A LONGITUDINAL STUDY OF RELATIONAL AGGRESSION
AMONG FEMALES USING HIERARCHICAL LINEAR MODELING

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The purpose of this study was to examine the stability of relational aggression among females in grades 3, 4, 5, and 6, and longitudinal relationships between relational aggression and the variables of physical aggression, perceived popularity, sociometric status, pubertal onset, social skills, peer support, friendship quality, and parental support. Hierarchical linear modeling was used to analyze data in this study. In order to explore the influence of predictors on relational aggression over time, level-1 analysis modeled the within-person trajectory of relational aggression with repeated measures of relational aggression and the time-varying covariates (physical aggression, social skills, friendship quality, and parental support) for each student. Level-2 analysis included time-invariant variables (pubertal onset, sociometric popularity, perceived popularity, and peer group).

Results indicate that there are differences between and within individuals in relational aggression. The interclass correlational coefficient for the unconditional means model indicates that approximately 32.6% of the variance in relational aggression lies between individuals. The results of the unconditional linear growth model indicate yearly growth in relational aggression was -.0195 points per year. The fixed effect representing initial relational aggression in the unconditional linear growth model was found to be significant at the $p < .001$ level. Results of the full model indicated
statistically significant results at the $p < .001$ level in initial relational aggression for sociometric status. The relationships between time-varying covariates of physical aggression, social skills, and friendship quality and yearly growth in relational aggression were also statistically significant. The calculation of $\hat{R}^2$ statistics show that the addition of variables accounted for approximately 29.3% of the variation in initial relational aggression and for 56.9% of the variation in growth in relational aggression. A positive correlation between initial relational aggression and yearly growth rate in relational aggression ($r = .863$) indicates that after controlling for all covariates, participants who have higher levels of relational aggression at third grade have higher annual growth in relational aggression. Comparisons of deviance statistics suggest that each subsequent model fits the data better than each previous model, with the full model having the best fit to the data.
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CHAPTER I

INTRODUCTION

Background Information

Overt aggression is typically what comes to mind when the topic of youth violence is discussed. While the negative effects of overt aggression are certainly substantial and well-documented, there is another form of aggression with comparable potential for damage that until roughly the last 15 years has largely been overlooked. This more subtle brand of aggression, known as relational aggression, often goes undetected by supervising adults and is often more covert in nature (Herrenkohl et al., 2007).

Relational aggression is defined as a brand of behavior that intentionally damages or has the potential to damage a relationship (Doyle & DeFago, 2009; Pellegrini & Roseth, 2006). Specifically, behaviors such as spreading lies, gossip, or secrets, ignoring or giving the silent treatment, and directly or covertly excluding a peer from an activity are used to bring harm or threaten to bring harm to relationships (Crick et al., 1999; Murray-Close, Ostrov, & Crick, 2007; Pellegrini & Roseth, 2006). This form of aggression may be direct (e.g., telling a person he or she is being excluded from a party) or indirect (e.g., spreading rumors about a person so that peers will reject him or her; Crick, Ostrov, & Werner, 2006; Doyle & DeFago, 2009). Due to evidence of significant commonality in the behaviors associated with indirect aggression, indirect bullying, relational aggression, and social aggression (e.g., Xie, Cairns, & Cairns, 2002; Xie, Swift, Cairns, & Cairns, 2002), relational aggression is the term that is characteristically used to
encompass all of these phenomena (Archer & Coyne, 2005; Coyne, Archer, & Eslea, 2006; Doyle & DeFago, 2009; Pellegrini & Roseth, 2006).

The interest in the topic of relational aggression has increased significantly over the past 15 years (Kuppens, Grietens, Onghena, Michiels, & Subramanian, 2008). Crick and Grotpeter first introduced the idea in 1995 defining relational aggression. Since that time the interest in the topic has grown immensely among the public and scholars alike resulting in the production of several movies and hundreds of popular books, research articles, and television episodes devoted to the topic. Despite this recent media attention, research regarding the prevention and treatment of relational aggression is sparse (Cappella & Weinstein, 2006).

**Outcomes Associated With Relational Aggression**

Victims of relational aggression endure significant and sometimes devastating outcomes, including lower rates of peer acceptance, lower school achievement, and higher rates of peer rejection, internalizing symptoms, feelings of loneliness, emotional distress, and drug use (Crick & Bigbee, 1998; Doyle & DeFago, 2009; Johnson & Foster, 2005; Ostrov & Keating, 2004; Sullivan, Farrell, & Kliewer, 2006; Woods & Wolke, 2004). Studies have reported that relational aggression is associated with adjustment problems in children and adolescents exhibiting such behavior, including peer rejection (Crick, 1996; Crick, Ostrov, Burr, et al., 2006); low social preference (Andreou, 2006); lower rates of peer acceptance (McNeilly-Choque, Hart, Robinson, Nelson, & Olsen, 1996) and prosocial behavior (Ostrov, Woods, Jansen, Casas, & Crick, 2004); internalizing problems such as depression, anxiety, loneliness, isolation, and withdrawal.
(Crick & Grotpeter, 1995; Crick, Ostrov, & Werner, 2006); and externalizing problems such as aggressive, disruptive, noncompliant, and antisocial behavior (Crick, Ostrov, & Werner, 2006; Marsee, Silverthorn, & Frick, 2005; Prinstein, Boergers, & Vernberg, 2001). Several studies have revealed more significant maladaptive effects for females than males, and evidence suggests that children who display gender non normative types of aggression (e.g., females who are physically aggressive and males who are relationally aggressive) may exhibit more psychosocial adjustment problems than those whose aggression is gender normative (Crick, 1996; Doyle & DeFago, 2006; Prinstein et al., 2001). Engagement in relational aggression has been shown over time to predict increases in social, psychological, and behavioral maladjustment, particularly internalizing and externalizing difficulties and peer rejection, among children (Crick 1996; Crick, Ostrov, & Werner, 2006; Werner & Grant, 2009).

Children who exhibit relational aggression are often significantly more maladjusted emotionally and socially than their nonrelationally aggressive peers (Crick & Grotpeter, 1995). Several studies have associated relational aggression with adjustment problems in children and adolescents, including peer rejection (Crick, 1996; Crick, Ostrov, Burr, et al., 2006); low social preference (Andreou, 2006); lower rates of peer acceptance (McNeilly-Choque et al., 1996) and prosocial behavior (Ostrov et al., 2004); internalizing problems such as depression, anxiety, loneliness, isolation, and withdrawal (Crick & Grotpeter, 1995; Crick, Ostrov, & Werner, 2006); and externalizing problems such as aggressive, disruptive, noncompliant, and antisocial behavior (Crick, Ostrov, & Werner, 2006; Marsee et al., 2005; Prinstein et al., 2001). More significant maladaptive
effects have been revealed for females than males, and evidence suggests that children who display gender non normative types of aggression (e.g., females who are physically aggressive and males who are relationally aggressive) may exhibit more psychosocial adjustment problems than those whose aggression is gender normative (Crick, 1996; Prinstein et al., 2001). Given the significance of problems associated with relational aggression, it is imperative that factors promoting this behavior are identified so that interventions can be implemented effectively (Crick, Grottpeter, & Bigbee, 2002).

**Statement of the Problem**

After the Columbine tragedy many schools began to focus on aggressive behavior and bullying resulting in policies that set limits on such behaviors. The majority of school anti-bullying policies concentrate on overt or physical aggression and, in turn, overlook more covert bullying behaviors such as exclusion, name-calling, and the spreading of rumors, which are commonly classified as relationally aggressive behaviors, despite findings that these indirect forms of aggression are the most common and problematic during the late childhood and adolescent years (Mullin-Rinder, 2003). Furthermore, indirect forms of aggression often lead to physical aggression. While statistics indicate that physical or overt aggression in school settings has decreased in recent years, which is likely due to the increase in policies and attention to this behavior, there is limited data on the occurrence of indirect forms of aggression (Mullin-Rinder, 2003).

Exposure to and engagement in relationally aggressive behaviors has been typically dismissed as a female rite of passage or as “girls being girls.” Research
indicates that among mothers relationally aggressive behaviors are considered to be more acceptable than physical aggression, and contributed less responsibility to the child for engaging in relationally aggressive behaviors (Werner & Grant, 2009). Relational aggression typically takes place within groups of friends and each member of the group is likely to take on a different role (victim, bystander, or aggressor) at any given point in time (Craig, Pepler, & Atlas, 2000; Sutton & Smith, 1999; Werner & Grant, 2009).

Evidence exists suggesting that, like overt aggression, individual differences in relational aggression tend to remain stable over time (Crick, 1996; Herrenkohl et al., 2007; Vaillancourt, Brendgen, Boivin, & Tremblay, 2003). This means that individuals who exhibit relationally aggressive behavior in elementary or middle school are likely to continue the behavior in later adolescence and even adulthood. As with most problem behaviors, the earlier the relational aggression is identified and addressed the more probable reoccurrence of the behavior can be eliminated or reduced (Herrenkohl et al., 2007). Therefore, it is imperative that relational aggression and the behaviors, traits, and conditions that are likely to contribute to the development of relational aggression assessment measures are detected early as a means of prevention. However, more needs to be learned about these predictors before assessment measures and effective interventions can be developed and implemented (Herrenkohl et al., 2007).
CHAPTER II

REVIEW OF THE LITERATURE

Parameters of the Literature Review

Publications selected for review were acquired by means of several series of literature searches. The following databases were used in order to search for books and journal articles: OhioLINK Psychology and Behavioral Sciences Collection, PsychINFO 1967-; ERIC (Education Resource Information Center); Education Research Complete; and MEDLINE. The search engines Google and Yahoo! were also utilized in order to locate research investigating the potential relationship between puberty onset and relational aggression. In addition to the previously mentioned databases, searches were conducted for mass produced books using search engines at the following sites: www.amazon.com, www.barnesandnoble.com, and OhioLINK Book Search (www.ohiolink.edu).

“Relational aggression” was the most often keyword combination used in searches for resources. This term was used in combination with other keywords when searches for empirical literature were conducted. The following terms were used in combination with relational aggression in databases searches: “developmental trajectory,” “predictors,” “gender differences,” “physical aggression,” “development,” “assessment,” “stability of,” “children,” “childhood,” “childhood physical aggression,” “parenting,” “parents,” “females,” “girls,” “outcomes females,” “outcomes,” “peers,” “middle childhood,” “elementary children,” “popularity,” “friendships,” “puberty,” “puberty onset,” “menarche,” “social skills,” and “sociometric status.” Occasionally in searches for
all literature types, the terms “bullying,” “social aggression,” and “indirect aggression” were used in addition to or as a replacement for the term relational aggression. Because no results were found for searches using the terms “relational aggression” and one of the following terms “puberty,” “puberty onset,” or “menarche,” searches were conducted using the term “aggression” combined with each of the three terms. In searches conducted specifically in pursuit of popular books, “relational aggression” was most often used as a singular keyword grouping; the terms “children,” “girls,” and “females.”

Literature regarding hierarchical linear modeling (HLM) was obtained through examination of textbooks and articles specifically addressing the rationale for and advantages of HLM in addition to the use of HLM in longitudinal studies and social, psychological, and educational research.

Exclusionary criteria was applied in order to ensure that only pertinent resources were selected for inclusion in the literature review. The scope of the literature review was adapted according to the topic being investigated. For example, there is virtually no prior research examining the relationship between onset of puberty among females and relational aggression. Consequently, literature exploring the link between overt aggression or physical aggression and puberty onset in females was considered for review as this research provides some background as possible relationship between relational aggression and onset of puberty. Because there is a relatively large amount of literature available exploring the connection between relational aggression and other factors (e.g., physical aggression, gender differences, etc.) more stringent exclusion standards were employed. Literature that involved primarily older adolescents and adults were generally
excluded because the current study does not include that age group. Publications focusing mainly on the connection between relational aggression and cognitive ability, academic achievement, or language development were excluded from this literature review because these factors are not explored in the current study. Studies concentrating on victims of relational aggression, relational aggression in romantic relationships, and racial differences in relational aggression were not included in the literature review because these topics are not relevant to the subject matter being explored in this study.

Females and Relational Aggression

Evidence indicates that girls are more attuned to and affected by relational aggression than boys. Relationally provoking situations (e.g., being excluded from a party) result in significantly higher levels of emotional distress for females (Crick et al., 2002). Relational aggression also appears to have greater long-term effects on social adjustment in females compared to males. Crick (1996) found that teacher-reported relational aggression in girls tended to contribute to overt aggression in the prediction of future social adjustment difficulties, whereas for males relational aggression did not contribute to overt aggression in the prediction of future social adjustment.

Crick and Grotpeter (1995) maintained that children resort to techniques that are likely to inflict the most damage to the social goals of a target when they intend to harm others. Boys tend to use physical forms of aggression that hinder the dominance goals of other boys, while girls use relational aggression in an attempt to hinder the goals of affiliation and intimacy that are typical of girls (Block, 1983; Crick & Grotpeter, 1995). Furthermore, acts of relational aggression are perceived by girls, in comparison to boys,
as being more hurtful and cruel, and, accordingly, girls often experience increased levels of emotional and physiological distress (Coyne et al., 2006; Cullerton-Sen et al., 2008; Galen & Underwood, 1997; Giles & Heyman, 2005). These findings support the assertion that girls tend to place greater value on relationships and, accordingly, are more hurt when relationships are put into jeopardy (Coyne et al., 2006).

Developmental Trajectory and Stability of Relational Aggression

Relational aggression has been shown to be highly stable across the developmental period (Doyle & DeFago, 2009). Crick (1996) followed 245 children ages 9–12 over the course of an academic year, assessing them three times during the year using peer nomination and teacher ratings of aggression. Relational aggression was reported to be relatively stable over a 6-month time period, with correlation coefficients of .68 for females and .56 for males. Crick, Ostrov and Werner (2006) reported comparable results for third and fourth grade children over a 1-year time period, with correlations of .55 for boys and .54 for girls on peer nomination measures. A generally high level of stability for an observational measure of relational aggression among preschoolers over the course of one academic year was reported, with a correlation coefficient of .59 between time 1 and time 2 results (Doyle & DeFago, 2009; Ostrov, Crick, & Stauffacher, 2006). Cillessen and Mayeux (2004) utilized a longitudinal design to examine the stability of relational aggression in 905 children and young adolescents in grades 5–9. Results from peer nominations indicated that correlation coefficients from grade to grade ranged from .37 (from grade 5 to grade 9) to .75 (from grade 7 to 8) for females, with similar patterns evident for males. Stabilities were highest across short
intervals and for older participants. A subsequent study over a 7-year period for grades 5 to 12 reported similar findings (Cillessen & Borch, 2006; Doyle & DeFago, 2009).

Children as young as three years of age have been found to exhibit relationally aggressive behavior (Ostrov, Crick, & Keating, 2005). While relational aggression is present throughout childhood, adolescence, and even adulthood, the nature of the behaviors changes in step with cognitive and social development. Middle childhood (fourth grade) or the late elementary school years are cited as being a period where relationally aggressive tactics become more complex and sophisticated. This, in tandem with the increased importance of peer acceptance and relationships which becomes salient at this age, leads to relational aggression becoming more substantial and its consequences more damaging (Crick & Dodge, 1999; Crick & Grot Peters, 1995; Rys & Bear, 1997).

**Relational Aggression and Physical Aggression**

Both physical and relational aggression are uncommon in populations of typically developing children. Crick, Ostrov, and Werner (2006) used peer nomination procedures to measure aggression in third grade children, and reported that the vast majority of youngsters did not meet the threshold for either physical or relational aggression (Doyle & DeFago, 2009). Their results indicated that 1.5% of their study participants displayed physical aggression only (more males than females), 1.3% exhibited relational aggression only (more females than males), and 1.3% exhibited both forms of aggression (Crick, Ostrov, & Werner, 2006; Doyle & DeFago, 2009). Rates of direct and relational bullying identified through interviews of 6- to 9-year-old children in the United Kingdom revealed
rates of 3.4% in the direct bullying category and 1.1% in the relational bullying category (Doyle & DeFago, 2009; Woods & Wolke, 2004). The incidence of physical and relational aggression in early adolescence has been reported to be between 1 and 2% for both males and females (Coyne et al., 2006; Doyle & DeFago, 2009). A study by Herrenkohl et al. (2007) conducted with seventh and ninth grade students found that the majority of participants (78.7%) were neither physically nor relationally aggressive. Approximately 6% of participants engaged in physically aggressive behavior alone, and 3.4% of participants perpetrated both physical and relational aggression (Herrenkohl et al., 2007).

Researchers have found that physical aggression and relational aggression are fairly interrelated, meaning that a child who engages in relational aggression may be more likely to engage in physical aggression. While relational aggression and physical aggression have been examined together as being markers of bully and peer harassment, the nature of the overlap between these behaviors or whether they possess a common etiology is unclear (Herrenkohl et al., 2007). Moderate correlations between physical and relational aggression for children of preschool age (McNeilly-Choque et al., 1996; Ostrov et al., 2006) and moderate to high associations between these constructs during middle childhood (Cillessen & Mayeux, 2004; Crick, Ostrov, & Werner, 2006) have been reported. In their meta-analysis of the relationships between physical and relational aggression using published and unpublished data from multiple informants, Crick et al. (1999) reported correlation coefficients ranging from .16 for observation methods to .63 for teacher ratings, with generally higher associations for females compared to males.
(Doyle & DeFago, 2009). Factor analytic studies have identified distinct overt and relational aggression constructs, although these tend to be significantly correlated (Crick & Bigbee, 1998; Crick & Grotpeter, 1995; Crick, Casas, & Mosher, 1997; Doyle & DeFago, 2009; McNeilly-Choque et al., 1996; Vaillancourt et al., 2003).

There is a significantly higher risk of later delinquency for youth who used direct bullying, such as hitting or other forms of direct physical aggression, compared with those who primarily used indirect forms of bullying, such as exclusion or ignoring (Herrenkohl et al., 2007). Although youth who engaged in relational aggression but not physical violence were lower on most risks than physically violent youth, they were higher than individuals who were not physically or relationally aggression on most risk factors.

**Relational Aggression and Social Competence**

In comparison to overt or physical aggression, relational aggression has been associated with higher levels of social intelligence (Andreou, 2006; Kaukiaienen et al., 1999). While social intelligence is typically associated with prosocial behaviors, it can be used as a tool which may be useful for antisocial behaviors as well (Andreou, 2006; Bjorkqvist, Lagerspetz, & Kaukiaienen, 2000; Kaukiaienen et al., 2002). Andreou (2006) found that social skills negatively predicted overt aggression, and relational aggression was positively linked with social information processing and social awareness. Relationally aggressive behaviors are inherently more socially sophisticated than physically aggressive behaviors. Consequently, the individuals who engage in relational
aggression need to possess higher levels of social information processing in order to perform such behaviors.

Models of social information processing indicate that children’s social behavior is a function of encoding social cues, interpreting social cues, clarifying goals, accessing or constructing a response, deciding on a response, and enactment (Crick & Dodge, 1994; Crick et al., 2002). Research indicates that physically and relationally aggressive children interpret provoking situations differently. Relationally aggressive children have a tendency to exhibit hostile attributional biases for specifically socially provoking situations, such as not being invited to a birthday party (Crick, 1995; Crick et al., 2002). Physically aggressive children are more likely to respond to instrumental provocations (e.g., getting pushed by a peer) with anger (Crick et al., 2002).

**The Influence of the Social Network**

Peer groups play a significant role in the shaping of both positive and negative behavior among children. These relationships with others, according to social identity theory, play an important role in self-appraisal, which motivates members of the peer group to create and maintain the norms of the group to achieve a positive group identity (Ellis & Zarbatany, 2007; Tarrant, 2002). This theory explains the conformity in the peer groups of children and adolescents and the development of antisocial behavior (Ellis & Zarbatany, 2007; Harris, 1995). A second factor which may explain the tendency of children and adolescents to conform to peer group norms involves group members passively falling victim to processes such as peer pressure, manipulation, and social
reinforcement that are employed by other group members to ensure that group norms are maintained (Brown, Clasen, & Eicher, 1986; Ellis & Zarbatany, 2007).

Peer group social status or centrality has been defined as the extent to which a peer group occupies a central location within a larger social group. Central peer groups are often very influential, and their level of influence may be enhanced by means of both prosocial and antisocial behaviors (Adler & Adler, 1995; Ellis & Zarbatany, 2007). The exclusivity of a central peer group and loyalty among its members are often maintained through relationally aggressive behaviors (Ellis & Zarbatany, 2007). In a study exploring the relationship between deviant behavior and peer group social status, which is defined as the degree to which a peer group occupies a central location within the larger social network, Ellis and Zarbatany found that children in centralized and highly relationally aggressive peer groups experienced an increase in relationally aggressive behavior over time. This increase did not occur for children who were in relationally aggressive, less central peer groups or for physically aggression behavior (Ellis & Zarbatany, 2007).

The Role of Parents

Several studies have looked at how various aspects of parenting relates to relational aggression. Parents can play a key role in the prevention and intervention, or, in some cases, contribute to the probability that their child will engage in relationally aggressive behaviors with peers. Investigating parenting related variables is perhaps the first step in the search for the developmental foundation of relational aggression. Broad parenting behaviors or styles have been linked to relational aggression, and studies have
identified unique parenting behaviors exist which may socialize relational aggression in children.

Research indicates that parental perceptions of relational aggression, and the likelihood of parents to intervene when their child engages in such behavior, may have an impact on the tendency for children to exhibit relationally aggressive behaviors. A study by Werner, Senich, and Przepyszny (2006) indicated that when presented with hypothetical situations involving physical and relational aggression, mothers were more likely to indicate that they would do nothing in response to relational aggression. Mothers who indicated that they would intervene reported that they would do so using methods that were significantly lower in power assertion and in communication that the child violated a moral rule (Werner et al., 2006). Children of mothers who reported that higher levels of rule violation in relationally aggressive behaviors were described by teachers as less relationally aggressive and demonstrating higher levels of prosocial behavior with peers (Werner et al., 2006). Werner and Grant (2009) found that mothers who reported that they would respond with higher levels of disapproval to their daughters’ relationally aggressive behavior had daughters who were significantly better accepted by peers and more prosocial according to teacher report. Overall, mothers in this study assigned less responsibility to their children when they engaged in relational aggression when compared to physical aggression and evaluated relationally aggressive behavior more positively than physically aggressive behavior (Werner & Grant, 2009). Differing beliefs regarding physical and relational aggression are likely a result of the damage done by relational aggression being less visible to outsiders and the fact that
children are likely to take on the roles of bystander, victim, and aggressor within the relational aggression cycle, which results in the harm being less concentrated on a single individual (Bauman & Del Rio, 2006; Craig et al., 2000; Sutton & Smith, 1999; Werner & Grant, 2009).

When looking at mothers’ perceptions of various types of aggression social learning theory indicates that parents who employ authoritarian strategies of parenting, which is a punitive style demanding strict adherence to rules and restricts open dialogue between the parent and child, will raise children who behave in a similar domineering fashion with peers (Casas et al., 2006; Sandstrom, 2007). Likewise, indulgent or permissive methods of parenting, characterized by the failure to set limits or boundaries, and relatively few behavioral expectations of children, may result in children with egocentric tendencies who expect that peers should accommodate their needs (Sandstrom, 2007).

Hart, Nelson, Robinson, Olsen, and McNeilly-Choque (1998) found that among a sample of Russian preschoolers more responsive parenting was linked to lower levels of relational aggression among boys and higher levels of relational aggression among girls. In a study including Chinese preschoolers a positive relationship was found to exist between mothers’ use of physical coercion and physical aggression in boys (Nelson, Hart, Yang, Olsen, & Jin, 2006; Sandstrom, 2007). Additionally, the use of psychological control by mothers and fathers, which is a brand of discipline involving the withdrawal of parental love and attention as an expression of displeasure with a child’s behavior or to manipulate behavior of children, was linked to relational aggression in girls (Casas et al.,
Maternal use of authoritarian strategies was correlated with both relational and overt aggression in Sandstrom’s study (2007) conducted with fourth grade students. The effects of permissive parenting were moderated by gender resulting in a positive relationship with relational aggression in girls and no significant association for boys (Sandstrom, 2007). However, Casas et al.’s study (2006) conducted with families with preschool age children found a significant connection between mothers’ permissive parenting and relational aggression among both boys and girls, suggesting that age may be a factor when considering the influence of parenting styles. A possible rationale for the link between permissive parenting and relational aggression is that as a result of this parenting style, girls enter the social world with a sense of entitlement and self-importance which conflicts with the nature of female friendships where interconnections and relationships are to be valued over personal agency (Sandstrom, 2007).

While permissive parenting is linked to female relational aggression, empathy and emotional warmth, a facet of this parenting style, serves as a protective factor associated with relational aggression. Barnett (1987) explained that parenting practices which foster empathy in children include those that are responsive to children’s emotional needs, allow for expression of emotions, and encourage children’s sensitivity to others. A study conducted with elementary school-aged children and their mothers confirmed this assertion finding that high levels of parental warmth and parental expression of positive emotions in the presence of the child were linked to high levels of empathy in children (Zhou et al., 2002). In turn, the absence of emotional connectedness and warmth between parent and child may lead to bullying behaviors, which include many of the same
behaviors as relational aggression, among children. Research indicates that maternal anger and low parent-child involvement is related to bullying behavior (Curtner-Smith, 2000; Curtner-Smith et al., 2006; Flouri & Buchanan, 2003). Bullies also report greater emotional distance between themselves and parents and more communication difficulties with parents than nonbullies (Bowers, Smith, & Binney, 1992; Curtner-Smith et al., 2006; Rigby, 1994). In a study differentiating between relational bullying behaviors and overt bullying behaviors, children with mothers who exhibited low levels of empathy for their children had higher scores for both overt and relational bullying when compared to children of mothers who were high in empathy (Curtner-Smith et al., 2006). The same study also found that mothers who had developmentally appropriate expectations of their children and who valued children’s independence over their own need to exert power had children with the lowest scores for relational bullying (Curtner-Smith et al., 2006).

Negative maternal affect was found by Brown, Arnold, Dobbs, and Doctoroff (2007) to be associated with relational aggression among children ranging from five to eight years of age.

**Perceived Popularity and Sociometric Popularity**

Investigations into the association between relational aggression and popularity have examined two moderately correlated but nonetheless distinct constructs: sociometric popularity and perceived popularity (Doyle & DeFago, 2009; LaFontana & Cillessen, 2002; Lease, Kennedy, & Axelrod, 2002; Parkhurst & Hopmeyer, 1998). Sociometric popularity describes how well-liked a person is by their peers and is typically measured using nominations where peers name who is liked-most and liked-least (Cillessen &
Mayeux, 2004). Perceived popularity is an indication of an individual’s social reputation and influence and is measured by means of peer identification of who is “popular” (Cillessen & Mayeux, 2004). A child who is sociometrically popular is not necessarily part of the popular crowd (Cillessen & Mayeux, 2004). Furthermore, a child who is part of the popular crowd is not necessarily sociometrically popular (Cillessen & Mayeux, 2004). Overall, perceived popularity has been found to be more stable than sociometric popularity or social preference due to the higher level of consensus regarding reputation compared to individual liking (Cillessen & Mayeux, 2004). Perceived popularity was found by Cillessen and Mayeux to be more stable among girls, and social preference was a more stable construct among boys.

Studies indicate that association between relational aggression and the two variations of popularity further differentiate the two constructs. A negative correlation was found to exist between social preference (sociometric popularity) and relational and physical aggression, whereas perceived popularity was positively correlated with both types of aggression in a study conducted with fourth through eighth grade students (LaFontana & Cillessen, 2002). In their longitudinal study of more than 900 children in grades five through nine, Cillessen and Mayeux (2004) reported that relational aggression reliably and positively predicted perceived popularity in each grade. A contrasting pattern was demonstrated for social preference; relational aggression was consistently and negatively associated with this “likeability” construct, and the magnitude of this effect increased over time. Gender and age effects of these reported associations also are evident, with more striking patterns being demonstrated for females (Cillessen &
Mayeux, 2004), and an age-related developmental trajectory characterized by a change in the direction of the association between relational aggression and perceived popularity between preschool/middle childhood and adolescence (Cillessen & Borch, 2006; Cillessen & Mayeux, 2004; Rose, Swenson, & Waller, 2004; Sandstrom & Cillessen, 2006).

**Relational Aggression and Pubertal Onset**

While the body of research regarding relational aggression and pubertal timing is very limited, existing studies show that the early onset of puberty is associated with increased engagement in aggressive and delinquent behaviors (Cota-Robles, Neiss, & Rowe, 2002; Lynne, Graber, Nichols, Brooks-Gunn, & Botvin, 2007). An explanation for this connection states as a result of looking older early matures are likely to be treated differently by peers and adults and may engage in behaviors that are typical of older adolescents at an earlier age than their peers (Lynne et al., 2007). In other words, the age-based social network is disrupted as early maturing peers may tend to associate with peers of comparable physical development (Lynne et al., 2007). Because signs of physical development are apparent in girls at a younger age, it is likely that early maturation may be more problematic for girls than boys. Lynne et al. (2007) found that association with delinquent peers served as a pathway between early pubertal onset and externalizing behaviors in a longitudinal study that spanned the middle school years. Results of this study also indicated that significantly higher rates of delinquent and aggressive behavior were reported by early matures.
Assessment of Relational Aggression

Best practice in addressing bullying behaviors, including relational aggression, involves a thorough approach of assessment, prevention, and intervention (Batsche, 1997; Crothers & Levinson, 2004). The first step in the prevention and intervention efforts is identification. Multiple methods for assessing relational aggression have been employed in past research including sociometric methods, interviews, teacher ratings, parent ratings, observation, and self-report. All of these methods are widely used and, furthermore, have their advantages and disadvantages (Pakaslahti & Keltikangas-Jarvinen, 2000).

Sociometric Methods

Sociometric methods typically involve peer nominations or rankings of an entire class of children based on the degree to which the child is liked or disliked or on specific descriptors (e.g., “keeps others from being in the group during activities or games,” “ignores or stops talking to other kids when they are mad at them”; Cillessen & Mayeux, 2004; Crick et al., 1999; Crothers & Levinson, 2004; Rose et al., 2004). Sociometric assessments can range from simplistic procedures such as having a child select from a collection of their classmates’ photographs who they feel fits a behavioral descriptor to as complex as bully and victim questionnaires incorporated into self-perception scales (Crothers & Levinson, 2004). In order to assess occurrences of peer victimization, children received nominations for “liking” and “disliking” in a study conducted by Dodge, Coie, Pettit, and Price (1990). A study by Bowers, Binney, and Smith (1994) used a picture sociogram which provided children with pictures of their classmates to sort
into two piles based on whether or not they bullied others. Other sociometric methods used in studies include peer nominations gathered from individual interviews with students, peer nomination questionnaires with items related to prosocial behavior, indirect aggression, direct aggression, and prosocial requiring students to identify three boys and three girls who acted in accordance with each item, and a picture nomination sociogram method asking students to pick three “most liked” individuals and three “least liked” individuals (Crothers & Levinson, 2004; Pakaslahti & Keltikangas-Jarvinen, 2000).

Sociometric procedures and peer assessment measures are useful when planning class-wide interventions (Crothers & Levinson, 2004). Advantages of sociometric approaches include the synthesis of ratings from multiple informants and their direct assessment within the peer social network (Merrell, Buchanan, & Tran, 2006), while limitations include potential age effects (i.e., the degree to which young children are able to reliably interpret peer behavior), gender-role stereotypes, and practical issues related to informed consent (Archer & Coyne, 2005; Doyle & DeFago, 2009; Merrell et al., 2006). However, research has suggested that children are adept at identifying bullies and victims within a classroom, and estimates of reliability have been satisfactory in studies reporting psychometric qualities of sociometric and peer assessment measures (Crothers & Levinson, 2004; Pakaslahti & Keltikangas-Jarvinen, 2000).

**Parent and Teacher Ratings**

Teacher ratings of relational aggression have demonstrated some promise, and have been recommended as a reliable indicator when peer nominations are not available (Crick, 1996; Doyle & DeFago, 2009). Peer and teacher ratings of relational aggression
have been found to be significantly correlated for both males and females (Crick, 1996). Teacher ratings have advantages as efficiency and ease of use, as well as strong psychometric properties (Crick & Bigbee, 1998; Doyle & DeFago, 2009; Merrell et al., 2006). They are also considered valuable because of the opportunities teachers have to observe students for extended periods of time in a variety of school settings (Pakaslahti & Keltikangas-Jarvinen, 2000). Additionally, teachers’ extensive experience with a large number of students provides them with an implicit sense of normative behavior against which to judge the behavior they observe (Pakaslahti & Keltikangas-Jarvinen, 2000).

Limitations of teacher ratings of relational aggression include potential informant bias resulting from a child’s reputation or gender stereotypes, a “wash out” effect of relational aggression in circumstances where high rates of physical aggression are evident, and possibilities that teachers are unaware of such covert behaviors (Crick & Bigbee, 1998; Doyle & DeFago, 2009; Merrell et al., 2006). Although parent ratings of relational aggression have been employed on only a limited basis, Crick adapted her teacher rating scale for use by parents (Crick & Bigbee, 1998), and parent ratings have been shown to be reliable indicators of this construct in large-scale population studies where implementation of sociometric approaches would not be practical (e.g., Vaillancourt et al., 2003).

**Student Interviews and Direct Observations**

Student interviews, using unstructured, semi-structured, or structured formats, have been employed in studies concerning relational aggression, especially with regard to investigations into the construction of this phenomenon and how it operates within peer
networks (e.g., Lease et al., 2002; Xie, Cairns, et al., 2002). Merrell et al. (2006) have suggested that student interviews may be particularly useful for investigating effects of relational aggression on victims (Doyle & DeFago, 2009). Self-report approaches, which ask children to identify the degree to which explicit descriptors are applicable to them, represent a fourth method for assessing relational aggression (Doyle & DeFago, 2009). Archer and Coyne (2005) suggested that self-report methods are not reliable for assessing relational aggression in children because of their inherent interest in keeping these behaviors unknown to adults, although this approach may have utility for deriving information about the effects of relational aggression on victims (Crick & Bigbee, 1998; Merrell et al., 2006). Yet, when interviews are conducted by personnel unaffiliated with the school system, students may be less concerned about divulging sensitive information and, therefore, may be able to discuss the occurrences of antisocial behavior and the motivations of those who engage in such behavior (Crothers & Levinson, 2004).

Direct observation methods have been employed in the assessment of relational aggression. While observations can be used to provide unbiased analyses of behavior when methods are objective and definitions are clear, they do not usually correlate well over time (Crothers & Levinson, 2004). However, these weaknesses can be minimized by observing behavior in multiple settings over an extended period of time (Crothers & Levinson, 2004; Pellegrini & Bartini, 2000). Ostrov et al. (2006) used naturalistic observation methods during preschoolers’ free-play activities to assess relational and physical aggression, and reported acceptable levels of reliability and intra-class correlations (Doyle & DeFago, 2009). McEvoy, Estrem, Rodriguez, and Olson’s (2003)
findings suggested that observation may be a more reliable measurement method of
relational aggression for females than for males. Merrell et al. (2006) have asserted that
observational methods have limited utility for assessing relational aggression because of
its covert nature, although methods that have incorporated video and audio technology
may have reduced reactivity and increase the reliability of observational data for
assessing relational aggression (Doyle & DeFago, 2009).

**Comparison of Assessment Methods**

As a result of differing perspectives, peers, teachers, and students themselves have
different information to offer regarding direct and indirect aggressive behavior. Research
regarding the correlation of multiple informants’ evaluations of aggression indicates that
teacher-peer consistency is greater than the consistency between self and peer ratings or
teacher and self ratings (Pakaslahti & Keltikangas-Jarvinen, 2000). For indirect
aggression, Pakaslahti and Keltikangas-Jarvinen found that peer, teacher, and self-
assessments were significantly correlated with consistencies between the ratings of the
peers and the teacher and between the teacher and the self being higher than the
correlation between peer ratings and self ratings. Consistency between peer and teacher
ratings on direct and indirect aggression decreased from early to late adolescence
(Pakaslahti & Keltikangas-Jarvinen, 2000).

Correspondence among different methods for assessing relational aggression has
been reported on meta-analytic studies, with correlation coefficients of .10 between peer
nomination and observation methods, .19 between teacher and parent ratings, .28
between peer and parent ratings, and .47 between peer and teacher nominations (Crick et
al., 1999; Doyle & DeFago, 2009). Some findings indicate that the extent of association across methods may vary by age and gender (Doyle & DeFago, 2009). For example, a contrast analysis of Crick et al.’s meta-analytic conclusions discovered that inter-informant agreement between peers and teachers increased with age (Doyle & DeFago, 2009). Other studies indicate that correspondence between multiple informants on behavioral and emotional problems is higher or equally as high for children when compared to adolescents (Cairns, Cairns, Neckerman, Ferguson, & Gariepy, 1989; Pakaslahti & Keltikangas-Jarvinen, 2000). With regard to gender differences, inconsistent patterns have been reported even when considering only studies involving preschool children. Some studies comparing teacher ratings and peer nominations have reported significant relationships for males but not females (McNeilly-Choque et al., 1996), some for females but not males (Crick et al., 1997), some for both males and females (Johnson & Foster, 2005; McEvoy et al., 2003; Nelson, Robinson, & Hart, 2005), and some for neither (Crick, Ostrov, Burr, et al., 2006; Doyle & DeFago, 2009). Teacher ratings and observations have been reported to have moderately high associations for both males and females in some instances (Ostrov & Keating, 2004), although others have reported modest relationships for females but not males (Crick, Ostrov, Burr, et al. 2006; McEvoy et al., 2003; McNeilly-Choque et al., 1996). Moderate correlations between observational measures and peer nominations were reported for males but not females in one study (McNeilly-Choque et al., 1996), although the opposite pattern was reported in another (McEvoy et al., 2003), and only nonsignificant relationships in a third (Crick, Ostrov, Burr, et al., 2006). Because of variability in correspondence across
measures of relational aggression, the use of multi-source, multi-methods for assessing relational aggression are frequently recommended to compensate for limitations associated with any single measurement approach (Archer & Coyne, 2005; Crick et al., 1999; Doyle & DeFago, 2009; McEvoy et al., 2003; Merrell et al., 2006).

Common Wisdom on Relational Aggression

The topic of relational aggression has garnered a considerable amount of attention in the past decade resulting in coverage by popular media and scholars alike. Coverage by popular media sources can serve as powerful platform for topics inspiring a level of awareness and interest among the masses that scholarly literature alone often cannot attain. Consequently, the extensive amount of popular wisdom available on the topic of relational aggression simply cannot be ignored.

Relational aggression is addressed in these best-selling books, articles in top-selling magazines, and hit movies in a compelling manner which is much more convincing to the lay public than the research that is presented in peer-reviewed journals. Although the information that is provided by research articles is invaluable and perhaps the best source for guidance regarding best practice, it is often not accessible to the parents, educators, and practitioners in the field that could benefit from such insight the most. Furthermore, empirical publications on relational aggression typically address specific facets of the topic which provides explicit information on the theme being explored, yet often fails to look at the big picture and provide practical suggestions. Popular literature offers a sampling of information on many topics associated with relational aggression therefore offering practical advice in a format that can be easily
understood and applied by the lay public. In this section the themes explored in popular publications are reviewed and compared to the findings that are cited in the academic literature researching relational aggression.

**Facts and Misconceptions**

Burton addressed adolescent girls in her book *Girls Against Girls: Why We Are Mean to Each Other and How We Can Change* (2009) regarding the gender differences discussing how girls are more skilled in communication, possess a greater awareness of their emotions, and place more value on sustained relationships with others. There are also discussions related to the influence of hormones and brain development during adolescence which results in misinterpretations of social situations and drastic changes in emotions (Burton, 2009). The significance placed on relationships by women is well supported by research on relational aggression (Coyne et al., 2006; Cullerton-Sen et al., 2008; Galen & Underwood, 1997).

In the book *Mean Girls Grown Up: Adult Women Who Are Still Queen Bees, Middle Bees, and Afraid-to-Bees* (Dellasega, 2005), gender differences which predispose women to relational aggression at all ages are discussed including women’s inclination to hold in higher regard the welfare of the group rather than individual achievement; the importance of relationships to women’s self-identity; and women’s ability to better interpret social cues when compared to men. These differences, which should result in closer bonds with others, often lead to relationally aggressive behavior, which damages the relationships that females yearn to form and maintain (Dellasega, 2005). Dellasega also elaborated on how these differences change over time making reference to the
different nature of men’s relationships when compared to women’s relationships. Women tend to form closer bonds with female friends than men form with same-sex friends. While men often have “buddies” or “neutral” acquaintances with whom they do activities, women’s same-sex relationships are typically much more emotionally-charged (Dellasega, 2005).

The cultural expectations regarding female behavior are explored in detail in popular literature. “Our culture refuses girls access to open conflict, and it forces their aggression into nonphysical, indirect, and covert forms” (Simmons, 2002, p. 3). Girls are expected to mature into nurturing caretakers; consequently, being friendly, agreeable, and nice is valued above all else (Simmons, 2002). Behaviors that are even mildly associated with aggression (e.g., arguing, speaking loud, noncompliance) are discouraged by adults early in girls’ lives (Simmons, 2002). The idea that overt aggression is discouraged among girls due to the desire gender-related expectations and the fear of losing friendships is addressed by Burton (2009) and is considered as a possible motive for relationally aggressive behavior due to the repression of feelings of anger. It is further explained that these angry feelings often resurface and result in girls talking to other girls about the person that upset them, which starts a cycle of gossip and rumors throughout the social group and other relationally aggressive behaviors (Burton, 2009). Males have been found to exhibit higher rates of physical aggression when compared to females at all ages (Bjorkqvist et al., 1992; Bonica, Arnold, Fisher, Zeljo, & Yershova, 2003; Crick, 1996; Crick et al., 1997; Crick & Grotpeter, 1995; Crick, Ostrov, Burr, et al., 2006; Crick & Bigbee, 1998; Doyle & DeFago, 2009; Ostrov & Keating, 2004). While it could be
theorized that girls are conditioned to refrain from physically aggressive behavior, there is no empirical evidence suggesting the significance of such conditioning or that refraining from physically aggressive behaviors results in the expression of anger via relational aggression.

In *Queen Bees and Wannabes: Helping Your Daughter Survive Cliques, Gossip, Boyfriends, and Other Realities of Adolescence*, Wiseman (2002) differentiated between “good” and “evil” popularity. Good popularity is described as when a girl is genuinely liked by others because she is nice to people (Wiseman, 2002). This positive variation of popularity is referred to as sociometric popularity in research literature, and is not considered to be linked to relational aggression or maladaptive social behaviors (Cillessen & Mayeux, 2004; LaFontana & Cillessen, 2002). Wiseman (2002) explained the concept of good popularity by stating that if parents could spy on their daughter (who is popular in a good way) they would be proud of how she treats other girls. Evil popularity refers to the concept of perceived popularity, an individual’s social reputation and influence, which has been linked to relational aggression (Cillessen & Mayeux, 2004). When defining “evil” popularity Wiseman (2002) referred to the roles of the social clique members: Queen Bee, Sidekick, Banker, Floater, Torn Bystander, Pleaser/Wannabe/Messenger, and Target. The Queen Bee, who is considered to possess this “evil” popularity by Wiseman, acquires popularity through fear and control and fits the quintessential description of a relationally aggressive girl as featured in much of the available research on the topic. “Through a combination of charisma, force, money, looks, will, and manipulation, this girl reigns supreme over the other girls and weakens
their friendships with others, thereby strengthening her own power and influence” 
(Wiseman, 2002, p. 25). Dellasega (2005) also categorized adult females as Queen Bees, 
Middle Bees, or Afraid-to-Bees based on their behavior and even provided a self-quiz to 
help the reader identify to which group she may belong. The description of the behaviors 
exhibited by the Queen Bee is consistent with what most researchers describe as 
relationally aggressive behavior.

A clique is defined as a “narrow exclusive group of persons; especially one held 
together by common interests, views, or purposes” (Merriam-Webster, 2009, definition). 
Wiseman (2002) stated that cliques are most detrimental in sixth, seventh, and eighth 
grades. The research on relational aggression and popularity indicates that cliques or 
peer groups typically become more of an influential factor during the middle school 
years. Cliques certainly do not disappear in adulthood; they just become more complex 
and differentiated with cliques at work, church, within extended families, and even in the 
PTO or other organizations in which women dominate (Dellasega, 2005). It is natural for 
cliques to occur in all settings and stages of life; however, high levels of exclusivity in 
cliques often prompt members to use relationally aggressive tactics to further the values, 
norms, and status of the group. Grotpeter and Crick (1996) found that the friendships of 
relationally aggressive children were characterized by greater intimacy. Additionally, 
teacher ratings in a study conducted by Sebanc (2003) indicated that children’s friendship 
exclusivity and intimacy were related to relational aggression.

Although gossiping is not a topic that is specifically addressed in empirical 
literature on relational aggression, it is certainly a relevant theme among adolescent girls
and is included in the majority of definitions of relationally aggressive behavior. Gossiping is addressed by Wiseman (2002) in a manner that encourages parents to recognize that gossip does occur and provides them with advice on how to best handle situations where their daughter is the one talking or being talked about. Burton maintained that gossip may serve as a bonding activity or an avenue for girls to gain acceptance among their peers, but it can also be malicious in intent.

The topic of parenting is also addressed in the popular literature on relational aggression. Wiseman (2002) provided descriptions of various parenting styles similar to those identified by researchers in the field (e.g., Baumrind). She encouraged an authoritative parenting style as well as provided advice to parents on how to encourage open communication. The major motion picture Mean Girls also provides an accurate portrayal of the permissive parenting style that researchers have linked with relational aggression in children (Messick, Michaels, Rosner, & Waters, 2004). The mother of Regina George, who is the “Queen Bee” of the clique featured in the movie, is depicted as a permissive mother who offers to let Regina and her friends drink at her house. While Burton (2009) did not specifically refer to parenting styles, she did convey that girls may learn to be cruel to one another from older women who have treated them in the same manner. The link between parental relational aggression and the use of psychological control tactics and authoritarian strategies among parents is well documented.
Research on Hierarchical Linear Modeling

Why Use Hierarchical Linear Modeling?

Much of social and developmental research involves hierarchical structures (Lee, 2000; Raudenbush & Bryk, 2002). Individuals within a population exist within clusters. These clusters can refer to the neighborhoods in which people live, group membership, the schools people attend, or the schools children attend (O’Connell & McCoach, 2008). As a result, data are often nested within persons, organizational units, and/or communities (O’Connell & McCoach, 2008; Raudenbush & Bryk, 2002). A participant in a study may be a member of a certain class that is housed within a school which exists within a school district thus creating a hierarchy. Hierarchical linear modeling (HLM) is a statistical methodology where variables are measured at different levels of a hierarchy (Raudenbush & Bryk, 2002). HLM models the nested nature of a data set by modeling the dependencies within the nesting units (Raudenbush & Bryk, 2002). HLM or multilevel analyses also allow us to look at effects occurring at each level and across levels. For example, a researcher may be investigating the effectiveness of a certain math curriculum and the influence of a student’s cognitive ability and socio-economic status on math achievement test scores. HLM allows for the specific analysis of data such as this.

Nesting implies that unit clusters within a larger unit are correlated, which is a violation of the assumption of independent observations in regression analyses and in analysis of variance which threatens the validity of a model (Raudenbush & Bryk, 2002). Most studies fail to address the hierarchical nature of social and behavioral data adequately. This neglect is reflected in the limited ability of traditional statistical
techniques in modeling hierarchy (O’Connell & McCoach, 2008; Raudenbush & Bryk, 2002). The disregard for the inherent nested structure of data results in an inability to distinguish between the within- and between-group variance (O’Connell & McCoach, 2008). When clustering or nesting is ignored, the estimates of variances derived from the sample tend to be much smaller than what would be expected if the clustered nature of the data had been incorporated into the calculation, which threatens the internal validity of the analysis (O’Connell & McCoach, 2008). Sources of hierarchical variability cannot be ignored without compromising the validity of results and the conclusions of research (O’Connell & McCoach, 2008).

Hierarchical linear models accommodate the structure of many settings in which research occurs (O’Connell, & McCoach, 2008). HLM has the ability to reflect the relationships that may exist between clusters or levels and represents each of the levels in a hierarchy by its own submodel (O’Connell & McCoach, 2008; Raudenbush & Bryk, 2002). These submodels convey the relationships among variables at a given level and indicate how variables at one level influence interactions occurring at another level thereby improving the estimation of individual effects (Raudenbush & Bryk, 2002).

**Using HLM with Longitudinal Studies**

In longitudinal studies where multiple observations are gathered over a period of time the repeated measures include information about each individual (Raudenbush & Bryk, 2002). The manner in which conditions or characteristics that occur over time influence the expression of the variable being measured is typically of interest to researchers (Raudenbush & Bryk, 2002). Observations taken repeatedly across
individuals tend to be similar just as observations taken from individuals within a cluster (O’Connell & McCoach, 2008). Consequently, repeated measures designs are vulnerable to the same intra-unit dependency problems as data collected from clustered sample designs (O’Connell & McCoach, 2008). Multilevel models, such as HLM, accommodate intra-individual correlation with each person in the longitudinal study serving as his or her own nesting unit or cluster (O’Connell & McCoach, 2008).

Severe constraints are placed on the form of data when traditional approaches for analyzing longitudinal data (e.g., repeated measures MANOVA or ANOVA techniques) are employed (O’Connell & McCoach, 2008). The most problematic constraints are related to the necessity for a time-structured data collection schedule which requires that data are collected at the same time for all individuals (O’Connell & McCoach, 2008). Listwise deletion procedures, which are used by default to discard missing data, result in a much-reduced data set that often does not accurately represent the originally sampled population (O’Connell & McCoach, 2008). The data in HLM and other multileveled modeling procedures are nested within the individual, which allows for a more flexible person-specific data collection schedule (O’Connell & McCoach, 2008). Furthermore, the flexibility afforded by HLM procedures allows for researchers to estimate person-specific growth patterns and examine relationships with covariates to model intra- and inter-person variability (O’Connell & McCoach, 2008).

**The Current Study**

This discussion illustrates the complex landscape associated with the phenomenon of relational aggression. This study replicates previous findings in several areas, as well
as contributes new information about the developmental trajectory of relational aggression, factors or behaviors identified in childhood or early adolescence that may increase the likelihood that an individual will engage in relational aggression later in life, and the utility of measures of relational aggression from multiple informants. The following research questions are examined:

1. What is the stability of relational aggression among females in grades 3, 4, 5 and 6?
   a. Null Hypothesis: Levels of relational aggression will remain stable among females in grades 3, 4, 5, and 6.
   b. Research Hypothesis: Levels of relational aggression will increase for females resulting in the highest levels of relationally aggressive behavior occurring in grades 5 and 6.

2. What are the longitudinal relationships between relational aggression and measures of physical aggression, social skills, peer support/network, friendship quality, and parental support?
   a. Null Hypothesis: Longitudinal relationships between relational aggression and measures of physical aggression, social skills, peer network, friendship quality, and parental support will not be found to exist.
   b. Research Hypothesis: Higher levels of physical aggression and lower levels of social skills, peer network, friendship quality, and parental support at all ages will be associated with increases in relational aggression over time.
3. Does a relationship exist between relational aggression and factors such as sociometric status and popularity?
   a. Null Hypothesis: There will be no relationship between relational aggression and sociometric status or popularity
   b. Research Hypothesis: Sociometric status will be negatively correlated with relational aggression, whereas popularity will be positive correlated with relational aggression.

4. Does a relationship exist between the onset of puberty and levels of relational aggression?
   a. Null Hypothesis: Pubertal onset will not be related to the levels of relational aggression.
   b. Research Hypothesis: Girls who experience puberty early will have higher scores on measures of relational aggression.
CHAPTER III
METHODOLOGY

Participants

Participants were recruited through hospital visits to mothers after the birth of a child in 1991 in 10 sites throughout the United States. Participants in the National Institute for Child Health and Development Study of Early Child Care were recruited from hospitals located in or near Little Rock, Arkansas; Irvine, California; Lawrence, Kansas; Boston, Massachusetts; Philadelphia, Pennsylvania; Pittsburgh, Pennsylvania; Charlottesville, Virginia; Morganton, North Carolina; Seattle, Washington; and Madison, Wisconsin for Phase 1 of data collection which began in 1991 when participants were one month old. Recruitment began in January 1991 and was completed in November 1991. A total of 1,364 families with full-term healthy newborns were enrolled. Participants were selected in accordance with a conditionally random sampling plan, which was designed to ensure that the recruited families included mothers who planned to work or to go to school in the child's first year, as well as some who planned to stay at home with the child and reflected the demographic diversity (economic, educational, and ethnic) of the sites. Both two-parent and single-parent families were included. Exclusionary criteria for participants included maternal age below 18 years, mother not conversant in English, known or acknowledged maternal substance abuse, serious medical complications in the infant, and residence in a neighborhood deemed by police as unsafe for visitation.

A total of 1,364 families with full-term healthy newborns were enrolled in the study in 1991. Only 261 participants dropped out of the NICHD-SECC study between
Phase 1 and Phase 2. Thus, 1,103 families continued participation through Phase II. Phase 3 of the NICHD-SECC involved 1,077 families, which is 79% of the families recruited at the start of Phase I. Data collection for Phase 3 occurred while participating children were in second grade through sixth grade.

Researchers followed the children, measuring their development at frequent intervals from birth through sixth grade. In 1991, the researchers enrolled 1,364 children in the study. Phase 1 of the study was conducted from 1991–1994, following the children from birth to age 3 years. Phase 2 of the study was conducted between 1995–2000, and Phase 3 of the study was conducted between 2000–2005 to follow over 1,100 of the children through their seventh year in school. The current study included the 513 female children involved in Phase 1, Phase 2, and Phase 3 of the NICHD-SECC.

**Instruments**

The independent variables utilized in this study include measures of social competence, overt aggression, relational aggression, cognitive ability, and academic achievement. Demographic information was collected during a home visit conducted by NICHD Study of Early Child Care investigators and research staff. Questionnaires and norm-referenced assessments were administered during school, home, and laboratory visits during Phases 1, 2, and 3 of data collection. The Cronbach’s alpha levels cited within the description of each instrument are from Phase 3 of data collection with the population included in the current study.
**Child Behavior with Peers**

The Child Behavior with Peers questionnaire was designed by NICHD-SECC researchers to measure peer-related behaviors. It was comprised of 43 items adapted from the following measures: Child Behavior Scale (Ladd & Profilet, 1996), the Peer Victimization Scale (Kochenderfer & Ladd, 1996), and the Relational Aggression Scale (Crick, Bigbee, & Howes, 1996). Thirty-seven items were from Ladd’s revision of the Child Behavior Scale measuring aggression, prosocial and asocial behavior with peers, exclusion by peers, bullying, and victimization. Six items measuring relational aggression were from Crick’s 1996 Children’s Social Behavior Scale. Respondents were asked to rate the study child’s behavior with peers on a 3-point scale (0 = Not True, 1 = Sometimes True, and 2 = Often True). The scale of Relational Aggression on the questionnaires completed by the participants’ teachers in grades three through six was used for this study. Cronbach’s alpha for the scale of Relational Aggression for grades three through six ranged from .84 to .87.

**Teacher Report Form**

The Teacher Report Form (TRF) obtains the teacher’s reports of adaptive functioning and problems of students in a standardized format (Achenbach, 1991). It is modeled on the Child Behavior Checklist/4-18, which gathers parents’ reports of a child’s competences and limitations. A series of behaviors were rated on 3 point scales from 0 (not true of the child) to 2 (very true of the child). Broad band scales of Internalizing and Externalizing problems and narrow band scales of Social Problems, Aggressive Behavior, Attention Problems, and Anxiety/Depression were derived from
the teachers’ ratings. The narrow band scale of Aggressive Behavior for grades kindergarten through six was utilized in the current study. Cronbach’s alpha levels for the scales ranged from .81 to .95.

**Social Skills Rating System**

The Social Skills Rating System (SSRS) provides a broad assessment of child social skills documenting the perceived frequency of target behaviors that influence the student’s development of social competence and adaptive functioning (Gresham & Elliott, 1990). The response levels for each item were 0 = Never, 1 = Sometimes, and 2 = Very Often. Social skills are defined as acceptable, learned behaviors that enable a person to interact effectively with others and to avoid socially unacceptable responses. Sharing, help, initiating relationships, and controlling one’s temper are all examples of social skills that are commonly valued in society. For this study the Social Skills Total Score from the teacher form for kindergarten through sixth grade was used. Cronbach’s alpha levels for the Social Skills Total Score ranged from .93 to .94.

**Contacts with Peers**

Descriptive information regarding how many friends the child has, the names of friend, and friendship quality was obtained from the students’ teachers using this questionnaire which is an unpublished questionnaire created by Vandell (1999). The Mean Friendship Quality with Study Child’s Close Friends scores from grades three through six were used in the current study. Cronbach’s alpha levels for this score ranged from .78 to .83.
Child-Parent Relationship Scale

The parent’s report of the study child’s parental attachment was assessed using this questionnaire which was adapted from the Student-Teacher Relationship Scale (Pianta, 1992). The 15 questionnaire items assessed the parent’s feelings and beliefs about his or her relationship with the study child. The Total Positive Relationship with Child score, which is a sum of items 1-15, was used in the current study. This score had reliabilities ranging from .81 to .84 with Cronbach’s alpha levels ranging from .82 to .87.

Sociometric Status

This measure consisting of four items was created by the NICHD-SECC research group as a means of assessing how well the child is liked or disliked by his or her peers as well as the child’s aggressive behavior, and the child’s social position among peers. Sociometric information was collected by teacher report as the logistical and staff demands of obtaining informed consent from families made the standard sociometric nomination process unfeasible. The Well Liked by Peers scale, which was completed in grade 2, was used in the current study. Ratings between the main teacher and the second teacher, which rated 20% of the children in the scale development sample, correlated .39 for the well-liked scale. Children who were rated by teachers using this measure as high on the well-liked scale were nominated by peers to be high on being a leader ($r = .42, p < .001$) and low on starting fights ($r = -.27, p < .001$) and getting in trouble ($r = -.23, p < .001$).
**Popularity**

This questionnaire requires the teacher to make sociometric ratings of the child’s popularity in the classroom setting. A child’s popularity among peers is highly influenced by his or her social competence. Teacher’s Rating of Child’s Peer Status, which was the score used in the current study, was computed as the sum of responses to four questions. The overall rating of the child’s peer status had moderate internal reliability with a Cronbach’s alpha levels of .89 for the score collected in sixth grade.

**Health and Physical Development Assessment (HPDA)**

Annual HPDA exams were conducted by adequately trained NICHD-SECC research associates starting at age nine and a half. The focus of the exam was the evaluation of the child’s Tanner state of development. The procedures included in the examination reflected recommendations from Lorah Dorn, a researcher in pubertal development at the University of Pittsburgh School of Nursing, and Karen Winer, a pediatric endocrinologist at NICHD. Tanner stages for girls were based on instructions from the American Academic of Pediatrics manual, Assessment of sexual maturity stages in girls. The Tanner stages for pubic hair and breast development at grade six were used for the current study.

**Peer Network Characteristics**

This questionnaire asks the mother to describe the group of kids the study child “hangs out with.” Child’s Positive Peer Group Score, which was the score used in the current study, was computed as the sum of items 1–6 and 8–9, after reflecting items 2–5.
This score was imputed by proportional weighting. The Cronbach’s alpha level for the Positive Peer Group Score was .84.

**Procedure**

Data were collected under the auspices of the NICHD Study of Early Child Care (SECC; http://secc.rti.org; NICHD-SECC, 2005), a longitudinal study funded by NICHD that has followed participant children’s family, child care, and school experiences since 1991. The NICHD Study of Early Child Care (SECC) is a comprehensive longitudinal study initiated by The National Institute of Child Health and Human Development (NICHD) in 1989 to answer the many questions about the relationship between child care experiences and characteristics and children's developmental outcomes. After a thorough scientific review, the NICHD selected a research team located at universities across the U.S., and at the NICHD, together providing multiple perspectives on and interests in child care research.

Beginning with the time of enrollment (the 1-month home visit), families were scheduled for extensive periodic data collections. Research assistants from the 10 data collection sites saw each child at home, in child care (if used), in school, and in a laboratory playroom. Telephone updates were completed every 3 months in Phase 1, every 4 months in Phase 2 (ending at child-age 54 months), with a 6-month phone follow-up at child-age 60 months, and annual phone contacts throughout Phase 3 (NICHD, 2001).

The raw data collected as part of the NICHD-SECC were examined and composites defined by small groups of individual principal investigators according to the
demographic, family, child care, and child outcome content of the data. The psychometric and distributional qualities of the variables along with site differences were examined. The variables chosen by the small groups of investigators were recommended to and ratified by the Study Steering Committee. The final set of ratified variables comprise the final set of NICHD-SECC data.

**Data Analysis**

Hierarchical linear modeling (HLM) was used to analyze data in this study. In this study, repeated observations were examined over time in level 1 and within people in level 2 (Reich, Bickman, and Heflinger, 2004). Within-person change is predicted by the level 1 model usually as a function of time and possibly as a function of predictors that were measured at each wave (Welte, Barnes, Hoffman, Wieczorek, & Zhang, 2005). The parameters in the level 1 regression model are modeled in the level 2 regression as a function of predictors that are measured once for each subject (Welte et al., 2005). The level 2 model also may contain random error terms, so that the level 1 parameters associated with the error term can be considered to be randomly varying across subjects.

The first analysis explores within-person growth in the relational aggression over time. Initially, an unconditional model was fitted to provide evidence for determining a proper specification of the individual growth equation and baseline statistics for evaluating subsequent level 2 models. A linear growth model was used due to the number of observations per student. For this investigation, grade was centered around the initial relational aggression score which is grade three. It is necessary to center grade because intercepts and slopes from level 1 become the outcome variable at level 2;
therefore, these variables need to have precise meaning to allow for statistical results to be meaningfully interpreted. The equation expressing this individual change is

\[ Y_{ti} = \pi_{0i} + \pi_{1i} (GRADE)_{ti} + e_{ti}, \]

where

- \( Y_{ti} \) is relational aggression score at time \( t \) for student \( i \);
- \( (GRADE)_{ti} \) is the grade at time \( t \) for student \( i \), centered around the earliest grade;
- \( \pi_{0i} \) is student \( i \)'s true relational aggression score at the earliest grade;
- \( \pi_{1i} \) is the growth rate in relational aggression for student \( i \);
- \( e_{ti} \) is the residual error at time \( t \).

The equations for group-level change explored growth in relational aggression over time are as follows:

\[
\begin{align*}
\pi_{0i} &= \gamma_{00} + r_{0i}, \\
\pi_{1i} &= \gamma_{10} + r_{1i},
\end{align*}
\]

where

- \( \gamma_{00} \) is the average relational aggression score for the population;
- \( \gamma_{10} \) is the population average of true yearly growth rate in relational aggression;
- \( r_{0i} \) is the residual error for student \( i \) on average relational aggression;
- \( r_{1i} \) is the residual error for student \( i \) on growth in relational aggression.
In order to explore the influence of predictors on relational aggression over time, analysis at level 1 modeled the within-person trajectory of relational aggression with repeated measures of relational aggression and the time-varying covariates (e.g., physical aggression, social skills, peer competence, friendship quality, and parental support) for each student. A linear growth model was used due to the number of observations per student. Grade was centered around the initial relational aggression score. The time-varying covariates were centered around the group-mean to ensure unbiased estimates of the relationships between these level 1 predictors and outcomes.

The Level 1 individual growth model of relational aggression at time $t$ of student $i$ is:

$$ Y_{ti} = \pi_{0i} + \pi_{1i} (GRADE)_{ti} + \pi_{2i} (PHYS\_AGG)_{ti} + \pi_{3i} (SOC\_SKILLS)_{ti} + \pi_{4i} (FRIEND\_QUAL)_{ti} + \pi_{5i} (PARENT\_SUP)_{ti} + e_{ti}, $$

where

- $Y_{ti}$ is relational aggression score at time $t$ for student $i$;
- $(GRADE)_{ti}$ is the grade at time $t$ for student $i$, centered around the earliest grade;
- $(PHYS\_AGG)_{ti}$ is physical aggression score at time $t$ for student $i$, centered around the group mean;
- $(SOC\_SKILLS)_{ti}$ is social skills score at time $t$ for student $i$, centered around the group mean;
- $(FRIEND\_QUAL)_{ti}$ is friendship quality score at time $t$ for student $i$, centered around the group mean;
• \((PARENT\_SUP)_{ti}\) is parental support score at time \(t\) for student \(i\), centered around the group mean;

• \(\pi_{0i}\) is student \(i\)'s true relational aggression score at the earliest grade;

• \(\pi_{1i}\) is the growth rate in relational aggression for student \(i\);

• \(\pi_{2i}\) is the strength of the longitudinal relationship between physical aggression and relational aggression for student \(i\);

• \(\pi_{3i}\) is the strength of the longitudinal relationship between social skills and relational aggression for student \(i\);

• \(\pi_{4i}\) is the strength of the longitudinal relationship between friendship quality and relational aggression for student \(i\);

• \(\pi_{5i}\) is the strength of the longitudinal relationship between parental support and relational aggression for student \(i\);

• \(e_{ti}\) is the residual error at time \(t\).

Level 2 analysis included time-invariant variables to model group-level change. Because six parameters were specified in the level-1 model, the six level-2 equations are as follows:

\[
\begin{align*}
\pi_{0i} &= \gamma_{00} + \gamma_{01}(SOCIO)_{i} + \gamma_{02}(POP)_{i} + \gamma_{03}(PUB)_{i} + \gamma_{04}(PEER\_NET)_{i} + r_{0i}, \\
\pi_{1i} &= \gamma_{10} + \gamma_{11}(SOCIO)_{i} + \gamma_{12}(POP)_{i} + \gamma_{13}(PUB)_{i} + \gamma_{14}(PEER\_NET)_{i} + r_{1i}, \\
\pi_{2i} &= \gamma_{20}, \\
\pi_{3i} &= \gamma_{30}.
\end{align*}
\]
\[ \pi_{4i} = \gamma_{40}, \]
\[ \pi_{5i} = \gamma_{50}, \]

where

- \((SOCIO)_i\) is the sociometric status score of the individual centered around the grand mean;
- \((POP)_i\) is the popularity score of the individual centered around the grand mean;
- \((PUB)_i\) is the individual’s age of pubertal onset centered around the grand mean;
- \((PEER_NET)_i\) is the peer network score of the individual centered around the grand mean;
- \(\gamma_{00}\) is the average relational aggression score for the population;
- \(\gamma_{01}\) is the effect of sociometric status on the population average of relational aggression in third grade;
- \(\gamma_{02}\) is the effect of popularity on the population average of relational aggression in third grade;
- \(\gamma_{03}\) is the effect of pubertal timing on the population average of relational aggression in third grade;
- \(\gamma_{04}\) is the effect of peer network on the population average of relational aggression in third grade;
\( \gamma_{10} \) is the population average of the true yearly growth rate in relational aggression for individuals who have average popularity and sociometric status, reached puberty at the average age, and have the mean score for peer network;

\( \gamma_{11} \) is the effect of sociometric status on the difference in the population average of true yearly growth in relational aggression;

\( \gamma_{12} \) is the effect of popularity on the difference in the population average of true yearly growth in relational aggression;

\( \gamma_{13} \) is the effect of pubertal timing on the difference in the population average of true yearly growth in relational aggression;

\( \gamma_{14} \) is the effect of peer network on the difference in the population average of true yearly growth in relational aggression;

\( \gamma_{20} \) is the effect of physical aggression on the population average of the true yearly growth rate in relational aggression for individuals who have average popularity and sociometric status, reached puberty at the average age, and have the mean score for peer network;
• \( \gamma_{30} \) is the effect of social skills on the population average of the true yearly growth rate in relational aggression for individuals who have average popularity and sociometric status, reached puberty at the average age, and have the mean score for peer network;

• \( \gamma_{40} \) is the effect of friendship quality on the population average of the true yearly growth rate in relational aggression for individuals who have average popularity and sociometric status, reached puberty at the average age, and have the mean score for peer network;

• \( \gamma_{50} \) is the effect of parental support on the population average of the true yearly growth rate in relational aggression for individuals who have average popularity and sociometric status, reached puberty at the average age, and have the mean score for peer network;

• \( r_{0i} \) is the residual error for student \( i \) on average relational aggression controlling for all other variables;

• \( r_{1i} \) is the residual error for student \( i \) on growth in relational aggression after controlling for all other variables.

The research questions intended to explore the stability of relational aggression among females, and the influence of various predictors on the trajectory of relational aggression over time. It is hypothesized that levels of relational aggression will increase
for females with higher levels of physical aggression and lower levels of social skills, peer support, friendship quality, and parental support at all ages associated with relational aggression. The strength of these relationships will increase with age. Lower levels of sociometric status will be negatively correlated with relational aggression, whereas popularity will be positively correlated with relational aggression. It is also hypothesized that girls who experience puberty early will have higher scores on measures of relational aggression.
CHAPTER IV

RESULTS

Introduction

The following chapter includes results of the analyses exploring relational aggression and its connection with other variables. Prior to reporting the results of the models for each test, results of analyses of descriptive statistics are reported to ensure that the assumptions associated with hierarchical linear modeling were not violated. Demographic information such as ethnicity of participants and the total income of the participant’s family were collected for the participants; however, because this information is not relevant to the research questions being addressed, the table containing these statistics can be found in the appendix.

Missing Data

Prior to HLM model building, the data sets containing each of the variables were examined. After a thorough review of each set of data it was determined that there was no systematic pattern of missing data across individuals. Participants who were missing data for over half of the observation periods were deleted from the data sets. Cases with variable data seemingly missing at random were included in the analyses. Given that missing level-2 variables cannot be accommodated by HLM, participants who were missing data for two or more of the four level-2 variables were not included in the analyses. Because data was determined to be missing at random, participants with missing data on just one of the level-2 variables were included in analyses, and multiple imputation was used to estimate missing data. Multiple imputation is the method
recommended for data sets that are used outside the agency that collected the data because it does not rely on the assumption that data are missing at random (Tabachnick & Fidell, 2007).

**Data Assumptions for HLM**

Three types of assumptions are associated with using HLM to study individual change over time: distributional assumptions, assumptions regarding the covariance structure, and assumptions about the metric of the outcome variable. Both the outcome variable of relational aggression and the growth parameters are assumed to be normally distributed. Normality of the outcome variable included a review of skewness, kurtosis, histograms, mean scores, and standard deviations. Descriptive statistics reviewed for level-1 and level-2 variables are reported in Tables 1-8.

**Normality of Scores**

Descriptive statistics were inspected in order to examine normality of data for all variables, and there was little evidence to suggest that this assumption had been violated. All values were within the possible range of values although it is noted that some values were two to three standard deviations above/below the mean. Scores for each measure appear to be normally distributed and the majority of skewness and kurtosis values are within acceptable ranges (between +2 and -2) providing evidence that assumptions were not violated. The variable of physical aggression was positively skewed and kurtotic; however, histograms for all variables were normally distributed overall.
Table 1

*Descriptive Statistics for Level 1 Variables Observed in Kindergarten*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>Skew.</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression</td>
<td>494</td>
<td>53.64</td>
<td>6.05</td>
<td>50</td>
<td>89</td>
<td>2.41</td>
<td>7.27</td>
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<tr>
<td>Social Skills Total Score</td>
<td>486</td>
<td>103.13</td>
<td>13.82</td>
<td>67</td>
<td>130</td>
<td>-.08</td>
<td>.28</td>
</tr>
<tr>
<td>Positive Relationship with Parents</td>
<td>524</td>
<td>63.67</td>
<td>6.93</td>
<td>40</td>
<td>75</td>
<td>-.69</td>
<td>.20</td>
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Table 2

*Descriptive Statistics for Level 1 Variables Observed in First Grade*

<table>
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<tr>
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<th>Min.</th>
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<th>Skew.</th>
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<tbody>
<tr>
<td>Physical Aggression</td>
<td>504</td>
<td>53.91</td>
<td>5.93</td>
<td>50</td>
<td>91</td>
<td>2.218</td>
<td>6.41</td>
</tr>
<tr>
<td>Social Skills Total Score</td>
<td>498</td>
<td>103.02</td>
<td>14.51</td>
<td>61</td>
<td>130</td>
<td>-.20</td>
<td>-.37</td>
</tr>
<tr>
<td>Positive Relationship with Parents</td>
<td>508</td>
<td>64.91</td>
<td>6.97</td>
<td>41</td>
<td>75</td>
<td>-.62</td>
<td>-.06</td>
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Table 3

*Descriptive Statistics for Level 1 Variables Observed in Second Grade*

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<th>Skew.</th>
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<tbody>
<tr>
<td>Physical Aggression</td>
<td>454</td>
<td>53.92</td>
<td>6.39</td>
<td>50</td>
<td>95</td>
<td>2.74</td>
<td>10.50</td>
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<tr>
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<td>450</td>
<td>105.35</td>
<td>14.78</td>
<td>62</td>
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<td>-.66</td>
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Table 4

*Descriptive Statistics for Level 1 Variables Observed in Third Grade*

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<th>Max</th>
<th>Skew</th>
<th>Kurtosis</th>
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<tbody>
<tr>
<td>Relational Aggression</td>
<td>492</td>
<td>.383</td>
<td>.46</td>
<td>.00</td>
<td>2</td>
<td>1.31</td>
<td>1.23</td>
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<tr>
<td>Physical Aggression</td>
<td>494</td>
<td>54.63</td>
<td>7.06</td>
<td>50</td>
<td>98</td>
<td>2.34</td>
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<tr>
<td>Social Skills Total Score</td>
<td>491</td>
<td>102.39</td>
<td>14.29</td>
<td>58</td>
<td>130</td>
<td>-.20</td>
<td>-.27</td>
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<tr>
<td>Friendship Quality</td>
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<td>.606</td>
<td>2</td>
<td>5</td>
<td>-.72</td>
<td>.31</td>
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<tr>
<td>Positive Relationship with Parents</td>
<td>518</td>
<td>62.95</td>
<td>7.71</td>
<td>40</td>
<td>75</td>
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Table 5

*Descriptive Statistics for Level 1 Variables Observed in Fourth Grade*

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<th>Skew</th>
<th>Kurtosis</th>
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<td>Relational Aggression</td>
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<td>.344</td>
<td>.44</td>
<td>.00</td>
<td>2</td>
<td>1.44</td>
<td>1.56</td>
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<td>Physical Aggression</td>
<td>453</td>
<td>53.60</td>
<td>5.83</td>
<td>50</td>
<td>89</td>
<td>2.50</td>
<td>8.13</td>
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<tr>
<td>Social Skills Total Score</td>
<td>446</td>
<td>102.68</td>
<td>13.55</td>
<td>66</td>
<td>130</td>
<td>-.15</td>
<td>-.45</td>
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<tr>
<td>Friendship Quality</td>
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<td>4.26</td>
<td>.624</td>
<td>2.33</td>
<td>5</td>
<td>-.56</td>
<td>-.47</td>
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<tr>
<td>Positive Relationship with Parents</td>
<td>506</td>
<td>63.30</td>
<td>7.56</td>
<td>38</td>
<td>75</td>
<td>-.49</td>
<td>-.27</td>
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Table 6

*Descriptive Statistics for Level 1 Variables Observed in Fifth Grade*

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<tr>
<th>Variable</th>
<th>n</th>
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<tbody>
<tr>
<td>Relational Aggression</td>
<td>461</td>
<td>0.385</td>
<td>0.46</td>
<td>0.00</td>
<td>2</td>
<td>1.35</td>
<td>1.29</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>465</td>
<td>53.94</td>
<td>6.53</td>
<td>50</td>
<td>92</td>
<td>2.35</td>
<td>6.53</td>
</tr>
<tr>
<td>Social Skills Total Score</td>
<td>463</td>
<td>103.11</td>
<td>14.5</td>
<td>61</td>
<td>130</td>
<td>-0.16</td>
<td>-0.59</td>
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<tr>
<td>Friendship Quality</td>
<td>454</td>
<td>4.29</td>
<td>0.595</td>
<td>2</td>
<td>5</td>
<td>-0.68</td>
<td>0.28</td>
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<tr>
<td>Positive Relationship with Parents</td>
<td>511</td>
<td>62.18</td>
<td>7.78</td>
<td>34</td>
<td>75</td>
<td>-0.55</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Table 7

*Descriptive Statistics for Level 1 Variables Observed in Sixth Grade*

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>Skew.</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relational Aggression</td>
<td>420</td>
<td>0.308</td>
<td>0.38</td>
<td>0.00</td>
<td>2</td>
<td>1.51</td>
<td>2.09</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>431</td>
<td>53.24</td>
<td>5.59</td>
<td>50</td>
<td>92</td>
<td>2.41</td>
<td>7.79</td>
</tr>
<tr>
<td>Social Skills Total Score</td>
<td>422</td>
<td>104.36</td>
<td>14.03</td>
<td>61</td>
<td>130</td>
<td>-0.27</td>
<td>-0.45</td>
</tr>
<tr>
<td>Friendship Quality</td>
<td>408</td>
<td>4.34</td>
<td>0.607</td>
<td>2</td>
<td>5</td>
<td>-0.69</td>
<td>0.06</td>
</tr>
<tr>
<td>Positive Relationship with Parents</td>
<td>512</td>
<td>61.24</td>
<td>8.47</td>
<td>34</td>
<td>75</td>
<td>-0.47</td>
<td>-0.25</td>
</tr>
</tbody>
</table>
Table 8

**Descriptive Statistics for Level 2 Variables**

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>Skew.</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociometric Status</td>
<td>498</td>
<td>5.09</td>
<td>1.24</td>
<td>1</td>
<td>7</td>
<td>-.62</td>
<td>.43</td>
</tr>
<tr>
<td>Popularity</td>
<td>523</td>
<td>.62</td>
<td>.23</td>
<td>.07</td>
<td>1.00</td>
<td>-.345</td>
<td>-.621</td>
</tr>
<tr>
<td>Pubertal Onset</td>
<td>513</td>
<td>2.70</td>
<td>.89</td>
<td>1</td>
<td>5</td>
<td>.18</td>
<td>-.46</td>
</tr>
<tr>
<td>Peer Network</td>
<td>506</td>
<td>38.85</td>
<td>5.89</td>
<td>14</td>
<td>45</td>
<td>-1.37</td>
<td>2.06</td>
</tr>
</tbody>
</table>

**Multicollinearity**

Multicollinearity refers to the inclusion of highly correlated variables in a model. In order to assess for multicollinearity, regressions of each predictor variable were conducted on the other predictor variables, and the diagnostic statistics (e.g., tolerances and variance inflation factors [VIFs]) were inspected. Examination of tolerances and VIFs is generally preferred over bivariate correlation inspection as one independent variable could be a linear combination of multiple independent variables and not be highly correlated with any one of them (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004). Additionally, it is often difficult to decide on a cutoff point or value that determines multicollinearity (Raudenbush et al., 2004). Tolerances below 0.10 and VIFs of 10 or higher are generally considered cause for concern regarding multicollinearity. Regressions of predictor variables resulted in tolerances below 0.10 and VIFs of less than 10 in all cases; therefore, it can be assumed that all variables are not collinear.
**Linearity**

For HLM models it is assumed that the growth trajectory for each individual is linear. In order to examine this assumption scatter plots for each participant’s scores on individual measures were visually inspected. Generally, the scatter plots did not show evidence of non-linear or curvilinear trends which indicates that the assumption of linearity had not been violated.

**Error Distribution**

It is assumed for HLM models where there are error terms at multiple levels that level-1 errors are normally distributed with a mean of zero and constant variance. Additional assumptions are made about level-2 errors and the relationship between errors and predictors at all levels. The assumptions of homogeneity of variance of level-1 residuals, homogeneity of residuals, and normality of residuals were examined after the HLM analyses were complete.

Homogeneity of residuals at Level-1 and Level-2 were examined using the test of homogeneity of level-1 variance. The chi-square statistic was not statistically significant indicating that null hypothesis of homogeneity of the level-1 variance is not rejected ($\chi^2_{[489]} = 5990, p > .5$). Moreover, inspection of the scatter plots of predictor variables and residuals at both level-1 and level-2 also do not indicate a violation of the assumption as the residuals had approximately equal range and variability for each value of the predictor variables.
Specification at Level-2

A proper specification is assumed for each of the level-2 equations in HLM (Raudenbush & Bryk, 2002). This refers to the assumption that the error term is not correlated with any of the predictors in that equation (Raudenbush & Bryk, 2002). In order to examine this assumption, a specification test was completed where the residual variance for the slope equation in level-2 ($r_{1i}$) was fixed. The specification test resulted in no considerable differences from the original model. Results of the specification test are included in Appendix D.

HLM Model Building

Prior to estimating the full model for each test, two models were estimated as part of the model building process. The models include the Unconditional Means Model (Model A), and the Unconditional Linear Growth Model (Model B). The full results for these models are presented in Appendix B and the results are briefly summarized before discussion of the full model including all variables. Model A indicates whether there are differences in mean relational aggression within (level-1) and between (level-2) individual participants and includes no predictor variables at either level. Because there are no predictor variables included in the model, it also is known as the “empty model.” Model B includes the addition of one variable representing time (GRADE) at level-1 and no predictor variables at level-2. The full model was estimated in which the variables of Physical Aggression, Social Skills, Peer Competence, Mean Friendship Quality, and Total Parent Positive Relationship were added at level-1, and the variables of Sociometric
Popularity (i.e., well liked by peers), Popularity, Positive Peer Group, and Pubertal Onset were added at level-2.

**Unconditional Means Model (Model A)**

The one fixed effect in Model A, $\gamma_{00}$, estimates the grand mean of relational aggression scores across occasions and individuals and was estimated to be 0.356 ($SE = 0.014$). The results for this model are presented in Table B1 in Appendix B. The $t$-ratio was statistically significant indicating that there are differences within and between individuals in relational aggression ($p < .001$). The variance associated with the level-1 error is the estimated within-person variance ($\sigma^2$) and was 0.128. The estimated between-person variance associated with level-2 ($\tau_{00}$) was 0.062. The $\chi^2$ statistic for the between-person variance indicated that there was unexplained variance between individuals in relational aggression. The intraclass correlation coefficient, $\rho$, indicates the proportion of total variation in relational aggression between individuals and was calculated as follows:

$$\rho = \tau_{00}/(\tau_{00} + \sigma^2) = 0.062/(0.062 + 0.128) = .326$$

This statistic indicated that approximately 32.6% of the variation in relational aggression lies between individual students.

**Unconditional Linear Growth Model (Model B)**

Two fixed effects were estimated for this model ($\gamma_{00}$ and $\gamma_{10}$). The average value for relational aggression in third grade was 0.465 ($SE = .045$), and yearly growth in relational aggression was -.0195 ($SE = .008$) points per year. The results for this model are presented in Table B2 in Appendix B. The fixed effect representing relational aggression at third grade was found to be significant at the $p < .001$ level, while the fixed
effect signifying growth in relational aggression was found to be significant at the $p = .011$ level.

The level-1 error decreased from 0.128 in the unconditional means model (Model A) to 0.127 in the current model after adding the predictor $GRADE$ to the level-1 model. Pseudo-$R^2$ ($\tilde{R}^2$) represents the amount of variation in the outcome variable (relational aggression) that is explained by the predictors in the model. It compares the variance between the current model (unconditional growth model) to the unconditional means model (the “empty” model or the model without any predictors) to quantify how much variation in the outcome was accounted for by the addition of predictor variables (in this case, $GRADE$). It was calculated as follows:

$$\tilde{R}^2 = (\sigma_{00}^2 (\text{empty model}) - \sigma_{00}^2 (\text{growth model}) / \sigma_{00}^2 (\text{empty model})$$

$$= (.128 - .127) / .128 = .007.$$ 

The $\tilde{R}^2$ value indicated that $GRADE$ accounted for approximately 0.7% of the variance within individuals.

**The Full Model (Model C)**

The final model estimated was the full model in which the additional four time-varying covariates representing physical aggression, social skills, peer competence, friendship quality, and parental support (respectively PHYS_AGG, SOC_SKILLS, FRIEND_QUAL, and PARENT_SUP) were added to the previous model (Model B), and the four time-invariant variables representing sociometric status, popularity, pubertal
onset, and peer network (respectively SOCIO, POP, PUB, PEER_NET) were added to the previous model at level-2. Results of the full model are presented in Table 9.

**Initial relational aggression.** The average relational aggression score for the population was found to be statistically significant at the $p < .001$ level indicating that there are significant differences between individuals on the variable. Participants with average scores for sociometric status, popularity, positive peer group, and pubertal onset had mean initial relational aggression of 0.382. Statistically significant results at the Table 9

**HLM Results for Full Model (with robust standard errors)**

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model for initial status, $\pi_0$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>.383</td>
<td>.041</td>
<td>9.414</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>SOCIO, $\gamma_{01}$</td>
<td>-.121</td>
<td>.035</td>
<td>-3.431</td>
<td>.001</td>
</tr>
<tr>
<td>POP, $\gamma_{02}$</td>
<td>.225</td>
<td>.197</td>
<td>1.143</td>
<td>.254</td>
</tr>
<tr>
<td>PEER_NET, $\gamma_{03}$</td>
<td>-.015</td>
<td>.008</td>
<td>-1.740</td>
<td>.082</td>
</tr>
<tr>
<td>PUB, $\gamma_{04}$</td>
<td>-.080</td>
<td>.049</td>
<td>-1.634</td>
<td>.103</td>
</tr>
<tr>
<td>Model for yearly growth rate, $\pi_1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, $\gamma_{10}$</td>
<td>-.004</td>
<td>.007</td>
<td>-.814</td>
<td>.540</td>
</tr>
<tr>
<td>SOCIO, $\gamma_{11}$</td>
<td>.011</td>
<td>.006</td>
<td>1.931</td>
<td>.053</td>
</tr>
<tr>
<td>POP, $\gamma_{12}$</td>
<td>-.016</td>
<td>.032</td>
<td>-.513</td>
<td>.607</td>
</tr>
<tr>
<td>PEER_NET, $\gamma_{13}$</td>
<td>-.001</td>
<td>.001</td>
<td>-.775</td>
<td>.438</td>
</tr>
<tr>
<td>PUB, $\gamma_{14}$</td>
<td>.014</td>
<td>.008</td>
<td>1.771</td>
<td>.076</td>
</tr>
<tr>
<td>Effect of physical aggression on relational aggression growth rate, $\gamma_{20}$</td>
<td>.037</td>
<td>.003</td>
<td>12.355</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Effect of social skills on relational aggression growth rate, $\gamma_{30}$</td>
<td>-.003</td>
<td>.001</td>
<td>-2.681</td>
<td>.008</td>
</tr>
<tr>
<td>Effect of friendship quality on relational aggression growth rate, $\gamma_{40}$</td>
<td>-.106</td>
<td>.017</td>
<td>-6.055</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>
Effect of parental support on relational aggression growth rate, \( \gamma_{50} \)

<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Variance Component</th>
<th>df</th>
<th>( \chi^2 )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r_{0i} )</td>
<td>.0548</td>
<td>515</td>
<td>1537.44</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>( e_t )</td>
<td>.0897</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \tilde{R}^2 \) Statistics

| \( \tilde{R}^2 \) (initial status) | 29.3% |
| \( \tilde{R}^2 \) (yearly growth)  | 56.9% |

Note. Results based on 1,674 observations across 515 students. Full Maximum Likelihood estimation was used.

\( p < .001 \) level in initial relational aggression were found for sociometric status. For every one unit increase in sociometric status, initial relational aggression is .121 points lower (\( p < .001 \)). Effects of pubertal onset, positive peer group, and popularity on the initial status of relational aggression were not found to be significant.

**Yearly growth rate.** Statistically significant results in yearly growth were not found for any of the time-invariant covariates. However, statistically significant results were found for the time-varying covariates of physical aggression, social skills, and friendship quality. For every one unit increase in physical aggression, yearly growth in relational aggression is 0.037 points higher (\( p < .001 \)). Yearly growth in relational aggression is 0.003 points lower for every one unit increase in social skills (\( p = .008 \)). For every one unit increase in friendship quality, yearly growth in relational aggression is 0.105 points lower (\( p < .001 \)).

**Proportion of variance explained.** \( \tilde{R}^2 \) statistics were calculated to estimate the proportion of variance explained as a result of the addition of the four time-varying
covariates at level-1 and the four time-invariant covariates at level 2. The current model was compared to the baseline model (Model B) in which the variable of \textit{GRADE} was included at level 1. The addition of the four variables accounted for approximately 29.3% of the variation in initial relational aggression and for approximately 56.9% of the variation in yearly growth in relational aggression.

\textbf{Covariance value as correlation coefficient.} The covariance value between true initial relational aggression in third grade and the yearly growth rate allows for the estimation of whether levels of relational aggression increase more or less rapidly over time for students who have high levels of relational aggression initially. Interpretation is made easier by expressing the covariance as a correlation coefficient. In the full model, the covariance is considered to be a partial covariance as it represents the relationship between two level-2 residuals after controlling for the effects of the predictor variables. There is a strong positive correlation between initial relational aggression and yearly

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{relation.png}
\caption{Mean Relational Aggression Measure Score by Grade}
\end{figure}
growth rate in relational aggression ($r = .863$). This means that after controlling for all covariates, participants who have higher levels of relational aggression at third grade have higher annual growth in relational aggression.

**Comparisons of Model Fit**

Comparisons of deviance statistics are made using $\chi^2$ statistics with degrees of freedom equal to the number of parameters by which the models differ. The deviance statistics are presented in Table 10. The results suggest that each subsequent model fits the data better than each previous model, with the full model having the best fit to the data (as compared to the other two models).

Table 10

*Deviance Statistics for All Models*

<table>
<thead>
<tr>
<th></th>
<th>Model A</th>
<th>Model B</th>
<th>Full Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deviance</td>
<td>1801.09</td>
<td>1795.12</td>
<td>1277.58</td>
</tr>
<tr>
<td>Parameters</td>
<td>3</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Models Compared</td>
<td>$\chi^2$</td>
<td>$df$</td>
<td></td>
</tr>
<tr>
<td>A vs. B</td>
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<td></td>
</tr>
<tr>
<td>B vs. Full Model</td>
<td>517.54</td>
<td>12</td>
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</table>
CHAPTER V
DISCUSSION

The significance of the problems associated with relational aggression is well documented by research and popular literature on the topic. Given the substantial effects associated with relational aggression, prevention and early intervention is imperative. Therefore, early detection of relational aggression and factors that are associated with the construct is vitally important. The present study intended to use Hierarchical Linear Modeling to explore growth in relational aggression over time as well as the influence of predictors on relational aggression over time. HLM was determined to be appropriate for this study because, unlike single-level regression models, it directly models longitudinal growth which was the purpose of this investigation. Despite the fact that much of educational and psychological research is hierarchical in nature and the advances in software used for analysis, HLM methods are not commonly used (O’Connell & McCoach, 2008; Raudenbush & Bryk, 2002; Singer & Willet, 2003). Murray-Close et al. (2007) completed a study where HLM was used to examine relational aggression in girls and boys over the fourth grade year. With exception of Murray-Close et al.’s study, HLM has not previously been used to investigate relational aggression.

HLM Model Building

A modeling building process is executed as part of HLM in order to determine if there are consequential differences within and between individuals that call for further investigation. Two models were analyzed prior to the full model with each subsequent model being of better fit than the previous model, and the full model best fitting the data
modeling individual growth. The following models were included as part of this study: (a) the unconditional means model; (b) the unconditional linear growth model which included the variable of grade; and (c) the full model which featured the additional five time-varying covariates representing physical aggression, social skills, peer competence, friendship quality, and parental support and the four time-invariant variables representing sociometric status, popularity, pubertal onset, and peer network. Models for this study were constructed in order to answer the research questions concerning (a) the stability of relational aggression from third through sixth grade; (b) the longitudinal relationships between relational aggression and measures of peer competence, peer support, friendship quality, and parental support; (c) the nature of the relationship between relational aggression and the factors of sociometric status and popularity; and (d) the effect of pubertal onset and levels of relational aggression. $\tilde{R}^2$ value that is provided through HLM estimates a proportion of the variance that is explained by the addition of predictor variables at each level in the model. A covariance value is also supplied, which is expressed as a correlation coefficient that allows for the interpretation of whether individuals with higher initial levels of relational aggression experience increases in levels of this trait more or less rapidly over time.

**Levels of Relational Aggression**

Results indicated that without controlling for individual characteristics statistically significant differences within and between individuals’ levels of relational aggression. The grand mean of relational aggression scores across occasions and individuals was estimated to be 0.383. Yearly growth in relational aggression according
to the linear growth model was negative with a rate of -0.0195 points per year. This result was statistically significant at the $p < .05$ level. Results of the full model also indicated negative growth in relational aggression over time with a rate of -0.004, which was not statistically significant. Based on these results the hypothesis for Research Question 1 would be rejected as negative growth in relational aggression occurred.

Given the research on relational aggression, these results are somewhat unexpected as literature suggests that rates of relational aggression increase over time, especially into late elementary school (Doyle & DeFago, 2009; Murray-Close et al., 2007). However, many studies have found relational aggression to be highly stable over time (Cillessen & Borsch, 2006; Crick, 1996; Crick, Ostrov & Warner, 2006; Ostrov et al., 2006), which, in turn, makes the results for the full model less surprising.

**Relational Aggression and Predictor Variables**

**Physical Aggression**

Physical aggression had a statistically significant effect on the yearly growth rate of relational aggression in the present study. Every one unit increase in physical aggression resulted in yearly growth of 0.036 points in relational aggression ($p < .001$). These results are in accordance with the hypothesis that accompanies Research Question 2 (higher levels of physical aggression will be associated with increases in relational aggression at all ages with the strength of the relationship increasing with age). Findings also corroborate previous research regarding the link between relational aggression and physical aggression. Moderate correlations between physical aggression and relational aggression for children have been reported with the strength of these correlations
increasing with age until middle childhood (Cillessen & Mayeux, 2004; Crick, Ostrov, & Werner, 2006; McNeilly-Choque et al., 1996; Ostrov et al., 2006).

While prior research has focused on the concurrent association between physical aggression and relational aggression (e.g., physical aggression and relational aggression are both measured when an individual is in third grade), this study focused on the longitudinal effects of physical aggression on growth in relational aggression. Nevertheless, the link between physical aggression and increases in relational aggression over time is not surprising given the findings of prior studies.

**Social Skills**

Higher levels of social skills were associated with negative yearly growth in relational aggression. This result concurs with the hypothesis for Research Question 2, which asserts that lower levels of social skills would be associated with annual growth in relational aggression. Literature concerning relational aggression and social competence indicates that while physical aggression is negatively linked with social competence (i.e., individuals with higher levels of physical aggression have lower levels of social competence), relational aggression is positively associated with the trait (Andreou, 2006; Kaukiaienen et al., 1999). There is some question as to the manifestation of the construct of social competence or social intelligence. Andreou (2006) asserted that the construct of social competence may be more adequately assessed by cognitive measures rather than behavioral assessments that measure social skills. Accordingly, individuals who engage in relational aggression may possess higher levels of social intelligence but display lower levels of social skills. Because the total T-score for the teacher report of the Social Skills
Rating System was used to assess individuals’ levels social skills or competence, it is likely that ratings are representative of social behaviors that were observed by the teacher rather than the social competence or skills possessed by the individual.

**Friendship Quality**

The quality of an individual’s friendships had a statistically significant impact on yearly growth in relational aggression. Higher friendship quality was associated with negative growth in relational aggression, which allows for the acceptance of the statements regarding friendship quality in the hypothesis for Research Question 2. Relationally aggressive children tend to have friendships that are very exclusive and seemingly “close,” yet dysfunctional (Grotpeter & Crick, 1996; Neal, 2009; Wiseman, 2002). Grotpeter and Crick found that relationally aggressive fourth and fifth grade children reported high levels of intimacy in their friendships as well as high levels of aggression occurring within the friendship. Friendship quality in the current study was assessed by teachers, whereas friendship-related variables in previous studies were measured for the most part by peer and self reports. Nevertheless, the negative relationship between friendship quality and growth in relational aggression in the current study corresponds with the research in the field that suggests the overall quality of friendships for relationally aggressive children tend to be lower. This result also brings attention to the potential benefits of positive friendships in relation to the prevention of relationally aggressive behavior.
Peer Network

The hypothesis for Research Question 3 indicated that positive peer group would be negatively associated with relational aggression. Positive peer group was not found to be associated with initial relational aggression or yearly growth in relational aggression. Parental ratings of their child’s group of friends were used to assess peer network which could explain why a significant relationship between this variable and relational aggression was not found to exist as parents may be aware of the general nature of their child’s peer group (i.e., whether or not peer group members engage in delinquent behavior, do well in school, or act physically aggressive, etc.), but understandably less aware of the details regarding interactions between members of the peer group.

Neal (2009) found that children who were rated high in relational aggression by their teachers tended to have dense social networks meaning that all members of the network were highly-related to each other and interconnected. Less dense social networks in this study were described as having members who maintained close relationships with members of their primary social network yet also had friends who were outside the social network (Neal, 2009). Additionally, teacher ratings in a study conducted by Sebanc (2003) indicated that children’s friendship exclusivity and intimacy were related to relational aggression. A term that is used in popular literature to refer to these dense social networks is “clique.” Wiseman (2002) stated that cliques are most detrimental in sixth, seventh, and eighth grades. The research on relational aggression and popularity indicates that cliques or peer groups typically become more of an influential factor during the middle school years. A possible explanation for the lack of a connection between
peer network and relational aggression is the ages at which variables were assessed. Because the data in this study were collected in the late elementary years it is possible that peer networks were still in the early stages of development, and, therefore, not fully representative of the peer networks that are often established in middle and high school.

**Parental Support**

Parental support was not found to be significantly associated with yearly growth in relational aggression. The variable parental support, which is an assessment of the quality of the attachment between a child and their parent, is based on the parent’s report. Research on relational aggression and the influence of parents has focused primarily on parenting styles, parental control, and parental awareness of relational aggression. Parental warmth and high levels of parental expression of positive emotions in the presence of the child, which are behaviors that foster secure parental attachment, have been linked to high levels of empathy in children, while the withdrawal of parental love and attention to control child behavior was linked to relational aggression in girls (Curtner-Smith, 2000; Curtner-Smith et al., 2006; Flouri & Buchanan, 2003; Zhou et al., 2002). Based on these findings, it was hypothesized that parental support would be negatively related to relational aggression in the current study. Because a relationship between parental support and relational aggression was not found to exist, the null hypothesis regarding this variable could not be rejected.

**Sociometric Status and Perceived Popularity**

The connection between relational aggression and the variables of sociometric status and perceived popularity was the focus of the third research question and
accompanying hypothesis. Results indicate a negative relationship between sociometric status and initial status of relational aggression relational aggression scores at third grade, which is in accordance with findings from previous studies and the third hypothesis for the current study. Though the result was statistically nonsignificant, yearly in relational aggression was found to be negatively associated with sociometric status \( (p = .053) \). Perceived popularity was not determined to be linked to initial status of relational aggression or yearly growth in relational aggression.

The negative relationship between sociometric status and relational aggression (i.e., individuals with high scores on sociometric status had lower levels of initial relational aggression) is not surprising given the research regarding the connection between the two characteristics. Sociometric status or sociometric popularity as it is sometimes labeled in writings on the topic, measures the degree to which an individual is liked by their peers and is referred to in the literature sometimes as “good” popularity \( (\text{Cillessen} \text{ & Mayeux, 2004; Wiseman, 2002}) \). The correspondence between the relationship between teacher-reported sociometric status and relational aggression in this study and relationship found to exist between sociometric status as measured through peer nomination and relational aggression in previous studies suggests that teacher report, which has not been utilized to a great degree in prior to this study, may be a viable method for gathering sociometric information regarding students especially through the elementary grades.

It was hypothesized that popularity in the current study would be positively associated with relational aggression. Results of prior research which indicate that a
positive relationship exists between perceived popularity and relational aggression served as a basis for this hypothesis (see Cillessen & Mayeux, 2004; LaFontana & Cillessen, 2002). While an individual’s sociometric popularity or likeability among peers hinges on how they treat others, perceived popularity is determined by how much power or influence an individual is thought to possess (Cillessen & Mayeux, 2004). It needs to be noted that in the vast majority of the studies reviewed perceived popularity was assessed by means of peer identification, whereas in the current study teacher report was used to measure the construct. This detail should be taken into account as the criteria used by teachers to determine popularity likely differs from that of children in sixth grade. Furthermore, in the current study popularity was assessed at the classroom level by teachers which may have unintentionally overlooked popularity in relation to the child’s entire peer group.

**Pubertal Onset**

The fourth hypothesis of the present study involved the link between relational aggression and early pubertal onset for girls. It was hypothesized that girls who experience puberty earlier would have higher scores on measures of relational aggression. Although the relationship between pubertal onset and the yearly growth or initial status of relational aggression was positive indicating that girls who experience early pubertal onset were more likely to have higher initial levels of relational aggression and increased yearly growth in relational aggression, it was not statistically significant, which indicates that the research hypothesis would need to be rejected. To date, the current study is the first to investigate the relationship between pubertal timing and relational aggression.
Literature available has focused primarily on the relationship between physical aggression and pubertal timing.

Research has shown that girls who experience puberty early are more likely to engage in aggressive and delinquent behaviors during middle school (Cota-Robles et al., 2002; Lynne et al., 2007). Early maturation is considered to be more problematic to girls than boys because the physical signs of female pubertal onset are much more apparent than those of males. It is thought that early maturing girls are treated differently by their peers and, therefore, engage in behavior that is typical of older adolescents at a younger age and associate with older peers of comparable physical development which causes a disruption in the age-based social network (Lynne et al., 2007).

Because relational aggression was measured at an earlier age in the current study it is possible that the effects of early maturation are not prominent quite yet, which would explain why the relationship between early pubertal onset and relational aggression is not a significant one. Due to relational aggression and physical aggression being two different constructs, it is possible that the variation between the two brands of aggression in terms of perceived popularity among peers may be related to the difference in terms of their connection to pubertal onset. In other words, because early maturing girls may look different from their peers, which is usually not a desirable trait in late elementary and middle school, they may serve as the victims of relational aggression rather the aggressors.
Conclusions

Results of this study confirm findings from other studies in several instances as well as contribute new information regarding the influence of certain variables on the initial status and developmental trajectory of relational aggression. This longitudinal study included level-1 variable data for participants spanning from kindergarten in most cases to sixth grade, which is an extensive time frame for data collection when compared to other longitudinal studies in the field. Collecting data over an extended period of time allowed for the consideration of behaviors and traits established in early childhood that may affect levels of relational aggression later in childhood. Identifying these variables, as the present study did, provides researchers and practitioners with important information regarding which specific behaviors should be targeted through early intervention efforts.

This study was the first to investigate the relationship between female pubertal onset and relational aggression. While research has recognized that the early onset of puberty among females is linked with increased engagement in at-risk behaviors, the focus of previous studies has been physical aggression and delinquent behaviors (Cota-Robles et al., 2002; Lynne et al., 2007). While the relationship between pubertal timing and relational aggression was not statistically significant, pubertal onset was found to be positively linked to yearly growth in relational aggression at the \( p = .076 \) level and initial status at the \( p = .103 \) which warrants further investigation into the nature of these relationships.
A statistically significant positive relationship was found to exist between physical aggression and yearly growth in relational aggression, while social skills and friendship quality were found to be negatively linked to yearly growth in relational aggression. Furthermore, the relationship between sociometric status and initial relational aggression was negative indicating that individuals who were well-liked by their peers had lower levels of relational aggression. The positive relationship between physical aggression and growth in relational aggression that was found in this study corresponds with the results of prior studies which have shown that these two behaviors are likely to occur concurrently (Crick, Ostrov, & Werner, 2006; McNeily-Choque et al., 1996) as well as draws attention to the longitudinal relationship between physical aggression in early childhood and relational aggression occurring later in childhood.

The relationship between higher levels of social skills and negative yearly growth in relational aggression is unexpected as research indicates that relationally aggressive individuals tend to possess higher levels of social intelligence when compared to their peers that engage in overt aggressive behaviors (Andreou, 2006; Kaukiaienen et al., 1999). Because teacher report was used to assess social skills, it is likely that scores obtained indicate to a greater degree behaviors observed rather than skill level which may explain the contradiction with past research. Results of this study may also be a reflection relatively unsophisticated, overt nature of relationally aggressive behaviors common in elementary school (e.g., calling names, telling someone they are not invited to a party, etc.) when compared to the more covert relationally aggressive behaviors that
are employed by children in middle and high school (e.g., spreading rumors, gossiping, etc.) that are less likely to be observed.

Research has shown that relationally aggressive children and adolescents have friendships that are of a lower quality when compared to their peers and have lower levels of sociometric status (Cillessen & Mayeux, 2004; Grotpeter & Crick, 1996; LaFontana & Cillessen, 2002; Neal, 2009). The negative relationships between friendship quality and relational aggression yearly growth and sociometric status and initial relational aggression in the current study are not surprising given this information. However, the relationship between friendship quality and relational aggression growth that was determined to exist represents a fairly significant contribution to the existing literature as is longitudinal in nature. The vast majority of research investigating the link between friendship quality and relational aggression examines the two variables simultaneously.

**Limitations**

Data collection for the NICHD Study of Early Child Care began when participants were one month of age. Consequently, many of the measures used to assess variables included in this study relied on parent or teacher report as data collection began when children were too young to report on many of the variables included in this study. As a result, peer and self reports of the variables included in this study were not available. Because many social behaviors, specifically relational aggression, are often difficult for individuals outside the peer group to detect teacher and parent reports regarding these behaviors may differ from the peer reports. Nevertheless, teacher ratings have been
determined to be reliable indicators of relational aggression (Crick, 1996; Doyle & DeFago, 2009; Pakaslahti & Keltikangas-Jarvinen, 2000). Parent report was used to assess the study child’s attachment to their parent. Ideally, this variable would have been based on the child’s report as the parent’s perspective on their relationship with their child may differ from that of their child. The use of HLM in this study could be considered a limitation as it is a method of analyses that is not often used and considered to be relatively complex. Consequently, the results of this study may not be easily generalized and interpreted by individuals who are not familiar with HLM.

Because this study was completed using an already existing set of data, the measures that were used to collect variable data were also in existence prior to formation of the specific research questions associated with the current study. Therefore, some of the variables that are measured by the instruments made available through data set may not exactly fit the precise definition of the traits as described in previous research. Thus, interpretation of the results in terms of their connection to previous research is somewhat more challenging. As noted in Chapter 3, the variable of relational aggression included in this study was based on the Relational Aggression Scale created by Crick et al. (1996). Because Crick is considered to be one of the leading experts on relational aggression, it is expected that the construct measured by her scale is consistent with the construct described in research.

**Implications for Practice**

The results of this study have identified both risk factors and protective factors associated with relational aggression. The major risk factor found to be associated with
relational aggression is physical aggression. The strong relationship between physical aggression, which was assessed annually beginning in kindergarten, and yearly growth in relational aggression substantiates the importance of early intervention and prevention. While physical aggression and relational aggression are indeed two different behaviors, they are highly associated. Consequently, intervention that targets physical aggression as part of a comprehensive approach to promoting prosocial skills in the preschool and early elementary years is likely to positively affect rates of relational aggression later in life.

The variables of friendship quality and social skills were identified in this study as being negatively associated with yearly growth in relational aggression. Sociometric status was found to be negatively associated with initial levels of relational aggression. Based on the results of this study, prevention and intervention programs that focus on social skill development and teaching friendship skills are likely to decrease the occurrence of relational aggression in middle childhood and adolescence.

Relational aggression can be addressed using primary, secondary, and tertiary interventions within the school environment (Crothers et al., 2008). Primary prevention programs are normally designed to minimize aggressive tendencies by focusing on children’s social skills and by providing children with cognitive training (Crothers et al., 2008). Individual work exercises can be designed to enhance children’s self-confidence, self-respect, and positive self-acceptance, and to promote the expression of inner feelings (Crothers et al., 2008). In turn, pair or group work exercises can be utilized to focus on mutual acceptance, mutual cooperation, tact, and the ability to fulfill the wishes of a partner (Crothers et al., 2008). Supportive peer relationships may be fostered through
social-skills training programs or with some character-education programs. For example, these programs might address qualities of a friend, ways to act as a good friend, and the importance of including other children in group activities. Interventions that focus on developing skills that can be practiced, observed, and reinforced rather than focusing on attitudes and beliefs tend to be most successful (Knoff, 2003).

Secondary intervention often consists of social competence and antiviolence curricula, including activities devoted to developing children’s empathy, perspective-taking, emotion regulation, anger management skills, social problem-solving, and assertiveness (Crothers et al., 2008; Doyle & DeFago, 2009). Research focusing on the prevention and intervention of social-emotional concerns suggests that perhaps best programming aimed to reduce antisocial behavior and promote social-emotional competency in schools is that which is incorporated within a building-wide positive behavior supports system (Merrell et al., 2006). Rather than target relational aggression as the exclusive focus of intervention, a better approach may be to emphasize relational aggression within the context of broader and more comprehensive intervention programs to promote positive social behavior and healthy emotional development, and to reduce antisocial behavior in general (Merrell et al., 2006). Training in empathy, perspective-taking, social problem-solving, assertiveness, emotion regulation, and anger management skills can be provided individually or within school-based social competence interventions (Merrell et al., 2006).

Several programs that have proved to be successful in reducing problem behaviors are WITS (Walk Away, Ignore, Talk – Use Words, Not Fists, and Seek Help),
Second Step (Middle School/Junior High), and Making Choices: Social Problems Skills for Children (Crothers et al., 2008; Doyle & DeFago, 2009). The goal of the WITS program is to foster school, classroom, and family environments that promote positive behaviors and reduce victimization (Crothers et al., 2008; Doyle & DeFago, 2009). The Second Step program provides classroom-based social–emotional lessons designed to inhibit aggressive behavior by improving children’s empathy, perspective-taking, anger management, and problem-solving skills (Crothers et al., 2008). The Making Choices: Social Problems Skills for Children program aims to promote social competence and reduce aggressive behavior by strengthening children’s social information processing and emotion regulation skills (Crothers et al., 2008).

Many maladaptive social skills are often first learned at home through sibling relationships. Consequently, involving the family in the social-emotional learning curricula by sending home information on skills that are being targeted at school and focusing on skills that can easily be generalized to the home environment is important (Crothers et al., 2008). Perhaps one of the best ways to prevent relational aggression from occurring is to provide training to parents and staff members on the topic (Doyle & DeFago, 2009; Merrell et al., 2006). Even if relational aggression does not appear to be a significant problem within a given school setting, teachers and other staff members are likely to benefit from a brief inservice training on this topic to increase their awareness and help prevent minor and isolated occurrences from becoming more serious or widespread (Merrell et al., 2006). Parent training on topics such as discouraging negative behaviors like conflict or aggression between siblings while simultaneously encouraging
prosocial behaviors are likely to be valuable and draw the interest of parents within the school community (Crothers et al., 2008).

Tertiary prevention programs provide treatment for children who are at risk for engaging in or being victimized by relational aggression, or are already involved in relationally aggressive behaviors as perpetrators or victims. Prevention programs such as Camp Ophelia and Club Ophelia are designed to create safe environments for middle school girls to learn about prosocial relationship skills and methods of gaining social support (Crothers et al., 2008; Doyle & DeFago, 2009). The Ophelia programs are constructed using an ERI model (educate, relate, integrate), in which girls learn about relational aggression and the harm it can cause, relate it to incidents in their own lives while simultaneously exploring alternative behavioral strategies, and integrate what they have learned into their own friendships (Crothers et al., 2008). Although not statistically significant, Dellasega and Adamshick (2005, as cited in Crothers et al., 2008) found positive behavior change in 42 middle school girls after they participated in these programs.

Relational aggression can be challenging to address for several reasons. First, it is typically not directly witnessed by teachers or parents. Furthermore, teachers and parents are less likely to intervene due to the perception relational aggression is less serious than physical aggression or typical behavior among children (Craig, Henderson, & Murphy, 2000; Doyle & DeFago, 2009; Jeffrey, Miller & Linn, 2001). Victims of relational aggression may feel less safe in school if they believe that adults are not noticing or
paying attention to the situation. In addition, students may get the message that such behaviors are tolerated or even permitted (Yoon, Barton, & Taiariol, 2004).

School psychologists and other professionals within the field of education can help to address these challenges through education of parents, teachers, and school personnel. School psychologists can also assist with assessment of relational aggression. In order to get a better understanding of peer relationships and of student perceptions of school, anonymous classroom-wide surveys and/or observations can be used (Yoon et al., 2004). It is beneficial interventions to be linked to assessments of the individual characteristics of those involved in relational aggression as well as environmental characteristics or contextual variables that may factor into development and maintenance of relational aggression (Doyle & DeFago, 2009). Addressing relational aggression in schools may require a multi-faceted approach that includes education about the issue, creative means of assessment, development of interventions, and continued consultation with school personnel and parents.

**Directions for Future Research**

The intention of this study was to investigate the developmental trajectory of relational aggression while considering the influence of several variables that have been previously linked to the construct. A secondary but no less important aim of this study was to demonstrate the utility of HLM in relation to long-term longitudinal research regarding behaviors such as relational aggression. While HLM has been used previously in a longitudinal study of relational aggression (see Murray-Close et al., 2007), use of this methodology in educational and social research is relatively limited. The successful use
of HLM in the current study suggests that future research should use this methodology across developmental periods such as adolescence and adulthood. For future studies of relational aggression and its prediction, it may be beneficial to include data from observations of predictor variables at an earlier age (e.g., kindergarten) and explore the relationship between those variables and relational aggression occurring later in childhood or adolescence.

Because just 28.3% of the variation in individual’s initial relational aggression scores and 56.9% of the variability in yearly growth was explained by the predictor variables included in the analysis, it is recommended future HLM analyses involving relational aggression employ additional and alternative variables. The inclusion of variables representing the reports of peers or direct observations of behavior would be suggested as well as assessments of social intelligence that are more representative of skills possessed by an individual rather than the social behavior observed. Another variable that should be considered for future analyses involving teacher assessed relational aggression is class size as this factor may affect teachers’ awareness of behavior in the classroom. Time invariant variables that might contribute to the literature regarding relational aggression include ethnicity and socioeconomic status.

This is the first study to assess the relationship between pubertal timing and relational aggression. Although a statistically significant relationship was not found to exist between this variable and relational aggression, results indicate that further investigation of this association is warranted, especially in studies expanding into adolescence. Because relational aggression is a relatively new phenomenon, future
research regarding the prediction and development of this brand of behavior is recommended in order to inform intervention and prevention.
APPENDICES
APPENDIX A

CODING AND DESCRIPTION OF VARIABLES INCLUDED IN THE ANALYSES
Table A1

Variables Included in Level-1 Analyses

<table>
<thead>
<tr>
<th>Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADE</td>
<td>Grade at time $t$ for student $i$, centered around the earliest grade</td>
</tr>
<tr>
<td>PHYS_AGG*</td>
<td>T-score for narrow band scale of Aggressive Behavior on Achenbach Teacher Report Form</td>
</tr>
<tr>
<td>SOC_SILLS*</td>
<td>Social Skills Total Score T-Score from the teacher report of the Social Skills Rating System</td>
</tr>
<tr>
<td>FRIEND_QUAL*</td>
<td>Friendship quality with study child’s close friends score from teacher questionnaire Contact with Friends</td>
</tr>
<tr>
<td>PARENT_SUP*</td>
<td>Score from parent report of study child’s parental attachment as assessed by the Child-Parent Relationship Scale</td>
</tr>
<tr>
<td>REL_AGG</td>
<td>Relational aggression scale on Child Behavior with Peers completed by the study child’s teacher</td>
</tr>
</tbody>
</table>

* Variables have been centered around the group mean
Table A2

**Variables Included in Level-2 Analyses**

<table>
<thead>
<tr>
<th>Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCIO+</td>
<td>Score for Well Liked by Peers on the Sociometric Status measure completed by the study child’s teacher in second grade</td>
</tr>
<tr>
<td>POP+</td>
<td>Measure of study child’s peer status or popularity in the classroom setting as assessed by the child’s teacher in sixth grade</td>
</tr>
<tr>
<td>PUB+</td>
<td>Tanner stage score for pubic hair and breast development from the Health and Physical Development Assessment completed at sixth grade</td>
</tr>
<tr>
<td>PEER_NET+</td>
<td>Child’s Positive Peer Group score from the Peer Network Characteristics questionnaire completed by the study child’s parent in sixth grade</td>
</tr>
</tbody>
</table>

+ Variables have been centered around the grand mean
APPENDIX B

HLM RESULTS FOR MODEL BUILDING PRIOR TO FULL MODEL
Table B1

**HLM Results for Unconditional Means Model (Model A)**

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient</th>
<th>Robust SE</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Initial Status $\gamma_{00}$</td>
<td>.356</td>
<td>.0141</td>
<td>25.43</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Variance Component</th>
<th>df</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between-person, $r_{0t}$</td>
<td>.062</td>
<td>519</td>
<td>539.58</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Within-person, $e_{it}$</td>
<td>.128</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Results based on 1689 observations across 520 students. Maximum Likelihood estimation was used.
Table B2

**HLM Results for Unconditional Linear Growth Model (Model B)**

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient</th>
<th>Robust SE</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Status</td>
<td>.465</td>
<td>.045</td>
<td>10.243</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Mean Growth Rate, $\gamma_{10}$</td>
<td>-.0195</td>
<td>.008</td>
<td>-2.540</td>
<td>.011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Variance Component</th>
<th>df</th>
<th>$\chi^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Status (1st grade), $r_{0t}$</td>
<td>.0622</td>
<td>519</td>
<td>343</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Within-person, $e_{it}$</td>
<td>.127</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\tilde{R}^2$ Statistics$^a$

| $\tilde{R}^2$ (within-person) | 0.7% |

*Note.* Results based on 1,688 observations across 520 students. *GRADE* is centered on the first time point. Maximum Likelihood estimation was used.

$^a$ The $\tilde{R}^2$ value was calculated relative to the unconditional means model (Model A).
APPENDIX C

DEMOGRAPHIC INFORMATION FOR PARTICIPANTS
Table C1

Demographic Statistics for Participants

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Percent of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian</td>
<td>.3%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2.1%</td>
</tr>
<tr>
<td>Black</td>
<td>13.1%</td>
</tr>
<tr>
<td>White</td>
<td>79.7%</td>
</tr>
<tr>
<td>Other</td>
<td>5.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Family Income</th>
<th>Percent of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,500-22,500</td>
<td>15.3%</td>
</tr>
<tr>
<td>27,500-55,000</td>
<td>34.9%</td>
</tr>
<tr>
<td>65,000-125,000</td>
<td>40.8%</td>
</tr>
<tr>
<td>175,000-500,001</td>
<td>9%</td>
</tr>
</tbody>
</table>
Table D1

*Level-2 Specification Test (Yearly growth rate model slope fixed)*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Original Model</th>
<th>Specification Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
</tr>
<tr>
<td>Model for initial status, $\pi_{0i}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>.383</td>
<td>.041</td>
</tr>
<tr>
<td>SOCIO, $\gamma_{01}$</td>
<td>-.121</td>
<td>.035</td>
</tr>
<tr>
<td>POP, $\gamma_{02}$</td>
<td>.225</td>
<td>.197</td>
</tr>
<tr>
<td>PEER_NET, $\gamma_{03}$</td>
<td>-.015</td>
<td>.008</td>
</tr>
<tr>
<td>PUB, $\gamma_{04}$</td>
<td>-.080</td>
<td>.049</td>
</tr>
<tr>
<td>Model for yearly growth rate, $\pi_{1i}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, $\gamma_{10}$</td>
<td>-.004</td>
<td>.007</td>
</tr>
<tr>
<td>SOCIO, $\gamma_{11}$</td>
<td>.011</td>
<td>.006</td>
</tr>
<tr>
<td>POP, $\gamma_{12}$</td>
<td>-.016</td>
<td>.032</td>
</tr>
<tr>
<td>PEER_NET, $\gamma_{13}$</td>
<td>-.001</td>
<td>.001</td>
</tr>
<tr>
<td>PUB, $\gamma_{14}$</td>
<td>.014</td>
<td>.008</td>
</tr>
</tbody>
</table>
APPENDIX E

TECHNICAL NOTE REGARDING CENTERING OF PREDICTORS
Technical Note Regarding Centering of Predictors

In quantitative studies it is imperative that the variables under investigation have precise meaning so that results can be related to the theoretical concerns that prompted the research (Raudenbush & Bryk, 2002). Because the slopes and intercepts in the level-1 model of hierarchical linear models become outcome variables at level-2 the meaning of these variables must be clearly understood. Centering involves the rescaling of predictor variables by means of subtracting a value, typically a mean, from each predictor score (Tabachnick & Fidell, 2007). Level-1 predictors are most commonly centered; however, level-2 predictors may be centered if doing so enhances interpretation (Tabachnick & Fidell, 2007).

The common locations of level-1 predictors include (a) the natural metric, (b) centered around the grand mean, and (c) centering around the group mean (Raudenbush & Bryk, 2002). In some instances using the natural metric value for level-1 predictors is appropriate. Yet, in other situations using this value for level-1 predictors may lead to nonsensical results. In the case of the present study, the lowest possible value for the variable Social Skills is 40. If the natural metric was used for this variable, the intercept would represent the outcome for an individual who had a Social Skills score of zero, which would lead to misinterpretation of the results as the correlation between the slope and the intercept would tend toward -1.0 (Raudenbush & Bryk, 2002). There are some instances in which the natural metric level-1 predictor would be meaningful. For example, in a study investigating the effect of a drug, a score of zero would represent no exposure to the drug. The centering of level-2 variables is recommended if zero is not a
valid value for one or more of the variables in a model (Singer & Willet, 2003). Zero was not a meaningful value for several of the variables included in level-2 of the full model for the current study.

In the current study level-1 variables, with the exception of grade which was centered around the earliest grade, were centered around their group mean, and level-2 variables were centered around the grand mean. Group-mean centering, which is sometimes referred to as within-context centering, involves recentering a predictor around the mean for each person thus the within-person effect is centered relative to the individual’s mean level (Singer & Willet, 2003). With group-mean or within-context centering, multiple constants, one per person, can be used for recentering. Grand-mean centering refers to subtracting the grand mean from each individual’s score on the predictor (Raudenbush & Bryk, 2002; Singer & Willet, 2003).
APPENDIX F

TECHNICAL NOTE REGARDING MISSING DATA
Technical Note Regarding Missing Data

Missing data is one of the most persistent problems in quantitative research. The degree to which it is problematic is largely dependent on the pattern of missing data, the amount of data that is missing, and the reason why the data is missing (Tabachnick & Fidell, 2007). Issues related to missing data are often more challenging for single-level models, as many of these models cannot accommodate missing data into the analysis. Perhaps the most important consideration related to incomplete data is the pattern of the missing data (Tabachnick & Fidell, 2007). Missing Completely at Random (MCAR), Missing at Random (MAR), and Missing Not at Random or Nonignorable (MNAR) are the types or patterns of missing data that have been identified in literature (Raudenbush & Bryk, 2002; Tabachnick & Fidell, 2007).

MCAR occurs when missing values of a variable are not dependent on any other values of a measured variable in the dataset and implies that there is no systematic reason for the missing data (Tabachnick & Fidell, 2007). MAR occurs when the pattern of the missing data is predictable from other variables (Raudenbush & Bryk, 2002; Tabachnick & Fidell, 2007). MNAR is not predictable from any other variables and the pattern of missing data is in some way related to the outcome variables (Raudenbush & Bryk, 2002; Tabachnick & Fidell, 2007). As its name implies, this type of missing data cannot be accommodated in the modeling process for statistical analysis.

One of the characteristics of HLM for repeated measures data is its flexibility to handle missing data of the MCAR and MAR types. Cases that have at least one observation for the level-1 model can be included in the HLM analysis as long as there is
not a systematic reason for the missing variables (Raudenbush & Bryk, 2002). The maximum likelihood estimation technique that is utilized in HLM for handling missing data efficiently uses all of the available time points for model estimation which ensures the unbiased estimation of MCAR and MAR data (Raudenbush & Bryk, 2002).
APPENDIX G

SCALE ITEMS USED TO MEASURE RELATIONAL AGGRESSION
Scale Items Used to Measure Relational Aggression

The content of the assessments used to measure variables included in this study are protected under copyright. Furthermore, because the scale items are sensitive information that are included in published norm-referenced tests specific item content cannot be divulged. Six items on the Child Behavior with Peers scale, which was completed by teachers, comprise the relational aggression scale. Items assess such behaviors as spreading rumors or gossip; excluding others; ignoring others; attempting to convince other children to exclude an individual; and threatening to stop being an individual’s friend in order to get their way.
REFERENCES
REFERENCES


