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Developmental Trajectories of Aggression from Toddlerhood to Early Adolescence in Boys and Girls: Exploring Early Predictors and Later Outcomes

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DEVELOPMENTAL TRAJECTORIES OF AGGRESSION FROM TODDLERHOOD

TO EARLY ADOLESCENCE IN BOYS AND GIRLS: EXPLORING EARLY

PREDICTORS AND LATER OUTCOMES

by

SuJung Park

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Human Development and Family Studies

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ABSTRACT

Developmental Trajectories of Aggression from Toddlerhood to Early Adolescence in

Boys and Girls: Exploring Early Predictors and Later Outcomes

by

SuJung Park, Doctor of Philosophy

Utah State University, 2019

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Childhood aggression is one of the most common behavioral problems in young

children to be referred for mental health services. Children exhibiting high and persistent

levels of aggression from a young age are at high risk for later adjustment problems in

school and life. The primary aim of the current study was to identify developmental

aggression trajectories, from ages 2 to 11, for boys and girls together and separately.

Early predictors and later outcomes of various developmental trajectories of childhood

aggression were explored. This study analyzed a large secondary data set from the Early

Head Start Research and Evaluation (EHSRE) longitudinal study from infancy to early

adolescence that included 3,000 children. For both boys and girls, the results showed four

trajectory patterns: low-stable, moderate-decreasing, moderate-increasing, and high-

stable groups. Early parenting and developmental factors at age 2 distinguished these

trajectory patterns. Compared with the low-stable group, moderate-decreasing and high-

stable boys and high-stable girls had mothers who used less positive parenting behaviors,

moderate-decreasing boys and high-stable girls showed poor language development, and moderate-decreasing and high-stable boys exhibited poor emotional regulation. Outcomes at age 11 differed for the moderate-decreasing, moderate-increasing, and high-stable groups that had poorer social skills, poorer academic performance, more internalizing problems, and delinquent behaviors in early adolescence when compared with the low-stable group. Collectively, aggressive young children were at highest risk for ongoing difficulties with aggressive behavior when, at age two, they had mothers with less positive parenting behaviors, or they showed delayed language development or deficits in emotional regulation.

(142 pages)

PUBLIC ABSTRACT

Developmental Trajectories of Aggression from toddlerhood to Early Adolescence in

Boys and Girls: Exploring Early Predictors and Later Outcomes

SuJung Park

Early behavior problems, such as childhood aggression, emerge in the second
year of life and decrease prior to school entry for typically developing children. However,
some children show frequent and persistent aggression and may be at risk for subsequent
difficulties that lead to poor school and life outcomes. The current study aimed to identify
aggression patterns in children from toddlerhood to early adolescence for boys and girls
together and separately. This study also explored early influences on aggressive
behaviors at age two, such as mothers' parenting behaviors, cumulative family risk, and
early child characteristics. A range of difficulties in early adolescence were investigated,
including poor social skills, low academic success, internalizing problems (e.g.,
depression and anxiety), and delinquent behaviors. Data from a previous study of 3,000
families and children, the Early Head Start Research and Evaluation longitudinal study,
which followed families and children from infancy to early adolescence were examined.
Four aggression patterns were found, characterized by changes over time in the amount
of aggressive behaviors exhibited, applicable to both boys and girls: low-stable,
moderate-decreasing, moderate-increasing, and high-stable. Early parenting and
development during toddlerhood discriminated these distinctive aggression patterns.
Compared with children in the low-stable group, boys in the moderate-decreasing and

high-stable groups, and girls in the high-stable group were less likely to have mothers using positive parenting behaviors. Boys in the moderate-decreasing group and girls in the high-stable group were more likely to show delayed language development. Boys in the moderate-decreasing and high-stable groups were more likely to indicate poor emotional regulation. Moreover, compared with children in the low-stable group, those in the moderate-decreasing, moderate-increasing, or high-stable groups tended to show difficulties in early adolescence, such as lack of social skills, lower academic success, more internalizing problems, and delinquent behaviors. Altogether, young children exhibiting high levels of aggression over time were at the highest risk for later social, behavioral, and academic problems when, at age two, they had mothers with less positive parenting behaviors or when they showed poor language development or poor emotional regulation.

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SuJung Park

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Childhood aggression, often referred to as externalizing behavior problems, is one of the most frequent reasons for referrals to mental health services in young children (Renk, 2005). Aggressiveness can be described as an array of inappropriate behaviors that annoy, irritate, or anger other people, which in turn causes them to feel discomfort (Achenbach, & Edelbrock, 1978; 1983). To be specific, aggressive children can be characterized by frequent arguing and fights, using physical attacks, teasing and bullying, seeking attention, disrupting, being disobedient, having temper tantrums, being moody, and being loud. A growing body of evidence has demonstrated long-term continuity of aggression from childhood to adolescence and even to adulthood. For instance, high and stable levels of childhood physical aggression heighten the risk for a wide range of negative outcomes across childhood and adolescence, including social and emotional maladjustment (Broidy et al., 2003). Moreover, children and adolescents exhibiting high levels of aggression, regardless of the change rate of the trajectory (i.e., increasing, decreasing, or persisting aggression), show greater risk for poor outcomes, such as psychiatric problems and property violations in adult life, compared with those with low levels of aggression (Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2010). Therefore, if children's persistent externalizing problems are left untreated, substantial detrimental outcomes become more likely for children, family, and society.

Early behavioral problems, such as noncompliance and tantrums, emerge in the second year of life, peak around 17 and 30 months of age, and decrease in their frequency in the subsequent years (Tremblay, 2000). Due to a view of defiant and disruptive

behaviors by toddlers as a normal developmental phase, aggressive behaviors in this age group have been often overlooked. Although the frequency of behavioral problems typically declines with age, some children show relative stability over time in their physical aggression (Broidy et al., 2003), suggesting distinctive developmental trajectories for children who are truly at risk for later problems related to aggression. Findings from a number of empirical studies reveal that the early emergence of aggression displayed in toddlerhood and early childhood may place children on a pathway toward more serious and long-term maladjustment problems in middle childhood (Campbell, Spieker, Burchinal, Poe, & NICHD ECCRN, 2006). Moreover, stable high aggression across middle childhood may extend that pathway toward criminal behavior, such as property damage and theft, in early adolescence (Maughan, Pickles, Rowe, Costello, & Angold, 2000). Thus, there is a need for more efforts to identify differentiated trajectories of childhood aggression starting from toddlerhood across childhood and early adolescence.

Research approaches to the study of childhood aggression have moved beyond identifying developmental trajectories to address both predictors and outcomes of different longitudinal trajectories of childhood aggression. Specific factors associated with persistent and escalating aggressive behavior in toddlerhood must be identified to understand early signs of future aggression. Indeed, various interpersonal, environmental, and individual elements are known contributing factors to childhood aggression, indicating that contributing elements in multiple domains must be explored. Bronfenbrenner's Process-Person-Context-Time (PPCT) model is useful in understanding contributors that are associated with the development of child behaviors in that it

considers multiple levels of factors from immediate to distal (Bronfenbrenner & Morris, 2006). Applying the PPCT model, the current study examined the factors that are theoretically and empirically meaningful in predicting childhood aggression. These factors include: (a) Process (i.e., maternal positive parenting, harsh discipline); (b) Person (i.e., early language development, early emotional regulation); and (c) Context (i.e., cumulative family risk); and (d) Time (i.e., child age).

Positive and supportive parenting with cognitive stimulation during children's early years is a protective factor linked with less physical aggression in early adolescence (Campbell et al., 2010), with negative or disengaged parenting thus being a risk for more childhood aggression (McNamara, Selig, & Hawley, 2010). Harsh and hostile discipline by mothers of preschoolers predicts higher and more stable child externalizing behaviors, including non-compliance and aggression in elementary school (Campbell et al., 2010). In addition, young children's delayed language development (Dionne, Tremblay, Boivin, Laplante, & Perusse, 2003) and emotional dysregulation (Röll, Koglin, & Petermann, 2012) are associated with their emerging ability to control and inhibit anger and aggressive behaviors (Séguin, Parent, Tremblay, & Zelazo, 2009). Finally, the compounding effects of multiple family risk factors such as single parent status, maternal education, and public assistance status create cumulative risk that predicts more childhood aggression (Bendersky, Bennett, & Lewis, 2006).

Prior research has examined developmental consequences of early childhood aggression, mostly focusing on more serious outcomes such as physical violence, theft, and criminality (Nagin & Tremblay, 1999). Nonetheless, more subtle adjustment problems resulting from early aggression may jeopardize children's well-being, even

when early aggression is only at a low to moderate level. For example, Campbell and colleagues (2006) investigated different patterns of adjustment outcomes within child gender, including behavioral problems, social functioning, school performance, and academic achievement in addition to risky behaviors (Campbell et al., 2006). They suggested that even children with only a low to moderate level of aggression showed some adjustment problems in sixth grade. However, children's internalizing problems were not related to aggression trajectories, though internalizing symptoms may have been overlooked by mothers. This study builds upon and expands these prior findings by including a broad range of difficulties. That is, along with childhood aggression trajectories, a broad range of other outcomes related to early aggression should be explored in early adolescence, such as social skills, academic success, internalizing problems, and delinquent behaviors. Moreover, given that girls show different onset and developmental pathways of behavior problems (Lussier, Corrado, & Tzoumakis, 2012), research should identify aggression trajectories separately by gender.

Recent studies have substantially contributed to our better understanding of early childhood aggression, but we still do not have enough knowledge to explain whether boys and girls show different developmental trajectories of aggression, which toddlers are more aggressive than others, which children continue to have difficulties with aggression while others do not, and why some children show more difficulties than others as a later outcome of early aggression. A recent unpublished dissertation study further explored the relations between early childhood risk factors and developmental trajectories of aggression to predict consequences in middle childhood within each child gender (Brennan, 2015). Toddler-age risk factors, such as children's inhibitory control, language

delays, and parental depression, and parental interactions with children, and socioeconomic status, were included to predict outcomes of internalizing and disruptive behavior problems, and social functioning regarding aggression trajectories. Findings from the study indicated that although boys showed higher levels of early childhood risk and base rates of aggression, the mechanisms leading to later consequences were not statistically significantly different between genders (Brennan, 2015).

While a growing body of longitudinal research has consistently found that boys are more likely to show greater levels of aggression than girls, results are contradictory in terms of the mechanisms of antecedent risk and subsequent outcomes of childhood aggression in boys and girls when examined separately. Therefore, this study aimed to investigate, separately by child gender, both early predictors (i.e., maternal positive parenting and harsh discipline, cumulative family risk, and early child language development and emotional regulation) and later outcomes (i.e., social skills, academic success, internalizing problems, delinquent behaviors) associated with identifiable trajectories of early childhood aggression from toddlerhood to early adolescence.

This study uses a large secondary data set from the Early Head Start Research and Evaluation longitudinal study from infancy to early adolescence (EHSRE; U.S. Department of Health and Human Services, Administration for Children and Families, 2011). As part of the EHSRE project, children's aggression was measured from parent report at multiple time points, along with other data collection regarding child and family characteristics and functioning. These data offer an opportunity to examine developmental trajectories of childhood aggression, changes in aggressive behavior from

when they are toddlers until they are beginning adolescence, and then explore early predictors and later outcomes of aggression patterns in boys and girls.

Research Questions

1. Aggression trajectories: Are there distinctive developmental trajectories of child aggression from early childhood to early adolescence across ages 2, 3, 5, and 11?

2. Aggression trajectory within each gender: Are there distinctive developmental trajectories of child aggression from early childhood to early adolescence across ages 2, 3, 5, and 11 in boys and girls?

3. Aggression predictors within each gender: What are the early predictors of childhood aggression trajectory groups in boys and girls?
    a. Early process and context factors: Do process factors (i.e., maternal positive parenting, harsh discipline) and context factors (i.e., cumulative family risk) in early childhood predict developmental trajectory group membership of child aggression?
    b. Early person factors: Do children's early person factors (i.e., early language development, early emotional regulation) predict developmental trajectory group membership of child aggression?

4. Aggression outcomes within each gender: What are the later outcomes of childhood aggression trajectory groups in boys and girls?
    a. Later outcomes: Do children with different aggression trajectories differ in later outcomes (i.e., social skills, academic success, internalizing problems, and delinquent behaviors) in early adolescence?

b. Predictive power: Do aggression trajectory groups offer better predictive

power than an average of aggression scores over time points?

CHAPTER II

REVIEW OF THE LITERATURE

Childhood aggression, which has plagued families, teachers, and clinicians over the decades, is the most common behavior problem to be referred for clinical help (Renk, 2005). The frequency of children's aggressive and disruptive behaviors increases over the first two to three years as toddlers develop a sense of autonomy and ownership (Hay, 2005; Tremblay, 2000). While some aggression and disruptiveness are viewed as normative and acceptable behavior for children during early periods of development, children showing high and persistent levels of aggression may be at greater risk for socio-emotional and behavioral adjustment throughout the preschool and elementary school years (Ettekal & Ladd, 2015; Ladd, 2006). Furthermore, frequent and chronic aggression early in life forecasts serious forms of continued problems involving violence, criminality, and substance abuse in youth and adulthood (Jennings, & Reingle, 2012; Timmermans, van Lier, & Koot, 2008). Findings from previous research indicate that by the time children enter the school years, a child's level of aggression is already strongly embedded, and children with high levels of aggression are more resistant to treatment, which highlights the importance of identifying and attending to children's behavioral problems at an early age. Given the stability and negative consequences of aggression, it is critical to explore contributing factors that lead to the development of early and persistent childhood aggression.

Aggression is not consistently defined in the research to date and may be included in varied behavior problems, including externalizing behavior problems, conduct problems, antisocial behaviors, disruptive behaviors, and oppositional or disobedient

behaviors. These behaviors are all generally considered to be socially undesirable, and the terms are often used interchangeably with each other. The overlapping of aggression with these other behavior problems challenges a clear understanding of the risk and developmental pathway of aggression that may be clarified by considering aggressive behaviors along with closely related classes of behavior problems (Moffitt, Caspi, Rutter, & Silva, 2001). To extend the findings from previous studies and because the mechanisms that underlie the risks for aggression and these other problem behaviors are not expected to differ, studies that measured the other above-mentioned childhood behavior problems were included in this review. Therefore, the term aggression is used to refer to verbal and physical aggression, externalizing behavior problems, conduct problems, antisocial behaviors, disruptive behaviors, and disobedient and oppositional behaviors. Because efforts for prevention and early intervention aim to address this broad constellation of problem behaviors, this review considered the full breadth of childhood aggression.

To sum, the purpose of this chapter is to: (a) describe the theoretical framework used for guiding the current study; and (b) examine previous research on both early predictors and later outcomes of various developmental trajectories of childhood aggression.

Theoretical Background

Empirical research on aggression has suggested that there are important variations between individual children in emergence, persistence, and escalation of aggressive behaviors, indicating that the development of aggression in children often follows

unpredictable, non-standard pathways beginning at different times (Jennings & Reingle, 2012; Moffitt, 1993; Moffitt et al., 2001). Factors contributing to inter-individual differences in childhood aggression may include child, family, and environmental factors.

Bronfenbrenner's Bioecological Theory

Urie Bronfenbrenner's (1986) bioecological theory of human development provides a comprehensive theoretical background, describing human development in terms of a dynamic interplay between the individual and the environmental context in which the individual is engaged. This perspective views a child's development as an interactive process between personal characteristics and environmental contexts over time (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 2006). That is, both individual and contextual features may collectively and interactively contribute to children's behavioral development. Based on this perspective, it is important to examine a wide range of intrinsic child, family, and contextual factors that have been shown to predict aggression in children.

The four defining components of the bioecological model consist of process, person, context, and time. These four components form the basis of the Process-Person-Context-Time (PPCT) model (Bronfenbrenner & Morris, 2006). The PPCT model is used here as a theoretical framework to examine factors affecting trajectories of children's aggressive behaviors from early childhood through early adolescence. Applying the PPCT model, the current study explored these beginning with process factors, and then considered person, context, and time to better understand the development of early childhood aggression over time.

Process Factors in the Development of Aggression

Process, or proximal process, encompasses interactions and relations a child has with his/her immediate surroundings, particularly with the people (i.e., parents, teachers, and peers) in those surroundings. Bronfenbrenner considered these proximal processes as the engines of human development that children experience on a fairly regular basis. These processes are shaped not only by the individual characteristics of the developing person, but also by the environmental contexts in which reciprocal interactions occur. These contextual elements involve personal characteristics of those who engage in the proximal process with the developing person and the social and physical settings in which the proximal processes occur.

For most young children between zero and five years, their interactions and relationships with their mothers provide the primary proximal processes for early development, and the quality of their interactions can make a significant difference in children's developmental pathways and outcomes of physical aggression (Bronfenbrenner & Morris, 2006; Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Vitaro, Barker, Boivin, Brendgen, & Tremblay, 2006). Therefore, this study examined the influences of maternal positive parenting and harsh verbal and physical discipline toward their children to examine the proximal processes in which mothers and children are engaged in relation to children's development of aggression.

Person Factors in the Development of Aggression

Person factors refer to individual qualities and characteristics, including biology, emotion, cognition, and behavior of the developing person. These properties play an important role in the developmental process. From the bioecological perspective,

children's individual-level variables contribute to behavioral outcomes both directly and indirectly through interaction with the developmental context (Bronfenbrenner, 1979).

Previous research on the development of physical aggression has shown that children's gender is a significant indicator of distinctive trajectories of aggressive behaviors in the preschool years, with boys engaging in more antisocial behavior and showing more conduct problems than girls (Lussier et al., 2012; Vitaro et al., 2006). A meta-analytic study found that studies of aggression and gender show gender differences in aggression pathways evident from age two through adolescence (Archer, 2004). In addition, poor language development and emotion regulation are reported as risk factors of early childhood behavior problems for both boys and girls (Lahey et al., 2006; Odgers et al., 2008). These emotional characteristics and cognitive capacities of children may influence externalizing behavior problems in relation to communication and self-control while interacting with others. Based on empirical evidence of predictors of childhood aggression, this study examined three personal characteristics of children that may predict their aggression trajectories: gender, language development, and emotion regulation.

Context Factors in the Development of Aggression

Context factors indicate the multilayered, nested systems of the developing person's environment ranging from immediate to more distant contexts. These factors are comprised of four levels of systems surrounding the child in the context: microsystem, mesosystem, exosystem, and macrosystem (Brofenbrenner, 1979). The microsystem refers to the innermost level, which makes direct contacts with the child, such as family, peers, and child care. The mesosystem is the second immediate level and involves the interplay between two or more systems. For instance, parent-teacher communication may

help the child better adjust to school and prevent conduct problems in classroom. The exosystem is defined as comprising one or more surroundings, which do not directly involve the developing child, but in which events happen that influence or are influenced by what occurs in that more proximal context, such as the family setting. One example is the influence of a parent's workplace schedule, which may affect the parent's availability and consequently their availability to interact the child. The macrosystem is the outermost level, consisting of broader social and cultural values.

Bronfenbrenner and Morris (2006) proposed that the extent to which contexts influence the child depends on the proximity of the contexts to the child and the proximal processes in which the child is involved. Therefore, it is important to identify how early environments exert an impact on the development of aggressive behaviors in children. The present study examined the influences of the exosystem, which contains environmental factors that have a profound impact on children's development, although children are not directly engaged in them. The exosystem factors in this study that could indirectly influence pathways of childhood aggression include single parenthood, the age of mothers at childbirth, education level, and poverty.

Time Factors in the Development of Aggression

Time or timing was later added to reflect the nature of human development, which can only take place over time while both personal characteristics and their surroundings are interacting. The time component encompasses various aspects, such as stability and change within the individual over the life course, the nature of periodicity and duration of the proximal processes, and even changes over time in the larger societal and historical

context both within and across generations (Bronfenbrenner, 2001; Bronfenbrenner & Morris, 2006).

Among these various time components, the current study looked at stability and change in aggression of the individual child over the life course as a key element in the child's behavioral development. It has been well accepted that children around age two years show more tantrums and noncompliance as they develop their sense of autonomy and independence, but that these levels of aggressive and disobedient behaviors tend to decline as they get older. This study aimed to investigate the course of childhood aggressive behaviors over time, within the individual, from early childhood through early adolescence. With children across this age range, the present study sought to identify individual and contextual factors that predict the persistence of aggression for some children, in spite of the expected average decrease in aggression as children approach school age.

Developmental Trajectories of Child Aggression

Toddlerhood is the age period when children most frequently show aggression during the life course, but many of them will decrease their use of disruptive and aggressive behaviors by the time they enter elementary school (Tremblay et al., 2004). The finding that some children who exhibit early aggression continue to have difficulties, while others do not, has shown the necessity to examine differential aggression trajectories (Campbell et al., 2010; Côté, et al., 2006). Discriminating the subgroups of children who follow different pathways of aggression from early childhood may have

significant implications for individualized prevention and early intervention efforts (Kjeldsen, Janson, Stoolmiller, Torgersen, & Mathiesen, 2014).

Common Patterns in Trajectories of the Development of Aggression

Two developmental trajectories of aggressive and antisocial behaviors that have been described provide a guideline for subsequent studies on childhood aggression. Patterson and colleagues (Patterson, DeBaryshe, & Ramsey, 1989; Patterson & Yoerger, 2002) suggested an early starter during childhood pathway and a late starter during adolescence pathway of delinquent behaviors (Patterson et al., 1989; Patterson & Yoerger, 2002). Similarly, Moffitt (1993) proposed a developmental taxonomy of antisocial behaviors such that developmental trajectories of aggressive behaviors can be classified into either a life-course-persistent pathway (i.e., continuity from childhood to young adulthood) or an adolescence-limited pathway (i.e., temporary involvement during adolescence). In addition, recent empirical research has reported additional childhood aggression trajectories, including patterns described as high or medium childhood limited (Kjeldsen et al., 2014), increasing or decreasing levels over time (Olson, Choe, & Sameroff, 2017), and high increasing, intermediate, and low decreasing (Wildeboer et al., 2015).

Fewer studies focused on trajectories of child aggression beginning before school entry, relative to studies beginning in the school years. However, children who are at risk for persistent behavior problem across the school years can be identified as early as age two to three years (Campbell et al., 2006; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). For instance, most toddlers identified at age two, followed to age eight decreased in overt aggression across time, with 42% and 38% of boys displaying moderate and high early

levels of aggression, respectively, followed by a steady decline across time, but 14% of boys showed a persistently low trajectory, and 6% of boys showed a persistently high trajectory (Shaw et al., 2003). Similarly, Campbell and colleagues (2006) classified boys and girls in a large national sample between two and nine years into five trajectory groups of childhood aggression: high-stable (3%), moderate-stable (15%), moderate and sharp declining (12%), low-stable (25%), and consistently very low (45%). Thus, developmental trajectories of children at risk for persistent aggression can be observed from the toddler period (Campbell et al., 2006).

Child Gender and Trajectories of the Development of Aggression

In addition to investigating patterns of distinctive trajectories of childhood aggression, researchers have been concerned with an additional factor that could influence stability and change in aggressive behaviors. Child gender is an influential variable having the potential to clarify developmental processes in relation to differential trajectories. Nevertheless, a sizable work on conduct problems of children has relied on all male samples and failed to investigate mixed-gender samples (Lacourse, Nagin, Tremblay, Vitaro, & Claes, 2003; Nagin & Tremblay, 1999, 2001; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003; Shaw, Hyde, & Brennan, 2012). Boys' risk for aggression is greater than girls' (Lussier et al., 2012), but there has been a lack of information specifying gender differences and similarities.

Some researchers have reported similar patterns of childhood aggression trajectories in common across genders, but gender differences in prevalence rates for trajectory membership (Barker, Oliver, & Maughan, 2010; Odgers et al., 2008). For example, a small proportion of females exhibit an early childhood onset trajectory of

aggression though often outnumbered by males. Also, females are less likely than males to display a life-course persistent trajectory (Moffitt & Caspi, 2001; Xie, Drabick, & Chen, 2011), and more likely than males to exhibit a low or no antisocial and aggressive pathway throughout childhood to adolescence (Martino, Ellickson, Klein, McCaffrey, & Edelen, 2008; Van Lier, Wanner, & Vitaro, 2007). Similarly, boys and girls showed four similar trajectories although they had different prevalence rates and took somewhat varying shapes (Gutman, Joshi, Parsonage, & Schoon, 2018). That is, more boys than girls were on an early-onset and persisting pathway, but more girls than boys were on a consistently low pathway from age 3 to 11. In addition, a few boys (3%) and girls (6%) exhibited a school-onset pathway, but this pathway among boys showed a sharper increase from 7 years, which led to higher prevalence rates of aggression at 11 years compared with girls. Another study longitudinally followed up a sample comprising of 731 boys and girls at high risk beginning at age two to nine and a half (Brennan, 2015). The results showed four trajectory patterns in both boys and girls. However, while proportionately more boys were in a high persistent aggression group than girls, proportionately more girls were in a low stable aggression group than boys. Thus, it is important to extend our understanding of childhood aggression by identifying how developmental pathways and the influences on these pathways may differ in boys and girls from early childhood to adolescence.

Predictors of Child Aggression

Early childhood onset behavior problems, especially when stable across the school years, place young children at greater risk for detrimental consequences,

compared with behavior problems beginning when children are older (Patterson et al., 1989; Odgers et al., 2008; Rutter, 2003). Indeed, those children who showed an aggression trajectory that emerged early and persisted throughout childhood displayed not only more severe forms of antisocial behavior in adolescence, but also a wide range of maladaptive outcomes such as substance abuse, abusive relationships, financial issues, and mental and physical health problems in adulthood (Odgers et al., 2008). Nonetheless, most follow-up research has been restricted to the preschool or early elementary school years, and only a few studies of childhood aggression have examined samples of early childhood to adolescence (Fanti & Henrich, 2010; Kjeldsen et al., 2014; NICHD ECCRN, 2004).

Child Gender and Predictors of Aggression

No gender differences in childhood risk factors have been identified in predicting aggression trajectories (Lahey et al., 2006; Moffitt & Caspi, 2001), indicating that risk factors exert in a similar manner within boys and girls. Recent studies have demonstrated similar linkages between individual and contextual elements among young children and early-onset aggression in boys and girls (Campbell et al., 2010; Odgers et al., 2008), suggesting consistent mechanisms by which risk factors influence aggressive behaviors of both genders. However, the inclusion of girls is relatively recent in the research literature, and the early influences on girls' aggression need to be further explored. Therefore, it is optimal timing to investigate early risk factors for trajectories of early-onset aggression, separately by child gender, with a starting point at the age of two years when children's aggressive and disobedient behaviors first begin to emerge.

Campbell and colleagues (2000) found that children showing early onset and persistent aggression were characterized by a common set of family stress and child characteristics beginning from an early age (Campbell, Shaw, & Gilliom, 2000). Specifically, childhood risk factors associated with surroundings involve positive or ineffective and harsh parenting (McNamara et al., 2010) as proximal factors, and single parenthood, teen mother, maternal education, and poverty as more distal factors (Lahey et al., 2006; Odgers et al., 2008; Pepler, Jiang, Craig, & Connolly, 2008). In addition, risk factors related to child characteristics include low language skills (Wang, Aarø, & Ystrom, 2018) and poor emotional regulation (Röll et al., 2012). Taken together, this study included maternal parenting behaviors, family risk factors, and child characteristics assessed in early childhood to predict trajectories of aggressive behavior from toddlerhood to early adolescence. It is necessary to understand typical developmental patterns of aggression in relation to a range of contextual factors and child characteristics that have been shown to explain the continuity and discontinuity of aggressive behaviors.

Maternal Positive and Negative Parenting

During early childhood, children are able to learn to internalize and comply with their parent's demands, but also to intentionally disobey and refuse them (Kochanska & Aksan, 1995). Even though the relationship between parent and child becomes more mutual in the preschool period of childhood, parents must still adjust their parenting behaviors to the child's level of development during this period of development (Harrist & Waugh, 2002). Thus, the quality of parenting behaviors is crucial to our understanding of why some young children show persistent disobedience and aggression while others do not (Olson et al., 2009; Trentacosta et al., 2011).

Positive Parenting and Childhood Aggression

The quality of parent-child relationships during early childhood has meaningful implications for children's later behavioral adjustment. Positive parenting behaviors with warmth, responsiveness, and sensitivity contribute to resolving developmental challenges such as aggression and temper tantrums in young children. For example, parents using effective disciplinary strategies with warm and sensitive behaviors can provide good role models such that their child can learn how to modulate and express negative feelings in an appropriate manner and develop skills to initiate and sustain positive social exchanges (Choe, Olson, & Sameroff, 2013b; Sameroff, 2009; Sroufe, 1996). In turn, these positive aspects of parenting can provide toddlers with experiences that support the development of communication and self-regulation skills that may reduce the likelihood of persistent aggression.

Mothers who are accepting, nurturing, and sensitive with their children tend to have children who are less aggressive with their peers, less likely to be rejected by their peers, and generally more socially competent (Mize & Pettit, 1997; Rubin & Burgess, 2002). Moreover, Campbell and colleagues (2010) observed that sensitive maternal behaviors decreased children's aggression and temper tantrums, highlighting the importance of active and positive maternal engagement with their children (Campbell et al., 2010). Also, when mothers are more involved with their children, more consistent and appropriate in limit setting, and more effective in communicating with their children, their children are less likely to engage in aggression (Landry, Smith, & Swank, 2006). Mothers' positive parenting appears to encourage children's socio-emotional

development such that mothers who are responsive and sensitive in interacting with their children tend to have children with better prosocial behaviors.

Negative Parenting and Childhood Aggression

In contrast to positive parenting, negative and coercive parenting practices raise anger and resentment in children, while mothers are modeling power assertive techniques of interacting with others (Snyder, Reid, & Patterson, 2003). When parenting behaviors are controlling, harsh, or rejecting, children show more behavior problems such as aggression and noncompliance (Paulussen-Hoogeboom, Geert, Stams, & Peetsma, 2007). Moreover, maternal negative parenting characterized by harshness, over-control, rejection, and noninvolvement is associated with more child aggression and disobedience, not only during preschool years (Smith, Calkins, Keane, Anastopoulos, & Shelton, 2004), but also throughout adolescence and early adulthood (Hentges, Shaw, & Wang, 2018), implying that the poor quality of maternal caregiving at an early age could lead to a chronic course of childhood aggression. Young children of mothers showing low parental warmth and responsiveness are more likely to fall into the decreasing trajectory group rather than being in the low-stable trajectory group, indicating that lack of mothers' positive parenting predicts children's early-onset aggression, but not necessarily chronic aggression into childhood (Olson et al., 2017).

Mothers' use of corporal punishment with young children has been associated with high levels of aggression that persist and increase across development (Campbell et al., 2010; Choe, Olson, & Sameroff, 2013a). Preschool-aged children who followed a path of increasing aggression across the transition to school had mothers using frequent corporal punishment (Olson, Lopez-Duran, Chang, & Lunkenheimer, 2011). Children

who showed chronic aggression experienced the highest frequencies of maternal physical punishment, followed by children who showed increasing, decreasing, and low aggression (Olson et al., 2017). Moreover, it should be noted that, even for toddlers who were in the normal range of aggression, early experiences of frequent corporal punishment by mothers predicted the development of late-onset aggression (Olson et al., 2017; Olson et al., 2011; Lunkenheimer, 2011; Smith, et al., 2014). This finding points to early parental punitive discipline as detrimental in the development of children's aggression such that it disrupts children's ability to learn how to use alternative and more adaptive strategies instead of behaving aggressively.

Gender, Parenting, and Childhood Aggression

There is abundant evidence linking positive parenting behaviors and children's low levels of aggression. Nonetheless, to date there have been inconsistent findings in terms of gender differences in aggression related to parenting. For example, maternal parenting practices characterized by sensitivity, supportiveness, low hostility during play and problem-solving tasks with children are significantly related to less frequent aggression regardless of child gender, but the relation is stronger for boys from ages two to nine (Miner & Clarke-Stewart, 2008). In addition, maternal parenting with more sensitivity and less intrusiveness during toddlerhood is associated with lower levels of aggression one year later, but only among boys (Caughy, Peredo, Owen, & Mills, 2016).

Previous studies have suggested that mothers parent boys and girls differently from early childhood (Keenan & Shaw, 1997; Lytton & Romney, 1991). Indeed, children's gender influences the use of negative parenting, such as harshness, physical discipline, and coercion (McKee et al., 2007; Sameroff, 1975), with negative parenting

more likely for boys than girls. This is not surprising, given boy's higher rates of aggression and noncompliance and the established association of negative parenting with child aggression. These child gender differences in parenting, with boys treated more harshly, may account for different aggression trajectories between boys and girls. With boys, but not girls, parents' low warmth and hostile reactions to child misbehavior at home were related to elevated externalizing behaviors, assessed from kindergarten to first, second, and third grades (McFadyen-Ketchum, Bates, Dodge, & Pettit, 1996). One possible explanation is that boys tend to increase misbehavior in the face of negativity and over-control by mothers, whereas girls tend to comply (Kuczynski & Kochanska, 1990; McFadyen-Ketchum et al., 1996).

Nonetheless, much of the research measuring negative parenting practices with toddlers and young children has not demonstrated gender differences (Browne, Odueyungbo, Thabane, Byrne, & Smart, 2010; Parent et al., 2011). A majority of studies using cross-sectional and longitudinal data investigated the links between parenting behaviors during early childhood and early-onset aggression, but failed to find gender differences in the relation (Browne et al., 2010; NICHD ECCRN, 2004, Stormshak, Bierman, McMahon, & Lengua, 2000). In a meta-analysis, there were no gender differences in the associations between children's behavior problems and negative aspects of parenting, including behavioral control and inconsistent discipline (Hoeve, et al., 2009). Some research explains that boys are more vulnerable than girls to developing aggressiveness in the context of negative parenting behaviors (Parent et al., 2011). Yet, negative parenting practices may occur more frequently with sons than daughters.

Moreover, only limited findings are available to suggest that aggression trajectories of boys and girls are differentially predicted by parenting practices.

The current study assumes that young children who are more susceptible to behavioral difficulties may be more sensitive to both positive and harsh parenting styles (Lakes, Vargas, Riggs, Schmidt, & Baird, 2011), regardless of gender. The differential susceptibility hypothesis may be useful for understanding the association between children's negative and difficult emotionality, and their susceptibility to parental rearing influences (Belsky, Hsieh, & Crnic, 1998). Children's varying susceptibility to parental influences should be explored in relation to how experiences of positive or harsh parenting in early years are associated with trajectories of aggression across early childhood to early adolescence.

Cumulative Family Risk and Childhood Aggression

Despite evidence that contextual risk factors surrounding young children are related to childhood aggression, few studies have investigated exosystem context factors that may discriminate developmental patterns of aggression among children in poverty. The focus of previous studies has been limited to family income, but family income seems to have selective effects on children's adjustment, related primarily to verbal skills and academic achievement (Duncan & Brooks-Gunn, 1997), while other more proximal contextual factors, such as a young parent with limited education, two family risk factors that commonly co-occur in economically disadvantaged families, are more likely to predict children's behavior problems. Therefore, rather than low-income or poverty per se, more proximal family risk factors should be examined in relation to children's aggression.

Indeed, children from economically disadvantaged families are likely to confront multiple contextual family risk factors that indirectly elevate children's adjustment difficulties, including psychological problems, social problems, and symptoms of delinquency (Santiago, Wadsworth, & Stump, 2011). Rutter (1979) initiated the investigation of research on the influences of cumulative risk and child outcomes. Rutter found that children having no or one family risk factor did not differ in adjustment, but children having two risk factors showed maladjustment four times as much as the former group, and children having four or more risks showed an additional multiplicative increase in maladjustment. That is, accumulation of numerous risk factors would be a better predictor of child externalizing problems than the presence of a particular risk factor (Sameroff, Gutman, & Peck, 2003; Trentacosta et al., 2008). Researchers have tried to identify the impact of cumulative risk factors occurring concurrently by proposing cumulative risk models in which a cumulative risk index is calculated by summing each item dichotomized as present on a value of 1 or absent on a value of 0 (Doan, Fuller-Rowell, & Evans, 2012). For instance, Campbell and colleagues (2010) found that each item tapped into a single latent factor of risk, using factor analysis for four items (i.e., years of maternal education, family income, ethnic minority status, and the presence of a husband in the household).

These cumulative risk approaches usually have shown a linear association between the number of risk indicators present during early childhood and subsequent aggression (Trentacosta et al., 2008). Higher risk scores were indicative of a greater probability of being classified into an aggression trajectory of frequent and chronic conduct problems instead of other aggression trajectories of less frequent and less chronic

problems (Campbell et al., 2010; NICHD ECCRN, 2004). Therefore, a variety of contextual risks, while young children are growing up, appear to have a cumulative association with children's aggression.

The compound effect of multiple family risks can be synergistic and negative on children's development of aggression. Children with more problem behaviors are more likely to be raised in a low-income household, live with a single parent, be from an ethnic minority group, and have a mother with low education and symptoms of depression (Brown & Moran, 1997; Malik et al., 2007). Five-year-old children showed more aggression when they had a larger number of multiple family risks that included maternal race (i.e., non-European American), single parenthood, using public assistance, having multiple caregivers, living in unstable environments, and having an irregular daily schedule for the child (Bendersky et al., 2006). In a longitudinal study, children's disruptive behavior was linked with the total number of up to nine different risks: poverty, low maternal education, minority ethnicity, single parenthood, high household density, maternal depression, authoritarian parenting style, unresponsive maternal interaction with their children, and low-levels of stimulation and responsiveness at home (NICHD ECCRN, 2004).

The present study used a cumulative family risk index based on the following indicators related to maternal vulnerability: single parenthood, maternal age under 20 at birth of child, low maternal education, and poverty. Childhood aggression has also been linked with a wide range of additional risk factors that should be accounted for, including child ethnicity (Watson, Fischer, Andreas, & Smith, 2004; Murry et al., 2002), the community where children live (Burchinal, Vernon-Feagans, Cox, & Key Family Life

Project Investigators, 2008), and their school's or neighborhood's level of poverty

(Hanish & Guerra, 2000; Jansen et al., 2016). Previous research suggested that cultural

variations matter in predicting the relation between maternal parenting behaviors and

children's behavioral outcomes (Berlin et al., 2009) as well as the subsequent mother-

child relationship quality (Ispa et al., 2004). Individual cultures value different parenting

practices and have different expectations for children's desirable behaviors, so research

findings should not generally be interpreted in the same way for each group. Therefore, in

addition to cumulative family risk, this study took into consideration community location,

program membership, child ethnicity, and school characteristics.

Gender, Cumulative Risk, and Childhood Aggression

Theoretical perspectives explaining gender differences in aggression have

proposed that boys possess more risk factors than girls (Eme, 2007), or that when

considering the context of risk, boys tend to show a lower level of threshold for

aggression (Moffitt et al., 2001; Hay, 2007). Eme and Kavanaugh (1995) explained that

boys rather than girls may be more vulnerable not only to biological stress, but also to

psychological stress because of slower early cognitive and socio-emotional development,

implying greater vulnerability for the development of aggression in males. While

previous research showed that child-level risks, such as language delays and impulsivity,

occur more frequently in boys, evidence has been inconsistent for gender differences in

contextual risk factors, such as socioeconomic status or other family risks, or for

heightened susceptibility in boys to either type of risk. The majority of findings do not

support a greater magnitude of association in boys than in girls between family risk

factors during early childhood and aggression (Barker & Maughan, 2009; Côté et al., 2006; Odgers et al., 2008).

It would be useful to distinguish cumulative risks at child-level and contextual-level when identifying gender differences in the association of risk with aggression. Exploring risk domains separately for boys and girls may show whether risks in each domain are similarly associated with aggression for both genders. In the present study, child-level and contextual-level cumulative risk are expected to be associated with early-emerging and stable aggression for both boys and girls, but boys are expected to have greater levels of child risk. In addition, boys with numerous family risks may be more susceptible than girls to developing aggression, but risk factors that distinguish trajectory membership of children may not differ between child genders.

Gender, Language Development, and Childhood Aggression

Early language development delay has been examined as a significant predictor of aggression over time. Children who have deficits in verbal ability may not be effective at expressing themselves and communicating with others, and are then more likely to employ oppositional and aggressive behaviors toward others (Tomblin, Zhang, Buckwalter, & Catts, 2003). Tremblay (2000) postulated that the level of childhood aggression should decrease as children acquire more sophisticated language and related social skills that they can use for alternative nonressive strategies such as negotiation and compromise when they want to achieve particular goals. Previous research confirmed associations between delayed early language development and disruptive and aggressive behavior in preschoolers (Dionne et al., 2003; Kaiser, Hancock, Cai, Michael, & Hester,

2000). Moreover, kindergartners with elevated aggression displayed poorer language and cognitive skills (Bierman, Torres, Domitrovich, Welsh, & Gest, 2009).

Empirical evidence implies that cognitive delay and delayed language development are associated with persistent aggression, particularly in males rather than females (Moffitt, 1993; Tremblay, 2000). However, in terms of gender differences in early language development, boys typically produce fewer words and exhibit slower rates of vocabulary growth, as early as 2 years of age and into school years, compared with girls (Bouchard, Trudeau, Sutton, Boudreault, & Deneault, 2009). Therefore, girls may be less likely to show aggression and acting out than boys because girls develop language earlier than boys thus girls are more able to use language skills for regulatory strategies when they feel angry or frustrated (Roben, Cole, & Armstrong, 2013).

The shape of developmental pathways of aggression, for both boys and girls, does not differ between children with language difficulties and those with typical language ability between ages 4 and 11 (Yew & O'Kearney, 2015). Nevertheless, children with language difficulties are persistently higher on aggression across childhood than their counterparts. Dionne and colleagues (2003) propose that slow language development may accelerate the increase in physical aggression in toddlerhood and concomitantly hinder the normal decrease in aggression, which is usually observed during this period (Dionne et al., 2003). Using a population-based sample of 592 infant twins, this study sheds light on how critical early prevention for childhood aggression is. Contrary to these results, other researchers reported no association between language ability and aggression over time, within each gender, following children ages 4 to 13 years (Barker & Maughan, 2009). Despite inconsistent findings regarding gender, early language skills, and

aggression, the current study is guided by recent research carried out by Brennan (2015), explaining that children with a greater level of risk for aggression tend to be lower in language development regardless of gender differences in initial levels of aggression (Brennan, 2015). Therefore, the current study hypothesized that both boys' and girls' poor language skills may be associated with more childhood aggression, even though boys' levels of aggression may be higher.

Gender, Emotional Regulation, and Childhood Aggression

To understand the expression of aggression in young children, it is useful to consider emotional regulation: the way children learn to control their emotions. Emotion regulation is the intrinsic and extrinsic capacity to monitor, control, evaluate, and adapt their emotional responses to achieve a desired goal in the current conditions (Thompson, 1994). Emotion regulation ability is a critical skill for children to develop in order to adequately manage their emotions, and it is closely related to conduct problems such as aggression, defiance, and disruptiveness (Landy & Menna, 2001).

As children gain more capacity for self-regulation, externalizing problems generally decrease over time from their peak levels during toddlerhood (Olson et al., 2017; Tremblay, 2004). Self-control skills in early childhood, such as children's ability to better regulate negative emotions, inhibit destructive impulses, and react appropriately to emotional situations, seem to be related to the trajectory of early aggression. These constructive strategies may provide a foundation for using socially acceptable behaviors other than aggression toward others to solve conflict or express needs in response to anger, frustration, or inadequacy. Likewise, preschool aged children who are able to control their emotions are more likely to use socially appropriate responses during

intrusive or aggressive play with peers (Blair et al., 2015). Moreover, these children show greater social competence such as prosocial skills, peer acceptance, and friendship quality in addition to emotion regulation 2 years later.

Olson and colleagues (2009) discussed the preschool years as a period of time when children's self-regulatory competence rapidly develops, but also a time of increased vulnerability for children if they fail to establish adequate self-regulation skills (Olson, Sameroff, Kerr, & Lunkenheimer, 2009). Higher levels of emotion dysregulation and negative and hostile emotion expression are related to short- or long-term problematic behaviors (Eisenberg et al., 2001; Shipman, Schneider, & Brown, 2004). In a longitudinal study, it was found that dysregulated emotion assessed during toddler years predicted more externalizing problems during the preschool years (Rubin, Burgess, Dwyer, & Hastings, 2003). Olson and colleagues (2017) demonstrated that children's early self-control difficulties at age three increase the probability of high and chronic aggression trajectories (Olson, Choe, & Sameroff, 2017).

In spite of identified gender differences in the association between predictors and levels of aggression, the focus of much of aggression research has been on boys. In a few exceptions, for both boys and girls, later high aggression is predicted by early lack of self-control (Leve, Kim, & Pears, 2005) especially for boys (Brennan, 2015). It seems that boys tend to possess more risk factors of developmental difficulties such as attention-deficit/hyperactivity disorder than girls, which then reduce their abilities to control aggressiveness relative to girls (Messer, Goodman, Rowe, Meltzer, & Maughan, 2006). However, delay of gratification as an indicator of self-control was not predictive of high aggression trajectory membership in either boys or girls (Campbell et al., 2010). Prior

literature proposed a sex-differentiated pathway to aggression in that self-control of attention and impulsivity was related to aggression for boys, but not for girls across the period from preschool to school entry (Chang, Olson, Sameroff, & Sexton, 2011). Given the conflicting findings and lack of research on differentiating developmental aggression trajectories in relation to child gender, more work on gender differences in the association between early self-regulation and aggression is warranted. The current study suggests the same mechanisms of how children's emotion regulation capacity operates to control aggressive impulses for boys and girls although their frequencies of aggressive behaviors may differ.

Outcomes of Child Aggression

Aggression starting in early childhood tends to be highly persistent, can hinder important developmental processes, and is responsible for an array of negative outcomes in both social and cognitive functioning in adolescence. Nonetheless, most research has focused on more serious antisocial and delinquent consequences such that high and chronic aggression developed by an early age is a risk factor for serious conduct problems involving drug use, violence, theft, and criminal problems in adolescence and incarceration in early adulthood (Petras et al., 2008; Schaeffer et al., 2003). Importantly, however, early childhood aggression may predict more subtle difficulties in adjustment, such as social-emotional and academic outcomes, which should be explored because such difficulties may confer risks for social or school problems in early adolescence even when levels of childhood aggression are low to moderate (Broidy et al., 2003). Moreover, given the relatively low rates of aggression in girls, compared with boys, in early

childhood and adolescence (Messer et al., 2006), investigation of a wider range of developmental outcomes may provide more understanding of childhood aggression in girls.

In early childhood, early-starting aggression may interfere with children developing a range of social skills and academic abilities (Campbell et al., 2006; Fergusson, Horwood, & Ridder, 2005). Children with disruptive behavior problems are at greater risk for numerous detrimental consequences, involving peer rejection, internalizing problems, juvenile delinquency, and school failure (Barker et al., 2010; Brennan, Shaw, Dishion, & Wilson, 2012; Broidy et al., 2003;). Indeed, Campbell and colleagues (2006) reported that while children with high-stable aggression exhibited signs of conduct problems and worsening social skills, those with only moderate-stable aggression displayed signs of attention and behavior regulation problems, and those with low-stable aggression also had signs of difficult peer relationships, especially girls, who reported high levels of loneliness (Campbell et al., 2006). These findings shed light on the importance of considering that even low or moderate levels of transient and persistent aggression may forecast later adjustment difficulties. Therefore, based on prior literature, this study explored a wide range of adjustment consequences of early childhood aggression in early adolescence: social skills, academic success, internalizing problems, and delinquent behaviors.

Overview of Research on Childhood Aggression Trajectories

Bronfenbrenner's ecological model (1986) explains that not only children's individual vulnerability, but also disadvantaged parental characteristics and

environmental contexts, such as in high-risk families, place children at greater risk of behavior problems (Bronfenbrenner, 1986). A number of studies have further demonstrated significant associations between childhood aggression pathways and developmental consequences in children (Brennan, 2015; Campbell et al., 2010; Lahey et al., 2006). Using longitudinal data from the NICHD Study of Early Child Care and Youth Development, Campbell and colleagues (2010) shed light on the importance of the quality of mother-child relationships and sociodemographic risk factors as well as children's long-term adjustment when studying childhood aggression trajectories by gender (Campbell et al., 2010). The sample in their study, however, was mostly low-risk middle class families, which may have restricted the findings from generalizing to high-risk families whose children are more prone to the development of aggression. In addition, another researcher explored toddler-age risk factors (i.e., child personal characteristics, contextual characteristics, and cumulative risk) and an array of subsequent difficulties in social domains with respect to childhood aggression patterns for boys and girls (Brennan, 2015). Despite the use of a high-risk sample, small group sizes in an otherwise large sample (total $N = 731$) resulted in relatively few numbers of children in each trajectory group (e.g., only 5 boys and girls, respectively, in a high aggression group) and failure to find significant gender differences in relations between early risk factors and aggression trajectories as well as between aggression pathways and subsequent outcomes. With data from the larger sample of the EHSRE project (EHSRE; $N = 690$), with a sample selected from the larger sample to be used in this study, a study by Li (2012) examined unique and collective contextual influences, from microsystem (e.g., mothers' characteristics, maternal discipline, family interactions, and parent-child

relationships) to exosystem (e.g., school poverty), as predictors of physical aggression in grade five in multiple ethnicity groups, highlighting the considerable predictive contributions of the multiple contexts in which a child is living to the development of aggression in children from low-income families. Despite the use of a longitudinal and prospective design with repeated measures across time for a large low-income sample, there was a considerable attrition rate (i.e., the exclusion of about 77% of sample) resulting from a listwise deletion method, which reduces the generalizability of the sample. In addition, since this study investigated a correlation between early physical aggression at age three and later physical aggression in grade five, it did not examine the pathways of childhood aggression across the multiple data collection time points in the study.

To build upon past research, this study examined whether a broad range of early predictors and later outcomes of children's developmental aggression trajectories in the large EHSRE sample of boys and girls, from ethnically and regionally diverse low-income families at moderate-risk who qualified for Head Start services ($N = 3,001$ families), including all available cases, using all available data to estimate parameters, and taking into account missing data. Guided by an ecological perspective of human development and previous scientific findings, the current study will make a meaningful and unique contribution both theoretically and empirically to the literature by exploring both early predictors, including gender, and later outcomes of aggression trajectories from age 2 to 11 for children from low-income families.

Overarching Study Goals

Aggressive behaviors displayed at an early age show both meaningful continuity and changes over the life course (Rutter, Kim-Cohen, & Maughan, 2006). Although most children show a typical decrease in aggression and disruptiveness prior to school entry, some children maintain high levels of behavior problems (Nagin & Tremblay, 1999; Tremblay & Nagin, 2005), raising important questions about the best way to find and intervene with children who are truly at risk for later aggression and other behavior problems. Investigating such children from early ages and identifying characteristics that distinguish them from more normative trajectories of early childhood aggression can guide the development and implementation of early interventions. In addition, consideration of childhood aggression in girls is warranted, with respect to questions about the frequency and chronicity of aggression by gender, because much of the research on developmental trajectories of childhood aggression has focused on boys (Hay, 2007; Lacourse et al., 2003; Messer et al., 2006; Shaw et al., 2012). This study would help address the relative lack of attention to developmental courses of childhood aggression in girls compared with boys. Thus, the first goal was to identify distinct trajectories of childhood aggression from toddlerhood (age 2) to early childhood (ages 3 and 5) to early adolescence (age 11), separately for girls and boys.

According to Bronfenbrenner's bioecological theory, the development of child behavior is established by processes in which individual characteristics, and relational and environmental contexts, from proximal to distal, operate together over time. Based on this perspective and earlier cross-sectional and longitudinal studies of childhood aggression using a similar perspective (Brennan, 2015; Campbell et al., 2010; Li, 2012),

the current study selected specific factors to test as predictors of aggression trajectories: early process factors (i.e., maternal positive parenting, harsh discipline); early context factors (i.e., cumulative family risk); and children's early person factors (i.e., early language development, early emotional regulation). Therefore, a second study goal is to explore influences of process, context, person, and time (PPCT) factors on childhood aggression trajectories guided by an ecological theory framework.

High and stable aggression from an early age elevates children's risk for greater detrimental consequences in multiple domains of socio-emotion and behavior, not only aggressive behavior. Although many studies focus on more severe consequences, this study investigated general adjustment problems (i.e., social skills, academic success, internalizing problems) as well as more serious problems (i.e. adolescent delinquency) with the purpose of extending and building upon previous findings by Campbell and colleagues (2010). Thus, the final goal of this study is to explore a range of child adjustment outcomes in early adolescence as a function of children's developmental trajectories of aggression, including social skills, academic success, internalizing problems, and delinquent behaviors. Furthermore, this study explored the predictive power of trajectory membership of aggression relative to an average score of aggression over time points.

To summarize, the present study aimed to investigate aggression trajectories of children from age 2 to 11, including how these trajectories differ when child gender is considered. This study also explored early influences at age two, including process, context, and person factors that distinguish these trajectories of aggression from toddlerhood to early childhood to early adolescence. Finally, a range of difficulties in

early adolescence was investigated to see how aggression in toddlerhood and early childhood may predict aggression and other outcomes in early adolescence.

Hypotheses

1. Aggression trajectories: Child aggression will show distinctive developmental trajectories from early childhood to early adolescence across ages 2, 3, 5, and 11.

2. Aggression trajectory within each gender: Child aggression will show distinctive developmental trajectories from early childhood to early adolescence across ages 2, 3, 5, and 11 in boys and girls.

3. Aggression predictors within each gender: The early predictors such as process, person, and context factors will predict childhood aggression trajectory group membership in boys and girls.

   a. Early process and context factors: Process factors (i.e., maternal positive parenting, harsh discipline) and context factors (i.e., cumulative family risk) in early childhood will predict developmental trajectory group membership of child aggression.

   b. Early child person factors: Early child person factors (i.e., language development, emotional regulation) will predict developmental trajectory group membership of child aggression.

4. Aggression outcomes within each gender: Children with distinctive aggression trajectories will differ in later outcomes in boys and girls.

a. Later outcomes: Children with different aggression trajectories will differ in later outcomes (i.e., social skills, academic success, internalizing problems, and delinquent behaviors) in early adolescence.

b. Predictive power: Aggression trajectory groups will show better predictive power than an average of aggression scores over time points.

CHAPTER III

METHODS

This chapter describes the methodology used to investigate developmental trajectories of childhood aggression from toddlerhood through early adolescence and to identify predictors and outcomes of aggression trajectories. This chapter includes descriptions of: (a) the source of data; (b) eligibility and characteristics of participants; (c) procedures of data collection; (d) measures used at multiple time points that were used in this study; and (e) an analytical plan to address the research questions.

Data Source

The current study employed a large extant data set from the Early Head Start Research and Evaluation (EHSRE; U.S. Department of Health and Human Services, Administration for Children and Families, 2011) project funded by the Administration for Children and Families (ACF). The EHSRE study was designed to evaluate the influence of Early Head Start (EHS) programs on child and family outcomes at the end of the program and in subsequent follow-up studies. EHS is a comprehensive, two-generation program that provides families with intensive services from before the child's birth until the child is three years old. The EHSRE project collected data at multiple time points to look at early and longitudinal impacts of the EHS program.

The EHSRE dataset consists of a nationally representative sample of families who qualified for EHS programs in 17 communities across the country and participated in EHSRE research between 1996 and 2010. From family enrollment, the EHSRE followed children and families over a 3-year period based on children's birth-related ages (i.e., 3, 5,

and 11 years) to capture the children's and families' experiences and their outcomes. The evaluation included assessment of a wide range of child and family outcomes. The dataset is based on a mixture of child assessments, ratings of child behaviors by parental reports and by in-person interviewers' ratings of parent-child interactions, and parental self-reports of their behaviors. The benefits of using the EHSRE dataset include its volume of longitudinal information on individual children and families from a variety of backgrounds. The EHSRE dataset represents a broad range of program approaches (i.e., center-based, home-based, and mixed), rural/urban locations, and regional and racial/ethnic diversity. In addition, the nationally representative aspects of the EHSRE dataset may allow generalization of the findings of this study to the population of EHS children and families.

This study used children's aggression levels as reported by parents at child age 2, 3, 5, and 11 years. In addition, other data were used that reflect family characteristics and functioning, maternal parenting behaviors, early child development, and later child academic and social outcomes. These data provide an opportunity to identify the distinctive trajectories of childhood aggression associated with early predictors and later outcomes within each gender from toddlerhood to early adolescence.

Sample

For EHSRE research, a total of 3,001 families from 17 communities were originally recruited at 17 EHS centers beginning in 1996 (Administration on Children, Youth, and Families, 2002). EHSRE eligibility requirements were: the primary caregiver must have been expecting a child or had a child younger than 12 months old; the family

must have met the program's income guidelines set by federal poverty guidelines (see Administration for Children and Families, 2002); and the family must have agreed to random assignment.

The EHSRE study identified 3,001 eligible children and families who were enrolled in EHRSE, and as part of the experimental research design, 1,513 families were randomly assigned to the EHS group to receive program services, while 1,188 families were assigned to the comparison group and received other services available in their communities that did not include EHS. In this study, one family was excluded because of the child enrollment age of minus 10 months, which was considered erroneous information. Finally, the current study used data from children having at least two aggression data points ($n = 2{,}295$). Those having fewer than two or two aggression data points ($n = 705$) were excluded.

Demographic background information, including risk factors used for a cumulative family risk index, were collected by EHS program recruiters at family enrollment and again at the child's birth as needed. Parents were asked to provide their demographic information by completing an Early Head Start application and enrollment forms. Table 1 shows child and parent demographic characteristics of 3,000 participants. Children up to the age of 12 months were eligible for the EHS. The majority of children (44%) were ages zero to five months and 24% were not yet born at random assignment ($M = 3.02$ months, $SD = 4.65$). Roughly 48% of the children were boys, 50% were girls, and 1% were missing gender. Children's primary caregivers were mainly their mothers (99%), whose age averaged 22.7 years ($SD = 5.65$; range = 12-48 years) at randomization. Approximately 36% of mothers were White, 34% African American,

23% Hispanic, and 5% other ethnicities. To qualify for EHSRE, families had to meet household low-income status according to a percentage of the federal poverty guidelines or have a child with a disability. Most of participants in the study sample (88.7%) were below the federal poverty line for their household income and family size (ACF, 2002; Administration for Children and Families, 2006).

Four family characteristics indicating family risk were combined to serve as a predictor of child aggression in the current study. At enrollment, 48 % mothers reported that they had dropped out of high school. About 39% mothers gave a birth when they were younger than 20 years, and 75% indicated that they had never married and were not cohabitating. Approximately 35% of families were receiving public assistance, an indicator of serious financial difficulties.

Table 1
Child and Mother Demographic Characteristics (N = 3,000) at Enrollment

	N	%	Mean(*SD*)	Range
Child age	3,000		3.02(4.65)	-8 - 15mo
Unborn	710	23.6		
≤ 5 months	1,324	44.1		
5 + months	966	32.3		
Child gender	3,000			
Boy	1,509	50.3		
Girl	1,448	48.3		
Missing	43	1.4		
Mother age	2,994		22.7(5.65)	12-48yr
Applicant is mother	3,000			
Yes	2,983	99.4		
No	17	.6		
Mother ethnicity/race [a]	2,925			
White	1,093	37.0		
African American	1,019	34.5		
Hispanic	693	23.5		

Other	150	5.1
Maternal Employment Status [a]	2,898	
Employed or in School/training	1,308	45.1
Neither	1,590	54.9
Household income as a percentage of poverty level	3,000	
Less than 100%	2,126	70.8
100 % or more	340	11.3
Program membership status [a]	2,976	
EHS program	1,503	50.5
Comparison group	1,473	49.5
Predictor: Cumulative family risk		
Dropout high school [a]	2,885	
Yes	1,374	47.6
No	1,511	52.4
Teenage mother (younger than 20)	2,912	
Yes	1,142	39.2
No	1,770	60.8
Single parenthood (not married nor cohabiting)	2,988	
Yes	2,237	74.9
No	751	25.1
Receiving public assistance [a]	2,396	
Yes	842	35.1
No	1,554	64.9

[a] Demographic variables showing statistically significant difference between the included ($n = 2,295$) and excluded ($n = 705$) samples.

Procedures

Participating research families at 17 EHS program sites were followed longitudinally from 1996 to 2010. Demographic information was collected through the EHS application and enrollment forms. Families who met the EHS eligibility requirements were randomly placed into either the study or control group. Depending on

when the family enrolled in the study, the services began usually during the third

trimester of primary caregiver's pregnancy and continued until the child was three years

of age. When the child was 14, 24, and 36 months of age, and again during the spring

before kindergarten and the spring before grade six, trained data collectors administered

measures of child and family characteristics and functioning with each family in their

home.

Child assessment, parent interviews, and parent-child interaction assessment were

carried out by data collectors who were trained and certified for reliability in

implementing structured interviews, standardized developmental assessments, and

systematic observations. Mothers were the major reporters for demographics, family

functioning, parent knowledge and attitudes about child development and discipline, and

perceptions on children's behaviors. Children's developmental performance, parent-child

interactions, and home environments were assessed using standardized measures by

trained examiners and observers.

The current study used data from five data collection waves. The 0-3 phase of the

study, from enrollment to child age 3, took place across three waves of data collection,

when the children were 14, 24, and 36 months old. The pre-kindergarten follow-up study

provided a fourth wave of data collection conducted in the spring prior to kindergarten

entry (approximately age 5). Finally, the fifth-grade follow-up study represents the fifth

wave of data collection, which was accomplished when their children were in the spring

of their sixth year of formal school education (approximately age 11).

Measures

The present study used multiple measures collected at multiple time points. Child aggression was assessed by the Achenbach System of Empirically Based Assessment (ASEBA), Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000) at 2, 3, and 5 years, and by the Child Behavior Checklist for Ages 6 to 18 years (CBCL 6-18; Achenbach & Rescorla, 2001) at 11 years. As predictors of child aggression, maternal positive and negative parenting behaviors (i.e., harsh discipline) were evaluated at two and three years, cumulative family risk at family enrollment, and child's characteristics including early language development and emotional regulation at two years. Maternal positive parenting was measured using the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 2003) the Infant/Toddler Version for two years. Maternal harsh discipline was measured using the Index of Severity Discipline Strategies. Cumulative family risk was assessed using an EHSRE-constructed composite score of five indicator items. This study selected four indicator items considered relevant to childhood aggression such as drop out of high school, teenage mother, single motherhood, and poverty. Child early language development was assessed using language-factor items from the Bayley Scales of Infant Development (BSID-II; Bayley, 1993), Mental Development Index (MDI), and the MacArthur Communicative Development Inventories (CDI; Fenson et al., 1994). Child emotional regulation was assessed using the Bayley Scales of Infant Development (BSID-II; Bayley, 1993) Behavioral Rating Scales.

As outcomes of child aggression at 11 years, children reported their peer social relations using Self-Description Questionnaire I (SDQ-I; Marsh, 1990). Internalizing

problems of children were assessed by parent report on the CBCL 6-18 (Achenbach &

Rescorla, 2001). Academic success was evaluated using the Peabody Picture Vocabulary

Test-III (PPVT-III; Dunn & Dunn, 1997), the Matrix Reasoning subtest of the Wechsler

Intelligence Scale for Children (WISC-IV; Belsky, 1990), and Early Childhood

Longitudinal Study, Kindergarten Class (ECLS-K; Pollack, Atkins-Burnett, Najarian, &

Rock, 2005; Princiotta, Flanagan, & Germino-Hausken, 2006) Cognitive Assessment

(i.e., literacy, math). Delinquent behaviors were measured based on children's self-reports

in response to 14 questions asking about their risky behaviors (Loeber, Stouthamer-

Loeber, Van Kammen, & Farrington, 1989). This study controlled for site (community),

program membership, child ethnicity, and school poverty at 11 years. Table 2 describes

measurement, time points when study variables were measured, items with possible

range, and internal reliability.

Table 2

Description of Measures and Time Points Measured

Variable/Measure	Subscale	Child age	Items (range)	Internal reliability
Child Aggression (mother report)				
ASEBA CBCL	Aggression	2	19(0-38)	.91
		3	19(0-38)	.88
		5	19(0-38)	.89
CBCL 6-18	Aggression	11	18(0-36)	.90
Predictors of Child Aggression				
Positive parenting (parent interview and home observation)		2, 3		
HOME Infant/Toddler	Warmth, Non-punitive, Stimulation	2	7(0-7) 5(0-5) 12(0-12)	.74 .71 .68

Cumulative family risk
  Cumulative risk index
  (parent report)
	Number of factors: incomplete secondary education, mother under age 20 at child's birth, mother living without a partner, serious poverty	ER	4(0-4)	-

Language development
  BSID-II; MDI
  (child assessment)
  CDI
  (parent report)
	Language factor	2	12(0-12)	.92

	Vocabulary Combining words Sentence complexity		100(0-100) 1(0-1) 36(0-36)	.98 .95

Emotion regulation
  BSID-II
  (child assessment)
	Emotional regulation	2	7(7-35)	.92

Outcomes of Child Aggression

Social skills
  SDQ-I
  (child report)
	Peer relations	11	6(6-24)	.79

Internalizing problems
  CBCL 6-18
  (parent report)
	Anxious/depressed
	Withdrawn/depressed
		11	21(0-42)	.83

Academic success
(child assessment)
  PPVT-III
  WISC-IV
  ECLS-K
	Matrix reasoning
	Reading
	Math
		11	4(40-160)
			35(1-19)
			106(0-186)
			18(0-18)	

Delinquent behaviors
  Risky behavior
  (child report)
		11	14(0-14)	.66

Covariates with Child Aggression

Site (community)	ER	South, West, Midwest, Northeast/Mid-Atlantic
Program membership	ER	Yes/No
Child ethnicity	ER	White, African American, Hispanic, Other
School poverty	11	% of students eligible for free lunch

Note. ER = enrollment.

Child Aggression

Child aggression was measured over four time points, at child age 2, 3, 5, and 11 years. The Achenbach System of Empirically Based Assessment (ASEBA) Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000) was used for children ages two, three, and five years. Parents completed questionnaires of the ASEBA aggressive behavior subscale asking about child behavior problems that indicate aggression. Examples include being easily frustrated, having temper tantrums, showing angry mood, hitting others, and being uncooperative and defiant. The aggressive behavior subscale consists of 19 items based on a three-point Likert scale (0 = *not true*, 1 = *sometimes or somewhat true*, 2 = *very or often true*) such that possible points range from 0 to 38 with higher score representing more aggressive behaviors in children. Internal reliability of EHSRE participants indicated $\alpha = .91$ at age 2 years, $\alpha = .88$ at 3 years, and $\alpha = .89$ at 5 years. Internal reliability of the sample in this study indicated $\alpha = .87$ at 2 years, $\alpha = .88$ at 3 years, and $\alpha = .89$ at 5 years.

The Child Behavior Checklist for Ages 6 to 18 years (CBCL 6-18; Achenbach & Rescorla, 2001) was used at child age 11. Each child's participating caregiver answered items on the CBCL questionnaires about behaviors such as physical aggression, attention seeking, lying, stubbornness, and disobedience. The aggressive behavior subscale is

comprised of 18 items based on a 3-point Likert scale (0 = *not true*, 1 = *sometimes or somewhat true*, 2 = *very or often true*) such that the possible response scores range from 0 to 36 with higher score indicating more aggressive behaviors in children. Internal consistency reliability on the aggressive behavior subscale indicated α = .90 for EHSRE participants and α = .89 for the sample of this study.

This study intended to analyze data in two ways: one set of analyses included all the items measured over time (i.e., 19 items of ASEBA and 18 items of CBCL 6-18, aggression subscale respectively) and another set of analyses with only the overlapping 8 items that were the same at every time point. Although previous research on distinguished pathways over time used only the overlapping items, considering an item-level approach, analyzing only the age-common behaviors such as destroying things, being disobedient, physically attacking others, and having temper tantrums may blur age-appropriate behaviors that should not be missed. For young children, not waiting, easily being frustrated, being accident-prone, hitting others, and being uncooperative can be a warning sign of their later aggression. In a similar vein, aggressive behaviors in older children such as arguing a lot, bullying or meanness to others, teasing and threatening people, and being suspicious can be a dangerous sign of negative outcomes related to aggression. Therefore, it was important to take a careful look at differences between analyses of only the age-general behaviors and analyses of both the age-general and age-specific behaviors.

Predictors of Child Aggression

Maternal parenting behaviors were assessed using two constructs in the present study: positive parenting and harsh discipline strategies.

Positive parenting was measured by the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 2003) the Infant/Toddler Version when children were two years old. The HOME measures three separate maternal practices: (a) emotional responsivity (parental warmth); (b) nonpunitive (parental lack of hostility) scale, (c) support of cognitive, language, and literacy environment (stimulation). Trained EHSRE examiners assessed the quality of cognitive stimulation and support available to a child in the home environment through a combination of interview and observation while parents were interacting with their children in the home.

The parental warmth subscale includes items such as whether the mother's voice conveyed positive feeling to child, whether the mother praised child, and whether the mother caressed, kissed, or cuddled child. Each of seven items was scored as a binary variable (1 = *yes* and 0 = *no*) with possible points ranging from zero to seven. Higher values indicate greater parental warmth. Internal consistency reliability on the parental warmth subscale for the EHSRE participants indicated $\alpha = .74$.

The parental lack of hostility subscale includes examples of whether the mother scolded the child, restrained the child, slapped, or spanked the child during the home interview. Each of five items was assessed using a binary variable (1 = *yes* and 0 = *no*) with possible response points ranging from 0 to 5. Higher values represent lack of parental hostility toward their child. Internal consistency reliability on the lack of hostility subscale for the EHSRE sample indicated $\alpha = .71$.

The support of cognitive, language, and literacy environment subscale includes observation items about the availability of age-appropriate toys and learning materials, mother-child verbal interaction, literacy activities, and parental encouragement of

learning in several domains. Each of 12 items was scored as 1 = *yes* and 0 = *no*, with possible scores ranging from 0 to 12. Higher values mean greater parental support of child cognitive, language, literacy, and learning stimulation. Internal consistency reliability on this subscale for parents in the EHSRE sample indicated $\alpha = .68$.

Harsh discipline was measured using the Index of Severity of Discipline Strategies created by the EHSRE researchers when children were two. Trained interviewers provided parents with three hypothetical conflict scenarios with the child and asked parents what strategies they would use for handling these potential conflict situations with the child. Examples of these scenarios include: child's risky behavior, refusing to eat, tantrum in a public place. The types of strategies parents describe in response to these situations are scored based on a five-point scale ranging from least to most harsh: (a) prevent/distract, talk, time out, or remove, (b) warn/remind; (c) threaten the child with punishment; (d) shout at the child; (e) use physical punishment. Possible response scores are from one to five and an individual's score is determined by the harshest discipline strategy of mothers in response to any of the conflict situations. Higher values indicate that parents use harsher discipline strategies.

Cumulative family risk was measured using a cumulative risk index devised by tallying the number of risk indicators, as suggested by research showing that the number of risks is more important than any particular risk (Rutter, 1979; Trentacosta et al., 2008). This study included four risk indices (see Table 1): (a) having less than high school education; (b) a mother younger than 20 at time of child's birth; (c) single parenthood (primary caregiver lives alone with children - no other adults in home); and (d) a recipient of public assistance. Cumulative family risk was calculated by tallying the

number of these four risk factors that parents reported, with possible response scores ranging from zero to four, indicating that the families experienced more risk factors.

Language development was assessed by the Bayley Scales of Infant Development (BSID-II; Bayley, 1993) Mental Development Index (MDI) and the MacArthur Communicative Development Inventories (CDI; Fenson et al., 1994) at child age two. The Bayley language factor was constructed by factor analyses, which showed good psychometric properties (U.S. Department of Health and Human Services, 2001). A child's language ability, such as receptive vocabulary, syntax, and conversational skills, was individually evaluated by trained assessors. Examples of a set of language items include *"child imitates a two-word sentence," "child points to five objects in photo named by observer,"* and *"child uses a three-word sentence."* Language factor score was determined by summing the number of 12 language-relevant test items passed into a raw score such that possible scores range from 0 to 12. Higher points indicate children with more advanced language skills. For the EHSRE sample, the reliability coefficient on the language factor score indicated $\alpha = .92$.

To conduct the CDI, parents were given a questionnaire with questions about the child's language skills in three subscales: vocabulary, combining words, and sentence complexity. Parents were provided with a list of 100 words and asked if their child are able to say each of the words. Possible points range from 0 to 100 with higher total scores showing that the child can say more words. Internal consistency on the vocabulary subscale for the EHSRE sample indicated $\alpha = .98$. Parents were also asked if their children have started to combine words yet (0 = *child has not yet begun to combine words* and 1 = *child sometimes or often combines words*). For the sentence complexity

test, parents were given 36 pairs of words or phrases and asked to choose which sounds most like the way their children talk. Possible response values range from 0 to 36 with higher scores representing children more advanced sentence complexity. Internal consistency reliability on the sentence complexity subscale for EHSRE participating children indicated $\alpha = .95$.

Prior research has demonstrated the concurrent validity of measures of early language functioning in children in terms of the degree of correspondence between examiners' direct observation in structured assessments and parental reports of children's language abilities (Heilman, Ellis Weismer, Evans, & Hollar, 2005). For example, a language performance on the Bayley MDI evaluated by examiners is strongly associated with the MacArthur CDI scores reported by low-income parents of 24-month-old children (Love et al., 2002). Maternal report of children's early language development was congruent with children's actual vocabulary use based on structured assessments. The current study used two measurements of early language development assessed using direct observation and parental reports.

Emotional regulation (ER) was evaluated using the Bayley Behavior Rating Scale (BRS), which is one of the three component scales of the BSID-II, in addition to the Mental Development Index and Motor scales (Bayley, 1993). The examiner scored the child's behaviors such as task persistence, adaptation to change, attention, activity level, and frustration tolerance during the administration of the BSID-II assessment. The EHSRE study used 7 items of the 10 original BRS-ER items, rated on a five-point Likert scale with possible points ranging from 7 to 35. Higher points are related to more

emotion regulation behavior by a child. The internal reliability coefficient on the BRS-ER for the EHSRE sample indicated $\alpha = .92$.

Outcomes of Child Aggression at 11 years

  Social skills were evaluated employing Self-Description Questionnaire I (SDQ-I; Marsh, 1990). The current study used the peer relations subscale. Children were asked to rate six items of their perceptions of relationships with peers based on a 4-point Likert scale (1 = *not at all true*, 2 = *a little bit true*, 3= *mostly true*, or 4 = *very true*). Example questions include how easily they make friends, whether others want them as a friend, and their popularity among friends. Possible response values range from 6 to 24, with higher total scores indicating that children have better social skills. Internal consistency reliability on the SDQ-I for the EHSER participants indicated $\alpha = .79$.

  Internalizing problems were measured by the Child Behavior Checklist for Ages 6 to 18 years (CBCL 6-18; Achenbach & Rescorla, 2001). The CBCL contains the internalizing problem subscale, which is a composite score of the Anxious/Depressed, Withdrawn/Depressed, and Somatic Complaints domains. It has been argued that the Somatic Complaints (SC) subscale may contain substantial bias when it assessed with children who have a chronic medical condition (Friedman, Bryant, & Holmbeck, 2007). That is, values on the SC subscale can be erroneously inflated in children of chronic illness and contribute to an overestimation of internalizing problems because parents may be unable to discern between chronic physical symptoms and stress-related symptoms of children. To prevent this issue, the current study used only the two CBCL domains of 13 items for anxious/depressed symptoms and eight items for withdrawn/depressed symptoms. Parents responded to 21 items asking child behavioral and emotional

problems based on a 3-point scale ($0 = $ *not true*, $1 = $ *sometimes or somewhat true*, $2 = $ *very or often true*) such that the possible response scores range from 0 to 42. Higher scores mean that anxious, depressed, and withdrawn behaviors are more typical of the child. Internal consistency reliability for EHSRE children indicated $\alpha = .83$ ($\alpha = .77$ for anxious/depressed; $\alpha = .72$ for withdrawn/depressed).

Academic success was evaluated using three measures including the Peabody Picture Vocabulary Test-III (PPVT-III; Dunn & Dunn, 1997), the Matrix Reasoning subtest of the Wechsler Intelligence Scale for Children (WISC-IV; Belsky, 1990), and the Cognitive Assessment (reading and math assessments) of the Early Childhood Longitudinal Study, Kindergarten Class (ECLS-K; Pollack et al., 2005; Princiotta et al., 2006).

The PPVT-III assesses children's knowledge of the meaning of spoken words, and their receptive vocabulary of single English words. A child is given four pictures and is instructed to indicate the picture, which matches the word spoken by the administrator. Possible response scores are from 40 to 160 with higher values indicating greater English receptive vocabulary skills of children. For a national norming sample of 10-year-old children ($n = 100$), internal consistency reliability indicated $\alpha = .96$ for Form IIIA and $\alpha = .95$ for Form IIIB. In addition, split-half reliability indicated $\alpha = .94$ for Form IIIA and $\alpha = .95$ for Form IIIB. Test-retest reliability on the subsample indicated $\alpha = .88$ for Form IIIA and $\alpha = .89$ for Form IIIB. The PPVT-III has shown moderate to strong concurrent validity with verbal intelligence tests such as the Wechsler Intelligence Scale for Children, $r = .90$ (WISC-III; Dunn & Dunn, 1997).

The Matrix Reasoning subtest from the WISC-IV measures children's fluid reasoning, which is the ability to problem solve in novel situations such that it evaluates children's on-the-spot reasoning capacity, a skill that is not dependent on previous experiences (Belsky, 1990). The subset includes 35 items in which a child is provided with an incomplete matrix and instructed to complete the matrix by choosing from one of five possible response options. This subset was devised to capture visual-spatial problem solving and nonverbal reasoning skills in children. Possible response values range from 1 to 19 with higher scores representing children who show greater fluid reasoning or intelligence. The WISC-IV has good convergent validity with previous versions of the WISC tests, as well as other Wechsler tests, with values greater than .70 for the WISC-IV Perceptual Reasoning Index, which includes the Matrix Reasoning subtest (Sattler, 2008).

ECLS-K cognitive assessment is divided into two parts, reading assessment (i.e., language and literacy) and mathematics assessment, which were developed for the U.S. Department of Education's Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999. The reading assessment is comprised of a subset of questions from which comparable scores can be estimated, based on item response theory, from children's responses to three second-stage adaptive assessments from low-difficulty (24 items), middle-difficulty (25 items), to high-difficulty (31 items) where children are provided with different sets of items at the second stage based on their performance on the first-stage routing test (26 items). Content areas of the tests include basic reading skills, vocabulary, and comprehension (e.g., developing interpretation, personal reflection, and critical stance). The score indicates the number of items the child answered correctly such that possible response scores range from 0 to 186. Higher scores indicate higher levels of

child performance on the reading assessment. The mathematics assessment consists of 18

items that were developed to evaluate ability of conceptual and procedural knowledge,

and problem solving. The EHSRE project used only the math routing test, which assessed

mathematics knowledge and skills of children: number sense, properties, and operations,

measurement, geometry and spatial sense, data analysis, statistics, and probability, and

patterns, algebra, and functions (Klein, Kemmerer, West, & Lim, 2016). Each item that

children answered correctly counted as one point, such that possible scores range from 0

to 18, with higher scores indicating better math performance.

Delinquent behaviors were measured based on children's self-reported

information about past risky behavior. Items were drawn from a study on childhood

disruptive behaviors (Loeber et al., 1989) and the National Institute of Child Health and

Human Development Study of Early Child Care and Youth Development, or created for

the EHSRE project. Children were asked to respond to 14 questions, 1 = *yes* or 0 =*no*,

about whether they had ever committed each of a series of delinquent behaviors.

Examples of risky behaviors include *"Taken or stolen something from a store without*

paying for it," and *"Cheated on a school test."* Possible response scores range from 0 to

14, with higher scores indicating that children who committed more delinquent behaviors

in the past. Internal consistency reliability on the risky behaviors scale for the EHSRE

participating children indicated $\alpha = .66$.

Covariates with Child Aggression

To reduce possible threats to validity, based on previous research, this study took

into account five variables that might affect child aggression stability in addition to

predictors of interest: site (community), program membership, child ethnicity, and school

poverty at age 11. These variables were selected based on studies suggesting that an array of risk elements should be considered, including demographics (Watson et al, 2004; Murry et al., 2002) and children's environments (Burchinal et al., 2008; Hanish & Guerra, 2000; Jansen et al., 2016).

The EHSER project was carried out in 17 communities with EHS programs: six in the West, four in the Midwest, four in the Northeast/Mid-Atlantic, and three in the South, coded as three dummy variables representing membership in the West (0, 1), Midwest (0,1), and Northeast/Mid-Atlantic (0, 1). Child ethnicity was categorized as White, African American, Hispanic, or other, coded as three dummy variables representing the first three ethnicities. School or neighborhood poverty was calculated based on percentage of students eligible for free lunch.

Analytic Plan

This study used EHSER longitudinal data to identify individual differences and changing patterns of child aggression over time in relation to antecedent and subsequent variables, controlling for site (community), program membership, and child ethnicity, and school poverty at age 11. Figure 1 shows a conceptual model for the current study.

For preliminary analyses, the study variables were examined by checking the distribution of scores for skewness and kurtosis. This study followed a recommendation that variables should meet the cutoffs (i.e., for skewness, $\leq |2|$; for kurtosis $\leq |7|$), indicating a normal distribution of variables (West, Finch, & Curran, 1995). After checking normality of data, analyses on descriptive statistics for variables of interest and correlation coefficients were conducted.
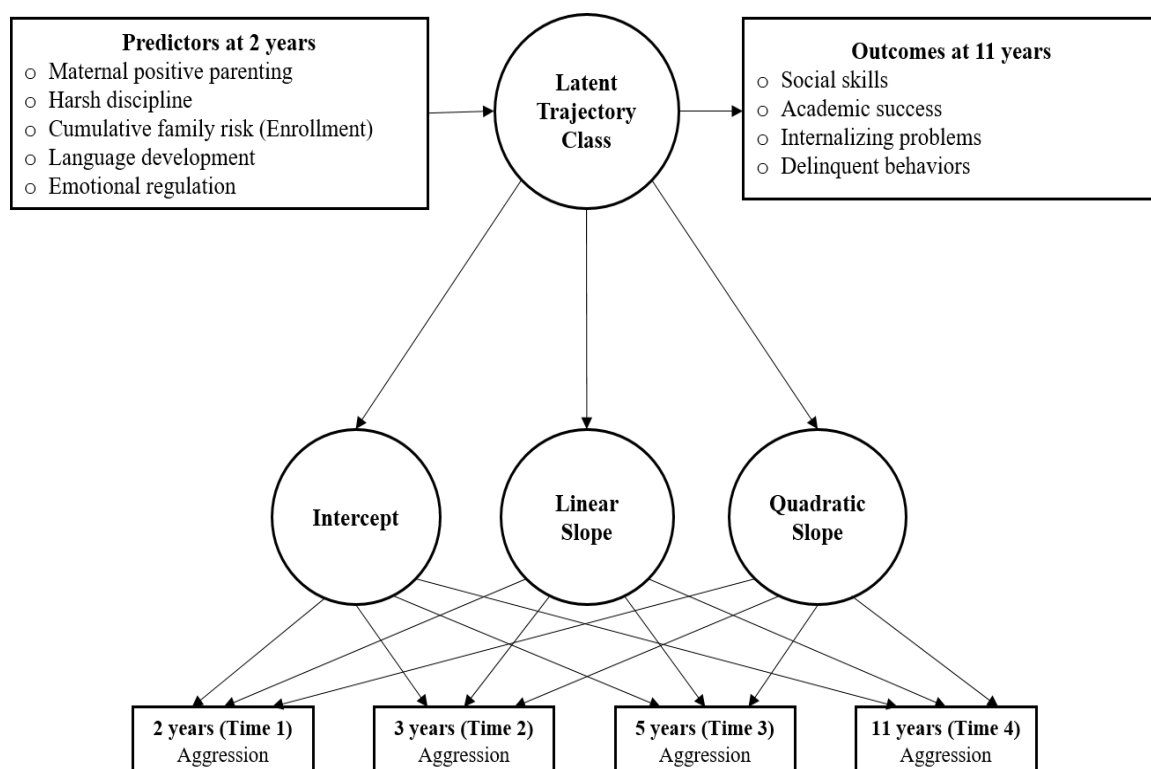
Figure 1. Proposed model of developmental trajectories in child aggression by child gender. Controlled for site (community), program membership, child ethnicity, and school poverty at 11 years old.

Data analyses to identify and compare childhood aggression trajectories were designed using the SAS Trajectory Procedure (SAS Proc Traj; Jones & Nagin, 2007; Jones, Nagin, & Roeder, 2001; Nagin, 1999, 2005). The Proc Traj is a specialized procedure for estimating developmental trajectories of subgroups within a population based on a semiparametric, group-based modeling approach known as Latent Class Growth Modeling (LCGM) (Jones et al., 2001). In contrast with hierarchical or latent growth modeling, which would employ continuous multivariate density functions, the approach used here follows a multinomial modeling strategy. The group-based modeling strategy is a mixture of probability distributions, which is useful for estimating unobserved heterogeneity of subgroups in a given population. By generating a regression

model for each discrete group, this method identifies group membership within a population based on developmental trajectories or patterns of change over time, in this case, changes in children's parent-reported aggressive behavior at ages 2, 3, 5, and 11.

Research question 1. Aggression trajectories: Are there distinctive developmental trajectories of child aggression from early childhood to early adolescence across ages 2, 3, 5, and 11?

To answer this research question, a group-based trajectory model, a type of growth mixture model, was employed to investigate longitudinal patterns of childhood aggression regardless of child gender; thus, group-based trajectory analyses for boys and girls concurrently were conducted first. This approach provides an empirical basis for identifying the number of clusters and the shapes of the trajectories. A group-based approach assumes that the population is comprised of distinctive subpopulations, with each subgroup following a similar pattern of developmental trajectory of behavior. Nagin (2005) suggests that this is an appropriate case for aggressive behaviors since there are subpopulations varying in specific patterns of aggression over the life course.

One important advantage of group-based modeling is that the procedure handles missing data through Full Information Maximum Likelihood (FIML), which is a model-based missing data approach proven to produce unbiased parameter estimates and standard errors. This method imputes parameter estimates while maximizing the likelihood function of the underlying distributions of incomplete data set such that all the information available is employed (Enders & Bandalos, 2001).

To determine the number of latent classes that underlie the data, a series of latent class analyses (LCA) were carried out. To select the optimal model, an iterative

procedure was used such that one-, two-, three-, four, and five-class solutions were examined and compared until the most parsimonious group membership solution was achieved. To determine the best solution for number of groups, this study used four criteria of selecting the best model: (a) the change in the Bayesian Information Criterion (BIC); (b) the log Bayes factor; (c) posterior probabilities ($\geq$ .07); and (d) group size ($\geq$ 5%). First, this study evaluated the change in the BIC between models favoring the parsimonious models with lower absolute BIC values. BIC is estimated in a given model as: $BIC = \log(L) - 0.5*\log(n)*(k)$, where L indicates the value of the model's maximized likelihood, where n indicates the sample size, and k indicates the number of parameters in the model (Nagin, 1999). Second, the log Bayes factor was considered to compare the alternative model to the null model. The log Bayes factor is estimated in a given model as: $\log$ Bayes factor $= 2\log_e(B_{10}) \approx 2(\Delta BIC)$, where ΔBIC is the difference between the BIC of the alternative model and the BIC of the null model (Jones et al., 2001). The log Bayes is interpreted as a measure of the evidence against the null model and is shown in Table 3. Third, a maximum probability procedure was employed to evaluate the model's ability to categorize each child into the class to which he/she has the highest probability of belonging based on observations across assessments, also referred to as the posterior probability of group membership (PPGM). Maximum posterior probabilities provide an objective criterion of assigning each child to the developmental trajectory group that best characterizes his/her behavior patterns. A minimum average posterior probability of .70 for each group is considered evidence of acceptable model fit. Each group membership was further described in terms of the key characteristics of shape (i.e., intercept, linear, or quadratic) that best represent the aggression trajectory group in the EHSER sample.

Finally, to ensure further tests of predictors and outcomes in relation to trajectory

membership in the next research questions, group size larger than 5% was considered.

Table 3
Interpretation of Log Bayes Factor

Log Bayes Factor	Evidence against H_0
0 to 2	Weak
2 to 6	Positive
6 to 10	Strong
> 10	Very Strong

Research question 2. Aggression trajectory within each gender: Are there

distinctive developmental trajectories of child aggression from early childhood to early

adolescence across ages 2, 3, 5, and 11 in boys and girls?

After the number and shapes of aggression trajectory groups for the entire sample

have been explored, further analyses to explore trajectory membership of aggression were

conducted separately for boys and girls. The procedures of analyzing the data were the

same as for research question 1.

Research question 3. Aggression predictors within each gender: What are the

early predictors of childhood aggression trajectory group membership in boys and girls?

After developmental trajectory groups have been specified within each gender,

multinomial logistic regressions were employed to test which predictor is significantly

associated with which trajectory membership with Mplus version 8 (Muthén & Muthén,

2017). Missing data were handled by using a Maximum Likelihood (ML) approach. In all

models, the group with the lowest levels of aggression served as the reference group to

which this study compares each of the aggression trajectories.

Research question 3a. Early process and context factors within each gender: Do process factors (i.e., maternal positive parenting, harsh discipline) and context factors (i.e., cumulative family risk) in early childhood predict developmental trajectory group membership of child aggression in boys and girls?

To address this research question, the model included covariates (i.e., site/community, program membership, child ethnicity, and school poverty at age 11) and predictor variables, such as maternal positive parenting, harsh discipline, and cumulative family risk to test in relation to children's aggression trajectories. This model explored the unique relations of predictors with aggression trajectory groups taking covariates into consideration. When significant relations between predictors in early childhood and group membership were detected, the method of pairwise comparisons with the lowest scoring aggression group as the reference group was conducted to explore which trajectory groups differ on these predictors. Effect sizes were estimated as odds ratios, which represented the extent to which a predictor differentially increases a chance of being included in one group over another group.

Research question 3b. Early person factors: Do children's early person factors (i.e., early language development, early emotional regulation) predict developmental trajectory group membership of child aggression?

To assess this question, the same analytic strategy was used as the previous question, with the same set of covariates and predictor variables of early child language development and emotional regulation.

Research question 4. Aggression outcomes within each gender: What are the later outcomes of childhood aggression trajectory groups in boys and girls?

To answer this research question, the trajectory groups were treated as independent variables. Path analyses were conducted using Mplus version 8 (Muthén & Muthén, 2017). Missing data were dealt with a ML methods.

Research question 4a. Later outcomes: Do children with different aggression trajectories differ in later outcomes (i.e., social skills, academic success, internalizing problems, and delinquent behaviors) in early adolescence?

In the final set of analyses, trajectory group membership served as the predictor in path analysis models that compare trajectory groups on child outcomes in early adolescence while taking into account covariates. Specifically, to predict later outcomes proposed in this study, summary scores from the trajectory groups such as individual intercept, linear, and quadratic slopes were used as the predictors. After individual estimates for the trajectory characteristics were calculated, these estimates were used as predictor variables. Next, individual regression models were fitted for each type of early adolescent outcome at a time, with non-reference trajectory groups as dummy-coded predictor variables.

Research question 4b. Predictive power: Do aggression groups offer better predictive power than an average of aggression scores over time points?

To answer this research question, latent trajectory group membership indicators and the average aggression score over time were used as predictors. This question was examined by using path analyses referring to standardized coefficients to compare the latent membership to the average aggression score while controlling for covariates. The low-stable group was set as the reference category and the other three trajectory groups were dummy-coded such that these dummy variables were entered to the model including

the average aggression score and covariates. Each model included a later outcome of children (i.e., social skills, academic success, internalizing problems, and delinquent behaviors) at 11 years. Based on standardized coefficients, whether which predictor had a larger effect compared to the other was decided.

Table 4

Descriptives of and Bivariate Correlations among Study Variables for the Entire Sample

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Aggression 2 yrs													
2. Aggression 3 yrs	.50**												
3. Aggression 5 yrs	.37**	.49**											
4. Aggression 11 yrs	.27**	.40**	.53**										
5. Positive parenting 2 yrs	-.22**	-.12**	-.10**	-.11**									
6. Harsh discipline 2 yrs	.08**	.01	.02	.03	-.16**								
7. Family risk at enrollment	.12**	.03	.04	.06*	-.23**	.22**							
8. Language development 2 yrs	-.15**	-.08**	-.06*	.00	.29**	-.03	-.06*						
9. Emotional regulation 2 yrs	-.18**	-.12**	-.11**	-.12**	.22**	-.09**	-.11**	.23**					
10. Social skills 11 yrs	.03	-.00	-.02	-.08**	.01	.05	.07*	.05	-.05				
11. Academic success 11 yrs	-.13**	-.11**	-.15**	-.11**	.32**	-.14**	-.24**	.37**	.27**	-.08**			
12. Internalizing problems 11yrs	.18**	.23**	.32**	.62**	-.02	-.05	-.02	-.05	-.05	-.10**	.04		
13. Delinquent behaviors 11 yrs	.15**	.15**	.18**	.34**	-.15**	.04	.14**	-.06*	-.13**	-.14**	-.12**	.12**	
N	2,103	2,031	2,014	1,616	1,927	2,156	2,251	1,586	1,912	1,545	1,528	1,616	1,545
Mean	10.13	11.08	10.89	5.69	20.69	2.70	1.87	.02	3.64	3.12	.005	4.72	1.52
Standard deviation	5.60	6.47	6.73	5.72	2.84	1.68	1.16	.78	.80	.63	.82	4.75	1.80
Range	0-30	0-37	0-38	0-30	6-24	1-5	0-4	-1.9-1.8	1-5	1-4	-2.6-2.4	0-28	0-11
Skewness	.52	.69	.82	1.43	-1.24	.31	.07	-.44	-.67	-.73	-.21	1.51	1.72

Note. Language development and academic success were standardized as z-scores. *$p < .05$; **$p < .01$

Table 5

Descriptives of and Bivariate Correlations among Study Variables for Boys and Girls

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Aggression 2 yrs	-	.49**	.39**	.27**	-.18**	.10**	.13**	-.12**	-.15**	.04	-.11*	.18**	.12**
2. Aggression 3 yrs	.51**	-	.49**	.40**	-.06	.04	.05	-.04	-.07*	-.04	-.10*	.23**	.07
3. Aggression 5 yrs	.35**	.50**	-	.54**	-.08*	.05	.06	-.07	-.04	-.02	-.11**	.33**	.08*
4. Aggression 11 yrs	.26**	.39**	.51**	-	-.06	.02	.06	-.01	-.10*	-.08*	-.11**	.63**	.28**
5. Positive parenting 2 yrs	-.24**	-.15**	-.11**	-.12**	-	-.17**	-.25**	.27**	.20**	.02	.26**	-.04	-.10*
6. Harsh discipline 2 yrs	.07*	-.02	-.01	.04	-.14**	-	.25**	-.08*	-.13**	.00	-.15**	-.06	.05
7. Family risk at enrollment	.11**	.01	.02	.06	-.22**	.20**	-	-.06	-.13**	.08	-.27**	-.03	.13**
8. Language development 2 yrs	-.16**	-.10**	-.02	.04	.30**	.01	-.05	-	.23**	.04	.38**	-.11*	-.06
9. Emotional regulation 2 yrs	-.20**	-.13**	-.14**	-.10**	.23**	-.06	-.10**	.21**	-	-.09*	.24**	-.05	-.90*
10. Social skills 11 yrs	.02	.03	-.02	-.07*	.00	.09*	.07	.05	-.02	-	-.04	-.06	-.16**
11. Academic success 11 yrs	-.15**	-.11**	-.18**	-.11**	.36**	-.13**	-.22**	.36**	.29**	-.12**	-	-.06	-.10**
12. Internalizing problems 11yrs	.17**	.23**	.31**	.62**	.01	-.04	-.02	.02	-.04	-.13**	-.02	-	.09*
13. Delinquent behaviors 11 yrs	.16**	.18**	.22**	.36**	-.16**	.05	.14**	-.01	-.12**	-.13**	-.14**	.14**	-
Boys N	1,065	1,028	1,041	822	973	1,092	1,171	795	960	786	776	822	788
M	10.48	11.62	11.50	6.28	20.53	2.68	1.86	-.09	3.53	3.11	.004	4.88	1.87
SD	5.74	6.73	6.95	6.08	2.96	1.66	1.16	.79	.82	.65	.87	4.85	1.95
Range	0-30	0-36	0-36	0-30	6-24	1-5	0-4	-1.9-1.6	1-5	1-4	-2.6-2.4	0-26	0-11
Skewness	.51	.66	.79	1.31	-1.24	.34	.09	-.43	-.58	-.79	-.20	1.43	1.51
Girls N	1,038	1,003	970	794	954	1,064	1,069	791	952	759	752	794	757
M	9.77	10.53	10.26	5.09	20.86	2.72	1.87	.13	3.75	3.13	.005	4.55	1.14
SD	5.42	6.15	6.42	5.27	2.70	1.70	1.15	.77	.76	.62	.77	4.64	1.54
Range	0-30	0-37	0-38	0-29	9-24	1-5	0-4	-1.9-1.8	1-5	1-4	-2.6-1.8	0-28	0-10
Skewness	.51	.68	.85	1.54	-1.22	.29	.04	-.46	-.76	-.65	-.23	1.61	1.96

Note. Correlations of boys are shown below diagonal and girls are above diagonal. Language development and academic success were standardized as z-scores. *p < .05; **p < .01

CHAPTER IV

RESULTS

In this chapter, analyses are described for research questions regarding developmental trajectory patterns of childhood aggression, specific trajectory patterns for boys and girls, and predictors and outcomes of trajectory patterns. For preliminary analyses, all study variables met the cutoffs (i.e., for skewness, $\leq |2|$; for kurtosis $\leq |7|$) as recommended by West and colleagues (1995) indicating a normal distribution of variables. Descriptives and correlations among study variables are in Table 4 for the entire sample and Table 5 separately for boys and girls. Each research question was addressed in turn.

Identification of Developmental Trajectories of Aggression

This study compared demographic information on those children included with at least two aggression data points ($n = 2,295$) and those excluded due to fewer than two or two aggression data points ($n = 705$). Included and excluded children did not differ on child age, gender, race, and school poverty variables. Included and excluded families did not differ on maternal age, poverty level, community, teenage mother, single motherhood variables. Included families were more likely to be in the program group of EHS (52% vs. 44%, $p < .05$) and less likely to get Aid to Families with Dependent Children (AFDC; 27% vs. 32%, $p < .05$). Included mothers were more likely to be white (38% vs. 33%, $p < .05$), to be employed or in school/training (45% vs. 39%, $p < .05$), and less likely to drop out of high school (44% vs. 52%, $p < .001$).

Data analyses to identify and compare childhood aggression trajectories were conducted using group-based trajectory modeling with the SAS Trajectory Procedure (SAS Proc Traj; Jones & Nagin, 2007; Jones et al., 2001; Nagin, 1999, 2005). The censored normal models that are appropriate for psychometric scale data were tested. Childhood aggression at 11 years was measured using a different version of the measure used at ages 2, 3, and 5 years. For early childhood, the CBCL has 19 items, but for middle childhood, the measure has 18 items, with only eight items overlapping across the two versions and the remaining items reflecting developmentally specific aggression behaviors. For example, the CBCL used with 11 year olds, included "threatens people" but not "won't share." This study tested two separate models to see if there were differences in results between when all items were used, reflecting behaviors that were both consistent and inconsistent across developmental periods, and when only the items overlapping across developmental periods were used. Model 1 used the standardized average scores of all the items and Model 2 used the standardized average scores of the eight items that are commonly shared across the four time points. Model selection was conducted by assessing the change in BIC, log Bayes factor, and estimated group proportions. Next, the average of posterior probabilities ($\geq .07$) was checked.

In Model 1, using all items, a four-group model was identified as the best solution, and Table 6 shows model selection using the criteria. Figure 2 displays the trajectories of childhood aggression ages 2 to 11 years: (1) low-stable (55.0%); (2) moderate-decreasing (31.3%); (3) moderate-increasing (8.1%); and (4) high-stable (5.6%) aggression. The average posterior probabilities ranged from .76 to .87, which are above the .70 cutoff.

Table 6

Model 1 Selection Using BIC, Log Bayes Factor, and Estimated Group Proportions

Number of groups	BIC	Log Bayes Factor	Estimated Group Proportions				
			1	2	3	4	5
2	-10335.25		73.75	26.25			
3	-10184.58	301.34	55.18	35.45	9.37		
4*	-10095.23	178.70	55.05	31.26	8.08	5.62	
5	-10049.79	90.88	51.26	31.87	7.97	4.66	4.24

Note. Asterisk (*) indicates a selected model.
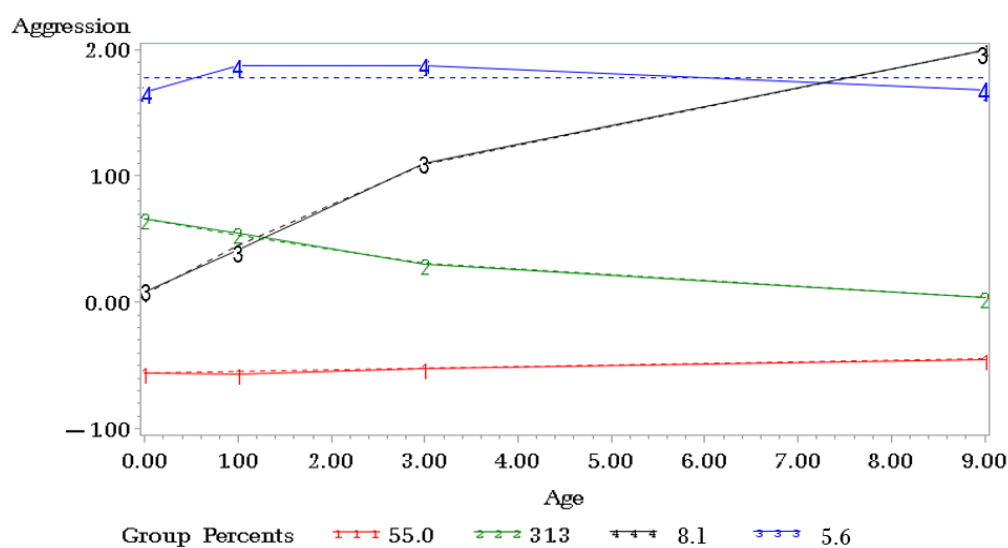
Figure 2. Trajectories of aggression, using all items, from age 2-11. X-axis refers to years since age two. The solid lines represent actual aggression and the dashed lines represent predicted aggression.

In Model 2, using only the eight overlapping items, a four-group model was again identified as the best solution, and Table 7 shows model selection using the criteria. Figure 3 displays the trajectories of childhood aggression ages 2 to 11 years: (1) low-stable (61.5%); (2) moderate-decreasing (24.5%); (3) moderate-increasing (8.8%); and eight items(4) high-stable (5.2%) aggression. The average posterior probabilities ranged from .73 to .87, which are above the .70 cutoff.

Table 7

Model 2 Selection Using BIC, Log Bayes Factor, and Estimated Group Proportions

Number of groups	BIC	Log Bayes Factor	Estimated Group Proportions				
			1	2	3	4	5
2	-10331.43		78.31	21.69			
3	-10214.03	234.80	64.35	29.45	6.20		
4*	-10123.97	180.12	61.53	24.48	8.76	5.23	
5	-10086.29	75.36	57.56	24.09	11.10	3.90	3.35

Note. Asterisk (*) indicates a selected model.
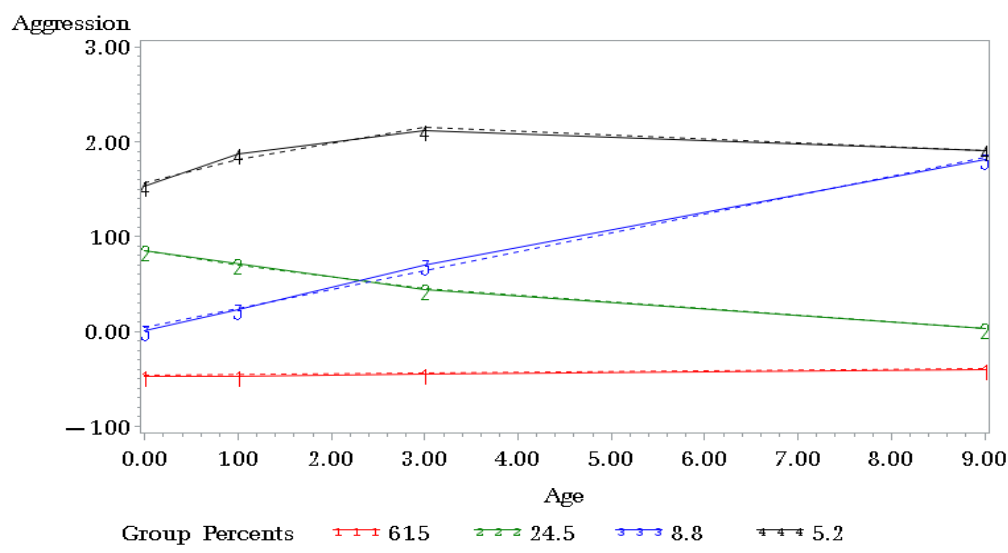
Figure 3. Trajectories of aggression, based on only the eight items common across all age points, from age 2-11. X-axis refers to years since age two. The solid lines represent actual aggression and the dashed lines represent predicted aggression.

Developmental Trajectories of Childhood Aggression in Boys and Girls

Having identified Model 1 and 2 with four latent classes, developmental trajectory membership of childhood aggression in boys and girls was inspected. In Boys Model 1, with all items, a four-group model was identified as the best solution, and Table 8 shows model selection using the criteria. Figure 4 displays the trajectories of childhood aggression in boys ages 2 to 11 years: (a) low-stable (53.4%); (b) moderate-decreasing

(31.3%); (c) moderate-increasing (9.5%); and (d) high-stable (5.7%) aggression. The

average posterior probabilities ranged from .71 to .85, which are above the .70 cutoff.

Table 8

Boys Model 1 Selection Using BIC, Log Bayes Factor, and Estimated Group Proportions

Number of groups	BIC	Log Bayes Factor	Estimated Group Proportions				
			1	2	3	4	5
1	-5790.66		100				
2	-5449.42	682.48	72.02	27.98			
3	-5382.76	133.32	54.93	33.15	11.92		
4*	-5344.44	76.64	53.42	31.34	9.52	5.73	
5	-5330.12	28.64	43.20	34.14	9.99	8.44	4.23

Note. Asterisk (*) indicates a selected model.
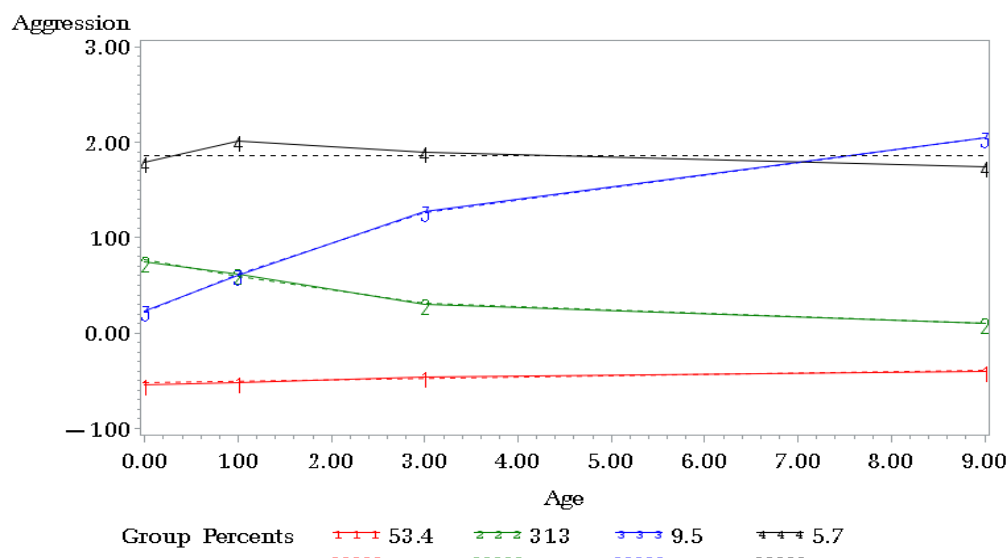
Figure 4. Trajectories of aggression, using all items, in boys from age 2-11. X-axis refers
to years since age two. The solid lines represent actual aggression and the dashed lines
represent predicted aggression.

In Boys Model 2, with only the eight overlapping items, a three-group model was

identified as the best solution, and Table 9 shows model selection using the criteria.

Figure 5 displays the trajectories of childhood aggression ages 2 to 11 years: (1) low-

stable (70.4%); (2) high-decreasing (21.6%); and (3) moderate-increasing (8.0%)

aggression. The average posterior probabilities ranged from .76 to .92, which are above

the .70 cutoff.

Table 9

Boys Model 2 Selection Using BIC, Log Bayes Factor, and Estimated Group Proportions

Number of groups	BIC	Log Bayes Factor	Estimated Group Proportions			
			1	2	3	4
1	-5780.74		100			
2	-5463.90	633.68	76.78	23.21		
3*	-5404.92	117.96	70.44	21.57	8.00	
4	-5375.40	59.04	58.24	29.72	4.43	7.61

Note. Asterisk (*) indicates a selected model.

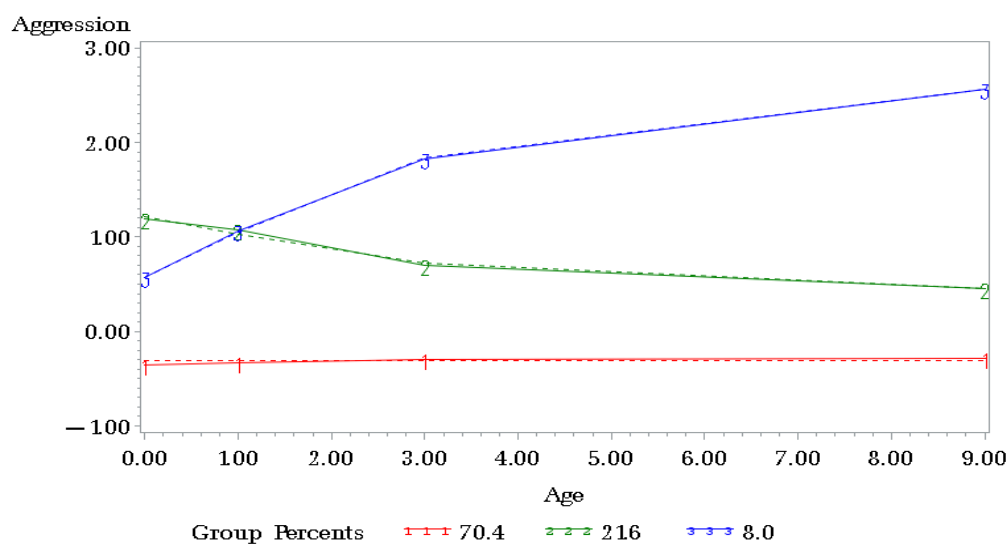*Figure 5.* Trajectories of aggression, based on only the eight items common across all age points, in boys from age 2-11. X-axis refers to years since age two. The solid lines represent actual aggression and the dashed lines represent predicted aggression.

In Girls Model 1, with all items, a four-group model was identified as the best

solution, and Table 10 shows model selection using the criteria. Figure 6 displays the

trajectories of childhood aggression in girls ages 2 to 11 years: (a) low-stable (58.0%);

(b) moderate-decreasing (30.7%); (c) moderate-increasing (5.8%); and (d) high-stable

(5.4%) aggression. The average posterior probabilities ranged from .76 to .88, which are

above the .70 cutoff.

Table 10
Girls Model 1 Selection Using BIC, Log Bayes Factor, and Estimated Group Proportions

Number of groups	BIC	Log Bayes Factor	Estimated Group Proportions				
			1	2	3	4	5
1	-5193.96		100				
2	-4874.54	638.84	74.91	25.09			
3	-4806.97	135.14	59.15	34.12	6.74		
4*	-4758.79	96.36	58.03	30.71	5.83	5.43	
5	-4743.01	31.56	32.37	40.90	17.09	6.22	3.42

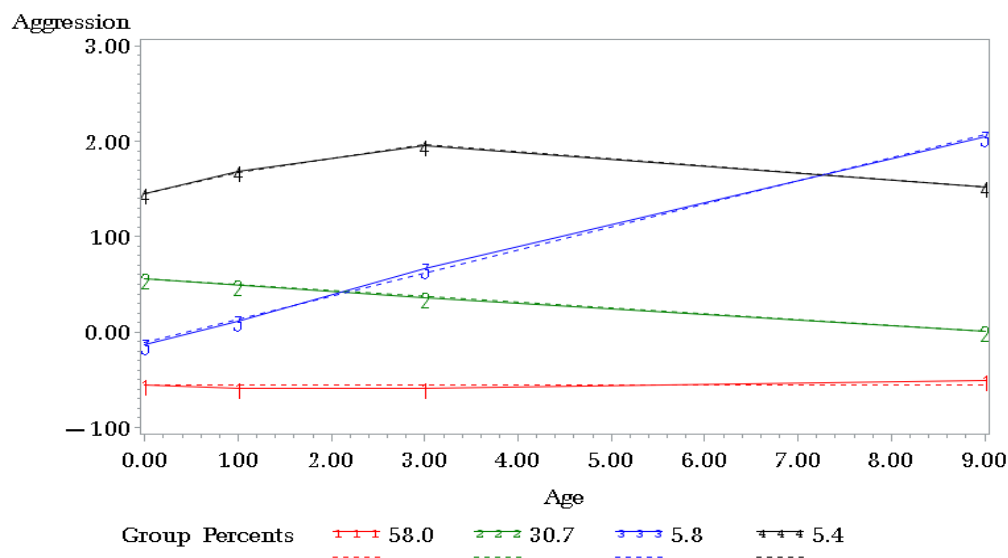*Note.* Asterisk (*) indicates a selected model.

Figure 6. Trajectories of aggression, using all items, in girls from age 2-11. X-axis refers to years since age two. The solid lines represent actual aggression and the dashed lines represent predicted aggression.

In Girls Model 2, with only the eight overlapping items, a three-group model was identified as the best solution, and Table 11 shows model selection using the criteria. Figure 7 displays the trajectories of childhood aggression ages 2 to 11 years: (a) low-stable (63.4%); (b) moderate-stable (31.4%); and (c) high-stable (5.1%) aggression. The average posterior probabilities ranged from .78 to .88, which are above the .70 cutoff.

Table 11

Girls Model 2 of Girls Selection Using BIC, Log Bayes Factor, and Estimated Group Proportions

Number of groups	BIC	Log Bayes Factor	Estimated Group Proportions			
			1	2	3	4
1	-5138.87		100			
2	-4856.66	564.42	78.98	21.02		
3*	-4802.80	107.72	63.42	31.44	5.14	
4	-4755.50	94.60	61.84	27.56	4.57	6.04

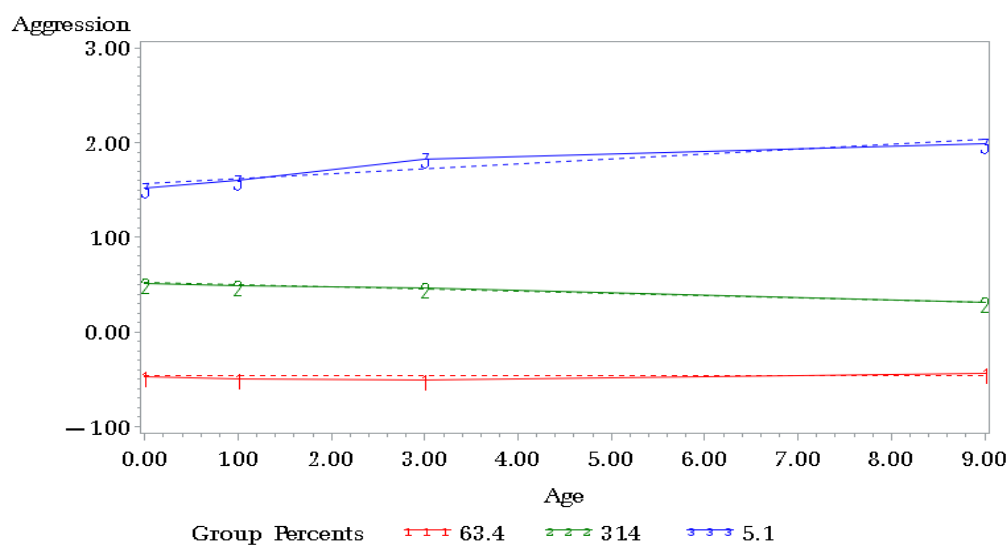*Note.* Asterisk (*) indicates a selected model.

Figure 7. Trajectories of aggression, based on only the eight items common across all age points, in girls from age 2-11. X-axis refers to years since age two. The solid lines represent actual aggression and the dashed lines represent predicted aggression.

Model Comparisons

Having identified the number of and shape of trajectory group membership for the entire sample, boys, and girls using all items and only the eight overlapping items, model comparisons were conducted by employing chi-square tests. Models using all items estimated four trajectory groups in both the entire sample and for just boys and just girls. However, using only the eight overlapping items estimated a different number of trajectory patterns, resulting in four trajectory groups in the entire sample and three trajectory groups for boys and for girls.

The four models resulting in four similar trajectory groups (i.e. a low-stable, moderate-decreasing, moderate-increasing, and high-stable groups) were used for model comparison tests to compare trajectory memberships. When comparing latent trajectories between the all-item and 8-item analyses for the entire sample, there was an 80.2% agreement between the two models, $\chi^2 (9) = 3617.45$, $p < .001$ and Pearson's correlation coefficient of ordinal by ordinal variables indicated $r = . 72$. When comparing latent trajectories for boys between the analysis of the entire sample and of only boys when using all items, there was an 87.9% agreement between the two models, $\chi^2 (9) = 2722.87$, $p < .001$ and Pearson's correlation coefficient of ordinal by ordinal variables indicated $r = . 83$. When comparing latent trajectories for girls between analysis of the entire sample and of only girls when using all items, there was an 89.5% agreement between the two models, $\chi^2 (9) = 2608.41$, $p < .001$ Pearson's correlation coefficient of ordinal by ordinal variables indicated $r = . 82$.

Group membership in latent trajectories is not expected to show much overlap for the groups identified in the analysis using only the overlapping eight items that resulted

in a different number of groups. Nevertheless, it is important to know what happened to the children in the high-stable groups that were not identified in the separate 8-item group models for boys and girls. When using only the eight items overlapping across age points, the best solution for boys identified only three groups: low-stable, high-decreasing, and moderate-increasing. Comparing membership in the four-group and three-group aggression trajectories, 55% of boys in the moderate-decreasing group moved to the low-stable group when there were only three groups, and 45% to the high-decreasing group. In the high-stable group, 67% of boys merged into the high-decreasing group, and 45% into the moderate-increasing group. In the moderate-increasing group, 44% of boys in the moderate-increasing group shifted to the high-decreasing group. While the high-decreasing group appeared, the moderate-decreasing and high-stable groups disappeared.

In terms of girls, when using only the eight items overlapping across age points, the best solution identified three groups: low-stable, moderate-stable, and high-stable. Comparing the four-group and three-group trajectory patterns, 26% of girls in the moderate-decreasing group shifted to the low-stable group when there were only three groups, and 14% of the moderate-increasing group shifted to the high-stable group. Moreover, while the moderate-decreasing and moderate-increasing groups disappeared, the moderate-stable group came up. The moderate-stable group was created being comprised of 73% of girls in the moderate-decreasing group, 80% in the moderate-increasing group, and 21% in the high-stable group.

Subsequent analyses of predictors and outcomes of the aggression trajectory groups are based on the four groups identified using all aggression items from the CBCL

at each age point: the low-stable, moderate-decreasing, moderate-increasing, and high-stable groups.

Early Predictors of Trajectory Groups of Childhood Aggression in Boys and Girls

To investigate predictors of aggression trajectory groups, multinomial logistic regression analyses were conducted. Two sets of analyses in which the low-stable group served as the reference group were tested in boys and girls respectively. Table 12 shows odds ratios with a 95% CI for effect sizes. The first models included predictors such as maternal positive parenting and harsh discipline, when children were age two years, and cumulative family risk, at enrollment, while taking into account covariates. Boys of moderate-decreasing, $B = -.08$, $SE = .03$, p $< .01$, and high-stable groups, $B = -.30$, $SE = .05$, $p < .001$, compared with those of the low-stable aggression group, were less likely to have mothers using more positive parenting behaviors.

Odds ratios, reflecting the strength of predictors in relation to trajectory group membership, show that a one-unit increase in maternal positive parenting, decreased boys' odds of being in the high-stable group, compared with in the low-stable group, by a factor of .74, OR= .74, 95% CI = [.68, .81], $p < .001$, and decreased boys' odds of being in the moderate-decreasing group decreased by a factor of .92, OR= .92, 95% CI = [.88, .98], $p < .01$. Put another way, boys of mothers with positive parenting behaviors were 26% less likely to be in the high-stable group than in the low-stable group and 8% less likely to be in the moderate-decreasing group. Maternal harsh discipline and cumulative family risk did not add to the prediction of boy's trajectory group membership.

Girls of the high-stable group, compared with those of the low-stable aggression group, were less likely to have mothers with more positive parenting behaviors, *B* = -.15, *SE* = .05, *p* < .01. For a one-unit increase in maternal positive parenting, the odds of girls' being in the high-stable group, compared with in the stable-group, decreased by a factor of .86, OR= .86, 95% CI = [.77, .95], *p* < .01. That is, girls having mothers with more positive parenting behaviors were 14% less likely to be in the high-stable group than in the low-stable group. Maternal harsh discipline and cumulative family risk did not add to the prediction of girls' trajectory group membership.

The second set of models included child development predictors, specifically early language development and emotional regulation at age two years, while taking into account covariates. Boys with higher levels of language development were less likely to be in the moderate-decreasing group than in the low-stable group, *B* = -.27, *SE* = .11, *p* < .05. For a one-unit increase in language development, boys' odds of being in the moderate-decreasing group, compared with in the low-stable group, decreased by a factor of .77, OR= .77, 95% CI = [.62, .95], *p* < .05. In other words, boys showing higher levels of language skills were 23% less likely to be in the moderate-decreasing group than in the low-stable group. Emotional regulation in boys was a statistically significant predictor of trajectory groups indicating that boys with better emotional regulation were less likely to be in the moderate-decreasing, *B* = -.37, *SE* = .10, *p* < .001, or high-stable group, *B* = -.66, *SE* = .19, *p* < .001, than in the low-stable group. For a one-unit increase in emotional regulation, boys' odds of being in the moderate-decreasing group, compared with in the stable-group, decreased by a factor of .69, OR= .69, 95% CI = [.57, .95], *p* < .001 and being in the high-stable group decreased by a factor of .52, OR= .52, 95% CI

= [.36, .75], $p < .001$ Put another way, boys showing higher levels of emotional regulation were 31% less likely to be in the moderate-decreasing group or 48% less likely in the high-stable group than in the low-stable group.

Girls with higher levels of language development were less likely to be in the high-stable group than in the low-stable group, $B = -.54$, $SE = .24$, $p < .05$. For a one-unit increase in language development, girls' odds of being in the high-stable group, compared with in the low-stable group, decreased by a factor of .59, OR= .59, 95% CI = [.37, .93], $p < .05$. In other words, girls showing better language skills were 41% less likely to be in the high-stable group than in the low-stable group. Emotional regulation did not add to the prediction of trajectory group membership in girls.

Table 12

Odds Ratios from Multinomial Logistic Regression of Factors Predicting Aggression Trajectory Groups in Boys and Girls

	LS vs. MD	LS vs. MI	LS vs. HS
Predictors	OR (95% CI)	OR (95% CI)	OR (95% CI)
Boys			
Positive Parenting	.92** (.88, .98)		.74*** (.68, .81)
Harsh Discipline			
Cumulative Family Risk			
Language Development	.77* (.62, .95)		
Emotional Regulation	.69*** (.57, .95)		.52*** (.36, .75)
Girls			
Positive Parenting			.86** (.77, .95)
Harsh Discipline			
Cumulative Family Risk			
Language Development			.59* (.37, .93)
Emotional Regulation			

Note. LS (reference) = low-stable; MD = moderate-decreasing; MI = moderate-increasing; HS = high-stable group. OR = odds ratio. Only significant values are shown. *$p < .05$; **$p < .01$; ***$p < .001$.

Later Outcomes of Trajectory Groups of Childhood Aggression in Boys and Girls

Developmental trajectory groups were served as a predictor of subsequent child outcomes such as social skills, academic success, internalizing problems, and delinquent behaviors respectively while taking into account covariates. The group showing low-stable aggression over time was treated as the reference category in comparison to the other three groups that were dummy-coded. Table 13 provides the results of path analyses with dummy variables representing trajectory group membership predicting subsequent social and academic outcomes. For boys, when comparing the low-stable group to the other three aggression trajectory groups, the moderate-increasing group showed lower social skills than did the low-stable group, $B = -.23$, $\beta = -.10$, $p < .01$. The moderate-increasing, $B = -.30$, $\beta = -.09$, $p < .01$, and high-stable groups, $B = -.78$, $\beta = -.16$, $p < .001$, had lower academic scores than did the low-stable group. The moderate-decreasing, $B = 1.94$, $\beta = .20$, $p < .001$, moderate-increasing, $B = 7.63$, $\beta = .42$, $p < .001$, and high-stable groups, $B = 4.88$, $\beta = .19$, $p < .001$, indicated more internalizing behavioral problems than did the low-stable group. The moderate-decreasing, $B = .38$, $\beta = .10$, $p < .05$, moderate-increasing, $B = 1.68$, $\beta = .24$, $p < .001$, and high-stable groups, $B = 2.32$, $\beta = .23$, $p < .001$, reported more delinquent behaviors than did the low-stable group.

For girls, when comparing the low-stable group to the other three aggression trajectory groups, the high-stable group had lower academic scores than did the low-stable group, $B = -.35$, $\beta = -.10$, $p < .01$. The moderate-decreasing, $B = 2.10$, $\beta = .24$, moderate-increasing, $B = 9.34$, $\beta = .35$, $p < .001$, and high-stable groups, $B = 6.73$, $\beta = .32$, $p < .001$, indicated more internalizing behavioral problems than did the low-stable group. The moderate-decreasing, $B = .33$, $\beta = .12$, $p < .01$, moderate-increasing, $B = 1.40$,

$p < .001$, $\beta = .17$, $p < .001$, and high-stable groups, $B = .56$, $\beta = .08$, $p < .05$, reported

more delinquent behaviors than did the low-stable group.

Table 13
Path Analyses of Later Outcomes of Group Membership

Outcomes	LS vs. MD		LS vs. MI		LS vs. HS	
	B (S.E.)	β	*B (S.E.)*	β	*B (S.E.)*	β
Boys						
SS			-.23(.08)	-.10**		
AS			-.30(.10)	-.09**	-.78(.15)	-.16***
IP	1.94(.33)	.20***	7.63(.52)	.42***	4.88(.75)	.19***
DB	.38(.15)	.10*	1.68(.23)	.24***	2.32(.34)	.23***
Girls						
SS						
AS					-.35(.13)	-.10**
IP	2.10(.31)	.24***	9.34(.62)	.35***	6.73(.70)	.32***
DB	.33(.12)	.12**	1.40(.24)	.17***	.56(.26)	.08*

Note. SS = social skills; AS = academic success; IP = internalizing problems; DB = delinquent behaviors. LS (reference) = low-stable; MD = moderate-decreasing; MI = moderate-increasing; HS = high-stable group. Only significant values are shown. *$p < .05$; **$p < .01$; ***$p < .001$.

Predictive Power of Trajectory Group Membership versus the Average Aggression Score in Boys and Girls

In the final path analyses, the trajectory group membership and an average of the

aggression scores across four time points were entered to each individual model as

predictors of child outcomes including social skills, academic success, internalizing

problems, and delinquent behaviors while controlling for covariates. Table 14 shows the

results of path analyses of predictive power of group membership verses average

aggression score. For boys, the average aggression score, $B = 7.68$, $\beta = .47$, $p < .001$, and

the moderate-increasing trajectory, $B = 3.67$, $\beta = .75$, $p < .001$, were both significant

predictors of boys' internalizing behavior problems. The chi-square difference test

showed statistically different effect sizes for predicting outcomes of childhood

aggression, $\Delta\chi^2 = 5.25$, $p < .05$, with the standardized coefficient for the moderate-increasing trajectory reflecting significantly stronger predictive power compared with the standardized coefficient for the average aggression score. The average aggression score, $B = 1.57$, $\beta = .25$, $p < .01$, the moderate-increasing trajectory, $B = .87$, $\beta = .45$, $p < .05$, and the high-stable trajectory $B = 1.05$, $\beta = .54$, $p < .05$, were significant predictors of delinquent behaviors. The standardized coefficients for the high-stable trajectory and moderate-increasing trajectory were greater than the standardized coefficient for the average aggression score, but a chi-square test showed no statistically significant differences in effect size.

For girls, only average aggression score was a statistically significant predictor of academic success, $B = -.51$, $\beta = -.18$, $p < .05$. The average aggression score, $B = 6.17$, $\beta = .38$, $p < .001$, and the moderate-increasing trajectory, $B = 6.66$, $\beta = 1.44$, $p < .001$, were significant predictors of internalizing behavior problems. The standardized coefficient for the moderate-increasing trajectory was greater than the standardized coefficient for the average aggression score, but a chi-square test showed no statistically significant differences in effect size. The moderate-increasing trajectory was the only statistically significant predictor of delinquent behaviors, $B = 1.01$, $\beta = .66$, $p < .01$.

In sum, the results of analyses identifying developmental patterns in childhood aggression showed a four-trajectory solution, identifying low-stable, moderate-decreasing, moderate-increasing, and high-stable groups for boys and girls. Early factors discriminated these trajectory groups such that compared with the low-stable group, moderate-decreasing and high-stable boys and high-stable girls had mothers with low positive parenting, moderate-decreasing boys and high-stable girls showed poor early

language development, and moderate-decreasing and high-stable boys exhibited poor

emotional regulation skills. Moreover, compared to the low-stable group, the other three

groups ended up with a broader range of later difficulties in early adolescence, including

poor social skills, academic difficulty, internalizing behavior problems, and delinquent

behaviors.

Table 14
Path Analyses of Predictive Power of Group Membership verses Average Aggression Score

	AGG		MD		MI		HS	
	B (*S.E.*)	β	*B* (*S.E.*)	β	*B* (*S.E.*)	β	*B* (*S.E.*)	β
Outcomes								
Boys								
SS								
AS								
IP	7.68 (1.10)	.47***			3.67 .76)	.75***		
DB	1.5 (.51)	.25**			.87 (.35)	.45*	1.05 (.53)	.54*
Girls								
SS								
AS	-.51 (.23)	-.18*						
IP	6.17 (1.17)	.38***			6.66 (.80)	1.44***		
DB					1.01 (.32)	.66**		

Note. SS = social skills; AS = academic success; IP = internalizing problems; DB = delinquent behaviors. AGG = average aggression score across four time points. MD = moderate-decreasing; MI = moderate-increasing; HS = high-stable group. Only significant values are shown. *$p < .05$; **$p < .01$; ***$p < .001$.

CHAPTER V

DISCUSSION

This chapter discusses the findings in relation to each of the research questions, along with limitations of this study and suggestions for future research. The present study makes noteworthy contributions in light of associated impact and implications regarding the importance of prevention and intervention of early aggression and related adjustment problems among children at risk.

The present study extends existing understanding of the development of childhood aggression by identifying developmental patterns along with early predictors and later outcomes of these aggression patterns for boys and girls. The primary goal was to identify developmental patterns of childhood aggression for boys and girls, together and separately by gender, across a 9-year span from toddlerhood at age 2 to early adolescence at around age 11. Four trajectory patterns of childhood aggression were selected as a best solution, including low-stable, moderate-decreasing, moderate-increasing, and high-stable groups. These aggression trajectories differed in early predictors and later outcomes. Boys' moderate-decreasing and high-stable groups, and girls' high-stable group tended to have mothers with less positive parenting. Boys' moderate-decreasing group and girls' high-stable group tended show poor language development. Boys' moderate-decreasing and high-stable groups tended to exhibit poor emotional regulation skills. In addition, children in these three aggression groups, compared with those in the low-stable group, showed a wider range of later difficulties in early adolescence, such as poor social skills, academic difficulty, internalizing behavior problems, and delinquent behaviors.

Developmental Trajectory Patterns of Childhood Aggression

To identify childhood aggression patterns from toddlerhood to early adolescence for boys and girls, together and separately by gender, four trajectory patterns were selected as the most parsimonious solution to represent developmental trajectories of childhood aggression. Put differently, there were four distinct pathways of childhood aggression showing different starting values, shapes, and endpoints of each group trajectory across age 2 to 11 years: the low-stable, moderate-decreasing, moderate-increasing, and high-stable groups. This finding is in line with previous studies that have identified four similar patterns in childhood aggression over time (Brennan, 2015; Olson et al., 2017).

This study is the first to explore two sets of analyses, one using both age-specific and age-general items and one using only the age-general items assessed at every age point. Prior studies identifying distinguished group trajectories have used only the overlapping items of aggressive behaviors across time points, while not considering developmental change in aggression as children grow. The current study analyzed trajectory patterns using only the overlapping eight items, but included additional analyses with all items to see if using age-specific along with age-common aggression behaviors would show different results. Surprisingly, while the results of all items consistently showed four trajectory groups as the best solution for the entire sample, boys, and girls, results from analyses using only the overlapping eight items separately for boys and girls showed only three trajectory groups.

Specifically, when comparing the four trajectory groups with the three trajectory groups among boys, the moderate-decreasing and high-stable groups disappeared and a

high-decreasing group newly appeared. When comparing the four trajectory groups with the three trajectory groups among girls, the moderate-decreasing and moderate-increasing groups disappeared and combined into a moderate-stable group, which newly appeared. Grouping different trajectories of aggression together in a smaller set of aggression trajectory patterns suggests that analysis using only the aggression behaviors that are the same at ages 2 and 11 does not accurately reflect patterns of childhood aggression over time that are likely to be important to recognize and identify for further study.

This interesting finding could be viewed in terms of measurement equivalence, the idea that the basic nature of an underlying construct may remain equivalent while being reflected in different behavioral expressions of the construct in different developmental or demographic groups (Knight & Zerr, 2010). Some indicators of children's aggressive behavior during toddlerhood differ from those during childhood and early adolescence as children's abilities change rapidly in the course of their normal development. In the current study, children in the trajectory group who were the most aggressive at age 11 did not show above average aggressiveness until reaching age 5, which suggests differentiation of trajectories during the period from age 2 to 11.

The inability to identify high stable aggression in boys or trajectories changing direction in girls, when age-specific aggression behaviors are ignored, implies that focusing on only aggressive behaviors that are the same at age 2 as at age 11 may prevent considering important behaviors of children that show functional equivalence over the course of development. For instance, early age-specific behaviors of young children such as not waiting or not sharing may be a warning sign of increasing or chronic aggression, and later age-specific aggression behaviors of elementary schoolers such as bullying or

threatening others, which create serious risks to school and neighborhood, are important aggression outcomes to consider. If these early- and later age-specific aggression behaviors are disregarded from our attention, children who truly need help may not be recognized. Therefore, using a conceptual perspective of development by including age-specific items along with age-general aggressive behaviors paints the basic course of childhood aggression differently, more consistently, and more informatively than when adhering to isomorphic behavior definitions that may not reflect age-appropriateness over a decade from toddlerhood to early adolescence.

Notwithstanding the meaningful findings in this study, it should be noted that it is plausible that including different aggressive behaviors at different ages may account for some differential findings with respect to predictors and outcomes of aggression trajectories. Nevertheless, the results showed that without the age-specific items, an entire latent class for each gender was missed, implying that researchers need to carefully consider the functional equivalence of developmental changes in children's behaviors in terms of measurement and analysis.

Early Predictors of Trajectory Groups

In response to the third research question, early antecedents of trajectory group membership, such as process, contextual, and child personal factors were explored. As hypothesized, early factors such as parenting behaviors and child characteristics had impact on later aggression, as shown in previous research (Brennan, 2015; Campbell et al., 2010). To be specific, the results of this study demonstrated that several early childhood factors discriminated trajectory group membership, including positive parenting, child early language skills, and emotional regulation ability. These differences

overall emerged between the low-stable group and the moderate-decreasing or high-stable groups. That is, positive parenting behaviors were lower for boys in the moderate-decreasing and high-stable groups compared with the low-stable group. Early language development was lower for boys in the moderate-decreasing group compared with the low-stable group. Early emotional regulation was lower for boys in the moderate-decreasing and high-stable groups compared with the low-stable group.

Positive parenting and early language development were lower for girls in the high-stable group compared with the low-stable group. Unexpectedly, early emotional regulation in girls did not differentiate aggression trajectory groups. A plausible explanation can be drawn from prior work by Sullivan and colleagues (Sullivan, Helms, Kliewer, & Goodman, 2010). The researchers indicated that emotional regulation is associated with different forms of aggressive behaviors (e.g., physical and relational aggression) within each child gender, such that boys and girls who were in the context of anger showed gender differences in meanings and ways of emotional expression. Thus, the influence of boys' and girls' emotional regulation on aggressive behaviors should be considered carefully in future studies while taking into account different forms of aggression for each gender.

Contrary to expectation, mothers' harsh discipline and families' cumulative risk did not show significant associations with trajectory group membership for either gender. The most likely explanation for the nonsignificance of harsh discipline is that given that both positive and negative forms of parenting behaviors were entered simultaneously, the statistical effects of positive parenting on aggression trajectories may have overridden those of harsh discipline. In addition, only one harsh discipline item measured in this

study, based on three hypothetical scenarios, may not have provided sufficient information regarding the severity of maternal harsh discipline.

A possible explanation for the nosignificant impact of cumulative family risk is that the effect of cumulative family risk may be mediated by more proximal variables surrounding children such as parenting practices, maternal depression, and parenting stress, that are more likely in families with multiple risk factors. For instance, family factors and early parenting may directly and indirectly exacerbate maternal depression, placing the child at risk for behavioral problems (Shaw et al., 2012). Correlations among variables of the present study showed that although cumulative family risk measured at enrollment, based on low education, early parenting, single parenting, and poverty, was related to childhood aggression at age two, it did not predict aggression trajectory patterns over time. Though cumulative family risk may well have direct and independent impacts on child behavior problems, the major influences of family risk on child adjustment are likely to be mediated by parenting and early development.

Another finding contrary to expectation was that the difference between the low-stable group and the moderate-increasing group was not statistically significant such that any predictor of this study did not distinguish the two groups. Albeit non-significant in the current study, previous work showed that frequent corporal punishment and low levels of warmth of mothers with toddlers and young children differentiated the two behavior problem patterns such as rising versus decreasing (Olson et al., 2017). Indeed, maternal harsh discipline at age 3 years was related to the escalation of behavior problems in preschoolers who had been exhibiting only modest levels of these problems. In this study, it should be pointed out that although the moderate-increasing group did not

show much early aggression at age two, children of this trajectory exhibited increasing levels of aggression over time and even exceeded those of the high-stable trajectory at age 11 years. There is urgent need to conduct further studies on the examination of early childhood risk factors to provide prevention or intervention programs for this worrisome group.

Later Outcomes of Trajectory Groups

In the fourth research question, later outcomes of aggression trajectory membership were investigated to see if children who belonged to different groups vary in their later adjustment, such as in their social skills, academic performance, internalizing problems, and delinquent behaviors in early adolescence. Children with high levels of aggression showed more difficulties in various developmental domains, which is supported by previous studies (Campbell et al., 2010; Lahey et al., 2006). Specifically, the findings of the current study showed that compared with boys in the low-stable group, those in the moderate-increasing group were more likely to exhibit poor social skills. Compared with boys in the low-stable group, those in the moderate-increasing and high-stable groups tended to be less successful in academic achievement. When comparing the low-stable group to the other three groups, boys in the moderate-decreasing, moderate-increasing, and high-stable groups were more likely to report higher levels of internalizing problems and delinquent behaviors than those in the low-stable group.

Compared with girls in the low-stable group, those in the high-stable group tended to be less successful in academic achievement. Compared with girls in the low-stable group, those in the moderate-decreasing, moderate-increasing, and high-stable groups were more likely to report higher levels of internalizing problems and delinquent

behaviors. Inconsistent with the hypothesis, girls' aggression trajectory patterns did not significantly predict their social skills. There is the need for additional replicated research to investigate whether socialization patterns and interpersonal skills of girls may operate differently than boys. This could be conducted by exploring the mechanisms by which other various potential factors mediate or moderate the relation of aggression to social skills.

The results for both genders showed that children of the moderate-decreasing, moderate-increasing, and high-stable groups relative to those of the low-stable group exhibited multiple difficulties. It should not be disregarded that even the moderate-decreasing group, for both boys and girls, showed few later adjustment difficulties such as internalizing problems and delinquent behaviors when compared to the low-stable group. These findings imply that parents and teachers should not overlook possible adjustment difficulties that may appear later even when their children show decreasing aggression over time.

Furthermore, tests compared power between aggression trajectory groups and the average aggression score for predicting later adjustment. The average aggression score and belonging to the moderate-increasing group were both indicative of more internalizing problems in boys, but the moderate-increasing group showed significantly greater predictive power. The average aggression score, and belonging to the moderate-increasing or high-stable groups were indicative of more delinquent behaviors for boys, but the difference in predictive power was not statistically significant. For predicting later social skills, the average aggression score was the only significant predictor in girls. The average aggression score and belonging to the moderate-increasing group were indicative

of more internalizing problems in girls, but the difference in predictive power between the two was not statistically significant. Belonging to the moderate-increasing group was the only significant predictor of delinquent behaviors in girls.

Of particular importance, although average aggression was a significant predictor of internalizing behavior problems in girls and being in the high-stable group was not, the standardized coefficient, reflecting the effect size, was larger from the high-stable group than from the average aggression score. This effect may have been underpowered due to a small sample size in the high-stable group. Thus, there is utility in using aggression trajectories for examining internalizing problems in at-risk youth.

In addition, the importance of using longitudinal data that reflect children's age-relevant behavior patterns should be highlighted. Ignoring age-specific aggressive behaviors in childhood resulting in different subsequent outcomes may fail to identify children needing early intervention services. For instance, although the moderate-increasing group can be problematic compared to the moderate-decreasing group, the average aggression score measured across time points may mask the direction of trajectories over time by making these two groups appear similar. Moreover, in accordance with the result that both the moderate-increasing and high-stable groups showed multiple difficulties, the early moderately aggressive behaviors of these children should not be dismissed while waiting until they reach 11 years. For example, consider two children who both start with high levels of aggression, one showing stable aggression and the other showing decreasing aggression. In this case, the child who exhibits stable aggression may be in more need of intervention compared to the child with decreasing aggression. Similarly, consider two children who both start with low levels of aggression,

one with stable aggression and the other with increasing aggression. In this case, parents and clinicians should pay close attention to increases in aggression as a signal for needing early intervention. Thus, looking at time to time stability and change in childhood aggression, compared with looking at averaged levels across age points, may be more informative and more useful for increasing our knowledge about how and when early intervention programs to reduce aggression should be implemented.

Limitations and Future Directions

Several limitations of the present study and suggestions for future research should be mentioned. First, measurements of child aggression over the four time points relied on only mother's reports, which may have failed to reflect their children's behavior outside the home. For example, the items asked of mothers about their 11-year-old children, such as "disobedient at school," and "cruelty, bullying, or meanness to others," are more likely in a school setting and may have been more accurately rated by teachers or peers than by mothers. Indeed, previous researchers comparing a single informant (i.e., mothers) with multiple informants (i.e., mothers and teachers) on scores of child and adolescent behavior problems concluded that using multiple informant data on children was more accurate than data solely based on a single informant (Campbell, 2000; Van Dulmen & Egeland, 2011). Capturing behavior problems occurring in multiple settings is critical in that pervasiveness of children's problem behaviors across different settings are regarded to be a sign of greater risk for the continuation of behavior problems over time and the development of other problems such as psychopathology (Wildeboer et al., 2015). Therefore, future research taking advantage of multiple informants can benefit for the

investigation of continuity of behavior problems in children and the identification of chronic aggression.

Second, harsh parenting at age two was assessed from one question asking three potential conflict situations with their children, which may not have accurately reflected parenting practices over time. Many parents find that using consistent discipline strategies is very difficult especially when their children are young (Janet, 2018). Therefore, in further studies, it may be desirable to use multiple measures that span different age and settings, which would be more reliable than measures from only one time point.

Third, causal associations between trajectory group membership and related factors cannot be determined, particularly for the factors that were evaluated with aggression at the same period (e.g., 2 years and 11 years in the present study). Thus, it is not certain whether the early and later variables were causes or outcomes of each trajectory group. In future work, evaluating these alternative roles and considering additional early and later variables may guide interventions that could be tested in rigorous experimental designs to determine if directly changing presumed causes of aggression in early childhood results in corresponding changes in aggression outcomes in early adolescence.

Conclusion

The present study advances our current knowledge about distinct developmental trajectories of aggression children exhibit, predictors of these distinctive pathways from early childhood, and how they result in long-term outcomes in early adolescence. A closer examination of features of each aggression trajectory group may offer better

understanding of when and how to prevent and intervene in childhood aggression, which will benefit children, families, schools, communities, clinicians, and researchers. It is noteworthy that this study analyzed different sets of aggression trajectory patterns, one set with all items reflecting aggression, both age-general and age-specific, and another set with only the items reflecting isomorphic behaviors across developmental periods. The findings shed light on the importance of considering the different indicators of aggression at different ages as children develop. Therefore, when studying the development of children, applying developmental considerations regarding measurement and analysis should be encouraged in order to examine children's age-appropriate behaviors at distinct developmental stages that may have similar function despite different form.

The current findings demonstrated that mothers' limited positive parenting and children's early delayed language development and poor emotional regulation were, particularly deleterious for children following a high-stable aggression trajectory. In general, as expected, the moderate-increasing and high-stable groups, relative to the low-stable and moderate-decreasing groups, showed a wider range of later problems including poor social skills, academic difficulty, internalizing problems, and delinquent behaviors. Replication of the findings from this study and rigorous empirical testing within the contexts of prevention and intervention can further help identify specific boys and girls who need more support based on their aggression trajectory, early history, and subsequent developmental consequences.

It appears clear that childhood aggression can be identified as early as age two, which warrants the importance of early identification of and intervention for behavior problems. It is also evident that children with early-onset and chronic aggression are

likely to be at highest risk for subsequent difficulties. For parents and teachers, the findings of this study imply that efforts to prevent or reduce childhood aggression should make use of limited resources by targeting services to children showing moderate-increasing or high-stable levels of aggression. This, however, does not mean that practitioners need to wait until children reach elementary school years before confirming persistent or serious aggressive behaviors that indicate a need for intervention.

Of importance, aggression trajectories confirmed in the current study showed that some children decrease aggressive behavior over time, others do not, and some show rapid increases in aggression. Future studies should be designed to identify early protective and risk factors of those who will not show decline in aggression. Therefore, it is important to find a set of early protective and risk factors that offer accurate prediction of aggression trajectories with relatively economical methods for predictive utility, over long periods of time, such as from toddlerhood, childhood to adolescence, along with the usage of aggression trajectory patterns to predict and prevent later difficulties during elementary school years or adolescence. The results here suggested that early intervention and prevention efforts that support positive parenting behaviors, children's language ability, and emotional control in the toddler years could be especially beneficial for children at the highest risk for long-lasting aggression.

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Tremblay, R. E., Nagin, D. S., Se´guin, J. R., Zoccolillo, M., Zelazo, P. D., Boivin, M.,... Japel, C. (2004). Physical aggression during early childhood: Trajectories and predictors. *Pediatrics, 114*(1), 43–50.

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Verhulst, F. C.,...Bakermans-Kranenburg, M. J. (2015). Early childhood

aggression trajectories: Associations with teacher-reported problem behaviour.

International Journal of Behavioral Development, *39*(3), 221-234. doi:

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Xie, H., Drabick, D. A., & Chen, D. (2011). Developmental trajectories of aggression

from late childhood through adolescence: Similarities and differences across

gender. *Aggressive Behavior*, *37*(5), 387-404. doi: 10.1002/ab.20404

Yew, S. G. K., & O'Kearney, R. (2015). The role of early language difficulties in the

trajectories of conduct problems across childhood. *Journal of Abnormal Child*

Psychology, 43(8), 1515-1527. doi: 10.1007/s10802-015-0040-9

CURRICULUM VITAE

SuJung Park

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Utah State University
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Logan, UT 84322-2905
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EDUCATION

Utah State University, Logan, UT   2019
Doctoral Candidate, Human Development and Family Studies
Dissertation: *Developmental trajectories of aggression from toddlerhood to early adolescence in boys and girls: Exploring early predictors and later outcomes*
Advisor: Lori A. Roggman, Ph.D.

Sungkyunkwan University, Seoul, Republic of Korea   2011
M.S., Child Psychology and Education
Thesis: *The mediating effect of aggression between empathy and psychological well-being: Focused on gender differences in late school-aged children*
Advisor: Yanghee Lee, Ph.D.

Sungkyunkwan University, Seoul, Republic of Korea   2009
B.A., Child Psychology and Education

RESEARCH INTERESTS

o Family dynamics at-risk families; Comparisons of family systems in cultural context
o Parenting behaviors and parent-child relationships; Fathering and father involvement
o Children's school readiness and outcomes
o Quantitative methods/ Longitudinal data analysis

PUBLICATIONS

Park, S. & Dotterer, A. M. (2018). Longitudinal associations of family stressors, fathers' warmth, and Korean children's externalizing behaviors. *Journal of Family*

Psychology, 32(8), 1036-1045. doi: 10.1037/fam0000486

Yu, J. J., & **Park, S.** (2017). Predictors and the distal outcome of general Internet use: The identification of children's developmental trajectories. *British Journal of Developmental Psychology, 35*(4), 483-497. doi: 10.1111/bjdp.12188

Jin, J. S., Song, S. M., & **Park, S.** (2014). The mediating effect of multicultural attitudes between intercultural sensitivity and multicultural teaching efficacy among early childhood teachers. *Asian Journal of Child Welfare and Development, 12*(3), 169-186.

MANUSCRIPTS SUBMITTED OR IN PROGRESS

Park, S., Park, S. J., & Dotterer, A. M. (in revision). The roles of fathers' support and children's behavior problems in mothers' parenting stress.

An, W., Dotterer, A. M., **Park, S.**, & Levin, M. E. (under review). Exploring psychological Inflexibility, perceived discrimination, and psychosocial outcomes among college students.

Kristin, H., Juhasz, A. C., Dotterer, A. M., **Park, S.**, & Boyce, L. K. (under review). A qualitative investigation of how student parents cope with multiple roles.

Park, S., & Dotterer, A. M. (in preparation). Children's school readiness and school engagement: Contributions of father warmth and child internalizing problems.

Park, S., Meter, D. J., & Roggman, L. (in preparation). Child self-esteem and life satisfaction: Roles of child abuse and peer attachment.

PRESENTATIONS

Roggman, L., Gurko, K., Olson, T., **Park, S.**, & Innocenti, M. (2019, May). PICCOLO+B: PICCOLO during the first year in relation to the child's parenthood and development at the second year of age. Invited research presentation to International PICCOLO Research Meeting, Universidad Catolica, Santiago, CHILE.

Park, S. & Dotterer, A. M. (2019, March). A longitudinal study of fathers' warm parenting, children's internalizing problems, and school readiness. Poster presentation at the Society for Research in Child Development (SRCD) Biennial Meeting, Baltimore, MD.

Dotterer, A. M., Juhasz, A., Kristin, H., **Park, S.**, & Boyce, L. (2018, November) Examining stress and family relationships among low income college student

parents; A mixed methods study. Poster presentation at the National Council on Family Relations (NCFR), San Diego, CA.

Roggman, L., Gurko, K., Olson, T., & **Park, S.** (2018, May). Developmental parenting and child development outcomes with US infants age 3-9 months: Expanding the validity of PICCOLO to infancy. Presentation at the World Association of Infant Mental Health (WAIMH), Rome, ITALY.

Park, S. & Dotterer, A. M. (2018, March). Longitudinal associations of family stressors on Korean children's externalizing behavior: The role of fathers' parenting. Poster presentation at the Society for Research in Human Development (SRHD) Bi-Annual Conference, Plano, TX.

Park, S., Park, S. J., & Dotterer, A. M. (2018, March). Perceptions of fathers' parenting support and child behavior problems on mothers' parenting stress. Poster presentation at the Society for Research in Human Development (SRHD) Bi-Annual Conference, Plano, TX.

Park, S., & Roggman, L. A. (2018, March). Income, maternal depression, family conflict, and child aggression: Is harsh parenting a mechanism?. Poster presentation at the Society for Research in Human Development (SRHD) Bi-Annual Conference, Plano, TX.

Kristin, H., **Park, S.,** & Boyce, L. K. (2017, April). The Influence of stress overload and parent gender on student parents' feelings of attachment toward their children. Poster presentation at the Society for Research in Child Development (SRCD) Biennial Meeting, Austin, TX.

Park, S., Roggman, L. A., Lee, Y., & Gurko, K. (2016, March). The mediating effect of harsh parenting on the associations between family stressors and child behavior problems. Poster presentation at the Society for Research in Human Development (SRHD) Bi-Annual Conference, Denver, CO.

Park, S., Roggman, L. A., Lee, Y., & Gurko, K. (2015, April). The mediating effect of harsh parenting on the association between family poverty and child academic achievement. Poster presentation at the Utah State Student Research Symposium, Logan, UT.

Park, S., Roggman, L. A., & Lee, Y. (2015, April). The mediating effect of parenting on the associations between family stressors and child behavior problems. Poster presentation at the Rocky Mountain Psychological Association (RMPA) Annual Convention, Boise, ID.

 GRANTS

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o   Human Service Business Funded by Ministry of Education and National Research Foundation of Korea as Specialization Project of the Metropolitan University in 2014 (CK-II), 2014-2019, $ 35,440. Status: Unfunded. Role: Research assistant of Suwon University in Korea

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WORK EXPERIENCE

Research Assistant   2014- Present

Department of Human Development and Family Studies, Utah State University

Supervising Professor - Lori A. Roggman, Ph.D.

o   Participate in preparation of conference poster presentations, including analyzing data, writing literature reviews, designing posters, and submitting paper
o   Code and analyze videos/materials of Parenting Interactions with Children Checklist of Observations Linked to Outcomes (PICCOLO)
o   Coordinate and assist Home Observation of Parenting and Early Development: Tele-Home Visits for Toddlers research
o   Coordinated Home Observation of Parenting and Early Development (HOPE-D) research
o   Trained home visitors to be equipped with collecting data from families

   Supervising Professor - Ann M. Berghout Austin, Ph.D.
o   Participated in and assisted with preparation of scholarly publications and courses

Teaching Assistant   2014-Present

Department of Human Development and Family Studies, Utah State University

o   Completed College teaching seminar course (IELI 7920, Fall 2014)
o   Assist with face-to-face sections of the course; grade assignments; lecture; proctor exams; exam review; prepare and provide class materials.
o   Attended teaching workshops (Graduate Instructor Forum, GIF)   2016-2018

Supervisor: Undergraduate Teaching Fellow

o   BrookeLyn Anderson (Fall 2018)

Supervisor: Undergraduate Apprenticeship Course in Psychology Department

   (PSY 4950)

- o Kyla Paulus (Spring 2019)
- o Rachel Knutzen (Spring 2019)
- o Anne Pollard (Spring 2019)
- o Mallory DeMotte (Spring 2018)
- o Kayce Bradley (Fall 2017 and Spring 2018)
- o Carter Holmes (Fall 2017)
- o McKenna Ballard (Fall 2017)

Best Speech and Psychotherapy Center, Therapist, Republic of Korea   2011-2012

- o Served as a play therapist for maladaptive or disabled children
- o Counseled parents who have maladaptive or disabled children

Gangnam Pure Child Counseling Center, Therapist, Republic of Korea   2010-2011

- o Served as a play therapist for maladaptive or disabled children
- o Counseled parents who have maladaptive or disabled children

Gangnam Pure Child Counseling Center, Intern, Republic of Korea   2010-2011

- o Underwent training needed to become a play therapist
- o Assisted Dr. Soyoung Joo in counseling parents and treating maladaptive or disabled children

Home Visiting, Therapist, Republic of Korea   2009-2011

- o Visited a home for maladaptive or disabled children and conducted psychotherapy
- o Counseled parents who have maladaptive or disabled children at their home

Rehabilitation Therapy Center for Disabled Children, Therapist, Republic of Korea 2009-2010

- o Served as a play therapist for maladaptive or disabled children
- o Counseled parents who have maladaptive or disabled children

Ansan Work Corporation Kindergarten, Assistant teacher, Republic of Korea   2006

- o Helped out teachers who educate and care children living in poverty

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TEACHING EXPERIENCE

Lecture: Graduate Instructor – Utah State University

o HDFS 2200 - Home Visiting (online class)	Fall 2018
o HDFS 2660 - Parenting and Child Guidance	Fall 2018

Guest Lecture – Utah State University

o FCHD 1500 - Human Development Across the Lifespan	Spring 2016
o IELI 2475 - Cross-Cultural Explorations	Spring 2017
o FCHD 2660 - Parenting and Child Guidance	Fall 2017, Spring 2018
o HDFS 2660 - Parenting and Child Guidance	Spring 2019
o HDFS 6910/7910 - Parenting	Spring 2019

PROFESSIONAL SERVICE

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o Ad hoc reviewer - *Developmental Psychology (APA)*	2015
o Ad hoc reviewer - *Infant Mental Health Journal*	2017

SERVICE

Sin-Il Kindergarten, Republic of Korea   2009-2010

o   Volunteered to educate children from multicultural family

Seoul Majang Elementary School, Republic of Korea   2009

o   Volunteered to teach children prosocial skills and cooperation

Seoul Municipal Eunpyeong Hospital, Republic of Korea   2009

o   Volunteered to educate children with Attention Deficit Hyperactivity Disorder

Sungdong Mental Health Center, Republic of Korea   2009

o   Volunteered to teach third-grade students social interaction skills using group activities

Seoul National University Children's Hospital, Republic of Korea   2008-2009

o   Volunteered to educate and treat preschoolers with Autism and Pervasive Developmental Disorders
o   Supported to camp three times per year

HONORS & AWARDS

Graduate Student Travel Award   2015, 2016, 2017, 2018
Department of Human Development and Family Studies, Utah State University

Graduate Student Travel Award   2015, 2016, 2018
School of Graduate Studies, Utah State University

Harriet Ann Richards Rasmussen Scholarship   2016, 2017
Utah State University

Academic Excellence Scholarship   2008
Department of Child Psychology and Education, Sungkyunkwan University

Pursuit of Excellence Scholarship   2007
Department of Child Psychology and Education, Sungkyunkwan University

Dean's List Scholarship   2004, 2005, 2006
Department of Child and Family Welfare SuWon University

CERTIFICATES

Kindergarten Teacher's License (Grade II)
Ministry of Education, Science and Technology, South Korea