettencourt, A.F., **Titchner, D.K.**, Mehari, K.R., & Farrell, A.D. (2010). *An Evaluation of the Application of the Articulated Thoughts in Simulated Situations Paradigm to Urban African American Adolescents*. Poster presentation at the 18<sup>th</sup> annual meeting of the Society for Prevention Research, Denver, CO.
- Titchner, D.K.**, & Farrell, A. (2010, March). *Developmental Trajectories of Physical and Relational Aggression and Their Relation to Delinquency and Substance Use in Adolescence*. Poster presentation at the biennial meeting of the Society for Research on Adolescence, Philadelphia, PA.
- Galanti, M., Newport, D.J., Pennell, P.B., **Titchner, D.**, Newman, M., Knight, B.T., & Stowe, Z.N. (2009). Postpartum depression in women with epilepsy: Influence of antiepileptic drugs in a prospective study. *Epilepsy & Behavior*, 16(3), 426-430.
- Titchner, D. K.**, Pugh, K.L., Mays, S.A., Bettencourt, A. F., Kramer, A. M., & Farrell, A.D. (2009, April). *Development and Evaluation of an Interview-based Measure of Social-Cognitive Processes Related to Aggression*. Poster presentation at the biennial meeting of the Society for Research on Child Development, Denver, CO.
- Pennell, P.B., Peng, L., Newport, D.J., Ritchie, J.C., Koganti, A., **Holley, D.K.**, Newman, M., & Stowe, Z.N. (2008). Lamotrigine in pregnancy: Clearance, therapeutic drug monitoring, and seizure frequency. *Neurology*, 70, 2130-2136.
- Holley, D.K.**, Newport, D.J., Knight, B.T., Stowe, Z.N. (2007, May). *The Effects of Childhood Trauma on Obstetrical Outcome*. Poster presentation for the American Psychiatric Association Annual Meeting, San Diego, California.
- Friedland, J.P., Pennell, P., Koganti, A. **Holley, D.K.**, Newman, M, Newport, D.J., Stowe, Z.N. (2007, April). *Pregnancy Outcomes for Women on Antiepileptic Drugs at a Single Site: A Prospective Observational Study*. Poster presentation for American Academy of Neurology 59<sup>th</sup> Annual Meeting, Boston, Massachusetts.
- Holley, D.K.**, Pennell, P.B., Newport, D.J., Ritchie, J.C., Newman, M.L., Stowe, Z.N. (2006, December). *Pregnancy-induced Alterations in Oxcarbazepine (MHD) Clearance and Placental Passage*. Poster presentation for American Epilepsy Society 60<sup>th</sup> Annual Meeting, San Diego, California.
- Pennell, P.B., Koganti, A., Peneg, L., Newman, M., **Holley, D.**, Stowe, Z.N. (2006, December). *Seizure Frequency in Women on LTG during Pregnancy using Therapeutic Drug Monitoring*. Poster presentation for American Epilepsy Society 60<sup>th</sup> Annual Meeting, San Diego, California.
- Holley, D.K.**, Pennell, P.B., Newport, D.J., Newman, M.L., Ritchie, J.C., Koganti, A., Stowe, Z.N. (2006, May). *Mood Stabilizers and Depression in the Postpartum Period*. Poster presentation for American Psychiatric Association 159<sup>th</sup> Annual Meeting, Toronto, Canada.



**Holley, D.K.**, Pennell, P.B., Newman, M.L., Newport, D.J., Koganti, A., Beach, A., Stowe, Z.N. (2006, April). *Depressive Symptoms during Pregnancy and the Postpartum Period in Women with Epilepsy*. Platform presentation for American Academy of Neurology 58<sup>th</sup> Annual Meeting, San Diego, California.

## **Teaching Experience**

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August 2003 – July 2005

### **Teach for America**

Kennedy Middle School - Atlanta, Georgia

Serving as a member of a national service corps of outstanding recent college graduates of all academic majors who commit two years to teach in an under-resourced urban public school. Courses taught included World Geography, Life Science, Language Arts, and Advanced and Remedial Reading for the 7<sup>th</sup> grade.

## **Professional Organizations**

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American Psychological Association, Division 53 (APA)

Association for Behavioral and Cognitive Therapies (ABCT)

Society for Prevention Research (SPR)

Society for Research in Adolescence (SRA)

## **Seminars & Workshops Attended**

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January 2011

### **Eating Disorders Examination Interview Training**

Attended a full-day training focused on instruction on the administration of Eating Disorders Examination Interview for both children and adults. This training included both research and clinical applications of the interview.

August 2010

### **Therapeutic Options (TOVA) Training**

Attended a full-day workshop on using a comprehensive approach to reducing violence and the use of restraint in behavioral health settings. Methods included focusing on the individual and therapeutic relationship, conducting a functional assessment of behavior to identify and manage aggression triggers, supporting the patient in crisis, and safe and effective physical skills for personal protection and aggression control if faced with unpreventable violence.

July 2010

### **Crisis Management Training**

Attended a full-day workshop on crisis management including the identification of challenging behaviors and the prevention of crisis situations. Methods of prevention included training on developing therapeutic relationships, verbal de-escalation, and using least restrictive treatment interventions in potentially dangerous situations that meet JCAHO/CMS restraint standards.

July 2010

### **Collaborative Problem Solving Training**

Attended a workshop focused on using evidence-based, trauma-focused, cognitive-behavioral strategies. This approach focused on using empathy, defining the problem (both child and adult concerns), and then problem solving in order to work with the child or adolescent to address both the needs of the patient and the needs of the therapist.

August 2007 – August 2010

### **Clinic Staff Meetings**

Attended bi-weekly clinic staff meetings and clinical forums that focus on various aspects of and issues pertinent to clinical training. Virginia Commonwealth University, Richmond, VA.

May 2009

### **Multi-level Modeling Training**

Attended a full-day workshop on Multi-level Modeling as a part of the annual meeting for the Society for Prevention Research. The course focused on analytic strategies for analyzing nested data structures and covered both cross-sectional and longitudinal multilevel data. The course also provided information on how to perform and interpret the results of these models.

May 2009

### **Strategies for Enhancing School Mental Health in Youth**

Attended the 47th Annual Child Psychiatry Spring Forum: Embracing the Whole Child: Strategies for Enhancing School Mental Health. Annual workshop consists of a daylong educational program on a special topic relevant to the mental health of the needs of children and is sponsored by the Commonwealth Institute for Child and Family Studies, Virginia Treatment Center for Children, Department of Psychiatry at Virginia Commonwealth University, and Communities in Schools in Richmond. Topics included engaging parents as partners in school mental health, mentoring in schools, implementing high quality evidence-based school mental health services, and conducting functional behavior assessments and developing positive effective behavior intervention plans.