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FAMILY ENVIRONMENT AND SCHOOL ENVIRONMENT AS PREDICTORS FOR PHYSICAL AGGRESSION IN LOW-INCOME CHILDREN

by

Xiaoyu Li

A THESIS

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FAMILY ENVIRONMENT AND SCHOOL ENVIRONMENT AS PREDICTORS FOR PHYSICAL AGGRESSION IN LOW-INCOME CHILDREN

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University of Nebraska, 2012

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The purpose of the current study was to examine the unique and collective contributions of child's own characteristics, their family environment and school environment to the development of child physical aggression at Grade 5. This study was based on Bronfenbrenner's Process-Person-Context-Time model (Bronfenbrenner & Morris, 2006). Children's gender and their aggression at age 3 were included as person characteristics. Family environment (primary caregiver's ethnicity, maternal education, home warmth, physical punishment, exposure to violence, family conflict, and parent-child dysfunctional interaction) and early child care experience measured by whether the child was in child care at both age 3 and age 4 were included in the microsystem of the bioecological model. Percentage of free or reduced lunch at school level was conceptualized as the exosystem factor in the bioecological model. The current study used the data from the Early Head Start Research and Evaluation Project (EHSREP). Participants of this study were 690 children (340 girls), followed longitudinally from age 3 to Grade 5, representing multiple races and ethnicities (White, 44.3%, Black, 24.6%, Hispanic 25.9%, other races 5.1%). Results suggested that early aggression at age 3

predicted later aggression at Grade 5. Home warmth was a marginally significant protective factor for children's aggression, whereas physical punishment, violence exposure, family conflict and parent-child dysfunctional interaction were risk factors for children's aggression. Child's experience in formal child care significantly predicted his/her higher aggression at Grade 5 and this effect was maintained with all predictors included in the hierarchical regression model. Results also indicated that school poverty at Grade 5 was not a significant predictor of children's aggression at Grade 5. The moderation of home warmth for the relations between physical punishment and child's aggression was not significant. Limitations of the current study, directions for future research, and implications for intervention are also discussed.

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Chapter 1: Introduction

Aggressive behavior predicts maladjustment in multiple areas for children and adolescents, such as poor peer relations, low prosocial behavior, school dropout, violence, and delinquency (Card, Stucky, Sawalani, & Little, 2008; Kokko, Tremblay, Lacourse, Nagin, & Vitaro, 2006). Research evidence indicates that early aggressive behaviors of children, parenting and out-of-home experiences may all contribute to children's aggressive behavior problems (Brame, Nagin, & Tremblay, 2001; Broidy et al., 2003; Li, Putallaz, & Su, 2011; NICHD Early Child Care Research Network, 2003). Many studies have investigated how the familial factors influence children's aggressive behavior. Family conflict, physical punishment and harsh parenting have shown to be significantly related to children's aggressive behavior (Alink, Mesman, Zeijl, Stolk, Juffer, Bakermans-Kranenburg, & Ijzendoorn, 2009; Tanaka, Raishevich, & Scarpa, 2010; Weiss, Dodge, Bates, & Pettit, 1992). There is controversy in the literature regarding whether parental warmth moderates between physical punishment and early childhood aggression (Alink et al., 2009; Stacks, Oshio, Gerard & Roe, 2009). Children's early child care experience is associated with children's aggression in subsequent education experience (NICHD Early Child Care Research Network, 2003). Though many research studies have investigated the relation between family environment factors and children's aggressive behavior, few studies have examined the impact of family environment, early childhood education and subsequent school context simultaneously on children's aggression. The purposes of this study are four-fold: (1) to examine whether early childhood aggression predicts later mid-childhood aggression; (2) to investigate which family factors constitute risk factors and protective factors for children's aggressive

behavior and examine whether parental warmth moderates the relation between physical punishment and aggressive behavior; (3) to examine whether formal early childhood education experience predicts later aggression and (4) how percentage of free and reduced lunch impacts children's aggressive behavior as well.

Conceptual Framework: Bioecological Model of Human Development

This study will adopt the bioecological model and the Process-Person-Context-Time (PPCT) model of human development proposed by Bronfenbrenner (Bronfenbrenner & Morris, 2006) as the conceptual framework. In the bioecological model, development is framed as continuity and change in the biopsychological characteristics of human beings, both in the individual level and in the environment (Bronfenbrenner & Morris, 2006). One of the principal characteristics of the bioecological theory is the emphasis of the interaction between the individual and his or her environment. There are four major properties of the bioecological model and they are process, person, context, and time. These four properties constitute the basis of the Process-Person-Context-Time (PPCT) model. The following are the illustrations of the concepts.

Process is the core of the model, which refers to the interactions between the individual and environment. Proximal processes are daily interactions of children with environment, which happen "on a fairly regular basis, over an extended period of time." (Bronfenbrenner & Morris, 2006, p.798). Proximal processes are considered as the primary mechanisms of human development. Some of the proximal processes examples could be: mother-child interactions, early child care experience in center, playing with a peer from child care, reading for the child on a daily basis and so on. Participation in

those proximal processes over time helps children to develop the competence, knowledge and skill to engage in such activities both with others and on their own (Bronfenbrenner & Morris, 2006).

Person in the PPCT model refers to the biological, cognitive, and behavioral characteristics of the developing person. According to Brofenbrenner and Morris (2006), there are three types of Person characteristics which are most influential in shaping the future development via their capacity to impact the direction of proximal processes through the life course. Those three types of person characteristics are: dispositions, bioecological resources and demand. Dispositions direct proximal processes in a certain developmental domain and maintain their operation. Ability, experience, knowledge in the bioecological resources are necessary for the effective functioning of proximal processes. Demand characteristics may invite or discourage interactions from the social environment. In the bioecological model, person characteristics are acting as influential factors for proximal processes and outcomes of those processes.

Children's gender and their behavioral characteristics (e.g. earlier aggression at age 3) are person characteristics which could influence the proximal processes and children's development. According to the literature, boys tend to display higher physical aggression, while girls tend to have higher relational aggression (Barth, Dunlap, Dane, Lochman, & Wells, 2004; Crick & Grotpeter 1995). Also, children's behavioral characteristics affect children's development. Many research studies have indicated that there is moderate stability of aggression across time (Olweus, 1979). Some trajectory studies have shown that around 4-10% of children follow chronic physical aggression from early childhood to adolescence (Broidy et al., 2003).

Context refers to the nested systems of children's environment from immediate to more distant. There are four levels of systems in the context and they are: microsystem, mesosystem, exosystem and macrosystem (Brofenbrenner, 1979). Detailed explanations of those four nested systems are as follows.

A microsystem emphasizes an individual's role and relations in the immediate setting containing the individual. Microsystem is defined as "a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical and material features and containing other persons with distinctive characteristics of temperament, personality, and systems of belief"(Bronfenbrenner, 2005, p. 148). Bronfenbrenner (1979) described that an individual would go through a series of "ecological transitions" as a "person's position in the ecological environment is altered as the result of a change in role, setting, or both" (p.26). For instance, with the development of a child, he or she is introduced to caregivers other than the mother: day care, preschool, peers, and finally the school systems. All of these interactions might symbolize "ecological transitions" for the developing child since the child assumes new roles and establish new relations with the immediate environment and increasingly distant environments (White & Klein, 2008, p. 259). In this study, there are several variables in the microsystems at home: maternal education level, primary caregiver's race and ethnicity, home warmth, physical punishment/spanking, exposure to domestic violence, family conflict, and parent-child dysfunctional interaction. There is one variable in the microsystem at school: whether the child attended formal child care at both age 3 and age 4.

Mesosystem was defined by Bronfenbrenner (1979) "as a set of interrelations between two or more settings in which the developing person becomes an active participant" (p. 209). Mesosystem involves the interconnection between two or more microsystems. It happens when the same person participates in activities in more than one setting, for instance, "when a child spends time both at home and at the day care center" (p. 209). When this occurs, it involves the incidence of "ecological transition." Many hypotheses pertaining to the mesosystem emphasize the compatibility of the role requirement across different settings and the smooth transition across different settings. Parent involvement at school and parent-teacher relationships may help children to have smooth transitions from home to school.

"An exosystem has been defined as consisting of one or more settings that do not involve the developing person as an active participant but in which events occur that affect, or are affected by, what happens in that setting" (Bronfenbrenner, 1979, p. 237). One example of this exosystem for a child is the relation between the home and the parent's workplace. If the mother assumes great responsibilities and pressure from work, her pressure and lack of time to spend with families would influence her relationship with her children. Social reforms, financial upheaval and new laws are also examples of exosystem factors which could influence a child's life indirectly. In this study, school poverty measured by percentage of enrolled students eligible for free or reduced lunch is an exosystem factor. Though a student doesn't necessarily play a role in the school financial system, school poverty could influence the child indirectly via the quality of teachers and quality of school environment.

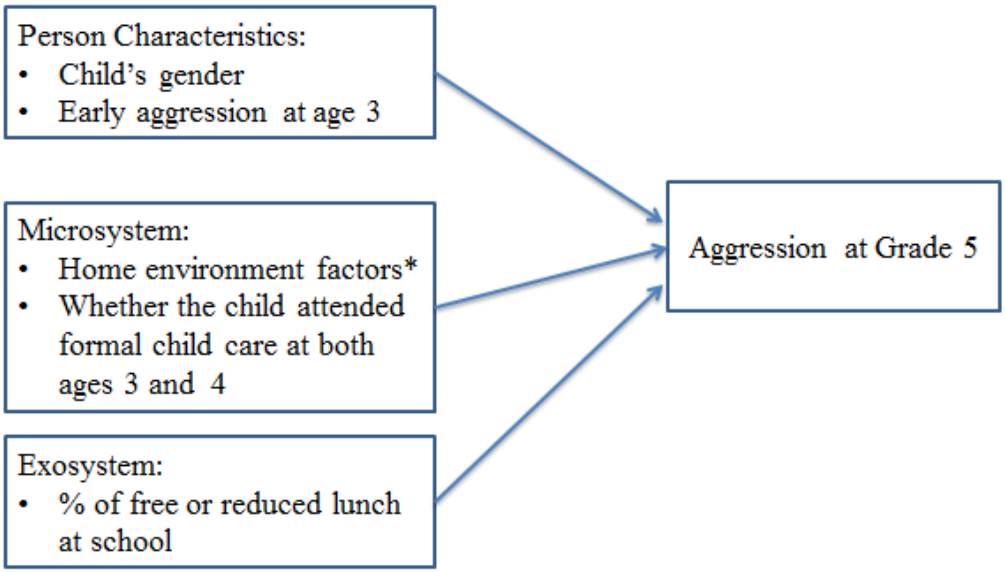
The last dimension is the macrosystem, which "refers to the consistency observation within a given culture or subculture in the form and content of its constituent micro-, meso-, and exosystems, as well as any belief systems of ideology underlying such consistencies" (Bronfenbrenner, 1979, p. 258). Culture is one example of macrosystem. As we know, parenting practices vary from culture to culture. Thus macrosystem could also influence a child's development indirectly via parenting, cultural beliefs and social environment.

Time is also a critical element in the study of behavioral development. In the PPCT model, person characteristics interact with context to form processes, which take place over time. There are three successive levels of time: mirco-, meso-, and macro- (Bronfenbrenner & Morris, 2006). "Microtime refers to continuity versus discontinuity in ongoing episodes of proximal process. Mesotime is the periodicity of these episodes across broader time intervals, such as days and week. Finally, macrotime focuses on the changing expectations and events in the larger society, both within and across generations (p. 796)".

Please refer to Figure 1 for the model of this study, which was based on the Process-Person-Context-Time model and the Bioecological Model.

Figure 1

The Model of the Current Study



* home environment factors include: primary caregiver's ethnicity, maternal education, home warmth, physical punishment, violence exposure, family conflict and parent-child dysfunctional interaction.

Aggressive Behavior and Family and School Environment Predictors

Physical Aggression versus Relational Aggression

Aggression has usually been defined as behaviors to cause harm for others though specific definitions varied over the years (Crick & Grotpeter, 1995). There are also different ways for classifications of aggression depending whether it is overt or covert, direct or indirect, verbal or nonverbal. In this study, I am going to differentiate physical aggression from relational aggression. Physical aggression is a more direct form of aggression, which intends to cause or threaten physical harm; while relational aggression is a more indirect form of aggression that involves inflicting harm on someone through

hostile manipulation of relationships, such as intentionally excluding a peer from social plans, spreading rumors about a peer, and insulting or hurting a peer through words (Archer & Coyne, 2005). The literature indicates that boys have higher physical aggression than girls, while girls display higher relational aggression than boys (Barth et al., 2004; Crick & Grotpeter, 1995). This study will mainly focus on physical aggression and examine children's individual characteristics, family environment, and school environment as predictors for children's physical aggression at Grade 5.

Person Characteristics

Child's Aggressive Behavior at Age 3. Many research efforts have been devoted to study the developmental trajectories of aggression from early childhood to adolescence or early adulthood. Research indicates that child's aggression peaks around 2 to 3.5 years and then reduces steadily afterwards (Tremblay & Nagin, 2005). Broidy et al. (2003) carried out a six-site study in three countries (Canada, New Zealand, United States) to examine the relationship between childhood disruptive behaviors and adolescent delinquency. For most sites, children's physical aggression was assessed repeatedly from age 6 to age 15. The developmental trajectories across sites and across countries were similar for boys in that vast majority within the samples follow a low-decreasing aggression or no aggression pattern from early childhood to adolescence (around 70%), while only around 4-10% of the sample followed a chronic physical aggression trajectory from early childhood to adolescence. A group of Chinese scholars also employed Nagin and Trembley (1999)'s group-based semi-parameter method to examine the developmental trajectory of 1618 Chinese Middle school students' aggressive behavior between the ages of 9 to 12 with the outcome measured annually (Chen, Zhang, Ji, Chen,

Wei, & Chang, 2011). The results of this study paralleled the Broidy et al's study (2003) in that 68.7% of children were in the membership of no aggression, 26.8% of children were in the membership of low-decreasing group, while only 4.5% children were chronically high aggressors. These two studies indicate that there is some continuity in children aggression from early to later stages.

Gender. Boys had significantly higher aggression than girls across early childhood to adulthood (Barth et al., 2004; Card, Stucky, Sawalani, & Little, 2008; Colder, Mott, Levy, & Flay, 2000; Stacks et al., 2009). Also, the boys were more likely than girls to be in "high increaser" membership of physical aggression across years in trajectory studies (Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Underwood, Beron, & Rosen, 2009). The gender difference might be due to the social and developmental influence. Girls' problem behavior was primarily channeled to internalizing behavior due to socialization, whereas boys' aggression was more accepted in the socialization (Keenan, & Shaw, 1997).

Microsystem Factors at Home Related To Aggression

Primary Caregiver's Ethnicity. Literature indicates that physical punishment is more common in African American parents than European parents (Deater-Deckard, Dodge, Bates, & Pettit, 1996; Straus & Stewart 1999). Research also demonstrates that physical punishment predicts children's aggressive behavior (Erath, Bierman, & Conduct Problems Prevention Research Group, 2006; Taylor, Manganello, Lee, & Rice, 2010). Thus, primary caregiver's ethnicity could influence child's aggressive behavior indirectly via parenting, such as physical punishment.

Maternal Education. Low maternal education was a risk factor for child's aggression in early childhood (Benzies, Keown, & Magill-Evans, 2009; Côté et al., 2007). Two trajectory studies demonstrated that low maternal education (not finishing high school) increased the children's likelihood of falling into high physical aggression profile (Côté et al., 2006; Harachi, Fleming, White, Ensminger, Abbott, Catalano, & Haggerty, 2006). There hasn't been much research to investigate the mechanisms between maternal education and child's aggression. Maternal education might influence parenting beliefs and parenting practices, which, in turn, influence children's social emotional behavior.

Parental Warmth. Parental warmth is mainly constructed to measure parents' emotional availability, sensitivity, affection, and support for their child. There are some inconsistencies in the literature as to whether parental warmth is associated with children's externalizing behavior. Some research indicates that parental warmth doesn't predict aggressive behavior directly in a sample of 1 to 5 years old children (Alink et al., 2009; Stacks et al., 2009); while other research finds that parental warmth is significantly negatively associated with children's externalizing behavior (White & Renk, 2012; Chen, Wu, Chen, Wang, & Cen, 2001). Furthermore, in a longitudinal study which tracks children's aggressive behavior over multiple years, low home warmth increases children's potential to fall into a "high-increasers" trajectory instead of other lower-risk trajectories, such as "low-stable", and "medium-desisters" trajectories (Underwood et al., 2009).

The literature also shows contradictory evidence in regards to whether home warmth moderates the relation between negative discipline and aggression in early

childhood. Alink et al (2009) examined the relations among maternal sensitivity, negative discipline and aggression in a sample of children (age ranges from 13.58 to 41.91 months) with high scores on child externalizing behavior. This study confirmed that maternal sensitivity moderated the effect of negative discipline on children's aggressive behavior. More negative discipline was associated with child aggression one year later, but only when mothers had low-sensitivity for their children. In contrast, Stacks et al. (2009)'s study didn't find this moderating effect of parental warmth. Stacks et al. also tested whether parental warmth moderated the negative impact of spanking on child aggression in a low-income sample of children (longitudinally measured at 14, 24 and 36 months). The results of this study didn't confirm the moderating role of parental warmth. The inconsistency results may be due to the sample difference since Alink et al (2009) studied this moderating effect in a higher-risk sample for aggression while Stacks et al. (2009) studied this effect in a low-income sample. It is important for future research to investigate more about the mechanism underlying the moderating effect of maternal sensitivity/home warmth.

A randomized controlled trial study provides some insight into the relation between home warmth and children's aggression by examining children's cortisol response (O' Neal, Brotman, Huang, Gouley, Kamboukos, Calzada, & Pine, 2010). This study recruited 92 children (mean age = 48 months) at risk for antisocial behavior and assigned 47 of them randomly into an intervention group. The intervention mainly offered home visits to improve parenting skills and encouraged parents to use nonharsh, consistent and appropriate disciplinary strategies to promote children's social competence. This intervention significantly increased parents' warmth, which in turn was

associated with increases in cortisol response. The cortisol level negatively predicted children's aggression. Therefore, cortisol level was a mediator between the intervention effects and children's aggression. Post hoc analysis indicated that changes in cortisol accounted for 69% of the intervention effect on child aggression. This study provided better understanding of the complex nature of relations among the family environment, neurobiological regulation of stress and developmental psychopathology. Moreover, this study also demonstrated evidence that home warmth could help children to improve their stress response system, which in turn helped children deal with social challenging situation relevant with later aggressive behavior.

Physical Punishment. Spanking and other corporal punishment in families have been disputed practices in the United States. According to a study, 94% of American parents spank their children by the time they are 3 or 4 years old (Straus & Stewart, 1999). Straus and Kantor (1994, p.543) defined corporal punishment as following: "the use of physical force with the intention of causing a child to experience pain but not injury for the purposes of correction or control of the child's behavior." In Hicks-Pass (2009)'s review article of corporal punishment, corporal punishment has been associated with aggression, and higher probability of violence in intimate relationships at a later age. Many studies indicated that spanking was related to later aggressive behaviors for young children (Erath, Bierman, & Conduct Problems Prevention Research Group, 2006; Taylor, Manganello, Lee, & Rice, 2010; Weiss, Dodge, Bates, & Pettit, 1992).

Spanking at 3 years old predicted the child's increased risk for higher levels of aggression when the child was 5 years of age after controlling the child's initial level of aggression and 8 potential parenting risk confounders (Taylor et al., 2010). Two studies

also found that harsh parenting (including slapping and spanking) was associated with elevated aggressive behavior in sample of kindergarteners (Weiss, et al., 1992; Stormshak, Bierman, McMahon, Lengua, & Conduct Problems Prevention Research Group, 2000). Weiss et al. (1992) suggested that the path from harsh parenting to children's aggression in school context was partially mediated by maladaptive social information processing. Some studies indicated that physical punishment could interact with other parenting features, such as maternal sensitivity and emotional support. Both maternal sensitivity and emotional support were found to be moderators between physical discipline and children's aggressive behavior in that children only demonstrated high aggression in the context of low maternal sensitivity and low emotional support (Alink et al., 2009; McLoyd & Smith, 2002).

Exposure to Violence. Exposure to violence is a widespread phenomenon according to a study of a United States sample, which indicates that around one-third of all children are victim of some form of violence and approximately 90 percent witness violence at least once during their lifetimes (Richters & Martinez, 1993). Many retrospective studies indicate that exposure to violence during childhood predicted later aggressive behavior in young adults (Henning, Leitenberg, Coffey, Bennett & Jankowski, 1997; Milletich, Kelley, Doane, & Pearson, 2010; Bailey & Coore-Desai, 2011). In Henning et al. (1997) study, 203 of 1452 in a survey sample reported that they had witnessed at least one incident of physical aggression between their parents. Compared with the group of young adults who never observed any physical aggression between their parents, the group of young adults exposed to interparental violence not only had significantly higher level of psychological distress but also higher externalizing behavior

problems. A meta-analytic review study demonstrated a significant association between exposure and child problems (*d*=-0.29) in correlational studies (Kitzmann, Gaylord, Holt, & Kenny, 2003). This meta-analysis also indicated that witnesses of violence had significantly worse outcomes relative to nonwitnesses, such as increased risk for psychological or interpersonal problems later.

A longitudinal prospective study also confirmed that prior exposure to violence significantly predicted subsequent elevated aggression, normative beliefs about aggression, and aggressive fantasy (Guerra, Huesmann & Spindler, 2003). Moreover, this study also suggested that social cognition supporting aggression partially mediated the association between earlier violence exposure and later aggressive behaviors. Besides the social cognition as a mechanism to understand this relationship between violence exposure and subsequent aggression, Massachusetts Coalition of Battered Women Service Groups (1995) provided some other possible mechanisms for this association: "(1) violence is an appropriate way to resolve conflicts; (2) violence is a part of family relationships; (3) the perpetrator of violence in intimate relationships often goes unpunished; and (4) violence is a way to control other people" (Osofsky, 2003, p. 165).

Research also indicates compounding effects of physical punishment and violence exposure. Hughes, Parkinson, & Vargo (1989) demonstrated that children who experienced both physical punishment and violence exposure had the most externalizing behavior; children who were exposed to violence but not received physical punishment were rated as having less externalizing behavior; while children who were nonexposed and non-receivers of physical punishment had the least externalizing behavior. This study illustrated that both physical punishment and violence exposure were risk factors for

externalizing behavior and those two factors have cumulative effects. Since there are few prospective literatures studying how earlier exposure to violence influences later aggressive, this current study will contribute to the literature in the use of longitudinally prospective design.

Family Conflict. Family conflict is a strong familial factor related to children's aggression in the literature (Andreas & Watson, 2009; Tanaka et al., 2010; Cummings, Goeke-Morey, & Papp, 2004； Li et al., 2011). Family conflict was directly associated with children's aggression in studies with middle childhood children (Cummings et al., 2004; Li et al., 2011). Tanaka et al. (2010)'s study found that family conflict was related to increased proactive aggression in children with high levels of anxiety in a sample of children from 7 to 13 years. In a longitudinal trajectory study of children's aggression from 2nd grade to 8th grade, family conflict was a risk factor for children's higher likelihood of falling into the high aggression trajectory (Harachi et al., 2006). All of these studies confirm that family conflict was associated with increased aggression and a risk factor for children's externalizing behavior. Additionally, positive family environment featured by high cohesion and low conflict reduced the aggressive behaviors of children with high aggressive beliefs in childhood (Andreas & Watson, 2009). Taken together, the literature indicates that positive family environment reduces children's aggression while negative family environment increases children's aggressive behavior. The following two studies provide some understanding of the mechanisms of how family conflict/marital conflict influences children's aggressive behavior.

Cummings et al. (2004) examined how marital conflict was associated with children's immediate aggressive responding, which, in turn, predicted children's

aggression. Parents' tactics and emotionality were important elements during the process of marital conflict. Parents' destructive conflict tactics and negative emotionality were associated with a higher possibility of aggression in children. By contrast, constructive behaviors and positive emotionality were associated with a lower probability of children's aggressive responses. Cummings et al. (2004)'s study not only confirmed family conflict as a risk factor for children's externalizing behavior, but also provided deeper understanding of the process context, such as, specific tactics and emotionality, which influenced children's aggressive behavior. Parents' constructive tactics and positive emotionality would help to reduce the negative effects of marital conflict on children's externalizing behavior.

Interparental conflict, parenting behaviors and children's overt and relational aggression were examined in Li et al. (2011)'s study. This study indicated that interparental conflict could directly and indirectly predict children's physical and relational aggression. Parental overt conflict was positively associated with boys' aggression, but not girls' aggression, and this effect was mediated through paternal coercive control. In addition, the associations between maternal overt conflict style and maternal coercive control with boys and girls were marginally significant. This study suggests that interparental conflicts could impact parent's overt and covert coercive control for children, which in turn is related to children's aggression. Thus this study provides some understanding for the mechanism of how family conflict influences children's aggression via the function of parenting.

Most of these studies focus on studying relations between family conflict and aggressive behavior for children in their middle childhood to early adolescence (age

range from 7-19 years old). Few studies have investigated how family conflict influences the aggression in young preschoolers and children in early childhood. The current study will contribute to the body of knowledge by studying children from age 3 to fifth Grade. Moreover, since this current study measures children's family conflict repeatedly at both age 3 and fifth grade, it will investigate which age period is more sensitive and vulnerable for children's exposure to family conflict.

Dysfunctional Parent-Child Interaction. Parent-child interaction is also an important element in the family process. A large body of research has indicated that negative parent-child interaction is related to children's aggression. Eichelsheim et al. (2010) examined parent-adolescent relationship and adolescents' aggression and delinquency in two Dutch samples. This study found that negative parent-child interaction, mainly featured by conflict and antagonism, was strongly associated with adolescents' aggression in both samples and in both genders. A prospective intergenerational study also found strong associations between child's externalizing behavior and the mutual parent-child attachment relationship, which mainly measured parent-child closeness, and child's admiration of parents (Brook, Lee, Finch, & Brown, 2012). This intergenerational study followed the participants from early adolescence (mean age around 14 years old) to middle adulthood (mean age approximately 32.3 years old), thus being able to capture three generations: G1, the participants' parents; G2, the participants; and G3 the offspring of the participants. This study demonstrated a bidirectional relationship between G3 child's externalizing behavior and G2/G3 mutual parent-child attachment. Dysfunctional parent-child attachment subtypes, including avoidance and anxiety attachment, were also related to physical aggression in young

adults. Female young adults were more likely to be physically aggressive when they had higher levels of avoidance attachment to their mothers and higher levels of anxiety attachment levels with their fathers (Williams & Kennedy, 2012).

Microsystem Factor at School Related to Aggression

Amount of Formal Child Care. Majority mothers in the United States choose to return to work after giving birth to a child before the child turns 1 year old. According to the Bureau of Labor Statistics (2000), 58% of all mothers with infants under 1 year old are in the labor force. Thus, extensive non-maternal child care becomes a routine for most families. The effects of such extensive and continuous non-maternal child care have called the attention of parents, policy-makers, and developmentalists (Belsky, 2001). Several studies have examined the effects of quantity, type and timing of external child care on problem behavior and socioemotional adjustment for children in ensuring years of school (Averdijk, Besemer, Eisner, Bijleveld & Ribeaud, 2011; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; NICHD ECCRN, 2003).

Accumulative quantity of nonmaternal care has been found to be associated with children's problem behavior and aggression (Averdijk, et al., 2011; NICHD ECCRN, 2003; Loeb, et al., 2007). Results from the National Institute of Child Health & Human Development (NICHD) study indicate that accumulative amount of time spent in any type of nonmaternal care arrangement across the first 4.5 years of life is predictive of children's externalizing problems and conflicts with adults at 54 months of age and in kindergarten as reported by mothers, caregivers, and/ or teachers; and that these effects remain even after controlling several plausible mediators of the quantity of child care effects—including quality, type, instability of child care, maternal sensitivity and other

family factors (NICHD ECCRN, 2003). Averdijk et al. (2011) also confirmed that accumulative external child care over the life course is associated with children's aggressive behavior and other types of non-aggression problem behaviors at age 7 in the context of Swiss sample; and this effect is due to group-based external child care rather than individual childcare; and also this effect remains even after controlling relevant child's characteristics at birth and family risk factors, including negative parenting, parental conflict, maternal depression, parental education and etc. Using the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) data, Loeb et al. (2007) also found that the quantity of experience in center child care has negative effects on children's externalizing behaviors even after controlling plausible family risk factors.

In contrast, some studies didn't confirm the relationship between amount of external childcare and children's externalizing behavior. Bacharach and Baumeister (2003) found that quantity of external care was not associated with severe externalizing behavior among kindergarten children beyond selection factors. Borge, Rutter, Cote & Tremblay (2004) also intended to differentiate the social selection and social causation regarding the effect of early childcare on physical aggression. This study found that for 2- to 3- year old Canadian sample, aggression was significantly more common in children under the maternal care setting than in those attending group day-care. Moreover, there is strong social selection effect in that there is significantly higher proportion of high-risk families choosing homecare than group day care.

Another issue of the literature is that the effect of early childcare on children's externalizing behavior fades out overtime. Sammons et al. (2007) found that children

who enrolled into center-based childcare below age 2 had higher level of antisocial behavior at entry into primary school than children who stayed at home in an England sample contest. However, this relationship disappeared when children were 10 years old. However, another study in the United States setting found the early child care effects sustained till 6th Grade (Belsky, et al., 2007).

Since there are some controversies in literature regarding the effect of external child care on children's externalizing behaviors, more studies are needed to testify this relationship with a different sample. Also, the literature indicates the negative effect of childcare on children's externalizing behavior fades out over time. Therefore it is also important to employ longitudinal data and investigate whether the negative effect of childcare on child's social emotional adjustment maintains when children are 10 years or older in a different sample.

Exosystem Factor at School Related to Aggression

School Poverty. School financial resource level has been associated with both students' academic performance and their behavioral functioning as well. High level of school poverty was negatively correlated with students' academic outcomes and positively correlated with students' social behavior adjustment (Battistich, Solomon, Kim, Watson & Schaps, 1995). Classroom climate and school poverty (measured by percentage of students qualifying for free or reduced cost lunch) were examined collectively for their roles in predicting children's aggression in a sample of elementary students (Thomas, Bierman, Thompson, Powers, & Conduct Problems Prevention Research Group, 2008). This study found that low-quality classroom contexts and school poverty were related to increased level of student aggressive-disruptive behavior at

school, even though only low-quality classroom contexts contributed unique variance for the prediction of aggression in the regression model (Thomas et al., 2008). Another empirical study found school poverty predicted unique variance in children's aggression for the urban African American and European children, but not the rural students. (Thomas et al., 2006). More research is needed to understand the mechanisms under which school-level poverty influences students' aggressive behavior.

The Current Study

This study examined the unique and collective contributions of microsystem factors (home warmth, physical punishment, violence exposure, family conflict, parent-child dysfunctional interaction, whether the child attended formal care at both age 3 and age 4), and exosystem factor (percentage of children enrolled eligible for free or reduced lunch at school level at Grade 5) to children's aggressive behavior at Grade 5, controlling child's early aggression at age 3, child's gender, primary caregiver' ethnicity, and maternal education in a sample of low-income children across 17 research sites in United States. This study was based on Bronfenbrenner's bioecological and Process-Person-Context-Time models, mainly examining how the microsystem and exosystem influence children's aggression at Grade 5. This study would contribute to the literature in understanding the mechanisms underlying children's aggressive behavior by including both the family environment and school context factors in a longitudinally prospective design. Since children's aggression was measured repeatedly at both age 3 and Grade 5, this study investigated the continuity of aggression across time and how early aggression related to later aggression. Moreover, the family environment and school context factors

were also measured across time from age 3 and Grade 5. Therefore, this study examined how early and concurrent home and school environment predicted aggression at Grade 5. The current study would add to the literature in understanding the moderating role of home warmth for the relation between physical punishment and children's aggression since there is inconsistency in the literature (Alink et al., 2009; Stacks et al., 2009). Also, this study would contribute to the literature in testing the longitudinal effect of formal early child care experience on children's aggressive behavior since there were also controversies regarding the longitudinal effect of early child care experience (Belsky et al., 2007; Sammons et al, 2007). The specific research questions and hypotheses are as follows:

Research Questions and Hypotheses

Research Question 1

Is there strong a correlation between early aggression at age 3 and later aggression at Grade 5?

Hypothesis 1. Early aggression at age 3 will positively correlate with later aggression and predict later aggression in Grade 5.

Research Question 2

Which home factors constitute risk factors for children's aggression and which home factors are protective factors for children's aggressive behavior?

Hypothesis 2. Home warmth across age 3, age 5 and Grade 5 will be negatively correlated with children's aggression and predict lower aggression for children in Grade 5.

Hypothesis 3. Physical punishment at age 3, whether children were spanked last week at age 5, whether child witnessed violence at age 5, and child's exposure to domestic violence at Grade 5 would predict higher aggression significantly in Grade 5.

Hypothesis 4. Home warmth would moderate the relationship between physical discipline and children's aggression.

Hypothesis 5. Family conflict at age 3 and Grade 5, parent-child dysfunctional interaction at age 3 and Grade 5 would predict higher aggression significantly in Grade 5.

Research Question 3

Does early child care experience at age 3 and age 4 predict aggression for children in Grade 5?

Hypothesis 6. Early child care experience would positively predict children's aggression in Grade 5.

Research Question 4

Does school poverty measured by enrolled students eligible for free or reduced lunch predict child's aggression at Grade 5?

Hypothesis 7. Percentage of free or reduced lunch would predict higher aggressive behavior for children in Grade 5.

Chapter 2: Method

Participants

This study used data from the Early Head Start Research and Evaluation Project (EHSREP) which includes 17 research sites throughout the United States. A total of 3001 children and their families were enrolled into this project when they were 12 months old or younger. Half of the children were assigned randomly into the birth to three intervention program and half of the children were assigned into the control group. EHSREP collected data and implemented parent interviews and assessments of children when they were 14, 24, and 36 months of age. Data were collected again in the spring before children were eligible to enter kindergarten, roughly two years after the end of Early Head Start services for children in the program (Chazan-Cohen et al., 2007). Then children's social-emotional, cognitive, family environment and school environment data were collected when they were in Grade 5 in order to test the longitudinal effects of Early Head Start.

The sample for this study was 690 (340 girls, 49.2%) children using the listwise deletion method. Those children had no missing data on all the dependent and independent variables across three time points age 3, age 5 and Grade 5. This sample represented multiple race and ethnicity (White, 44.3%, Black, 24.6%, Hispanic 25.9%, other races 5.1%). Around half the sample had been enrolled in the EHS intervention group (n=327, 47.4%).

Measures

Demographic Information. Child's gender, race and ethnicity and maternal education were collected in the baseline phase, when the EHSREP was initiated. There were four categories of race and ethnicity, and they were White, Black, Hispanic, and other ethnicities. Maternal education was coded into 3 levels of categories. Mother who had less than 12 years of education (not finishing high school) was coded 1, who had 12 years of education (finished high school) was coded into 2, who has more than 12 years of education was coded into 3.

Child Aggressive Behavior. Children's aggressive behavior at 36 months was measured by parent report using the aggressive behavior scale score on the Achenbach System of Empirically Based Assessment (ASEBA) Child Behavior Checklist for ages 1 ½ -5 years (Achenbach & Rescorla, 2000). The ASEBA has 39 items at 36 months, of which 19 items measure the incidence of aggressive behavior in children. The following are some of the items: can't stand waiting and wants everything now; is defiant; destroys things belonging to family or other children; gets in many fights; gets hurt a lot, is accident-prone; has angry moods; physically attacks people; screams a lot; and has temper tantrums or a hot temper. On each of the 19 items, parents were asked to report how true they are for their child. The scores are coded as following: 0=not true, 1=sometimes or somewhat true, 2=very or often true. Scores on this subscale can range from 0, if parents report all of the behavior problems are not true for their child, to 38, if the parents report that all of the behavior problems are very true or often true for their child. Internal consistency for this scale at 36 months is reported to be 0.88 by study authors Love et al. (2002).

Children's aggressive behavior at Grade 5 was measured by Child Behavior Checklist (CBCL) (Achenbach & Rescorla, 2001). Similar with ASEBA, CBCL is also reported by parents. Eighteen items in CBCL measure the incidence of child behavior and emotional problems. A sample of the items includes: argues a lot; cruelty, bullying, or meanness to others; demands a lot of attention; destroys his/her own things; disobedient at school; gets in many fights; screams a lot; sudden changes in mood or feelings; and temper tantrums or hot temper. On each of the 18 items, parents were asked to report how true they are for their child. The scores are coded as following: 0=not true, 1=sometimes or somewhat true, 2=very or often true. Subscale scores ranges from 0 if all the behaviors are never observed by the parents; to 36 if all the behavioral problems are often observed by parents. If more than 8 items were missing, then subscale score was set to missing. If data was missing for 8 or fewer items, the values of the missing items were imputed with the means of the non-missing items for that person.

Home Warmth. Home warmth was measured repeatedly at the following time points of child's age: 36 months, age 5 and Grade 5. Home warmth measures responsive and supportive parenting behavior observed by the interviewer during the home visit using the subscale of warmth from the HOME measurement (Caldwell, & Bradley, 1984). At 36 months, interviewer observes the following three parent behaviors during the home visit: (1) parent's voice conveys positive feeling to child, (2) parent spontaneously praises child's qualities twice during visit; (3) parent caresses, kisses, or cuddles child during visit. The score can range from 0, if none of the positive behaviors were observed, to 3, if all of the behaviors were observed. The internal consistency of the

HOME warmth was reported to be 0.72 at age 36 months for 1794 families participating in the EHSRE study in study by Love, Kisker, Ross, Schochet & Brooks-Gunn (2002).

Home warmth at age 5 was also measured by the subscale of home warmth from HOME (Caldwell, & Bradley, 1984).There are 6 items in the age 5 home warmth subscale: (1) caregiver converses twice with child twice; (2) caregiver answers questions or requests, (3) caregiver responds verbally to talking, (4) caregiver spontaneously praises child twice, (5) caregiver caresses kisses cuddle child once, (6) caregiver lets child show off. Interviewer observed whether those 6 responsive and supportive parenting behaviors exhibited by parent during visit. Scores can range from 0, if none of the positive behaviors were observed, to 6, if all of the behaviors were observed.

Home warmth at Grade 5 was also measured by the subscale of home warmth from HOME (Caldwell, & Bradley, 1984). There are 9 items in the Grade 5 home warmth subscale: (1) parent talks twice to child during visit (beyond correction and introduction), (2) parent answers one of child's questions or requests verbally, (3)parent encourages child to contribute to the conversation during the visit, (4) parent helps child demonstrate some achievement during visit or mentions a particular skill, strength, or achievement, (5) parent spontaneously praises child's behavior or qualities twice during visit, (6) parent uses some term of endearment or some diminutive for child's name when talking about or to him/her at least twice during visit, (7) parent's voice conveys positive feeling when speaking of or to child. (8) parent caresses, kisses, or cuddles child once during visit, (9) parent shows some positive emotional responses to praise of child by visitor. Interviewer made observation of those 9 responsive and supportive parenting behaviors

during visit. Score can range from 0, if none of the positive behaviors were observed, to 9, if all of the behaviors were observed.

Physical Punishment. Physical punishment at 36 months during the past week was reported by parents. The parent was asked whether he/she spanked the child during the past week, and if so, how many times. This variable was coded as binary. If parent did not spank the child, then this variable was coded as 0. If parents did spank the child in the previous week, then it was coded as 1. If parents didn't respond, then it was coded as missing.

Whether child was spanked during past week when the child was 5 years old was also reported by parents to indicate whether they spanked their child during past week. The coding was the same as the variable "physical punishment at age 3." If parent did not spank the child, then this variable was coded as 0. If parents did spank the child in the previous week, then it was coded as 1. If parents didn't respond, then it was coded as missing.

Witnessed Violence. When children were age 5, parents reported whether child had witnessed violence in the past year. If child had witnessed violence during the past year, then this variable was coded as 1. If child hadn't witnessed violence during the past year, then this variable was coded as 0.

Exposure to domestic violence at Grade 5 was also reported by parents. The parent responded to the following question: "In the past year, has [child's name] been a witness to domestic violence?" It was coded as a binary score. If child had been exposed to domestic violence, then this variable was coded as 1. If child hadn't been exposed to domestic violence, then this variable was coded as 0.

Family Environment Conflict. Family environment conflict was measured repeatedly; one is when child was 36 months, and the other is when child was in Grade 5 using the Family Environment Scale. The Family Environment Scale measures the social environments of families in 10 key dimensions, which include family relationships (cohesion, expressiveness, and conflict); features of personal development that could be endorsed by families (for instance, achievement orientation; independence); and maintenance of the family system (organization and control) (Moos & Moos, 1994). Only one dimension—family conflict was assessed in this study. Family conflict measures the magnitude of open expression of anger and aggression and generally conflictual interactions in the family. Parents report on a 4-point scale. Sample items include "we fight a lot", and "we hardly ever lose our tempers." Some item scores were reverse-coded so that a score of 4 indicates higher conflict in the family environment. There are 5 items in this scale. The average score of the 5 items was calculated to be the subscale score. Thus the score of family conflict ranges from 1 to 4. Any case with a missing item is set to be missing for the scale score. According to Moos and Moos (1981), internal consistency for the Conflict scale was good (Cronbach's alpha = .75). Also, the test–retest reliability was .85 after 2 months and .76 after 12 months.

Parent-Child Dysfunctional Interaction. Parent-Child Dysfunctional Interaction was measured repeatedly; one was when child was 36 months and the other was when child was at Grade 5. Parent-child dysfunctional interaction was measured by Parenting Stress Index – Short Form (Abidin, 1995). Parent-child dysfunctional interaction measures parent's perception that the child does not meet the expectations of the parent, and interactions with the child are not reinforcing the parent. The parent might feel that

the child abuses or refuses the parent or the parent feels frustrated or estranged from the child. The parent responded his/her agreement or disagreement to the following sample statements "Your child rarely does things for you that make you feel good," and "Most times you feel that your child does not like you and does not want to be close to you," and "Your child seems to smile less than most children." Item responses are coded on a 5-point scale, with 5 indicating high levels of parent-child dysfunctional interaction. Scores on the 12-item subscale can range from 12 to 60. Missing data were imputed for this variable.

Parent-Child Dysfunctional Interaction at Grade 5 was measured again using the same measurement Parenting Stress Index – Short Form (Abidin, 1995). The difference from the 36-month Parent-Child Dysfunctional Interaction measurement is that only 6 items were assessed in this Grade 5 variable. Item responses are still coded on a 5-point scale, with 5 indicating high levels of parent-child dysfunctional interaction. Scores on the 6-item subscale can range from 6 to 30.

Experience of Formal Child Care. Percentage of time in formal program at ages 3 and 4 was reported by parent to indicate child's experience in formal child care program. Originally, the parent reported whether his/her child was in formal child care program when the child was at age 3 and age 4 or not. If the child didn't attend any formal child care program during that period, then this variable was coded as 0; if the child participated in formal child care during the time period, then it was coded as 1.Thus it was a dichotomous variable. Since imputation was used to deal with missing data, some children were imputed to have certain amount of child care experience between 0 and 1. In the current sample of this study (n=690), 395 children had no childcare experience and

they had 0 as the score for this variable, and 279 child had childcare experience and they had 1 as the score for this variable. Sixteen children were imputed to have certain amount of child care experience between 0 to 1. Please refer to Table 8 for the frequency distribution of this variable.

School Poverty. School poverty was measured by the percentage of enrolled students eligible for free or reduced lunch at Grade 5. Score of this index ranges from 0 percent to 99.65% (mean=61.8%) in this sample.

Procedures

One of the primary research coordinators provided access to the usage of EHS dataset necessary for this study. I signed the confidentiality form to agree with the usage of the EHS data for the research purpose only. The Institutional Review Board at University of Nebraska-Lincoln approved this study.

Data Analysis Plan

Data Attrition. There was a considerable amount of data attrition in this study due to the longitudinal nature of the dataset. The amount of the sample of this study 690 was around 23% of the amount of the original 3001 participants in the EHSREP, which tracked child's development from birth to Grade 5. Listwise deletion method was adopted to deal with the missing data so that all 690 children had complete data in all variables of this study. Independent samples t test and Chi-square test were performed to compare the difference between the participants with missing data and the current sample with complete data. The results from independent samples t test indicated that there was not significant difference between the individuals with missing data and the current sample in

the core measurements. The current sample (with complete data) had significantly higher home warmth at age 3 ($t=-2.60$, $p<.01$) and marginally significantly higher home warmth at age 5 ($t=-1.89$, $p<.06$), and significantly higher family conflicts at age 3 ($t=-2.16$, $p<.05$) than the individuals with missing data. There was no significant difference in aggression at age 3 and Grade 5, parent-child dysfunctional interaction, physical punishment and violence exposure between the individuals with missing or without missing data. Please refer to Table 1 (Independent Samples t Test for Data Attrition). From the Chi-square test, race was significantly different among the individuals with missing data and the current sample χ^2 (3, 2941) = 41.36, $p<.001$. More Children with White or Hispanic primary caregiver were in the current sample than expected count, while more children with Black primary caregiver were in the missing category than expected rate. Please refer to Table 2 (Cross-tab and Chi-Square Test for Primary Caregiver's Race). There was no significant difference in children's gender and maternal education level between children with missing data and children with complete data. Please refer to Table 3 (Cross-tab and Chi-Square Test for Child's Gender) and Table 4 (Cross-tab and Chi-Square Test for Maternal Education)

Table 1

Independent Samples t Test for Data Attrition

	Total Sample			Participants With Missing Data			Participants Without Missing Data			t
	n	Mean	SD	n	Mean	SD	n	Mean	SD	
36m Aggression	2031	11.08	6.47	1341	10.99	6.53	690	11.25	6.37	-0.87
Grade 5: CBCL Aggression	1622	5.70	5.72	932	5.66	5.84	690	5.75	5.57	-0.30
36m Home Warmth	1794	2.53	0.83	1104	2.49	0.87	690	2.59	0.78	-2.60**
Age 5: Home Warmth	1763	4.27	1.45	1073	4.22	1.51	690	4.35	1.37	-1.89+
Grade 5: Home Warmth	1555	6.59	2.20	865	6.55	2.19	690	6.65	2.21	-0.89
36m Physical Punishment	2029	0.50	0.50	1339	0.49	0.50	690	0.52	0.50	-1.26
Age 5: Spanking	2048	0.36	0.48	1358	0.36	0.48	690	0.37	0.48	-0.52
36m Family Conflict	1829	1.67	0.53	1139	1.65	0.54	690	1.71	0.53	-2.16*
Grade 5: Family conflict	1622	1.43	0.44	932	1.42	0.44	690	1.44	0.45	-0.75
36m Parent-child Dysfunc	2022	17.76	6.28	1332	17.91	6.52	690	17.46	5.80	1.59
Grade 5: Parent-child Dysfunc	1621	9.72	4.59	931	9.77	4.71	690	9.65	4.42	0.55
Age 5: Child witnessed violence	2057	0.11	0.32	1367	0.12	0.32	690	0.10	0.30	1.03
Grade 5: Exposure to DomViolence	1621	0.06	0.24	931	0.06	0.24	690	0.06	0.23	0.57
Age 5: formal care at both age3 & age4	2112	0.42	0.49	1422	0.43	0.49	690	0.41	0.49	0.67
Grade 5: % free/-reduced lunch	1488	61.13	26.73	798	60.64	26.36	690	61.69	27.15	-0.76

**p<.01, *p<.05, +p<.06

Table 2

Cross-tab and Chi-Square Test for Primary Caregiver's Race

		White	Black	Hispanic	Other	Test Statistics
Participants with Missing Data						$\chi^2(3,2941)=41.36$***
	Count	787	850	514	100	
	Expected Count	836.6	780.7	530.4	103.3	
Current Sample						
	Count	306	170	179	35	
	Expected Count	256.4	239.3	162.6	31.7	

*** $p<.001$

Table 3

Cross-tab and Chi-Square Test for Child's Gender

		Girls	Boys	Test Statistics
Participants with Missing Data				χ^2 (1, 2958)=.038, ns
	Count	1108	1160	
	Expected Count	1110.2	1157.8	
Current Sample				
	Count	340	350	
	Expected Count	337.8	352.2	

Table 4

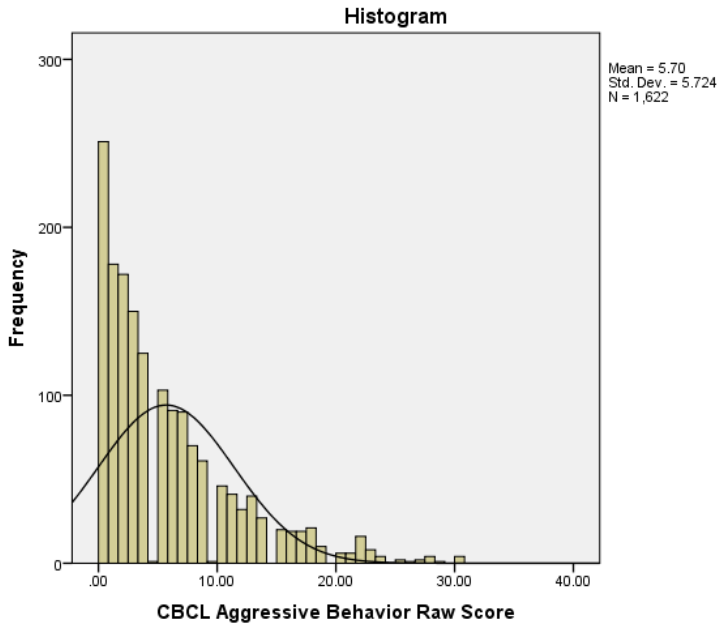
Cross-tab and Chi-Square Test for Maternal Education

	Less than 12 yrs	Equals 12 yrs	More than 12 yrs	Test Statistics
Participants with Missing Data				χ^2= (2, 2886)=2.68, ns
Count	1065	619	512	
Expected Count	1046.3	629.3	520.5	
Current Sample				
Count	310	208	172	
Expected Count	328.7	197.7	163.5	

Statistics Model. Due to the positive skewness of the criterion variable of aggressive behavior at Grade 5, transformation of this variable to its square root form was applied to improve the fit of the model for linear regression. Please refer to Graph 1 (Distribution of the Original Aggressive Behavior at Grade 5) and Graph 2 (Distribution of the Root Square Form of Aggressive Behavior at Grade 5). You could see that the normality of distribution is improved in Graph 2 after the transformation. Preliminary analysis, including demographic statistics and Pearson correlation was carried out before the subsequent analysis using regression. Hierarchical regression was performed to examine the unique and collective contributions of child's characteristics, family environment and school environment for child's aggression at Grade 5.

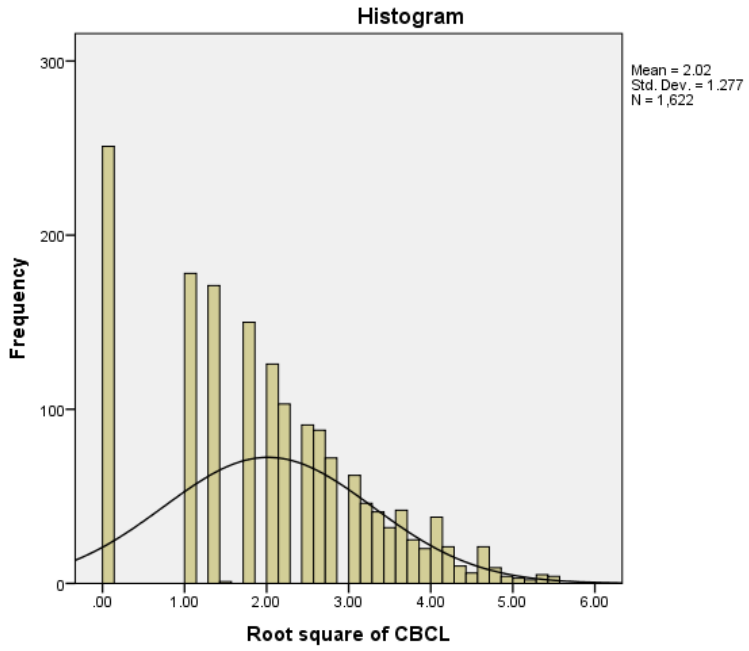
Graph 1

Distribution of the Original Aggressive Behavior at Grade 5



Graph 2

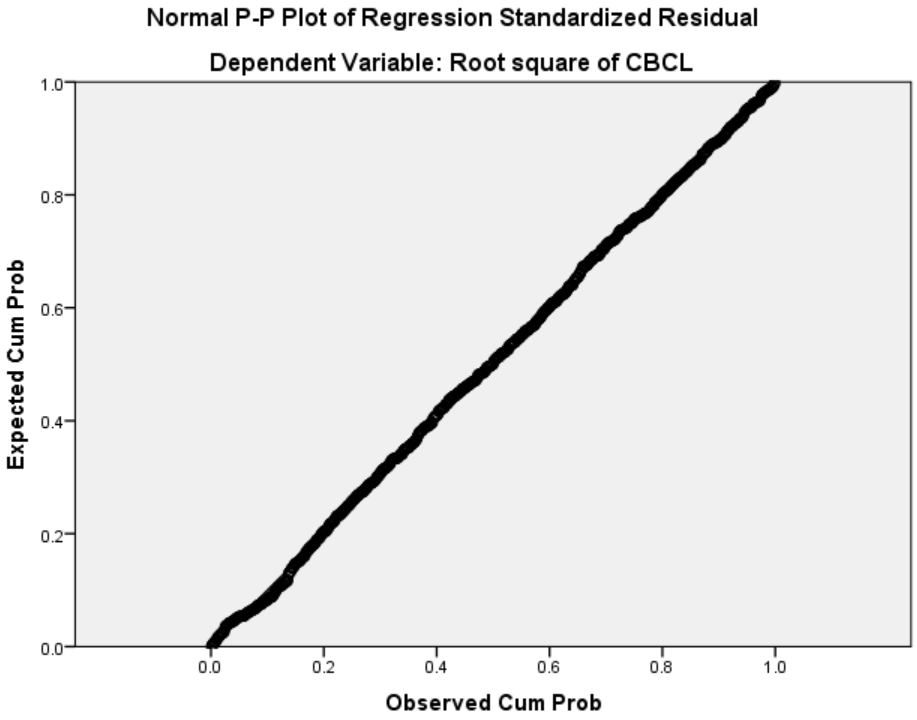
Distribution of the Root Square Form of Aggressive Behavior at Grade 5



Assumptions for Regression. Regression diagnostics were carried to make sure that the assumptions of regression are met for regression analysis. Normal P-P plot of regression standardized residual was mapped to test the normality of the regression model. Please refer to Graph 3 (Normal P-P Plot of Regression Standardized Residual). Graph 3 indicated that the normality assumption for regression was met because the residuals distributed very close to the straight line and not in a crooked or S-shape.

Graph 3

Normal P-P Plot of Regression Standardized Residual

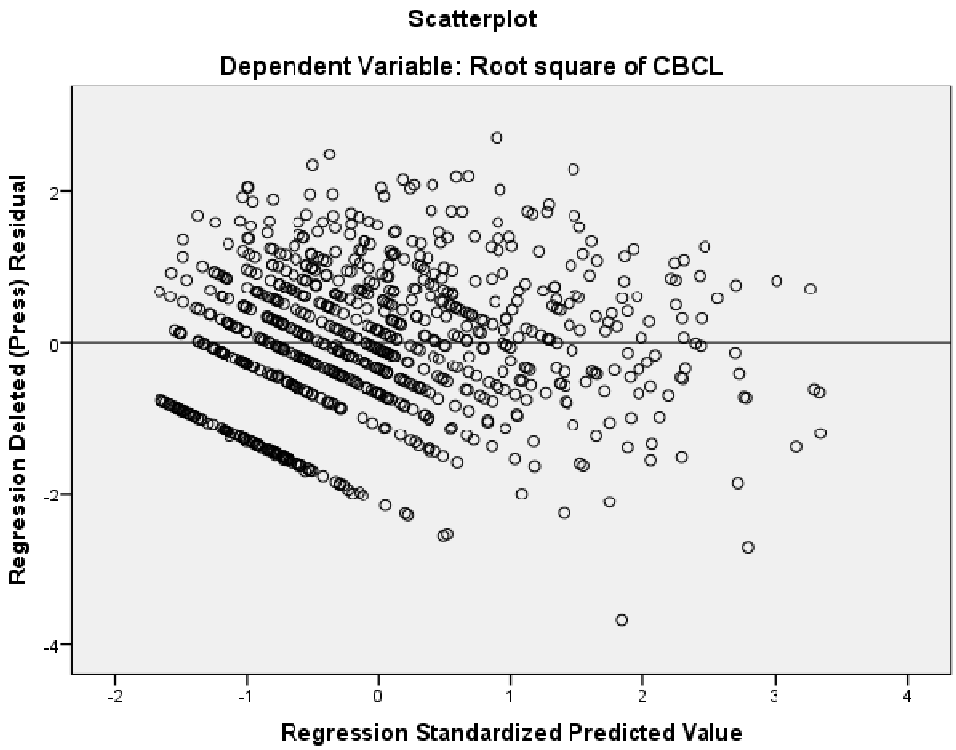


Non-constant error variance was also examined by mapping the scatterplot of regression deleted residual (using root square form of aggressive behavior at Grade 5 as the outcome variable). Please refer to Graph 4 (Scatterplot of Regression Deleted

Residual against Predicted Value). Graph 4 indicated that there was no non-constant error variance from the distribution of the dots of residual.

Graph 4

Scatterplot of Regression Deleted Residual against Predicted Value



Collinearity was examined by checking the statistics of tolerance and VIF values. Please refer to Table 5 (Collinearity Test for the Hierarchical Regression Model). A rule of thumb for checking non-collinearity is that VIF value is less than 10 (Kutner, Nachtsheim, & Neter, 2004). From Table 5, we could see that all the tolerance values are very close to 1 and all the VIF values are far less than 10. Those two statistics indexes suggested that there was no collinearity among the predictors. There were no redundant predictors in the model.

Table 5

Collinearity Test for the Hierarchical Regression Model

	B	SE B	β	Collinearity Statistics	
				Tolerance	VIF
Age 3 Aggressive behavior	.05	.01	.28***	.73	1.36
Black versus White	-.41	.09	-.14***	.75	1.34
Hispanic versus White	-.29	.09	-.10**	.69	1.45
Other races versus White	-.08	.16	-.02	.92	1.08
Child gender	.15	.07	.06*	.95	1.05
Maternal edu=12 versus <12	.06	.08	.02	.78	1.29
Maternal edu>12 versus <12	.01	.09	.01	.75	1.33
36m Home Warmth	.01	.05	.01	.79	1.26
Age 5 Home Warmth	-.05	.03	-.06+	.82	1.22
Grade 5 Home Warmth	-.01	.02	-.02	.85	1.17
36m Physical punishment	-.08	.07	-.03	.82	1.22
Age 5: Spanked last week	.20	.08	.08**	.84	1.19
Age 5: Child witnessed violence	-.01	.11	-.01	.95	1.06
Grade 5: Exposure to dom violence	.34	.15	.06*	.94	1.06
Age 3 Warmth x Punishment	.12	.09	.04	.93	1.08
Age 5 Warmth x Spanking	.01	.05	.01	.97	1.04
36m FES Conflict	.04	.07	.02	.83	1.20
Grade 5: FES Conflict	.53	.09	.19***	.77	1.29
36m Parent child dysfunc interaction	-.01	.01	-.01	.76	1.32
Grade 5: Parent child dysfunc interaction	.09	.01	.34***	.76	1.31
Age 5: % in formal care at age3 & age 4	.23	.07	.09***	.95	1.06
Grade 5: % of free or reduced lunch at school	.01	.01	.01	.85	1.17

***p<.001, **p<.01, *p<.05, +p<.06

Chapter 3: Results

Preliminary Analysis

Demographic Information. The demographic features of the sample were as follows. There were 690 children in the current sample, and about half of them were girls (n=340, 49.3%). This sample represented multiple races and ethnicities in the primary caregivers (White, 44.3%, Black, 24.6%, Hispanic 25.9%, other races 5.1%). For the maternal education level of this sample, the distribution was as follows. Forty-five percentage of children's mother had less than 12 years of education (not finished high school); thirty percentage of children's mother had 12 years of education (finished high school); and twenty-five percentage of children's mothers had more than 12 years of education (beyond high school). Physical punishment at age 3 was a quite common discipline for parents since 52.17% of parent(s) reported that he (she) had spanked the child during past week. This discipline practice dropped to 36.96% when the child was 5 years old. Around 10% of children witnessed violence when they were 5 years old. The violence exposure rate dropped to 5.65% when children were in Grade 5. Please refer to Table 6 (*Descriptive Statistics of Categorical Variables and Binary Variables)* for the actually number of children and their descriptive statistics.

A separate table for continuous variables was made. Please refer to Table 7 (Descriptive Statistics of Continuous Variables). From Table 7, we could see that the average aggression from age 3 to Grade 5 reduced dramatically though the age 3 aggression's score range 0-38 was slightly higher than the Grade 5 aggression's scale range 0-36. Also, the average family conflicts from age 3 to Grade 5 dropped and the two scales had the same range from 1-4.

Table 6

Descriptive Statistics of Categorical Variables and Binary Variables

		n	Percent	Min	Mean	Max	SD
Child's Gender							
	Boy	350	50.70				
	Girl	340	49.30				
Primary Caregiver's ethnicity							
	White	306	44.35				
	Black	170	24.64				
	Hispanic	179	25.94				
	Other	35	5.07				
Maternal Education							
	less than 12	310	44.93				
	Equals 12	208	30.14				
	More than 12	172	24.93				
36m Physical Punishment-past week				0	0.52	1.00	0.50
	0	330	47.83				
	1	360	52.17				
Age 5: Spanked last week				0	0.37	1.00	0.48
	0	435	63.04				
	1	255	36.96				
Age 5: Child witnessed violence				0	0.10	1.00	0.30
	0	619	89.71				
	1	71	10.29				
Grade 5: exposure to domestic violence				0	0.06	1.00	0.23
	0	651	94.35				
	1	39	5.65				

Table 7

Descriptive Statistics of Continuous Variables

Variable	Scale range	Min	Mean	Median	Max	SD
Age 3 Aggression	0-38	0.00	11.25	11.00	37.00	6.37
Grade 5 Aggression	0-36	0.00	5.75	4.00	30.00	5.57
36m Home Warmth	0-3	0.00	2.59	3.00	3.00	0.78
Age 5: Home Warmth	0-6	0.00	4.35	5.00	6.00	1.37
Grade 5: Home Warmth	0-9	0.00	6.65	7.00	9.00	2.21
36m Family Conflict	1-4	1.00	1.71	1.60	3.80	0.53
Grade 5: Family conflict	1-4	1.00	1.44	1.38	3.63	0.45
36m Parent-child Dysfunc	12-60	12.00	17.46	16.00	50.00	5.80
Grade 5: Parent-child Dysfunc	6-30	6.00	9.65	8.00	29.00	4.42
% free or reduced lunch	0-1	0.00	61.69	63.80	99.65	27.15

A separate table was made for the distribution of percentage of time in formal care at both ages 3 and 4. This variable was reported by the parent whether the child had formal child care when the child was age 3 and age 4 or not. Thus it was a binary variable for the majority kids. Since imputation was applied for dealing with the missing data, 16 children had certain amount of child care experience between 0 and 1. Please refer to Table 8 (Descriptive Statistics and Frequency of Percent Time in Formal Child Care at Both Ages 3 and 4, Imputed).

Table 8

Descriptive Statistics and Frequency of Percent Time in Formal Child Care at Both Ages 3 and 4, Imputed

Variable	Actual or Imputed Value	n	Percent	Min	Mean	Max	SD
% time in formal Child Care at both ages 3 and 4, imputed				0	0.41	1	0.49
	0.00	395	57.25				
	0.28	2	0.29				
	0.41	5	0.72				
	0.44	2	0.29				
	0.45	1	0.14				
	0.46	2	0.29				
	0.49	1	0.14				
	0.50	1	0.14				
	0.58	1	0.14				
	0.72	1	0.14				
	1.00	279	40.43				

Correlational Analysis

Corrletional analysis examined the relationships among children's gender, family factors (including maternal education, home warmth, family conflict, parent-child dysfunctional interaction, physical punishment/spanking, and exposure to violence, across time points), school factors (including percentage of formal care at both age 3 and age 4, and percentage of free/-reduced lunch in school level at Grade 5) and children's aggressive behavior at both age 3 and Grade 5. See Table 9 (Correlations among Variables).

Table 9

Correlations among Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Child Gender																
2. Maternal Education	.01															
3. 36m Aggression	.11**	-.01														
4. Grade 5: CBCL Aggression	.11**	.02	.42**													
5. 36m Home Warmth	-.05	.12**	-.09*	-.08*												
6. Age 5: Home Warmth	-.09*	.10**	-.06	-.15**	.34**											
7. Grade 5: Home Warmth	-.04	.01	-.15**	-.18**	.16**	.26**										
8. 36m Physical Punishment-past week	.04	.05	.20**	.09*	-.09*	-.06	-.06									
9. Age 5: Spanked-past week	.05	.05	.21**	.21**	-.09*	-.02	-.10**	.31**								
10. 36m Family Conflict	.03	-.08*	.25**	.22**	-.10**	-.02	-.06	.10*	.11**							
11. Grade 5: Family conflict	.01	-.02	.24**	.44**	-.01	-.07	-.12**	.03	.10**	.33**						
12. 36m Parent-child Dysfunc	.05	-.13**	.39**	.27**	-.19**	-.15**	-.14**	.09*	.09*	.19**	.19**					
13. Grade 5: Parent-child Dysfunc	.07	.02	.27**	.54**	-.12**	-.12**	-.20**	.09*	.15**	.15**	.35**	.31**				
14. Age 5: Child witnessed violence	.09*	.01	.07	.10**	-.03	-.07	.03	.05	.07	.09*	.06	.06	.09*			
15. Grade 5: Exposure to Dom Violence	.05	-.01	.02	.16**	-.02	.03	.02	.01	.09*	.10*	.12**	.04	.09*	.12**		
16. Age 5: formal care at age3 & age4	.01	.08*	.01	.06	-.06	.04	.03	.01	.06	-.06	-.02	.01	.01	.03	-.07	
17. Grade 5: % free/-reduced lunch	.08*	-.22**	.05	.01	-.02	-.02	.02	.06	.03	.09*	.03	.06	.01	.03	.01	-.06

*p<.05; **p<.01

Since this Pearson correlation table included a nominal scale (child's gender) and several ordinal scales (physical punishment at age 5, spanked last week at age 5, witnessed violence at age 5, and domestic violence exposure at Grade 5), the pearson r coefficient might be a little bit biased when those two kinds of scales were involved in the correlation.

Child Gender. Similar with the results from independent samples t test, child gender (coded as following, female=0, male=1) was positively correlated with aggression at both age 3 and Grade 5 ($r=.11$, $p<.01$ for both age 3 and Grade 5), indicating boys were more aggressive than girls on both ages on average. Moreover, child gender was negatively correlated with home warmth at age 5 ($r=-.09$, $p<.05$), which indicated boys were in home environment featuring less home warmth, compared with girls, on average. In addition, boys witnessed more violence at age 5 and were enrolled in school with higher percentage of free-/reduced lunch at Grade 5 compared with girls ($r=.09$, $p<.05$; $r=.08$, $p<.05$ respectively).

Maternal Education. Maternal education was positively correlated with home warmth at both age 3 and age 5 ($r=.12$, $p<.01$; $r=.10$, $p<.01$ respectively), indicating that higher maternal education predicted higher home warmth toward children at both age 3 and age 5. Maternal education was negatively correlated with family conflict at age 3 and parent-child dysfunctional interaction at age 3 ($r=-.08$, $p<.05$; $r=-.13$, $p<.01$ respectively), indicating that higher maternal education predicted less family conflict and less parent-child dysfunctional interaction when the children were 3 years old. Maternal education was positively correlated with children's percentage of formal care at both age 3 and age 4 ($r=.08$, $p<.05$), which suggested that children were more likely to attend formal child

care if their mother had higher education. Moreover, maternal education was negatively correlated with percentage of free/-reduced lunch at school level at Grade 5 ($r=-.22$, $p<.01$), indicating higher maternal education predicted children attending school with lower level of percentage of free/-reduced lunch.

Home Warmth. Home warmth across 3 time points (age 3, age 5 and Grade 5) were negatively correlated with children's aggressive behavior at both age 3 and Grade 5 (r ranges from -.08 to -.18, $p<.05$ or $p<.01$), indicating higher home warmth predicted lower level of children's aggressive behavior at both age 3 and Grade 5. Home warmth across 3 time points (age 3, age 5 and Grade 5) were negatively correlated with parent-child dysfunctional interaction at both age 3 and Grade 5 (r ranges from -.12 to -.20, $p<.01$). Also, home warmth at age 3 was negatively correlated with physical punishment at age 3, spanking at age 5, and family conflict at age 3 (r ranges from -.09 to -.10, $p<.05$ or $p<.01$), which suggested that home warmth was a unique protective factor and opposite from the other negative parenting factors. Moreover, home warmth was positively related to each other across 3 time points (r ranges from .16 to .34, $p<.01$), indicating home warmth was pretty consistent in the family environment longitudinally.

Negative Family Environment Factors. Physical punishment at age 3, spanking at age 5, family conflict at age 3 and Grade 5, parent-child dysfunctional interaction at both age 3 and Grade 5 were mostly strongly correlated with children's aggressive behavior at age 3 and Grade 5 (r ranges from .09 to .54, $p<.05$ or $p<.01$). Family conflict and parent-child dysfunctional interaction at Grade 5 were strongly correlated with children's aggression at Grade 5 ($r=.44$, $p<.01$; $r=.54$, $p<.01$ respectively), indicating family conflict and parent-child dysfunctional interaction were robust predictors of

children's aggressive behavior. Moreover, those factors were positively correlated with each other across time (r ranges from .09 to .35, p<.05 or p<.01), which suggested non-positive parenting usually lead to one another and was consistent across time too.

Witnessing Violence. Child witnessing violence at age 5 and their exposure to domestic violence at Grade 5 were positively correlated with children's aggressive behavior at Grade 5 (r=.10, p<.01; r=.16, p<.01, respectively). These findings suggested that parent reported higher aggression at Grade 5 for those children who were exposed to violence at age 5 or Grade 5. Child witnessing violence at age 5 and their exposure to domestic violence at Grade 5 were also positively correlated with family conflict at 36 months and parent-child dysfunctional interaction at Grade 5 (r ranges from .09 to .10, p<.05). In addition, child witnessing violence at age 5 was positively correlated with their exposure to domestic violence at Grade 5 (r=.12, p<.01), indicating violence exposure was also, to some extent, consistent in family environment.

Hierarchical Regression Examining the Ecological Model

A hierarchical regression was conducted in order to examine the unique contributions of the incremental variance associated with children's early aggression at age 3, family environment factors across time, and school environment factors across time in predicting their aggressive behavior at Grade 5. In this hierarchical regression, variables were added in seven Blocks according to the following order.

Rational of adding variables in different blocks:

(1) Children's aggressive behavior at age 3 was added in Block 1 in order to control the early aggression at age 3.

(2) Child's gender, primary caregiver's race and ethnicity, and maternal education were entered in Block 2. Those variables served as control variables in this model.

(3) Home warmth at age 3, age 5 and Grade 5 were added in Block 3 in order to examine the unique contributions of home warmth for child's aggression at Grade 5.

(4) Physical punishment during past week at age 3, spanked last week at age 5, child witnessed violence at age 5, and exposure to domestic violence at Grade 5 were entered in Block 4. This block of variables examined the influence of violence exposure for child's aggression at Grade 5.

(5) Two sets of interaction effects were added in Block 5 to test the moderation role of home warmth. The first set was the interaction between home warmth at age 3 and physical punishment during past week at age 3, and the second set of was the interaction between home warmth at age 5 and spanked during last week at age 5.

(6) Family conflict at age 3 and Grade 5, and parent child dysfunctional interaction at age 3 and Grade 5 were added in Block 6 to examine the negative family relationships for child's aggression at Grade 5.

(7) Whether the child attended formal child care at both age 3 and age 4, and percentage of free or reduced lunch at school level at Grade 5 were added in Block 7 to examine the unique contribution of school environment factors for child's aggression at Grade 5.

Please refer to Table 10 (Hierarchical regression analysis for aggressive behavior) for the statistical coefficients and the R square change for each block of variable(s).

Table 10

Hierarchical Regression Analysis for Aggressive Behavior

Variables	B	SE B	β	Δ R^2
Block 1, F (1, 722)=182.36***, R^2=0.20,				.20
Age 3 Aggressive behavior	.08	.01	.45***	
Block 2, F (7, 716)=32.70***, R^2=0.24; ΔF (6, 716)=6.39***				.04
Age 3 Aggressive behavior	.08	.01	.43***	
Black versus White	-.53	.10	-.19***	
Hispanic versus White	-.40	.10	-.14***	
Other races versus White	-.08	.19	-.01	
Child gender	.20	.08	.08*	
Maternal edu=12 versus <12	.01	.10	.01	
Maternal edu>12 versus <12	-.01	.10	-.01	
Block 3, F (10, 713)=24.75***, R^2=0.26; ΔF (3, 713)=4.95**				.02
Age 3 Aggressive behavior	.08	.01	.42***	
Black versus White	-.56	.10	-.20***	
Hispanic versus White	-.34	.10	-.12***	
Other races versus White	-.10	.19	-.02	
Child gender	.17	.08	.07*	
Maternal edu=12 versus <12	.02	.10	.01	
Maternal edu>12 versus <12	.03	.10	.01	
36m Home Warmth	-.03	.05	-.02	
Age 5 Home Warmth	-.06	.03	-.07+	
Grade 5 Home Warmth	-.05	.02	-.09*	
Block 4, F (14, 709)=20.07***, R^2=0.29; ΔF (4, 709)=6.45***				.03
Age 3 Aggressive behavior	.07	.01	.39***	
Black versus White	-.53	.10	-.19***	
Hispanic versus White	-.34	.10	-.12***	
Other races versus White	-.06	.19	-.01	
Child gender	.15	.08	.06+	

Maternal edu=12 versus <12	.02	.10	.01	
Maternal edu>12 versus <12	.02	.10	.01	
36m Home Warmth	-.01	.05	-.01	
Age 5 Home Warmth	-.07	.03	-.07*	
Grade 5 Home Warmth	-.05	.02	-.08*	
36m Physical punishment-past week	-.07	.08	-.03	
Age 5: Spanked last week	.32	.09	.13***	
Age 5: Child witnessed violence binary	.10	.13	.02	
Grade 5: Exposure to domestic violence	.51	.17	.10**	
Block 5, F (16, 707)=17.65***, R^2=0.29; ΔF (2, 707)=0.80,				.00
Age 3 Aggressive behavior	.07	.01	.39***	
Black versus White	-.53	.10	-.19***	
Hispanic versus White	-.34	.10	-.12***	
Other races versus White	-.07	.19	-.01	
Child gender	.15	.08	.06*	
Maternal edu=12 versus <12	.02	.10	.01	
Maternal edu>12 versus <12	.02	.10	.01	
36m Home Warmth	-.02	.06	-.02	
Age 5 Home Warmth	-.06	.03	-.07*	
Grade 5 Home Warmth	-.05	.02	-.08*	
36m Physical punishment-past week	-.09	.09	-.04	
Age 5: Spanked last week	.32	.09	.13***	
Age 5: Child witnessed violence binary	.10	.13	.03	
Grade 5: Exposure to domestic violence	.51	.17	.10**	
Age 3 Warmth x Punishment	.13	.10	.04	
Age 5 Warmth x Spanking	.01	.06	.01	
Block 6, F (20, 703)=28.96***, R^2=0.45 ΔF (4, 703)=53.31***				.17
Age 3 Aggressive behavior	.05	.01	.28***	
Black versus White	-.37	.09	-.13***	
Hispanic versus White	-.28	.09	-.10**	
Other races versus White	-.08	.17	-.01	
Child gender	.15	.07	.06*	
Maternal edu=12 versus <12	.07	.09	.03	
Maternal edu>12 versus <12	.03	.09	.01	
36m Home Warmth	-.01	.05	-.01	
Age 5 Home Warmth	-.05	.03	-.05	
Grade 5 Home Warmth	-.01	.02	-.01	

36m Physical punishment-past week	-.09	.07	-.03	
Age 5: Spanked last week	.21	.08	.08**	
Age 5: Child witnessed violence binary	.01	.12	.01	
Grade 5: Exposure to domestic violence	.30	.15	.06*	
Age 3 Warmth x Punishment	.11	.09	.04	
Age 5 Warmth x Spanking	.01	.05	.01	
36m FES CONFLICT	.03	.07	.01	
Grade 5: FES CONFLICT	.53	.09	.20***	
36m Parent child dysfunc interaction	-.01	.01	-.01	
Grade 5: Parent child dysfunc interaction	.09	.01	.34***	
Block 7, F (22, 701)=27.10***, R^2=0.46 ΔF (2, 701)=5.10***				.01
Age 3 Aggressive behavior	.05	.01	.28***	
Black versus White	-.41	.09	-.14***	
Hispanic versus White	-.29	.09	-.10**	
Other races versus White	-.08	.16	-.02	
Child gender	.15	.07	.06*	
Maternal edu=12 versus <12	.06	.08	.02	
Maternal edu>12 versus <12	.01	.09	.01	
36m Home Warmth	.01	.05	.01	
Age 5 Home Warmth	-.05	.03	-.06+	
Grade 5 Home Warmth	-.01	.02	-.02	
36m Physical punishment-past week	-.08	.07	-.03	
Age 5: Spanked last week	.20	.08	.08**	
Age 5: Child witnessed violence binary	-.01	.11	-.01	
Grade 5: Exposure to domestic violence	.34	.15	.06*	
Age 3 Warmth x Punishment	.12	.09	.04	
Age 5 Warmth x Spanking	.01	.05	.01	
36m FES CONFLICT	.04	.07	.02	
Grade 5: FES CONFLICT	.53	.09	.19***	
36m Parent child dysfunc interaction	-.01	.01	-.01	
Grade 5: Parent child dysfunc interaction	.09	.01	.34***	
Age 5: % in formal care at age3 & age 4	.23	.07	.09***	
Grade 5: % of free/-reduced lunch at school	.01	.01	.01	

***p<.001; **p<.01; *p<.05, +p<.1

Block 1 and Hypothesis 1. In Block 1, children's aggressive behavior at age 3 significantly predicted their aggression at Grade 5, F_{change} (1, 722) = 182.36, p<.001, R^2_{change} = .20, which indicated that around 20% of variance in aggression at Grade 5 was explained by aggressive behavior at age 3. This result confirmed hypothesis 1 in that children's early aggressive behavior at age 3 predicted their later aggression at Grade 5. The standard β value was .45, which was the largest among all predictors. Also R^2_{change} was .20, which was also the largest among all Blocks.

Block 2. Primary caregiver's race and ethnicity, child's gender and maternal education were added in Block 2, resulting in a significant regression equation, F_{change} (6, 716) =6.39, p<.001, R^2_{change} =.04, which indicated that around 4% of variance in aggression at Grade 5 was explained by those three variables. To examine this block of variables more closely, primary caregiver's race and ethnicity and child's gender were significant predictors for child's aggression at Grade 5, while maternal education was not a significant predictor of child's aggression at Grade 5. Child with Black caregiver or Hispanic caregiver had significantly lower aggression compared with child with White caregiver (β=-.19, p<.001 for Black versus White; β=-.14, p<.001 for Hispanic versus White). Boys had significantly higher aggression than girls (β=.08, p<.05). Those variables served as control variables for this model.

Block 3 and Hypothesis 2. Home warmth at age 3, age 5 and Grade 5 were added to Block 3, resulting in a significant regression equation and incremental variance was explained, F_{change} (3, 713)=4.95, p<.01, R^2_{change} =.02, which indicated that around 2% of variance in child's aggression at Grade 5 was explained by home warmth across age 3,age 5 and Grade 5. Home warmth at age 5 was a marginally significant predictor of

child's aggression at Grade 5, standard $\beta = -.07$, $p<0.06$. Home warmth at Grade 5 was a significant predictor of children's aggression at Grade 5, standard $\beta = -.09$, $p<.05$. However, home warmth at age 3 was not a significant predictor of children's aggression at Grade 5. The results partially supported hypothesis 2 in that home warmth at age 5 and Grade 5 significantly predicted lower aggression in Grade 5. The results indicated that home warmth was a protective home factor for children's aggressive behavior development.

Block 4 and Hypothesis 3. In Block 4, physical punishment at age 3 and age 5, and exposure to violence at age 5 and Grade 5 were added, resulting in a significant regression equation and additive variance was explained, F_{change} (4, 709) = 6.45, $p<.001$, R^2_{change} =.03, which indicated that around 3% of variance in child's aggression at Grade 5 was explained by physical punishment and violence exposure. In this block, spanked last week at age 5 was a positive significant predictor of child's aggression at Grade 5, standard $\beta = .13$, $p<.001$. Exposure to domestic violence at Grade 5 was also a positive predictor of children's aggression at Grade 5, standard $\beta = .10$, $p<.01$. These results also confirmed hypothesis 3 partially in that spanked last week at age 5 and exposure to domestic violence at Grade 5 both predicted higher aggression for children in Grade 5, while physical punishment during last week at age 3 and child witnessed violence at age 5 were not significant predictors.

Block 5 and Hypothesis 4. In Block 5, home warmth was examined as a moderator between physical punishment and children's aggressive behavior at Grade 5. Two sets of interactions were tested: the interaction of home warmth at age 3 and physical punishment at age 3, the interaction of home warmth at age 5 and spanked last

week at age 5. These interactions didn't predict children's aggression at Grade 5 significantly, F_{change} (2, 707) = 0.80, p<.45, R^2_{change} =.002. Thus hypothesis 4 was not supported because the moderating role of home warmth between physical punishment and children's aggression at Grade 5 was not significant.

Block 6 and Hypothesis 5. In Block 6, family conflict at age 3 and Grade 5, and parent-child dysfunctional interaction at age 3 and Grade 5 were entered. This block of variables significantly predicted children's aggressive behavior at Grade 5, F_{change} (4, 703) =53.31, p<.001, R^2_{change} =.17, which indicated around 17% of variance in child's aggression at Grade 5 was explained by family conflict and parent-child dysfunctional interaction. In this block, children's early aggression behavior at age 3 (β=.28, p<.001), spanked last week at age 5 (β=.08, p<.01), and exposure to domestic violence at Grade 5 (β=.06, p<.05) continued to be significant predictors, whereas home warmth at age 5 and Grade 5 ceased to be significant predictors of children's aggressive behavior in Grade 5. Examined closely, family conflict at Grade 5 (β=.20, p<.001) and parent-child dysfunctional interaction at Grade 5 (β=.34, p<.001) were positive predictors for children's aggression at Grade 5. This result confirmed hypothesis 5 in that family conflict and parent-child dysfunctional interaction were risk factors for children's aggression and predicted higher aggression in children at Grade 5.

Block 7 and Hypothesis 6 and Hypothesis 7. In Block 7, individual experience in formal child care at both ages 3 and 4 and average percentage of free or reduced lunch at school level were added, resulting in a significant regression equation and additive variance was explained, F_{change} (2, 701)=5.10, p<.001, R^2_{change} =.01, which indicated that around 1% of variance in child's aggression at Grade 5 was explained by percentage of

attendance of child care at both ages 3 and 4 (percentage of free or reduced lunch was not a significant predictor). In this block, attendance of formal child care at both ages 3 and 4 was a positive predictor of children's aggression at Grade 5, β=.09, p<.001, while average percentage of free or reduced lunch at school level was not a significant predictor of children's aggression at Grade 5, β=,01, p<.83. Thus hypothesis 6 was confirmed in that formal early child care experience predicted higher aggressive behavior at Grade 5. Hypothesis 7 was not supported since free or reduced lunch at school level was not a significant predictor of children's aggressive behavior at Grade 5. In this block, children's early aggression at age 3 (β=28, p<.001), home warmth at age 5 (β=-.06, p<.06, marginally significant), spanked last week at age 5 (β=.08, p<.01), exposure to domestic violence at Grade 5 (β=.06, p<.05), family conflict at Grade 5 (β=.19, p<.001), and parent-child dysfunctional interaction at Grade 5 (β=.34, p<.001) continued to be significant predictors of children's aggressive behavior at Grade 5.

Chapter 4: Discussion

This study examined children's aggressive behavior in the Process-Person-Context-Time model: person characteristics (child's gender, and earlier aggressive behavior at age 3), mcriosystem context (primary caregiver's ethnicity, maternal education, home warmth, physical punishment, family conflict, and parent-child dysfunctional interaction, formal child care experience) and exosystem context (school poverty measured by percentage of students enrolled eligible for free or reduced lunch). It is important to include variables in multi-level of the bioecological model since previous studies showed that children's individual characteristics, family factors, neighborhood factors and school factors all contributed to the development of aggression (Loeber & Hay, 1997; Thomas et al., 2006). This study contributed to the literature in that it examined the unique and collective influence of child's characteristics, their family environment and school environment on the prediction of children's aggression in a low-income sample.

Person Characteristics

Early to Later Aggression. It was hypothesized that early aggression at age 3 correlated and predicted later aggression at Grade 5 (Hypothesis 1). The results supported this hypothesis. The results of study found that early aggressive behavior at age 3 was moderately correlated with aggression at Grade 5 ($r=.42$) and positively predicted aggression at Grade 5 ($\beta=.45$, $p<.001$, $R^2_{change} = .20$), which indicated around 20% of variance in Grade 5 aggression was explained by age 3 aggression. This result was consistent with previous studies in that aggressive behavior was relatively stable over

time and early aggressive behavior predicted later aggression and delinquency (Brame et al., 2001; Olweus, 1979). Study by Olweus (1979) indicated that the average correlation between early and later aggression was .63 (.79 when attenuation was corrected). In the study by Brame et al. (2001), boys who scored higher on childhood aggression were far more likely to fall into the profile of higher-level of adolescent aggression trajectory. This pattern was also applicable for girls. Early physical aggression was associated with later antisocial behavior for boys and girls, and even more strongly for girls than for boys (McEachern & Snyder, 2012). However, the results of this study didn't indicate a causal link from early to later aggression and should be interpreted with caution. According to several trajectory studies which tracked children's aggression from early childhood to adolescence, most children followed low-decreasing or no aggression profile (around 70%), while only around 4-10% of the sample followed a chronic physical aggression trajectory (Broidy et al., 2003; Chen et al., 2011), which demonstrated children's aggression was subject to heterogeneity pattern of development over time.

Microsystem Context

Home warmth. Research question two investigated the relations between family environment factors and children's aggression and which were risk factors and which were protective factors. Home warmth was hypothesized to correlate negatively with aggression at Grade 5 and to predict lower level of aggression (Hypothesis 2). The results confirmed this hypothesis. Home warmth across age 3, age 5 and Grade 5 were negatively correlated with aggression at Grade 5. Home warmth at age 5 and Grade 5 predicted lower level of children's aggression when they were entered at Block 3 in the

hierarchical model, though only the effect of home warmth at age 5 was maintained when other family factors were entered in the final model Block 7 (e.g. family conflict, parent-child dysfunctional interaction). The results were consistent with previous research studies by Chen et al. (2001) in a Chinese preschool children sample (mean age =4) and White & Renk (2012) in an American adolescent sample (mean age=12) in that maternal warmth negatively correlated with children/adolescents' aggression and predicted less aggression. This study added to the literature regarding the importance of home warmth in helping reduce aggression since some studies didn't find this association in preschool age samples (Alink et al., 2009; Stacks et al., 2009). Future studies are needed to examine the role of home warmth in prevention of children's aggressive behavior.

Physical Punishment and Violence Exposure. Consistent with literature (Colder et al., 2000; Erath et al., 2006; Guerra et al., 2003; Taylor et al., 2010; Weiss et al., 1992), physical punishment and violence exposure positively predicted children's aggression at Grade 5 even after controlling for child's earlier aggression at age 3, primary caregiver's race and ethnicity, and maternal education. It might be due to a recency effect that spanking at age 5 was a significantly predictor of children's aggression, whereas physical punishment at age 3 was not a significant predictor of children's aggression. Similarly, exposure to domestic violence at Grade 5 was a significant predictor of children's aggression, whereas witnessing violence at age 5 was not a significant predictor of children's aggression.

In the current study sample, physical punishment was widely used as a disciplinary practice for parents (52.2% and 37% used physical punishment at age 3 and age 5, respectively). The link between physical punishment and later physical aggression

might be partially mediated by maladaptive social information processing patterns (e.g., hostile attributional biases, evaluations of outcomes of aggression) that were developed as a result of harsh discipline (Weiss et al., 1992). Physical punishment may also serve as a modeling of behavior for children according to the social learning theory (Bandura, 1973). Child could imitate the negative discipline and use aggression instead of other positive behaviors in face of challenging situations. This study added to the literature for the possible detrimental effects of physical punishment on children's aggression in a low-income sample. An experimental intervention study showed that reductions of harsh parenting predicted lower rates of physical aggression in a risk sample of preschoolers (Brotman, O'Neal, Huang, Gouley, Rosenfelt, & Shrout, 2009). In addition, according to pediatricians, physical punishment is not a necessary practice to discipline children, other or more effective nonphysical practices could be used to discipline child (Taylor et al., 2010).

Violence exposure happened at a much less frequency in the current sample (10.3% of children witnessed violence at age 5; 5.7% of children were exposed to domestic violence at Grade 5), compared with the rates of physical punishment above. Though it occurred at much lower frequency in this sample, exposure to violence at Grade 5 significantly predicted higher aggression. Previous studies indicated that exposure to violence was associated with strong positive or normative beliefs about aggression, which in turn, predicted children's higher aggression (Colder et al., 2000; Guerra et al., 2003). Those two studies demonstrated that exposure to violence affected children's social cognition about violence and children may even adopt the violence behavior as an effective solution to deal with certain challenging situations.

Home Warmth as a Moderator. Home warmth was tested as a moderator between physical punishment and children's aggression at Grade 5 in order to add evidence since there was inconsistency regarding the moderating role of home warmth in the literature (Alink et al., 2009; Stacks et al., 2009). In the current study, the interactions between home warmth and physical punishment (at both age 3 and age 5) were not significant. This result was consistent with Stacks et al (2009) study, which also used the data from Early Head Start Research and Evaluation Study, but included a larger sample (n=2792) and focused on child's outcome at age 3. One possible reason of failure to detect this interaction effect might be due to the small variations of home warmth in this sample (Mean =2.59, median =3, range =0-3 for home warmth at age 3; Mean =4.35, median =5, range=0-6 for home warmth at age 5). Future studies are needed to explore this moderation effect in diverse representative samples and build up more evidence for this interaction.

Family Conflict and Parent-Child Dysfunctional Interaction. Both family conflict and parent-child dysfunctional interaction at Grade 5 significantly predicted higher aggression for children at Grade 5, which was consistent with growing body of literature (Andreas & Watson, 2009; Brook et al., 2012; Eichelsheim et al., 2010; Erath et al., 2006; Tanaka et al., 2010). Family conflict and parent-child dysfunctional interaction are both proximal processes in the family environment, which have strong influence on the child's life and are primary engines for child development. Those two variables explained 17% of variance in aggression at Grade 5 after controlling for children's earlier aggression, home warmth and physical punishment. Family conflict could influence parenting practice, which has more direct association with children's aggression.

Interparental conflict was positively related to paternal coercive control, which in turn, predicted boys' overt aggression (Li et al., 2011). Harsh parenting was a mediator for the association between marital conflict and child aggressive-disruptive behavior at home and explained 40% of variance in the association (Erath et al., 2006). Those studies indicated that family conflicts could spill over to the parenting practice and influence child's aggression. In line with violence exposure and physical punishment, family conflict could also be a model for aggressive reactions that children imitate and adopt for other interpersonal conflict situations (Erath et al., 2006).

Parent-child dysfunctional interaction indicated negative and slightly alienated parent-child relationships (e.g. sample item of the measure, "Most times you feel that your child does not like you and does not want to be close to you") (Abidin, 1995). Consistently with previous studies (Brook et al., 2012; Eichelsheim et al., 2010), parent-child dysfunctional interaction predicted higher aggression in the child. The negativity and hostility in the parent-child relationship might spill over to child's other interpersonal relationships (Eichelsheim et al., 2010). In addition, the relationship between parent-child dysfunctional interaction and child aggression could be bidirectional, as indicated from Brook et al (2012)'s intergenerational study. The current study also suggested this bidirectional association since there were medium to strong correlations among aggression at age 3, parent-child dysfunctional interaction at age 3, aggression at Grade 5, and parent-child dysfunctional interaction at Grade 5 (r ranges from .27 to .54, $p<.01$). Please refer to the correlational Table 9. Future studies may further investigate the bidirectional relationship between negative parent-child interaction and child's aggression.

Experience of Formal Child Care. This study addressed the inconsistency in the literature regarding the impact of formal child care on children's social-emotional adjustment and the duration of this impact in a low-income sample. The result of this study was consistent with some of the previous studies in that experience of early care significantly predicted higher aggression when children at Grade 5 after family environment factors (e.g., family conflict, violence exposure and children's early aggression at age 3) were controlled (Averdijk, et al., 2011; Loeb, et al., 2007; NICHD ECCRN, 2003). The results of this study added to the literature in that experience of formal child care had long duration effects (till children at Grade 5) on child's aggression. However, Borge et al (2004)'s study found that children looked after by their mother had significantly higher aggression than children enrolled at group child care. Borge et al (2004)'s study differentiated the social selection from social causation. This study found that children at home care were much likely to be in high-risk families than children enrolled into group child care. Future studies may replicate this research inquiry and investigate social selection based on family environment (SES, race and ethnicity) and how social selection affects children's social emotional adjustment.

Previous studies also showed that early child care was associated with children's academic benefits, such as reading, math and vocabulary scores though accumulative early child care experience predicted externalizing behavior (Belsky et al., 2007; Loeb et al., 2007). It seemed there was a tradeoff between academic benefits and possible social emotional maladjustment for the amount of early child care experiences. The possible mechanisms linking early child care to externalizing behavior could be peer processes. Time spent in a large group of peers moderated the association between early child care

hours and child's externalizing behavior (McCartney et al., 2007). When child was exposed to a larger peer group, the chances of conflicts and possible aggression increased. Future studies may investigate the actual mechanisms underlying this association – quantity of child care and children's social-emotional adjustment.

Exosystem Factor

School Poverty. School poverty was not detected to be a significant predictor for child's aggression at Grade 5, which was not consistent with some of the previous studies (Thomas et al., 2006; Thomas et al., 2008). The inconsistent results might be due to the sample difference. In the Thomas et al. (2006) study, the participants were in Grades 1-3, whereas the current study examined this association when children were in Grade 5. Moreover, Thomas et al. (2006) looked at school size, school poverty and students' ethnicity simultaneously and found African American students were more likely to be in high-aggressive classrooms when they attended large, urban schools with high poverty rates among students. Compared with classroom environment (measuring disruption, problem solving during conflicts and teacher responsiveness), school poverty was a weaker predictor of behavior (Thomas et al., 2008). Future study may investigate how school poverty interacts with ethnicity and community violence exposure to influence students' aggressive behavior.

To sum up, the current findings supported the hypotheses in that individual factors (child's gender, child's earlier aggression at age 3), and microsystem context factors (primary caregiver's ethnicity, home warmth, physical punishment, family conflict, and parent-child dysfunctional interaction, formal child care experience) all contributed to

child's aggression at Grade 5. This study added to the literature in that it examined the influence of child's individual characteristics, home environment and school environment simultaneously on child's social emotional behavior, based on the bioecological model. Early aggression at age 3 and family proximal factors explained the 42% of variance in child's aggression at Grade 5. All of the variables predicted aggression in the expected direction according to the literature and hypotheses. Effect of early child care experience maintained even when children were in Grade 5. This study also indicated the importance of considering multi-level of systems in the bioecological system to examine child's behavior development.

Limitations and Future Research

Despite the strengths of this study, including a large low-income sample, longitudinal and prospective design, and repeated measures across time, there are several limitations of this study and directions for future research.

First, this study is correlational in nature and thus no causal conclusion could be drawn. Previous studies suggested that child's behavior (aggressive behavior) also predicted parenting behavior and parent-child relationships (Brook et al., 2012; Xing, Wang, Zhang, He, & Zhang, 2011). Therefore, child's behaviors and home environment (parenting behaviors and parent-child relationships) may influence each other.

Second, more variables could be added to the bioecological model to make it more complete. Only two school environment factors were included in the current study, and they were early child care experience, and school poverty at Grade 5. Other school factors in the mesosystem could also influence child's socioemotional adjustment, such

as parent involvement in school, and parent-teacher relationship. Futhermore, other macrosystem factors, such as cultural beliefs regarding physical punishment and violence, could also impact on child's social cognition and aggression, according to the social information processing theory by Crick and Dodge (1994). Future studies could address those additional variables and conceptualize a more complete framework to understand child's aggression.

Third, parents reported most of the variables in this study, including age 3 and Grade 5 aggression, physical punishment, family conflict, and parent-child dysfunctional interaction. Reports might be influenced by biases related with social desirability. Also, single informant source of data could lead to common variance. Therefore, more informants of data sources, such as teachers and children, could be adopted to improve the validity of the data.

Fourth, there was considerable amount of data attrition due to the longitudinal design of the current study. Around 77% of participants were excluded using the list wise deletion method. Though the missing individuals didn't differentiate from the participants in the core measures, more children with Black caregiver were lost due to missing data, while a higher portion of children with White or Hispanic caregivers had complete data over the years from the Chi-squares analysis. The attrition of the data could bias the representativeness of the sample. More advanced and statistical sensitive data imputation method could be used in future studies to reduce the bias related to data attrition.

Fifth, the generalizability of the data was limited since it only recruited low-income sample in the context of United States. Future studies may replicate this study in a difference sample and context.

Implications for Interventions

This study suggested several implications for interventions to help reduce child's aggression. First, since there was a moderate stability from age 3 to Grade 5 in child's aggression and early aggression explained the most variance in Grade 5 aggression, intervention initiated in early childhood may have larger benefits for child's social adjustment over the life course. Preschool teachers and parents might get help from relevant agencies to address child's aggression and other conduct problems. Teachers could seek support and suggestions from developmental specialist to supervise child's behavior (Stacks et al., 2005).

Second, family environment explained the second largest variance in child's aggression at Grade 5. Thus it is important to provide intervention on parenting behaviors to create a good environment for child's behavioral development. Previous empirical experimental study had shown that improved parenting in the following aspects: providing more responsiveness and stimulation, and reducing harsh parenting and using more positive discipline, were effective in helping reduce child physical aggression in a risk sample (Brotman et al., 2009). Since studies also suggested that child behaviors also influenced parenting (physical punishment, parent-child interaction) (Brook et al., 2012; Xing et al., 2011), it is also important to include child in the intervention and focus family processes.

Third, the bioecological model of this study indicated that multi-level of contexts (family environment, school environment, and possibly community environment) all played a role in child's aggression. Collaboration between family, community and school may help children to transit more smoothly during the developmental periods and reduce

the pressures inherent with transition for children. Furthermore, it is also important to consider multiple risk factors and multiple contexts during the intervention for children with aggression. Family, peers at school and neighborhood are important context for child's social emotional adjustment and those elements should all be considered during the intervention processes.

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