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CHILD CARE EFFECTS AND ATTACHMENT CONTINUITY
ON THE GROWTH OF SOCIAL COMPETENCE AND
ACADEMIC ACHIEVEMENT OF CHILDREN

By

Yoon Kyung Choi

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ABSTRACT

CHILD CARE EFFECTS AND ATTACHMENT CONTINUITY ON THE GROWTH OF SOCIAL COMPETENCE AND ACADEMIC ACHIEVEMENT OF CHILDREN

By

Yoon Kyung Choi

This study investigated the continuity of early child care effects and attachment continuity on the children's growth outcomes of social competence and academic achievement. For these inquiries, two pillars of literature were necessary. Studies of early child care and attachment were integrated in predicting the children's growth trajectories. This study applied a latent growth curve model of child outcomes using the NICHD data and implemented multiple group comparisons to investigate group differences in child care effects and attachment continuity by ethnic backgrounds and poverty history of families in early years of children's lives.

This study found that the influences of early child care experiences and attachment security significantly predict regarding children's growth trajectories. The pattern and the degree of continuity were different in the relations of child care effects and attachment continuity, and relative to outcome domains of social and academic growth. Particularly, the influences of ethnic culture and the depth of poverty were substantial and manifested in a diverse spectrum of interactions leading to the trajectories of children and family processes.

Findings from this study further delineate variations and differences in the impact of poverty within low-income populations and in interactions with ethnicity. Also revealed was a set of negative relations of child care quality and attachment security on

the social growth of African American children. These findings are interpreted in the context of understanding attachment phenomena in groups of cultural minorities and socioeconomically disadvantaged groups rather than applying a single interpretation across all groups.

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To my parents

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CHAPTER ONE

Introduction

Children grow in the context of parental and nonparental care, and relationships. Close relationships are understood to provide resources and environments for sound development with positive social and cognitive outcomes. Environments which fail to provide care and protection, and fail to meet children's needs for security, have negative influences on children's life trajectories. Attachment theory posits that having a secure base within mother-child relationships provides a fundamental mechanism for human life. Young children, especially, benefit in their development and general functioning from consistent bonds with their mothers or significant caregivers (Ainsworth, 1974; Bowlby, 1969, 1982). The importance of the mother-child relationship, referred to as the "microsystem" and "proximal processes", was also noted in Bronfenbrenner's bioecological agenda for human development. The quality of interactions and processes, which progress and sustained within secure relationships, was emphasized as a fundamental catalyst and developmental engines for child growth (Bronfenbrenner, 1979; Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998).

Early childhood years are a crucial period for the growth and consolidation of social skills and cognitive functioning. Specifically, social competence and academic achievement are important constructs of a child's adaptive and developmental outcomes during primary school years (Wentzel, 1991). Prior studies indicated that major interindividual differences in these two areas already have emerged by the time children arrive at school, and there are persistent gaps in academic achievement among children during school years (e.g., Burchinal et al. & National Institute of Child Health and

Human Development - Early Child Care Research Network (NICHD-ECCRN), *in press*; Smith, Brooks-Gunn, & Klebanov, 1997).

A broad range of family, parenting, child care, a child's own characteristics, and sociocultural factors contribute to the growth of social and academic outcomes of children before and during school years (e.g., Ackerman, Brown, & Izard, 2004a; Hirsh-Pasek & Burchinal, 2006; Morrison & Cooney, 2002; NICHD-ECCRN, 2001c, 2003a, 2003c). Among those key factors, first, nonmaternal *early child care* (U.S. Census Bureau, 2000, NICHD-ECCRN, 1997a) influences children's developmental trajectories enormously even for a lifetime. Early child care experiences can buffer environmental disadvantages in childhood by leading to better life outcomes of children (e.g., Burchinal et al., 1997, 2000; Schweinhart, Barnes, & Weikart, 1993). But the nonmaternal care in early months of child life also raises concerns regarding risk to healthy development of children in terms of behavioral problems and attachment formation (e.g., Belsky, 2001; Belsky et al., 2007). Second, the child's own mental script of outer world, mother, and himself - the *attachment security* - also influences the child's social development, cognitive functioning, and academic achievement (Sroufe, 1996, 2000; Thompson, 1999). Among many variables known to buffer against family risks and disadvantages, attachment relationship and child care experiences are important factors for better child outcomes, but some empirical evidence did not support this supposition (e.g. Belsky & Fearon, 2002; Bryant, Burchinal, Lau, & Sparling, 1994; NICHD-ECCRN, 2002b; Weinfield, Sroufe, & Egeland, 2000).

If attachment security is formed via experiences in caregiving environments in early child life and functions as a developmental base for child trajectories of social and

academic outcomes, how does the attachment security of children work together with the impetus of nonmaternal child care experience, in leading to child growth? Specifically if the interindividual and intergroup gaps in the academic achievement of children persist (Burchinal et al. & NICHD-ECCRN, *in press*), how much can those gaps in child's outcomes be traced back to the early parameters of child care and attachment formation?

Attachment studies are divisible into two major areas of study: one deals with antecedents of attachment - the formation of attachment quality within caregiving environments, the other with the consequences of early attachment security. If classic previous studies have focused on attachment formation from traditional research into parenting and caregiving contexts - i.e., the hypothesis of maternal sensitivity (before-attachment), later studies have focused on the attachment's continuing effects - *attachment continuity* - on later child behaviors and functioning (after-attachment). More recent studies have extended the study interest to lifelong stability within children and the intergenerational stability of attachment patterns within family members. However an integrative study of before- and after- attachment, starting from an early caregiving context and leading to child outcomes through the attachment of children, has not been implemented in a longitudinal way. The nonmaternal child care parameter, is not taken to be significant in recent attachment studies.

Likewise, although earlier child care studies began with questions of child care effects on the attachment of children, as the child care effects on attachment were revealed to be insignificant in a recent nationwide study (NICHD-ECCRN, 1997b; 2001b), attachment phenomena no longer seem considered in child care studies. In contrast to earlier studies of child care where the child care effect on attachment outcome

were negative, neutral or mixed, NICHD studies discerned no significant direct impacts of early child care on the attachment of children. Child care and attachment studies diverge in the literature, with no further investigations into understanding mechanisms of significant or insignificant child care processes on child development together with attachment phenomena.

This study seeks to understand how these two forces of early child care experiences and early attachment security work together or separately in affecting children's social and academic growth in a longitudinal time frame. Another purpose of this study is to investigate influences of family *ethnicity* and *poverty history* on the child care effects and the attachment continuity on child trajectories. This is to understand how much the child care effects and attachment continuity on the child growths depend on cultural background of ethnicity and poverty experiences of families.

Factors such as income, poverty, and culture serve as important proximal antecedents and overarching moderators of child trajectories through the underlying processes of mothering and child care (Brooks-Gunn & Duncan, 1997; Garcia-Coll, Lamberty, Jenkins, McAdoo, Crnic, Wasik, & Garcia, 1996; Johnson, Jaeger, Randolph, Cauce, Ward, and NICHD-ECCRN, 2003; McLoyd, 1990, 1998). However, it is still unclear how to capture the apparent main effects of ethnic culture and poverty experiences on the processes leading to child outcomes. Indeed, there is much to understand about the nature and strength of such family socioeconomic and cultural factors that influence child care experiences and attachment formation and continuity.

The ethological universality of attachment formation has been studied thoroughly (e.g., Ainsworth's Uganda and Baltimore Projects, 1967, 1978; De Wolff & van

IJzendoorn, 1997; Pederson & Moran, 1996). Although the necessity of applying different criteria and interpretation across cultures for the nature of attachment formation and attachment consequences was proposed (e.g., Jackson, 1993; Nakagawa, Lamb, & Miyake, 1992), those empirical studies are few and mostly about attachment formation with little attention to attachment continuity. The perspectives of cultural uniqueness tended not to be accepted under the umbrella of universality of attachment phenomena (e.g., Rothbaum, Weisz, Pott, Miyake, & Morelli, 2001; van IJzendoorn & Sagi, 1999). Perspectives for economically disadvantaged and ethnic minority groups are still lacking in attachment studies.

The NICHD child care study well represents diversity by ethnicity and socioeconomic status (SES) of families. Many studies with NICHD data included ethnic covariates (i.e., white versus non-white) in analyses of child care effects; some differences were detected, but did not question or hypothesize adequately about ethnic variations.

An analysis of merged samples (with ethnic covariates) may not reveal the group-specific processes of attachment and child care effects across ethnic backgrounds. Multiple group analyses are needed to understand salient developmental links or non-significant factors which either are or not at work under specific group conditions and to compare the processes of influences across groups (Ackerman, Brown, & Izard, 2004a, 2004b; Bollen & Curran, 2006; NICHD-ECCRN, 2005a; Scarr, 1998). Different mechanisms based on group populations may have more generalizability than a universal perspective and function in an appropriate way to disentangle cultural impacts from poverty impacts (Johnson, 2000).

Multiple child outcomes of (attachment), social competence, and academic achievement were used to understand the effects of interest: the continuity of early child care effects and attachment security. This study applies a latent growth curve model of child outcomes, repeated measures of which are parameterized as initial levels and growth rates for a period (Duncan, Duncan, Strycker, Li, & Alpert, 1999). By applying growth curves to child outcomes for an extended time, child trajectories are better identified than were aggregated or separated outcomes of children in specific time points to be used.

Attachment, social competence, and academic achievement reflect different outcome domains of children but it is hypothesized they are interconnected within a child in leading to academic growth outcomes. Thus interrelationships among the child growth outcomes are another study interest.

Although child care arrangements have increased dramatically in number and have become a normative trend in childrearing, it is still in transitory and variant context compared to the impact of *mothering*. The predominant position of mothering remains consistent, invariant, and critical (e.g., Belsky et al. & NICHD-ECCRN, 2007; Clarke & Clarke, 2003; NICHD-ECCRN, 1999c, 2001c). In measuring child care effects and attachment continuity on child outcomes, the mother's contribution as a primary caregiver should be taken into account as an important context. The current study incorporates the influences of mothers as covariates not only by maternal sensitivity but also by the mother's verbal intelligence. This is because there is consistent impact of maternal sensitivity on attachment and other child outcomes, and significant associations between the intelligence of mother and the academic outcome of children.

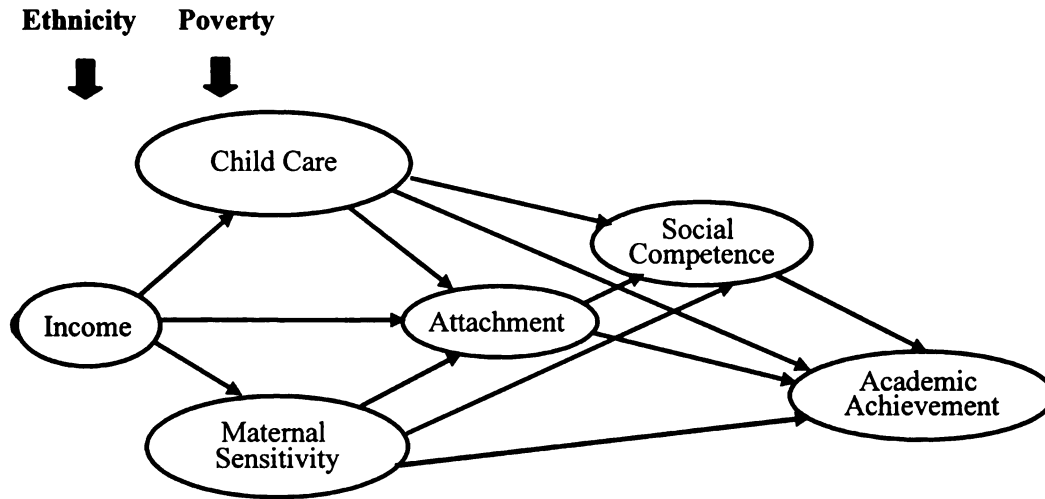


Figure 1. A conceptual model of child care effects and attachment continuity

Figure 1 indicates the conceptual regression model for investigating the child care effects and attachment continuity on children's growth of social competence and academic achievement. By looking into pathways starting from early family income to later child outcomes through early child care experiences and attachment security, and by comparing them across ethnic and poverty history groups, it is expected that dynamic forces exerted by socioeconomic and cultural factors will be more revealing concerning child care effects and attachment phenomena.

Purpose of the Study

The first purpose of the study is to determine how early factors of child care experiences and attachment security are associated with the child's developmental trajectories of social competence and academic achievement. Family income and maternal factors will be considered also. The second purpose is to investigate the indirect paths of how the developmental flows from early family income to child growth trajectories are interconnected as a process in a mediated way through early child care experiences and the attachment security of children.

The third objective of this study is to examine inter-group differences and commonalities by ethnicity and poverty history in the context of child care effects and attachment continuity. Participants will be categorized into groups based on ethnicity and poverty history to compare the processes of interests. It is assumed that child care effects and attachment continuity on child growth may progress differently, given the unique experiences associated with cultural forces of ethnicity and the different family experience of the timing and the duration of poverty.

Research Questions

Major research questions addressed by this study are summarized thus:

- 1) How do children grow socially and academically from before school entry (54 months) to 5th grade?
- 2) How does the quality of early child care and attachment security directly influence a child's growth of social competence and academic achievement from 54 months to 5th grade?

- 3) Within a child, if the organization of attachment security is a precursor of later growth of social competence and academic achievement, does the attachment of children mediate the impacts of earlier experiences in caregiving contexts, to their later social competence and academic achievement; are social growth trajectories related to concurrent trajectories of academic achievement and mediate the earlier experiences to the academic achievement?
- 4) How do family ethnicity and poverty history influence directions and magnitudes of child care effects and attachment continuity in leading to the child growth of social competence and academic achievement?

The corresponding analyses can be rephrased as investigations of (1) the additive direct effects of early experiences – the child care quality and the attachment security, (2) the mediating effects of attachment in bridging early caregiving contexts and child growth outcomes, and (3) the moderating effects of ethnicity and poverty history through group comparisons.

CHAPTER TWO

Literature Review

This chapter discusses what the literature indicates about child care effects and attachment continuity on child outcomes. First, a brief review of the attachment theory is presented with core concepts, and diverse themes or concerns raised in the attachment studies are explained. Second, literature on child care effects on child outcomes of attachment, social outcomes, and cognitive and academic outcomes are examined and summarized respectively. Third, studies of attachment continuity on social and cognitive/academic outcomes of children, and relationships between social and academic outcomes of children are presented. Fourth, former studies of poverty, income, and culture in the family functioning and the child development are discussed. Based on literature reviews, research questions which are raised and answered in this study are briefly mentioned.

Attachment Theory

Bowlby-Ainsworth's attachment theory, which has origins in ethology, views the human species as being equipped with a number of behavioral systems whose adaptive functions are to promote survival (Bowlby, 1969, 1982). This theory posits that children's mental scripts are built through the early relationship quality between mother and child and provides the core base for children's life trajectories. If caregivers routinely have been available to them, sensitive to their signals, and responsive with reliable consistency, children's security needs are met. Children develop a confident assurance of security that supportive care will always be available to them and that their signals are effective. Well-regulated emotional transactions between mother and child in infancy

(Sroufe, 1996) make children feel worthy of being cared for and allow them to view the outer world as an agreeable place. The primary caregiver serves as a “secure base” for infants' proximity seeking and explorations of the outer world (Ainsworth, 1967; Waters, Vaughn, Posada, & Kondo-Ikemura, 1995).

This confident status of the mother-child relationship is ‘attachment security’. The availability of the attachment figure is the set-goal of the attachment system, although some representational processes make it possible to maintain the model of attachment figure without proximity. The internal working model of attachment is the system of cognitive beliefs associated with the attachment figure, the self, and the relationship between the two, evolving as lifelong schema (Bowlby, 1969; Bretherton & Munholland, 1999). The internal model influences children’s feelings, beliefs, and expectations, thus directs attention, interprets information, and organizes behaviors of children (Colin, 1996).

Unlike Freud, Bowlby (1969) regarded children as efficient motivators for their own development, not passively influenced by an intra-psychic complex. If Bowlby set the primary goal of attachment as sustaining ‘security’ in emergency situations (e.g., during abrupt separations from mother), Ainsworth emphasized the importance of attachment’s role as a continuous support for exploration, learning, and social functions, namely adaptation to the outer world in ordinary situations. Ainsworth (1990) further described child exploration as not only a general interest in the world but also as “interest in gaining specific knowledge and skills about the environment” (p.473). The second generation of attachment studies has elaborated on attachment consequences and empirically validated *attachment continuity* regarding children’s personalities,

interpersonal adjustments, and socioemotional functioning. They described how it functions as a secure base and how they organize children's behaviors and emotions in adaptive ways (Sroufe, 1996, 2000; Waters & Cummings, 2000).

The referential use of mother as a secure base also allows the child to achieve good developmental growth in the cognitive domain (Belsky, Sprints, & Crnic, 1996; Cassidy, 1986; Waters & Cummings, 2000). Compared to attachment's effects on socioemotional functioning, however, effects on cognitive and academic outcomes have been less studied and emphasized, although theoretically the attachment effect is not limited to domains of children's personalities and socioemotional functions.

Attachment continuity, stability, and universality

Conceptually, the definitions of attachment *stability* and attachment *continuity* do not seem to be under clear consensus in the literature, but attachment stability can be defined as the developmental consistency of attachment quality or patterns over time, and attachment continuity is used for the continuing carry-over effect of early attachment quality on later developmental outcomes of a child- i.e., attachment consequences. This means that, over time, the organizational characteristic of attachment behaviors manifests into general functioning of children.

Ainsworth (1967) discovered attachment patterns through observations of individual differences in the Strange Situation. By imposing on 12-month-old infants a series of separations and reunions in an unfamiliar, stressful setting, she activated the children's attachment control system and identified three organized patterns of attachment: secure (B), insecure-avoidant (A), and insecure-ambivalent, or resistant (C) types.

Ainsworth's classification of attachment quality is categorical, which assumes that early attachment patterns are mutually exclusive, and it is coherent over the child's life span. Attachment security has been found to be stable from infancy to adulthood or even through generations (Frayley, 1999; Grossman, Grossman, & Zimmerman, 1999; Howes & Hamilton, 1992b); however, other studies of attachment have shown that the quality of a child's attachment is not necessarily stable over time (Belsky, Campbell, Cohn, & Moore, 1996) and may not be categorical (Fraley & Spieker, 2003; Pederson & Moran, 1995).

Significant but moderate stability in attachment quality from infancy to preschool was found in studies (NICHD-ECCRN, 1999b, 2001b; Main & Cassidy, 1988; Vondra, Hommerding, & Shaw, 1999). Low stability of attachment patterns was reported, especially in early years of childhood (Belsky et al. 1996; Crittenden, 2000; Grossmann et al., 1999; NICHD-ECCRN, 2001b). For example, the stabilities between attachment patterns at 15 months and 36 months were significant in NICHD data, but the agreement index was low (e.g., Kappa=.05 in NICHD-ECCRN, 2001b). Studies reported that changes in attachment quality are a function of the quality and consistency of maternal and non-maternal caregiving environments (Egeland & Farber, 1984; NICHD-ECCRN, 2006; Waters, Hamilton, & Weinfield, 2000). In terms of the global and stable model of attachment representation, developmental changes of attachment patterns tend to be understood as a normative maturation process under the rubric of attachment stability (Crittenden, 2000); however, the instability of attachment seems commoner than theoretically documented and acknowledged. This requires explanations of individual differences in the (in)stability or the developmental changes of attachment quality.

Compared to findings of attachment stability in low-risk samples of middle-class families (Ainsworth, 1990; Hamilton, 2000; Waters, Weinfield, & Hamilton, 2000), those of high-risk poverty samples experiencing more stressful life events found no overall significant stability in attachment security from infancy to late adolescence or adulthood (Weinfield, Sroufe, & Egeland, 2000; Weinfield, Whaley, & Egeland, 2004). In low-income samples, the stability of early classifications was less (36%) than the overall stability in low-risk samples (50%) (Vondra et al., 1999) or the high stability in intact middle-class families (80%) (Waters, 1978).

Concerning attachment formation, the universality of sensitivity-security associations were validated across ethnic groups (e.g., Barnett, Kidwell, & Leung, 1998; DeWolff & van IJzendoorn, 1997; Vereijken, Riksen-Walraven, Kondo-Ikemura, 1997), although overall the associations of non-white, non-western samples were lower than those of white middle-class samples. Regarding socioeconomic and cultural impacts on attachment *formation*, differences in attachment quality among SES groups and ethnicity have been reported as significant. The relationship between maternal behavior and child attachment security was found to be weaker among low SES samples (Ispa et al., 2004). While socioeconomic variations in attachment formation are well-identified, however, empirical cross-cultural studies of attachment phenomena (particularly of attachment *continuity*) are rare, and commentaries of cultural variations and differences in attachment phenomena were not well-accepted in the field (e.g., Kondo-Ikemura, 2001; van IJzendoorn & Sagi, 1999; 2001).

For example, in a recent study of attachment differences between African American and European American children in the NICHD sample (Bakermans-

Kranenburg, van IJzendoorn, & Kroonenberg, 2004), African American children's Attachment Q-set security (AQS) scores were substantially lower when compared to those of European American children. African American mothers showed less sensitive responsiveness in the first two years than did European American mothers. African American children scored lower on items such as 'uses mother as base from which to explore' and 'enjoys relaxing in mother's lap', but were 'more sociable to strangers'. They claimed that the low security scores resulted mainly from low income status rather than from cultural differences, incorporating the family stress model of less sensitive parenting in low income conditions. Within-culture variations were understood to be larger than between-culture differences. However, considering African American children's greater sociability even within the lesser sensitivity of mother's caregiving, different mechanisms of processes appear to exist for African American families, beyond the explanations of the family stress model.

Youngblade and Belsky (1992) reported several unexpected findings of attachment phenomena observed in *White* American children. As expected on the basis of attachment theory, the hypotheses of positive attachment continuity on the children's peer relations and friendship were supported: Children securely attached to their mothers at the age of 1 were less negative and asynchronous friendships at 5; positive father-child relationships at 3 were associated less dyadically negative and asynchronous friendships at 3. However, secure father-child attachment was also related to less connected, less synchronous, and less cognitively sophisticated in peer plays; more positive mother-child relationships predicted less positive, less connected friendships. They explained that children may compensate in friendships for parent-child relationship that are or are not

satisfying emotionality (compensatory processes); children who are doing well with parent or siblings may be less engaged in interactions with peers and friends; secure attachment to father in the Strange Situation can indicate enmeshed or dependent behavior of children. But because the study did not consider socioeconomic differences of families, it is not possible to understand how those deviations relate to family functioning and SES.

At the same time, there were emic discussions that attachment continuity may not be valid for the social competence and the exploration behaviors of African American children (e.g., Jackson, 1993; Rothbaum et al., 2001), but another study reported that attachment predicted African American children's sociocongruive function and social (in)competence significantly – i.e., perception of support, attribution, and behavioral/internalizing problems (Anan & Barnett, 1999). Unresolved issues are remained in the studies of attachment continuity on the social development of children. More cultural analyses are necessary in empirical studies, not to decide the universality or locality of attachment phenomena, but better to understand different mechanisms of attachment formation and attachment continuity in family processes leading to children's developmental trajectories. Disentangling effects of poverty from race and securing inclusive agendas (Johnson, 2000; Johnson et al., 2003) for cultural uniqueness is a still unresolved task to be undertaken in attachment studies.

Attachment measures

If the Strange Situation Procedure (SSP) is to activate a child's attachment system through stressful situations in the laboratory, the Attachment Q-set (AQS) (Waters & Deane, 1985) occurs through extended naturalistic observations of mother-child

interactions and relationships in a non-stressful familiar setting at home. Both AQS and SSP are assumed to have an equivalency for developmental comparisons (e.g., Howes & Hamilton, 1992b) in that AQS converges validly with the SSP in a meta-analysis (van IJzendoorn, Vereijken, Bakermans-Kranenbrug, Risken-Walraven, 2004; Pederson & Moran, 1995; Vaughn & Waters, 1990). For the preschool period, there is a modified Strange Situation method that uses the MacArthur coding system during a laboratory visit (Cassidy & Marvin and the MacArthur Working Group on Attachment, 1992). Recently, the representational methods of attachment security through interviews and storytelling have been diversely applied to a wide range of ages.

Although direct comparisons between Strange Situation experiments for infants and preschoolers (Grossman et al., 1999) and AQS scores of security have not been completely supported in the field, these efforts to have equivalent measures across ages have been made and validated consistently. Applying a conversion system among different attachment measures was implemented to have equivalent properties of attachment across measures and across ages (Bretherton et al., 1989; Bretherton, Ridgeway, & Cassidy, 1990; Huth-Bocks, Levendosky, Bogat, & von Eye, 2004; Pederson & Moran, 1995; Rosen & Burke, 1999; Teti & Ablard, 1989). For example, the continuous properties of AQS scores can be classified into the categories of more secure *versus* less secure (e.g., Teti & Ablard, 1989), and the Strange Situation coding system can be transformed into continuous scores of security (e.g., Fraley & Spieker, 2003). More studies of the validity and the comparability of attachment measures are necessary for studying group-specific attachment processes across subsets of families and the intergenerational stability and continuity of attachment.

Child care effects

Child care quality

As the *quality* of care has been focused on as the most influential factor in child care studies, the definition of quality child care has been asserted to be: "... warm, supportive interactions with adults in a safe, healthy, and stimulating environment, where early education and trusting relationships combine to support individual children's physical, emotional, social, and intellectual development" (Bredekamp, 1989, Cited in Scarr, 1998, p.102). Although the caregiver's sensitivity and the relationship between child and caregiver are essential properties of quality care, more policy-ready measures of child-caregiver ratios, caregiver training, and group size, which are able to be regulated, have been studied more (Howes, 1997; Burchinal, Roberts, Riggins, Zeisel, Neebe, & Bryant, 2000; NICHD-ECCRN, 1999a, 2002a). The routine use of child-to-adult ratios as a quality index does not measure appropriately the quality of dynamic interactions and caregiver's sensitivity in child care settings, but is based on the shared premise that the child care experience influence children via interactional and relational processes in the child care setting.

How we define 'child care quality' and child care features (quantity, type, entry of age, stability, etc.) affects our understanding of child care effects. The study of child care *quality* effects requires investigation of the process-oriented index, which measures caregiver sensitivity children receive in interactions and relational quality formed between caregiver and child, alongside structural criteria of group composition (Howes, Hamilton, & Matheson, 1994; Howes, Phillips, & Whitebook, 1992). In this way, child care quality can have more conceptual equivalence with the quality of maternal care –

i.e., maternal sensitivity. It thus facilitates looking into child care effects and comparing them to the mother's impacts on child outcomes, specifically within a theoretical viewpoint of attachment theory, for example.

Child care effects on the attachment of children

Earlier studies from the 1970s and 1980s reported the negative impact of child care on attachment in terms of the maternal deprivation hypothesis (Belsky, 1988; Belsky & Rovine, 1988; Clarke-Stewart, 1989); however, many later studies failed to replicate the link between non-maternal care and attachment insecurity in infancy (e.g., Roggman, Langlois, Hubbs-Tait, & Rieser-Danner, 1994), including an analysis from the NICHD study using the Strange Situation at 15 and 36 months (NICHD-ECCRN, 1997b, 2001b). Also, there was re-evaluation of whether differences in attachment classifications at an earlier or specific time point among children in child care should be regarded necessarily as a risk factor (Scarr et al., 1989). NICHD child care studies and other relevant studies of child care and attachment have demonstrated more diverse and complex results (NICHD-ECCRN, 1997b, 1999b, 2001b; De Wolff & van IJzendoorn, 1997; Belsky, 1999b).

Although there has been widespread critique of Belsky's analysis (1988) in that measuring attachment using the Strange Situation experiment is ecologically invalid for children in child care settings (Clarke-Stewart, 1989; Fox & Fein, 1990) and there were no appropriate controls for family background factors, the studies of early child care effects were initiated and developed originally by the controversies over attachment outcomes. Belsky's recent analyses (1990, 2001) revalidated that *early* and *extensive* non-maternal care (defined as 20 or more hours per week in the first year of life) is still

risky because of the increased probability of attachment insecurity – specifically in the insecure-avoidant type, together with increased aggression and noncompliance rates of the child.

In the Haifa study of Israeli children in formal child care centers (Sagi, Koren-Karie, Gini, & Joels, 2002; van IJzendoorn & Sagi, 1999), which is assumed to represent *low* quality child care arrangement in terms of its high adult:child ratios, lack of caregiver training, and the collective sleeping, the (*low*) quality of child care was associated directly with attachment insecurity –specifically the more anxiously ambivalent type, and constrained maternal sensitivity to shape child attachment security (Aviezer, Sagi, and Koren-Karie, 2003). Studies on an Israeli kibbutz with collective sleeping as a planned separation have shown that an infant’s attachment relationship to non-maternal caregivers affects later child development more strongly than attachment to mother (e.g., Oppenheim, Sagi, & Lamb, 1988). On the contrary, the infants in *high* quality kibbutz settings, sleeping together with their families during the night (as compared with the collective sleeping at child care setting), have shown much more attachment security with mothers (Sagi, van IJzendoorn, Aviezer, Donnell, & Mayseless, 1994).

The longitudinal design of the Sydney Family Development Project (SFDP) in Australia was similar to the NICHD early child care study design, yet the results indicated a different relationship between child care and child outcomes that may have been due to different policies and social support systems for the maternal workforce in Australia (Harrison & Ungerer, 2002; Love et al., 2003). Australia actively encourages women to return to work by providing extensive provisions of subsidized and regulated

child care. Registered formal child care facilities are of high quality, and this has been associated with higher attachment security when compared to unregistered informal care.

It also has been argued that *hours* away from the mother during the first year of life may adversely affect the proximal processes of mother-child interaction and ultimately the attachment relationship (Belsky, 1999b; Jaeger & Weinraub, 1990). Some studies have supported a negative association between child care quantity and quality of mother-child interaction, but other recent studies have not (Booth, Clarke-Stewart, Vandell, McCartney, & Owen, 2002; Love et al, 2003; NICHD-ECCRN, 1999b). It was argued that, because there is no significant difference in the quality of mother-child interactions within the variations of child care quantity and type, stronger significance for attachment outcome resulted from maternal sensitivity (Meins, Fernyhough, Fradley, & Tuckey, 2001) or from child care *quality* by caregiver sensitivity and caregiver-child relationship quality (Howes & Hamilton, 1992a ; Howes, Hamilton, & Philipsen, 1998), rather than from the child care quantity or other features of child care.

For the NICHD samples (NICHD-ECCRN, 1997b), there was no significant main effect of child care characteristics (quality as positive caregiving, quantity, type, age of entry, stability) on attachment classification at 15 months of age. Rather, there were significant interaction effects that infants, who received either poor quality care, consisting of more than ten hours per week, or were in more than one child care arrangement during the first 15 months of life, were more likely to be insecurely attached at 15 months but only when the mothers were low in sensitivity. In the 2001b NICHD study as well, no child care factors (quality as caregiver sensitivity and involvement, quantity, and type) predicted attachment security at 36 months; but, when maternal

sensitivity was low, more hours in child care somewhat increased the risk for the insecure-ambivalent type in the NICHD samples. It is assumed that the attachment quality of infants from higher risk home environments appeared more affected by the experience of early child care, but it was not identified how child care effects on attachment outcome were moderated by ethnicity or socioeconomic disadvantages of families in the NICHD samples.

Looking beyond attachment outcomes, other NICHD studies (1998d, 1999b, 2002) have reported direct effects of child care quality and quantity on the quality of mother-child relationship, where the mother-child relationship quality was approached in terms of general characteristics, such as the child's positive engagement with mother and affection for mother by including the felt-security as a sub-factor (NICHD-ECCRN, 1999b, 2003b), or patterns of mother-child interaction (NICHD-ECCRN, 1998), rather than using attachment measures. The conceptualization of attachment relationship is different and needs to be differentiated from that of the general mother-child relationship (quality) – i.e., harmonious, affectionate, positively engaging toward, nevertheless considering the overlapping behavioral content between attachment and general relationship characteristics. Those studies leave different speculations regarding child care effects on overall mother-child relationship building and also on attachment relationships.

Child care *hours* were related to less harmonious patterns of mother-child interaction in the first three years (NICHD-ECCRN, 1998); the negative association between child care *hours* and the mother-child relationship quality was reconfirmed when the mother-child relationship quality was measured by positive engagement with and

affection toward mother in mother-child interactions, but the child care *quality* was related positively (NICHD-ECCRN, 1999b). In the following cross-cultural study with an extended time span (NICHD-ECCRN, 2003d) using the same relationship quality outcome as the 1999b study, a significant difference was detected between white and non-white groups in the effect of child care *hours* on the mother-child relationship quality. More time in child care was associated with less positive engagement with mother for white American children, but positive engagement with mother for non-White American children through first grade. Different family processes are assumed to occur in the child care effects on the mother-child relationships and interactions depending on the white or non-white ethnic background, but the explanations of the revealed ethnic differences were not tested in the study.

Thus, the NICHD study results of no direct effects of child care on attachment (NICHD-ECCRN, 1997b, 2001b) are not congruent with other NICHD studies that reported significant child care (quality and quantity) effects on the *general* mother-child relationship quality (NICHD-ECCRN, 1998, 1999b, 2003d) and some prior studies that demonstrated the direct negative effect of early child care on children's insecure attachment (Barglow, Vaughn, & Molitor, 1987; Belsky & Rovine, 1988, Egeland & Hiester, 1995; Vaughn, Gove, & Egeland, 1980), but it still is consistent with other streams of studies (e.g., Thompson, 1988; Burchinal, Bryant, Lee, & Ramey, 1992). The *interactions* among (low) maternal sensitivity, child care features, and attachment outcomes were reported in the NICHD attachment studies, but the moderating effect of maternal sensitivity seems insufficient to understand the family processes of child care

effects and attachment formation across diverse ethnic and socioeconomic groups of families.

Considering the stability or instability of attachment quality over time as well as attachment quality at specific times, significant moderate stability in attachment quality from infancy to preschool was found (NICHD-ECCRN, 2001b; Main & Cassidy, 1988; Vondra et al., 1999). Attachment stability also was associated with diverse child care features of hours and age of entry (Howes & Hamilton, 1992b), maternal sensitivity and parenting quality at home (Egeland & Farber, 1984; Vondra et al., 1999), and the family's socioeconomic background (Goossens & van IJzendoorn, 1990). Children entering child care part-time or as 3-year-olds had more stable attachment than those who were full-time during infancy in middle-class European American samples. This indicates there can be main child care effect on the developmental *changes* of attachment quality under a moderate level of maternal sensitivity in middle-class families. Therefore, studies of child care effects on attachment need to consider various child care features, the diverse relationship outcomes (i.e., attachment stability, general relationship quality in home environment) and specific group dynamics related to ethnicity and the SES of families.

Child care effects on the social development of children

Infants organize the capacity to respond to variations in the environment. They learn self-control and emotional regulation, and develop internalized competence through experiences of social interactions in the caregiving context – i.e., nonmaternal child care experiences. The associations between child care and social development have been mixed, and the studied outcomes have ranged widely from positive

adjustment/functioning and social competence to negative behavioral or internalized problems (e.g., Yoshikawa, 1995, NICHD-ECCRN, 2001a, 2002a). Earlier studies have reported negative associations between early child care and social adjustment (Belsky, 1988, 1990; Clarke-Stewart & Fein, 1983; Rosenthal, 1991), but other studies have contradicted those claims by finding that more *hours* in child care were associated with more social skills and a decrease in behavior problems (Votruba-Drzal, Coley, & Chase-Lansdale, 2004). Recent studies have reported that higher *quality* was related to improvements in social functioning (Howes, 1990; Lamb, Hwang, Bookstein, Broberg, Hult, & Frodi, 1988; Lee, 2005; Votruba-Drzal et al., 2004).

Looking into positive associations between child care experiences and child social outcomes, child care quality was associated with socioemotional outcomes, such as compliance, sociability, attention regulation, peer relations, social skills in peer interactions, and lower rates of negative affect and behavior problems (NICHD-ECCRN, 1998a, 1998b, 2001a). Children more engaged with peers (in terms of child care hours and type) in either positive or negative exchanges had the opportunity to acquire greater social and emotional knowledge, more effective communication skills, and greater skills in compromise and negotiation with peers (Rubin & Rose-Krasnor, 1992).

Concerning the *procedural* quality of child care which focuses on the content of caregiver sensitivity, relationship quality, and interactions between caregiver and children, children with highly involved and responsive caregivers displayed more exploratory behaviors and better peer relationships (Holloway & Reichhart-Erickson, 1989; Howes & Hamilton, 1992a) and social adjustment (Bretherton, 1996; Phillips, McCartney, & Scarr, 1987; Sroufe, Carlson, & Shulman, 1993). Closeness in the

caregiver-child relationship or attachment to teachers significantly influenced the children's social adaptations at kindergarten in the kibbutz children (Oppenheim et al., 1988); toddlers' felt-security with caregivers was associated with less hostile aggression, more complex peer plays, and prosocial behaviors, indicating that attachment to teachers influenced social competence with peers in middle-class White American children (Howes, Matheson, & Hamilton, 1994). Child care quality, as defined by classroom interactions and the emotional closeness of the caregiver-child relationship also significantly affected growth in social skills from ages four to eight in the Cost, Quality, and Child Outcomes (CQO) study, and the positive effect was stronger for children from more at-risk backgrounds (Peisner-Feinberg et al., 2001).

Concerning the other factors of child care within the early entry group, children in full-time care have shown more social, cooperative play than part-time children (Field, Masi, Goldstein, Perry, & Parl, 1988); however, Belsky (1999, 2001) found more evidence that early, extensive, and continuous child care still was related to poorer social outcomes such as aggression and poor affective-cognitive functioning. His 1999 study of working, middle-class, two-parent European families rearing boys has shown that more time in child care during the first 3-5 years predicted more mother-reported externalizing behavioral problems, and the effect of child care quantity was mediated by negative parenting. The negative impact of child care (quantity, entry of age, stability) resulting in elevated levels of aggression and noncompliance was supported also by the NICHD studies (2003a, 2004b, 2004c). More time in any type of child care led to more of children's externalizing behavior problems, such as disobedience and aggression, regardless of care quality and other factors.

More recent studies using the NICHD data added findings that the link between child care hours in *any type* and behavioral problems of children disappeared at third or fifth grade time points (NICHD-ECCRN, 2005b), but other studies clarified that more time specifically in *center* care and *nonrelative* care still related to more externalizing behavior problems (Belsky et al., & NICHD-ECCRN, 2007; van IJzendoorn et al., 2004, Cited in Belsky et al.'s 2007) that were sustained up to sixth grade. These NICHD findings are consistent with other large-scale longitudinal analyses across ethnic and at-risk groups (e.g., Baydar & Brooks-Gunn, 1991; Hofferth, 1999; Lee, 2005), and the magnitude of the child care (hours) effect was smaller than those of maternal sensitivity and family SES (e.g., Hofferth, 1999; NICHD-ECCRN, 2003a; Phillips et al., 1987).

In other studies, child care *type* predicted better peer sociability and social functioning in the uniformly high, quality child care settings of Sweden (Lamb et al., 1988), and children in center care were likelier to exhibit self-regulation than were children at home (Howes & Olenick, 1986). Looking into the policy-driven child care programs, Head Start research has shown little evidence of increased aggressive behavior, low well-being, or poor development of social skills among Head Start children (Currie, 2000; Raver, 2002), given the emphasis of Head Start on social competence as a goal (Zigler & Styfco, 1999). Second, the Sydney Family Development Project (SFDP), supportive of maternal employment with regulations for quality care, found no relationship between child care quantity and social or behavioral problems, but lower quality and instability were significant. Third, when child care arrangements were funded by a child care subsidy under work-based antipoverty programs for parents, e.g., the New Hope Project, developmental outcomes of preschool and school-aged children were

modestly positive both in school performance and social behaviors, and no significant differences were found for the positive association by ethnicity (Huston et al., 2001). It is understood that *policy-driven* child care supports with regulated high quality and/or subsidies work as significant predictors or conditions positively influencing children's social development in diverse family contexts.

Although diverse findings of (longitudinal) effects of child care features on social outcomes were mounted and consistent core findings are being summarized, it still is difficult to speculate on child care effects on social outcomes in light of diverse and conflicting findings reporting everything from positive to negative to disappearing but expecting reappearance at some point (e.g., 'more hours increased behavior problems, but disappeared at some point;' 'more hours in center care increased behavior problems and were still sustained up to sixth grade;' 'quality care increased social skills and sustained longitudinally but the effect size was very modest and becoming weaker.' Rather than detecting the sustained or disappearing significances of the effects, it is required to look into processes of flow and understand the mechanism of influences in families and within-children themselves. Clearly, further investigations with a theoretical tool and perspective to look into the processes will guide us to better understand child care effects on the social development of children and the family processes beneath the significance matrix.

In estimating child care effects, the longitudinal study of publicly funded preschool impact – Effective Provision of Preschool Education (EPPE) project - in the United Kingdom (Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, & Elliot, 2003) applied variables at the item-level, rather than as a composite. For example, preschool's

impact was negative in cooperation, conformity, and peer sociability, but positive in antisocial behavior and worry, compared to nursery classes. Overall, preschool's impact on social/behavioral outcomes was significant but diverse in the content of specific items, and the portion of explained variance was lower than in equivalent analyses of cognitive attainments in the UK study. Although some other studies found that child care (quality) effects were *equally predictive* of social and cognitive outcomes (e.g., Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000), this study (including NICHD studies) indicated that cognitive attainment is more susceptible and sustained than are diverse results in social domains found in preschool groups.

Child care effects on the academic achievement of children

Through focused endeavors to reduce socioeconomic and racial gaps in the school readiness of children, high quality intervention and community child care programs have been implemented and reported to be associated with improved cognitive and language outcomes across groups (Barnett, 1995; Burchinal, Campbell, Bryant, Wasik, & Ramey, 1997; Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001; NICHD-ECCRN, 1999a, 2000c, 2003b, 2003c, 2004a; Peisner-Feinberg et al., 2001; Schweinhart, Barnes, & Weikart, 1993). The more limited the family resources, the greater the benefit children derive from child care experiences. Many studies (Campbell et al., 2001; Barnett, 1995; Ramey, Campbell, & Ramey, 1999; Wasik, Ramey, Bryant, & Sparling, 1990) have reported a high association between early interventions and the cognitive and academic achievement of poor African-American children. For example, the effects of early, intensive, high-quality intervention for poor, minority children (98% of African Americans) in the Abecedarian Project have shown modest but long-lasting positive

effects on cognitive and academic development, even into career success in adulthood (Burchinal et al., 1997).

Other studies (e.g., Barnett, 1995; Burchinal et al., 2000) have shown that quality of child care is related to child's outcomes for *all* children but provided limited support for the idea that child care quality may matter more for children experiencing more risk factors. For evidence, language development was the only outcome in which child care quality interacted with risk variables and ethnicity. It leads to questions whether child care quality might work differentially for specific domains of child outcomes in at-risk or minority contexts.

Through general studies of child care effects for all children, child care quality as measured by lower child-staff ratios, smaller group sizes, and higher levels of caregiver education have been found to be related to higher child developmental scores in cognitive domains (Burchinal, Roberts, Nabors, & Bryant, 1996; NICHD-ECCRN, 1999a). There seems to be an upward, linear relationship between the quantity of standards met and child outcomes, and associations are a function of child age, outcome domain, and quality standards. Also, the child care effects were manifested more when the mothering and the family environment were positively related with the child care experiences of children as promoting environment. Burchinal et al. (1997) reported that cognitive and academic outcomes between six months and eight years of age were associated with intensive educational child care, responsive and stimulating care at home, and higher maternal IQ.

In searching for specific quality indexes of great importance for child academic achievement, studies from early childhood education have supported a relationship between emotionally positive classroom climate and child outcomes. An intervention

study also has demonstrated that affective and informational *verbal* interactions between children and caregivers accelerated verbal and cognitive skills of children (Wasik et al., 1990). Recent NICHD studies have demonstrated that quality interactions between teachers and children and emotionally supportive climates in classrooms in elementary school are associated significantly with children's academic trajectories (e.g., NICHD-ECCRN, 2005b, 2006).

NICHD studies specified that child care features of quality, quantity, and type were significant predictors for children's short- and long-term cognitive outcomes (NICHD-ECCRN, 2003b). When a wide range of family selection factors and the quality of child care were controlled, the quantity of center care and child care homes were related to higher cognitive and language outcomes. It also was found that in infancy more hours in child care were associated with lower preacademic test scores, but more hours in toddlerhood were associated with higher language scores (NICHD-ECCRN, 2000b, 2000c, 2004a).

It should be noted, however, that *racial gaps* in the academic achievement did not lessen, even widening over time (Burchinal et al., in press), although early child care effects were found to have significant long-term effects on cognitive outcomes of children, specifically for children at risk. Positive outcomes of early child care effects in a sub-population through within-group investigation seems not necessarily to mean a contribution to lessening inter-group gaps in the growth trajectories of children. As aforementioned, the strongest impact for child outcomes still comes from family risks and mothering rather than from child care effects (NICHD-ECCRN, 2002b). Therefore, child care effects on academic achievement require a more detailed investigation of the

through-processes as related to the family environment of cultural uniqueness and socioeconomic disparities in order to understand processes leading to academic outcomes of children across groups.

Maternal sensitivity

Within and beyond attachment theory

Maternal sensitivity has been a seminal predictor of child attachment outcomes (Ainsworth et al., 1978; Belsky, Fish, & Isabella, 1991; Bowlby, 1969; Vondra, Shaw, & Kevenides, 1995). The core concept of maternal sensitivity is that the mother is able to detect her infant's signals promptly, interpret them correctly, and respond in a timely and adequate manner (Ainsworth et al., 1978, Cited in Kondo-Ikemura, 2001). Such maternal interactive behaviors, referred to as sensitivity or responsiveness, form the experiential basis through which infants develop their working models of security (Main, Kaplan, & Cassidy, 1985; van IJzendoorn, 1995). Infants of mothers who demonstrated higher levels of sensitivity were likelier to have babies showing secure attachment during the Strange Situation. By contrast, intrusive maternal behavior is reported to be related to the insecure-avoidant attachment behaviors of children, and unresponsive maternal behaviors are related to the insecure-resistant/ambivalent and even disoriented pathological behaviors of children.

Attachment theory maintains the premise that children's attachment security is formed primarily via direct experiences of receiving care from their primary attachment figure. Now, however, it seems widely acknowledged that sensitivity plays a reliable but not exclusive or robust role in attachment formation (Belsky, 1997; Bretherton & Munholland, 1999; De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987). For

example, the mean effect size was modest, as $r=.24$ (De Wolff & van IJzendoorn, 1997); a sensitivity-intervention study (Bakermans-Kranenburg et al., 2003) has shown small or even negative effect sizes on attachment security (e.g., $d=-.03$), and a recent study using NICHD data reported an *unexpected* positive association between maternal sensitivity and children's externalizing behaviors in first graders (Bradley & Corwyn, 2005).

Maternal sensitivity might not work optimally for child outcomes under specific cultural and socioeconomic conditions. At the same time, other studies have suggested that child characteristics such as child temperament (see Belsky, 1999b) or family poverty and risks (Barnett et al., 1998) explain an important portion of the remaining variance in children's attachment formation after accounting for the impact of maternal sensitivity.

As the predictive power of the sensitivity-security hypothesis was not considerably validated in empirical studies, the traditional attachment theorem of sensitivity-security formation needs questioning. This lack of causal evidence requires elucidation of the ecological conditions under which maternal sensitivity exerts stronger or more insignificant influences on attachment. Differences in sensitivity-security associations by SES and ethnicity are important to understanding maternal impacts on child development. The relationship between maternal sensitivity and child attachment is weaker among low SES and high risk groups (Aviezer et al., 2003; DeWolff & van IJzendoorn, 1997; Raikes & Thompson, 2005), although secure attachment is understood as particularly beneficial for low-income children as a buffer to the effects of risk environments on child development (Sroufe, Egeland, & Kreutz, 1990).

In terms of *cultural* differences, maternal insensitivity predicted attachment insecurity only when the mother was the infant's primary caregiver in the African

American group (Ward & Carlson, 1995). Maternal caregiving, measured as warmth and control, relates differently to child behaviors and mother-child relationships across ethnic groups (Isa et al., 2004): Maternal intrusiveness overall predicted increased child negativity toward mother in all ethnic groups, but the strength of association was higher in the European American group than in the African American group and the association was moderated by maternal warmth only in the African American group. Cultural differences in the effects and the role of maternal *sensitivity* in family functioning were discovered in studies, but understanding and explanations of differences in terms of deeper mechanisms are scarce.

Quality of maternal caregiving has been acknowledged as an important predictor of children's social and academic outcomes in the literature (e.g., Hirsh-Pasek & Burchinal, 2006; Shonkoff & Phillips, 2000). In another study, both attachment security and maternal sensitivity respectively predicted better social and cognitive development in adopted children (Stams, Juffer, & van IJzendoorn, 2002). It will be informative to examine how maternal sensitivity and the sensitivity-security link, *per se*, contribute to children's social and cognitive development across subsets of families.

Attachment continuity

Effects of attachment on the social development of children

Securely attached children learn emotional regulation and social skills through mother-child interactions (Kobak, 1999; Thompson, 1999). Attachment relationships are considered as valid developmental antecedents to children's acquisition of socially competent behaviors (Sroufe, 1983, 1996). Studies of attachment continuity have primarily focused on attachment effects on early adaptive social functions (Bretherton,

1985; Elicker, Englund, & Sroufe, 1992; Waters & Sroufe, 1983). Those studies have examined ways in which children's behaviors are organized, how attachment security functions for children's interpersonal adaptations, and how early attachment behaviors build into a pattern of later behaviors and competences. The security experienced through attachment relationships is associated with personality and the social and cognitive development of children (Sroufe, 1996). Children who have experienced responsive relationships are likelier to view relationships as secure bases for their active explorations of the world and be empathetic to the perspectives of others.

Secure attachment quality is linked to ego-resiliency and social competence (Urban, Carlson, Egeland, & Sroufe, 1991). Attachment representation assessed by a story completion of five year-olds related consistently to concurrent and later social competence at school (composed of social functioning with peers, disruptive behaviors, anxious/withdrawal behaviors, and school adjustment) (Verschueren, Marcoen, & Schoefs, 1996). Children with a secure representation of attachment to their mothers were more popular, better accepted by their peers, and showed more prosocial behaviors towards their peers; however, these findings were based on non-observational representation methods of attachment. Insecure attachment has been shown to be related to aggressive behaviors and problems with conduct (Greenberg, 1999; Lyons-Ruth, 1996). Specifically, infant's insecure-disorganized attachment – characterized by the absence of organized strategies adaptive to the child's adverse environment – is understood to be a major risk factor for later problematic or pathological functions such as externalizing behaviors, lower emotional health in school years, and disassociation in adolescence (Carlson, 1998).

Cross-cultural approaches to attachment continuity (Jackson, 1993; Rothbaum et al., 2001) have contended that attachment continuity may not be a valid construct for explaining the social competence and exploration behaviors of African American children. Descriptive differences in the 24 month attachment Q-set scores by ethnicity were also found in the NICHD samples (Bakermans-Kranenburg et al., 2004). African American children have shown more sociability though having significantly lower security scores than White children. Another study, however, reported that attachment predicted African American children's sociocongruive function and social incompetence – i.e., perception of support, attribution, and behavioral/internalizing problems (Anan & Barnett, 1999). White American children in relatively advantaged middle-class families also failed to show significant associations between attachment at 12 months and their behaviors toward peers at four years old (Howes, Matheson, Hamilton, 1994), and even negative associations with White children's friendship and peer play (Youngblade & Belsky, 1992). Jacobson and Wille (1986) found that early attachment was not associated with the child's peer behaviors but with the peer's behavioral responses to the target child. More research is needed to explain discrepancies in the continuing consequences of early attachment quality across subsets of groups by culture and SES and in terms of the developmental timing of attachment.

Effects of attachment on the academic achievement of children

There has been growing interest in attachment consequences for diverse indices of academic achievement (Bernier, Larose, Boivin, & Soucy, 2004; Jacobsen & Hofmann, 1997; Moss & St-Laurent, 2001; Spieker et al., 2003; Teo, Carlson, Mathieu, Egeland, & Sroufe, 1996). Attachment theory provided a developmental background for cognitive

and academic achievement (Ainsworth, 1990); however, empirical validations still reside in ambiguity and scarcity, so are open to speculation.

Meins's study (1997) showed that the search behavior of securely attached children is superior to that of insecurely attached children at the age of one and that they have a greater vocabulary at the age of nineteen months. Securely attached infants are likelier to search for occluded objects and people. Securely attached children have a greater sense of their own self-image, which manifests in their greater ability to recruit relevant cognitive resources to achieve desired goals. Children who are anxious, angry, or depressed in attachment quality do not learn, and people who are in an unstable relational context do not absorb information efficiently nor learn it well. Insecurely attached children are less able to derive knowledge and skills from their interactions with the outer environment because they are less motivated toward outer-world explorations due to attachment-related anxieties in their mental states and disorganized behaviors (De Ruiter & van IJzendoorn, 1993; Grossman & Grossman, 1993). Secure children have more ability to meet the academic demands of school than have insecure children, because their positive internal working models of themselves and others may encourage development of their motivation and perceived competence in this context (Moss & St-Laurent, 2001). This also has been supported by positive associations between attachment and goal orientation, academic competence (Jacobsen & Hofmann, 1997), and continuing associations between attachment and later cognitive reasoning tasks throughout childhood and adolescence, even when controlling for IQ and attention problems (Fonagy, Redfern, & Charman, 1997; Jacobsen, Edelstein, & Hofmann, 1994).

Securely attached children have shown more advanced cognitive skills than have insecurely attached children (van IJzendoorn & Vliet-Visser, 1988), regardless of child care experience (Spieker et al., 2003); this is in addition to more eagerness, endurance, spontaneity, and efficiency in learning and problem-solving tasks (Bus & van IJzendoorn, 1988; Grossmann et al., 1999). Securely attached infants explore more, are better at negotiating their physical environment, and also become better problem-solvers (Cassidy, 1986).

Children of mothers securely attached in their childhoods, scored 19 points higher on the Stanford-Binet IQ test compared to children of insecurely attached mothers, and mother-child synchrony in play interactions were related to children's IQs (Crandell & Hobson, 1999). In a meta-analysis (van IJzendoorn, Dijkstra, & Bus, 1995), differences in attachment quality were found not to play a major role in shaping differences in intelligence scores of children, but language development was more stimulated in the context of a secure attachment relationship. Thus, it is assumed that attachment formation is associated with verbal interactions and shared genes of intelligence between mother and child; however, associations among attachment, intelligence, and language seem to have been less questioned and identified in attachment studies.

In studies of attachment effects using NICHD data, a significant link was found between attachment and basic cognitive functioning (memory, attentional performance) and problem-solving skills, particularly under interactions with gender and cumulative contextual risks, problem-solving skills under contextual risks (Belsky & Fearon, 2002; Fearon & Belsky, 2004), and between attachment and specific academic outcomes of verbal and mathematic performances in first grade (O'Connor, 2005). Studies with

expanded time spans are necessary to, and would be informative in, understanding the process of attachment continuity as it leads toward academic achievement of children during later school years.

Social competence

Social competence is a major construct in studies of peer relations, skills, and social development. It has a wide conceptual spectrum ranging from social to cognitive, emotional, perceptual-motor, behavioral, and self-related aspects (Lemerise & Arsenio, 2000; Rose-Krasnor, 1997). Social competence is interchangeable with peer competence and partially overlaps with self-related constructs (e.g., self-competence, self-confidence, self-efficacy, self-control) and emotional regulation (Eisenberg, 2001). Most conceptualizations of social competence in the literature include *effectiveness in interpersonal interactions* as a common central focus (Rubin & Rose-Krasnor, 1992).

Some studies of social competence treat it as comprising socially desirable behaviors only (e.g., capable use of adaptive strategies in group settings, prosocial behaviors, effective interpersonal interactions and relationship making, regulatory skills, and empathetic understanding), but others incorporate undesirable, negative behaviors also (peer difficulties and internalizing and externalizing behavioral problems) under the construct of social competence (e.g., NICHD-ECCRN, 2002a).

The effects of social competence on the academic achievement of children

Social and behavioral competencies in early grades are important indicators of early school success and subsequent outcomes (Ladd, 1990; Ladd & Burgess, 1999). Children's current and long-term cognitive developments are affected by their social capacities formed through social experiences with peers and adults in their early. There

has been increased recognition of the links between social incompetence (as peer difficulties) and poor socioemotional and academic adjustment (Hartup, 1992; Newcomb, Bukowski & Pattee, 1993; Parker, Rubin, Price, & DeRossier, 1995). Unless children achieve minimal social competence by the age of six, they have high probability of being at risk in several ways (Kinsey, 2000; Rogoff, 1990).

Goleman (1995) reported that the ability to delay gratification was more predictive of academic success than IQ. Interpersonal skills, degrees of independence, responsibility, and self-control observed in the classroom contributed to children's academic performances (Alexander, Entwisle, & Dauber, 1993). Children who felt emotionally competent with classmates and teachers were likelier to be active participants in learning activities and to exert more effort during their work, thus resulting in greater academic achievement. Children possessed of social competence increase the degree to which they feel positively about school learning and educational activities over time (Ladd, 1999). Clinically disruptive children's poor social competence has been seen as predictive of adverse, long-term outcomes of academic failure, criminality, drug use, and psychiatric illness (Parker & Asher, 1987);

Social competence, seen as sociometric status and peer relationships, was reported as related to children's academic achievements in school settings. Elementary school-aged children not accepted by classmates tend to be at risk of dropping out of high school (Coie, Dodge, & Kupersmidt, 1990) and of having poor language and mathematics scores during early elementary school (O'Neil, Welsh, Parke, Wang, & Strand, 1997; Parker & Asher, 1987). Children who are generally disliked, aggressive and disruptive, unable to sustain close relationships with other children, and who cannot establish a place for

themselves in the culture of their peers are seriously at risk socially and cognitively (Hatrup, 1992, 1996). There has been another study, however, reporting no significant differences in academic achievement between rejected and non-rejected children (Wentzel & Asher, 1995).

Developmental associations between social and academic outcomes of children are influenced by their family's socioeconomic status, unstable parenting, and punitive parent-child relationships (Wentzel & Asher, 1995; Woodard & Fergusson, 1999, 2000). Moderations by poor parenting and low SES support prior findings that peer-rejected children tend to achieve less academically in school and that they are likelier to have low SES family backgrounds. Different mechanisms leading to children's social and academic growth are assumed to exist across subsets of children depending on cultural and socioeconomic family environment. As reviewed, NICHD studies (e.g., NICHD-ECCRN, 2003a, 2004a) have reported associations between child care experiences and an increase not only in externalizing behavior problems but also in social skills and higher cognitive and language outcomes of children. Further incorporation of within-child transfers between social and academic outcomes will elucidate understanding of child care effects on children's growth trajectories.

Dynamic forces of income, poverty, and ethnicity

Through seminal efforts to identify mechanisms of poverty and sociocultural differences exerted on families, more detailed implications have been reported in the literature. Studies have demonstrated that the characteristics of poverty and the distribution of income within poor populations are profoundly different across groups, thus have proposed that those embedded differences should be addressed and need to be

presented as key parameters in theoretical models (Garcia Coll et al. 1996; Johnson et al. 2003; McLoyd, 1990, 1998). For example, the poverty of African American families is more persistent and geographically concentrated, whereas the poverty of White American families is relatively transitory and geographically diffuse (McLoyd, 1990). Effects of income were strongest when poverty was chronic and deep. Thus, the need to consider characteristics of poverty as experienced in families for a considerable while was raised, questioned and implemented in studies (e.g., Burchinal et al., in press; NICHD-ECCRN, 2005a).

Measures of family socioeconomic status and poverty became multi-dimensionalized by measuring their persistence, extent, timing, and changes over time (Brooks-Gunn & Duncan, 1997; Dearing, McCartney, & Taylor, 2001; Sameroff, Seifer, Baldwin, & Baldwin, 1993). For example, poverty status in *early* years of children's lives was reported to be more critical for children's later developmental trajectories (Duncan, Yeung, Brooks-Gunn, & Smith, 1998), and the early lag-behind in the child's transition into school lasts through all school years (Haskins & Rouse, 2005). However, recent studies has reported that being poor concurrently or later tended to be more detrimental to mid-elementary or adolescent children's outcomes than did early poverty (Ackerman, Brown, & Izard, 2004a, 2004b; NICHD-ECCRN, 2005a). Other studies have shown that children in persistent or chronic poverty have less favorable cognitive and social development than have those in transitory poverty (Bolger et al., 1995; Duncan & Brooks-Gunn, 1997; McLeod & Nonnemaker, 2000). Thus it still is unclear *how* poverty or low income affects families and child development, in terms of its timing, duration, severity and nature.

Negative effects of economic hardship on children's developmental outcomes via parenting are well-documented (Conger et al., 1992). McLoyd (1998) proposed that poverty affects child development through less sensitive, punitive, and coercive parenting styles. Low income increases parents' exposure to negative life events and stressors, which in turn produce psychological distress diminishing the capacity to provide optimal caregiving to children. van IJzendoorn et al. (2004) explained, using a family stress model, that African-American children had lower Attachment Q-set security scores due to life stresses from adversities of low income environments in which the association between income and attachment security was mediated by (low) maternal sensitivity. Other mediational analyses consistently indicated that poverty is linked to child outcomes indirectly through less positive-parenting quality (e.g., Bolger et al., 1995; NICHD-ECCRN, 2005a).

Concerning child care selections, income is related to the type and quantity of child care children receive (Early & Burchinal, 2001); families with lower income tend to select relatives'-home/s child care, whereas families with higher income are likelier to use nonrelatives' child care. Selected child care type was also related to the child's ethnicity and household composition, and factors predicting care quality varied across different types of care. Often, selection of center-based care has been found to have curvilinear relation to income, presumably because of availability of child care subsidies or center-based intervention programs for poor families (NICHD-ECCRN, 1997a).

The NICHD studies (NICHD-ECCRN, 1997a, 1999a) reported associations between child care arrangements and family income. Poor children spent less time in non-maternal care but usually experienced lower quality care than did those from more

affluent families. Because quantity of care is known to be associated with both relatively high levels of behavior problems and more learned social skills of children at school entry, it still is questioned how child-care experiences in culturally different or socioeconomically disadvantaged environments (i.e., of relatively less quantity, of lower quality, of lower dependence on center care in infancy but increased accessibility to center-based programs after age three) lead to later desirable or undesirable social and academic outcomes.

Family income has been studied as having a larger and more consistent independent effect among cultural and socioeconomic factors on children's outcomes, such as academic achievement in early grades. Income itself is associated strongly with family functioning and parenting and leads *directly* to children's school achievement (Mistry, Biesanz, Taylor, Burchinal, & Cox, 2004). It influences *indirectly* children's outcome trajectories through the sensitivity-security link (Raikes & Thompson, 2005), and also affects the way caregiving factors influence children's life trajectories *interactively* depending on race and the poverty experiences (Burchinal et al. & NICHD-ECCRN, in press; NICHD-ECCRN, 2005a).

As reviewed, child care quality is associated not only with academic achievement, but also with social development of children in poverty; however, there is inconsistent evidence regarding whether child care quality matters more for poor than for non-poor children, especially when parenting behaviors are controlled (Burchinal et al., 2000; NICHD-ECCRN, 2002b). White American and African American children from low income families seem disproportionately at risk for academic failure or social incompetence. McLeod & Nonnemaker (2000) reported a stronger effect of the

persistence of poverty on children's behavioral problems for White American children than for African Americans and Hispanics when considering other family and personal factors such as delinquency history and marital status. Socioeconomic differences within each ethnic group need to be investigated independently from cultural forces. Those disentangling efforts of (low) income effect from ethnicity can be applied analytically, but interpretations of the result still leave unresolved issues because culture itself encompasses the long history of adaptive ways of living to survive adversities and economic hardships. It is understood that socioeconomic (dis)advantages are embedded in cultural uniqueness and (dis)advantages. But as the impacts of income or poverty are found to be stronger for family processes and child outcomes in literature, the effects of cultural factors seem more difficult to identify and understand.

Summary of literature review

As studies of early child care effects and attachment continuity are mounted, notable findings have been well-informed and summarized. However, they also reveal unresolved contradictions and lacunae not adequately questioned; questioned but not answered enough; answered but neither accepted nor further questioned, etc. This study expects to identify lacunae in the literature and fill them as indicated in subsequent paragraphs.

First, child care effects on attachment long has been studied, but seems suspended since the NICHD study reported no significant direct associations between child care and attachment. Major findings of significant moderating effect of (low) maternal sensitivity still leave unexplained how it relates to cultural and socioeconomic variations of families.

Second, attachment studies acknowledged the possibility of cultural differences in attachment formation and attachment continuity, but variations in attachment phenomena are explained mainly by socioeconomic differences in family resources and functioning (i.e., family stress model), rather than by cultural differences. The role of maternal sensitivity has been questioned considerably in attachment studies due to small effect size, but maternal sensitivity as key mediator and predictor still prevail in understanding diverse family processes for child outcomes, including attachment. Further efforts are necessary to discern other precursors or explanations of processes to child outcomes, beyond the family stress model.

Third, the child care effects on social outcomes are most mixed and diverse in significance and the duration or timing of effects. Literature has demonstrated a wide range of findings on social outcomes, but it is still difficult to synthesize them with a comprehensive grasp of influences on a child in an environment.

Fourth, the multi-dimensionalization of poverty is noteworthy in former studies of poverty. Based on findings of diverse spectra of poverty, this study tries to add one more speculation of the different nature or severity of poverty in its effects, in the context of child care effects and attachment continuity.

Fifth, separate domains of child outcomes tend to be left disconnected in predictions of child care effect and attachment continuity. It is necessary to inter-relate children's outcomes domains and understand how they converge for their growth.

CHAPTER THREE

Method

This chapter details the methodology employed in this study. First, a brief description of data and participants is offered. Measures for testing hypotheses are presented. Then, analysis procedures for testing the proposed theoretical model with brief explanations of growth curve modeling and group comparison method are presented. Last, hypotheses are listed with the analytic path model.

Data and Participants

This study uses data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care, which is an investigation of normative development in children across varying child care contexts. The NICHD Study of Early Child Care has been an ongoing (since 1991), prospective, longitudinal study of 1,364 full-term healthy infants and families recruited in hospitals at delivery (NICHD-ECCRN, 1999d). The NICHD study children do not comprise a clinical population at risk of, for instance, attachment disorder, severe neglect from mothers, or devastatingly-low-quality child care.

Families were recruited through hospital visits to mothers shortly after birth of their children in 1991 in ten locations in the United States. Potential participants were selected from among 8,986 mothers giving birth during selected 24-hour sampling periods to determine their eligibility for the study. Subjects were excluded from the sample if (a) the mother was under 18; (b) the mother was not conversant in English; (c) the family planned to move; (d) the child was hospitalized for more than seven days following birth or had obvious disabilities; (e) the mother had a known or an acknowledged substance-abuse problem; and (f) the family lived a considerable distance

from the site or in a location that posed a danger to home visitors. Of those contacted in the initial sampling periods, 5,265 met eligibility criteria for the study and agreed to be contacted for it. A subset of this group was selected in accordance with a conditional-random sampling plan. At least a 10% representation of mothers without partners, without a high school degree, and members of an ethnic minority, was sampled for inclusion in the study.

When the infants were one month old, 1,364 families were enrolled in the NICHD child care study. Though the sample is not nationally representative, the subjects were randomly selected from ten major regions of the country (NICHD-ECCRN, 1996, 1997a, 1999d). The resulting sample was diverse in socio-demographic distribution. It included 24% ethnic minority children, 10% mothers who had not completed high school, and 14% single mothers. Of the infants, 52% were boys. Compared with families that remained in the study and contributed to interviews and tests, those who did not remain in the study or those who were recruited but missed measurements were likelier to have mothers who were ethnic-minority, mothers with less education and more depressive symptoms, and members of households with fewer two-parent families and lower income-to-needs ratios.

The most notable features of the NICHD dataset are, first, that the majority of mothers who were employed returned to work in their infant's first year and placed their child in some kind of routine non-maternal child care arrangement before the child was six months old (See also NICHD-ECCRN, 1997a). Assessment of the quality of child care that infants, toddlers, and preschoolers experienced relied on intensive, multiple, and repeated observations of the children's day-to-day experiences. The other beneficial

feature was its attention to selection effects – a wide variety of potential third variables, such as characteristics of family, mother, child, community, and school. This scheme reduced the likelihood that effects attributable to other factors were not understood mistakenly as the effects of child care.

Measures

Measures comprise three clusters of early factors, child outcome variables, and covariates. Predictors are the *early* factors of caregiving environment - family income at 6 months, child care quality at 15 months, and maternal sensitivity from 6 to 15 months. Outcome variables are children's growth trajectories of attachment at 15, 24, 36 months, and social competence and academic achievement from 54 months to 5th grade. Covariates are child care hours, maternal sensitivity and mother's verbal intelligence, and child gender.

Table 1. *Timepoints of measurement for variables*

Months & Grade	1	6	15	24	36	54	K	1st	3rd	4th	5th
Factors											
Income	●	●○	○	○	○	○		○			
Child Care Quality			●								
Maternal Sensitivity		●	●								
Attachment			●	●	●						
Social Competence						●	●	●	●	●	●
Academic Achievement						●		●	●		●

Note. ● indicates time points for measuring income as a direct predictor of other factors; ○ indicates time points for assessment of income in creating the moderating variable of poverty history for group comparisons.

Socioeconomic and cultural factors of family

Income. Income is quantified in an ‘income-to-needs ratio’ rather than in absolute number of dollars. It was calculated for each family by dividing total family income by the poverty threshold for that family size. Family income was calculated from mothers’ reports of earnings of all family members, including other sources of household income, such as public assistance. An income-to-needs ratio of 1.0 is the U.S. government definition of poverty; therefore, a ratio of 2.0, for example, represents a per capita income twice the poverty level. Income-to-needs ratios at child birth and 6 months were averaged and used as early family income from 0 to 6 months.

Poverty history. Categorical measurement of a household’s poverty status (poor vs. not poor) was derived from the income-to-needs ratios. A family was defined as poor if the (mean) income-to-needs ratio was less than 2.0. The *early* versus *late* period from birth to 1st grade was divided by the middle time-point of 36 months². The sample was categorized into four groups of families who were never poor, poor early only (0 - 24 months) but not late, poor late only (36 months – 1st grade of age) but not early, and always poor (birth – 1st grade). Group categories are referred to as “never poor, early poor, late poor, and always poor,” respectively, in the following analysis. Thus, the income-to-needs ratio is used twice in the model analysis, both as a continuous antecedent for other study factors and as a categorical criterion for group comparisons by poverty history through first grade.

Ethnicity. For the purpose of this study, three ethnic groups (African American, White American, Hispanic American) of child were created based on the

² In the measurement time-points, the ‘early’ period was composed of the measures of 6, 15, and 24 months, and the ‘late’ period, 36, 54 months, and first grade.

following questions: “How would you describe the baby’s ethnicity?”, “Do you have Hispanic origin?”.

Quality of Caregiving

Child care quality. When the children were 15 months old, the nonmaternal child care provider was contacted and a visit was scheduled to observe the child. The child could be in any care types as long as it was at least ten hours weekly. If the child was in more than one care arrangement, observers visited the setting in which the child spent most time. Observations of child care settings were conducted on two half-days scheduled within a two-week interval. During these sessions, observers scored child care quality using the Observational Record of the Caregiving Environment (ORCE) (NICHD-ECCRN, 1996). At each visit, observers used the ORCE to assess the wide range of quality of care that the child experienced.

The quality index in this study is the qualitative ratings of caregiver’s sensitivity – i.e., the quality of the caregiver-child interactions the child received. This is assumed to have conceptual equivalence to maternal sensitivity within the attachment framework. The nine dimensions are the same for maternal sensitivity: sensitivity to distress/nondistress, detachment/disengagement, intrusiveness, stimulation of development, positive regard for the child, negative regard for the child, flatness of affect, and positive engagement of child with caregiver. The instrument showed good internal consistency (i.e., Cronbach’s $\alpha = .88$).

*Maternal Sensitivity*³. Maternal sensitivity was derived from observations of mother-child interaction in a play task, in which tapes were rated for qualities such as positive regard and intrusiveness during home visits using Ainsworth's Sensitivity Scale (Ainsworth et al., 1978). Mothers were asked to play with their children with age-appropriate toys. Mothers sensitivities' to distress and non-distress, intrusiveness, detachment and disengagement, positive/negative regard for the child, and flatness of affect, were evaluated and composited as maternal sensitivity at 6 months and 15 months (see NICHD-ECCRN, 1999b). Cronbach's alphas were .75 and .70 for the 6- and 15-month composites, respectively. These scores at 6 months and 15 months were averaged to create the maternal sensitivity variable for the period.

Other control variables

Child care hours. In 16 epochs, every 3-4 months from 3 months to 54 months of age, mothers reported the hours their children spent in child care per week. Self-reported hours for the period 3-15 months are counted as child care quantity and assessed in the model.

Mother's verbal intelligence. Mother's verbal intelligence (verbal IQ) was assessed by the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981) when the child was 36 months old. PPVT-R is a test of receptive⁴ vocabulary achievement and verbal ability. To measure the mother's verbal intelligence, mothers were shown four numbered pictures and were read a word by a rater. Mothers were then

³ Although maternal sensitivity is incorporated as a control variable in the study, it is an important counterpart of nonmaternal child care quality. Thus this maternal factor is presented under the content of caregiving quality.

⁴ If output system of language is speaking and writing, receptive language is the input system of language. It is how we see, hear, and ingest information through the senses for comprehension.

asked to point to the picture that corresponded to the word presented. PPVT-R scores were closely correlated with general intelligence test scores (Miller & Lee, 1993). This is incorporated as a covariate to provide better prediction of academic outcomes of children and for clarification of the effect of maternal sensitivity.

Gender. Although not many studies have paid attention to the effect of gender on the attachment, a few studies (e.g., Barnett, Kidwell, & Leung, 1998; Egeland & Farber, 1984) have reported that boys were more sensitive or vulnerable to the quality of care they received, and it was reported that there were gender differences in the social and cognitive outcome of children within economically disadvantaged families; however, gender effect will be controlled in the present study.

Prediction of child outcomes

Attachment

Child attachment was measured by trained observers at three time-points: 15, 24, and 36 months of age. At 15 months, Ainsworth et al.'s (1978) Strange Situation procedure was administered, using standard attachment classifications of insecure-avoidant (A), secure (B), insecure-resistant (C), disorganized (D), and unclassifiable (U). Attachment security was assessed at 24 months using the Attachment Q-set. Two-hour home visits were conducted during which trained observers noted the child's behaviors that occurred naturally or in response to semi-structured situations introduced by the observer. After visits, observers used the Attachment Q-set (AQS) to describe children's attachment security with their mothers (Vaughn & Waters, 1990; Waters & Deane, 1985). A child's attachment Q-security score is a correlation coefficient between the

resulting profile of Q-items and that of a prototypically secure child, which is determined by experts in the field.

A modified Strange Situation procedure, based on recommendations by Cassidy, Marvin, and the MacArthur Working Group on Attachment in 1992, was used to assess attachment classifications at 36 months (see NICHD-ECCRN, 2001, for details). The MacArthur coding system classifies preschoolers as: secure (B) or insecure-avoidant (A), insecure-resistant (C), and other (D).

For growth modeling of attachment, continuous Q-set scores were converted into two groups, more secure and less secure, replicating the 2 to 1 ratio of secure to insecure attachment in low-risk populations (eg., Teti & Ablard, 1989; Rosen & Burke, 1999). Children whose security scores fell in the top two-thirds of the distribution, are designated as more secure, children whose scores fell into the bottom third as less secure. The conversion is to create measurement equivalences between Strange Situation classifications and the Q-set security rating in applying the growth modeling of attachment. This procedure is based on theoretical and empirical links established between the Attachment Q-set and the Ainsworth tripartite classification system, the latter of which typically finds about two-thirds of infants in normal, low-risk U.S. samples to be securely attached and about one third to be insecurely attached (Lamb, Thompson, Gardner, & Charnov, 1985).

Social competence

The Social Skills Rating System (SSRS) developed by Gresham and Elliott (1990) was used to measure child social competence⁵. Social skills are defined as socially acceptable, learned behaviors that enable a person to interact effectively with others and to avoid socially unacceptable responses. The scale assesses sharing, helping, initiating relationships and controlling one's temper in diverse situations, and identifies deficits in positive social behaviors of negotiation, cooperation, assertions, responsibility and self-control. Standardized total scores of social skills, rated by the mother/primary caregiver at six time-points of 54 months, kindergarten, 1st, 3rd, 4th and 5th grade, were used. Higher scores indicate more socially acceptable and competent behaviors, as perceived by the child's mother/primary caregiver. Items used to create social competence had high internal reliability (i.e., Cronbach's alpha ranged between .87 and .91).

Academic achievement

The Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R) test (Woodcock, 1990; Woodcock & Johnson, 1989) was used to measure academic achievement. Tests were measured at four time-points: 54 months, 1st, 3rd, and 5th grade. WJ-R tests assess the child's cognitive ability and achievement, such as memory for names/sentences, incomplete words, picture vocabulary, letter-words identification, applied problems in mathematics, and analytic practical problems. Standard scores for each item were averaged for academic achievement measures for each time-point. The items had good internal reliability (i.e., Cronbach's alpha ranged from .66 to .93).

⁵ SSRS has two dimensions of social skills and problem behaviors. The problem behavior subscale was not included for social competence in this study.

Overview of the analysis plan

Latent Growth Curve Modeling. This study applies latent growth curve modeling (LGCM) for repeated measures of child outcomes – attachment, social competence, and academic achievement of children. If the child's developmental change is systematically related to the passage of time and there are significant interindividual variabilities in those changes, LGCM provides a useful tool for investigating the within-individual and between-individual differences in the trajectories (Burchinal & Appelbaum, 1991; Willet & Sayer, 1994). Compared to analysis of separate or averaged scores across time points, LGCM provides more informative profiles of growth trajectories of children in a longitudinal time span. In the LGCM, the trajectory is latent in that it was not observed directly, but we infer them from the repeated measures observed. The focus of the analysis is estimating the parameters for the latent trajectory. Two underlying key factors are the initial true status at the beginning of the study period (intercept) and the change along underlying latent dimensions of interest across all repeated assessment (slope) of the linear or nonlinear trajectory (Bollen, 1989; Bollen & Curran, 2006; Duncan et al., 1999; Raycov, 2006). Model parameters to be estimated are the mean of the intercept and slope, variance of intercept and slope, correlation between intercept and slope, residual variance, and overall model fits. This is for understanding the population children's growth. Thus the first step of the analysis is to establish growth modeling of the repeated measures of child outcomes - attachment, social competence, and academic achievement, then the estimated growth parameters of child outcomes will be examined to see how children grow in attachment relationship, social competence, and academic achievement for a period.

This applies Maximum Likelihood (ML) estimation method which is robust in estimating model parameters under a variety of less optimal analytic conditions such as small sample size, non-normal distribution, and incomplete data (Hoyle, 1995), but it requires large sample size to meet the multivariate normality assumption (Bollen, 1989). The full information maximum likelihood (FIML) estimation was employed for missing data, which maximizes probability of observed data. This is to minimize the bias of results toward remaining subjects with available data. Specified structural equation models of LGCM were tested using the Mplus Version 3 program (Muthen & Muthen, 1998).

Regression Analysis. When repeated measures of child outcomes are established as a growth trajectory - i.e., initial levels and growth rates of social competence and academic achievement for all children, this leads to the following questions of how to explain them using Structural Equation Modeling (SEM): Why do some children start with higher social competence and academic achievement at the initial time point, and why do some children grow so rapidly while others show little change? What predicts the initial levels and the growth rates? The unconditional growth model can be extended to include predictors, covariates, and other growth trajectories – the conditional LGCM.

This study hypothesizes that early child care experiences and attachment security of children influence children's social and the academic growth. Full regression models assess the direct impacts of early child care experiences and attachment securities on the social and academic growth outcomes of children, while the impacts of income, maternal factors (maternal sensitivity and mother's verbal intelligence), and child's gender are controlled.

Mediation test. Processes of influences for the child growth outcomes can be studied validly through ‘how’ and ‘why’ questions of causal links between factors, known as mediations. Moderation tests provide important implications for the conditions of child outcomes, but do not provide enough information to explain the mechanism in leading to children’s social and academic outcomes. Mediated pathways among the early factors and child outcomes are necessary to understanding of causal sequences leading to the child’s social and academic growth. SEM procedures provide the analytical tool for investigating such indirect paths as transferring prior impacts to later outcomes of children.

This study hypothesizes that early family income influences child care experiences and the attachment formation of children (see Figure 2). Thus the mediation test is to investigate whether child care experiences and attachment security mediate the impact of early family income on the growth outcomes of children. This study also hypothesizes interrelations among growth outcomes of attachment, social competence and academic achievement within a child. Thus another mediation test is about whether the social growth trajectory mediates the impact of attachment quality and other early factors in children’s academic growth.

Moderation tests through group comparisons. A moderator does not intervene in causal sequence but exerts importantly on the processes leading to child outcomes. This is about ‘when’, ‘under what condition’, and ‘for whom’ questions, which denote dependences on the levels of moderators. The test of moderating effect can be analyzed through multiple group comparisons which establish a separate model and data for each group. This shows more informative profile of processes in a specific group, compared to

the application of interaction terms in an analysis of merged multiple-population (Duncan et al., 1999). This permits the determining of negligible or notable differences in the proposed model for each group.

Multiple group analysis is based on separate datasets and models which are established with equivalent latent growth structure for each group. A formalized comparison procedure is implemented through a nested model chi-square difference test (also called a likelihood ratio test). In a series of increasingly restrictive (or releasing) equality constraints on the nested models of different groups, difference between two comparing nested models in chi-squares and in their degrees of freedom provide a significance test of the null hypothesis that the more restrictive model fits the same as the less restrictive without constraints. A significant chi-square difference suggests that adding an equality constraint is inaccurate, thus the groups differ in a least one of the parameters tested (Bollen & Curran, 2006).

Group comparisons are applied to unconditional growth models of child outcomes, which indicate mean comparisons of initial levels and growth rates of attachment, social competence, and academic achievement of children. Then they are extended to compare the full conditional model of proposed pathways as described in Figure 2, which means comparisons of regression impacts of child care experiences and attachment security, on growth outcomes of children across groups. Later in the analyses, income levels within the White American group were further incorporated in ethnic group comparisons, for the purpose of better identification of cultural *versus* economic influences among ethnic groups.

Hypotheses

The path model shown in Figure 2 presents the hypothesized associations among factors, starting from family income to child trajectories of social competence and academic achievement through child care effects and attachment continuity, while controlling for impacts of other early factors. Major hypotheses testing the model are listed as follows under the overarching research question: focal questions are about the continuing effects of early child care experiences and early attachment security on the social and academic growth of children, mediations by attachment and social competence, and group comparisons of the growth trajectories of children and phenomena of the child care effects and the attachment continuity.

1. Growth trajectories of child outcomes (attachment, social competence, and academic achievement)

Question: How do children grow or change in outcomes of attachment security, social competence, and academic achievement in early years of child life? Do initial levels of child outcomes predict later growth rates of those in the following years?

1.1. [Exploratory question: Changes in attachment security] Is there a significant relationship between initial attachment security at 15 months and the following changes in attachment security from 15 months to 36 months?

1.2. (Growth of social competence) There is a significant relationship between the initial level of social competence at 54 months and the following growth rates of social competence from 54 months to 5th grade.

1.3. (Growth of academic achievement) There is a significant relationship between the initial level of academic achievement at 54 months and the following growth rates of academic achievement from 54 months to 5th grade.

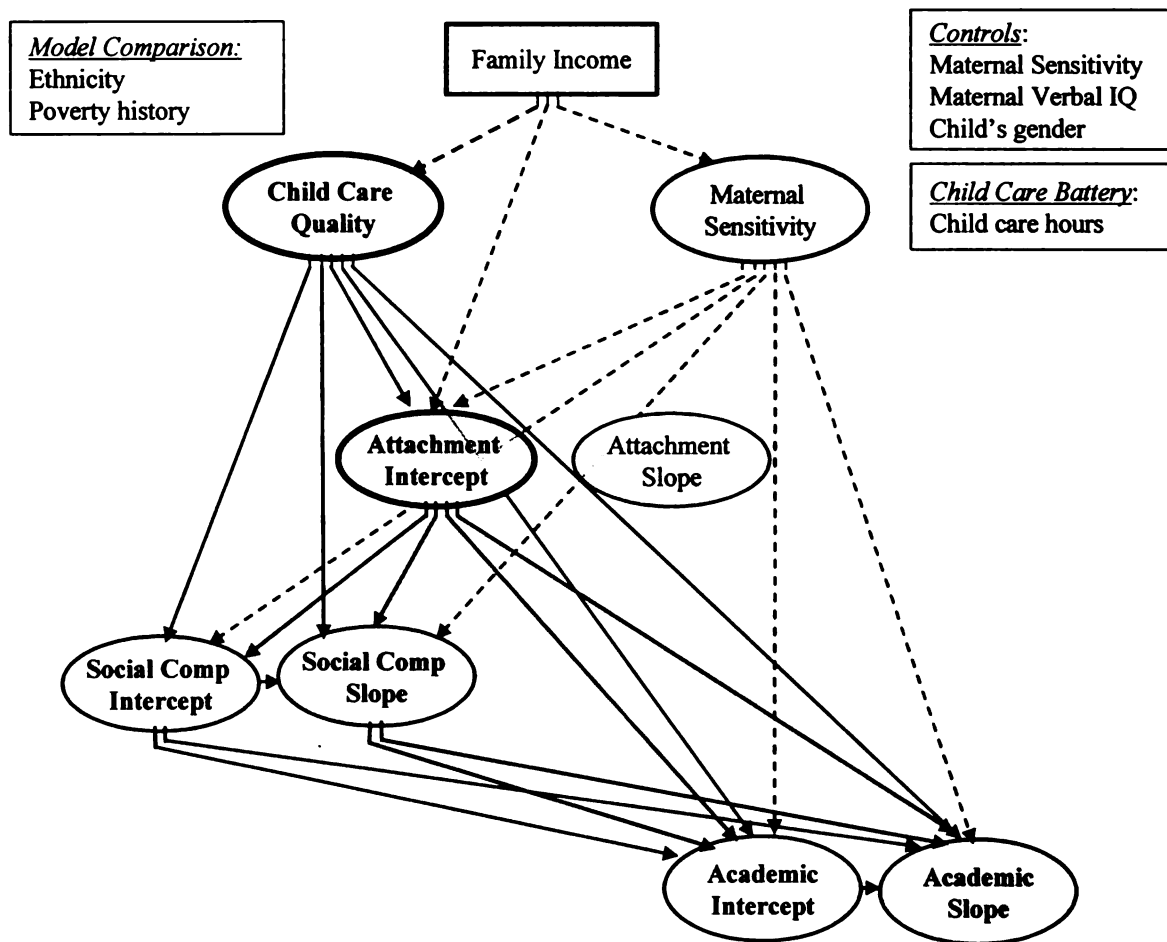


Figure 2. Analytic path model for hypothesis tests ⁶

⁶ Influences of mother - maternal sensitivity and mother's verbal intelligence- are controlled in the study, but the maternal sensitivity is presented in the analysis model to better describe important ecological factors for child outcomes of the study.

2. Child care effects

Question: Does the child care quality at 15 months influence initial levels and growth rates of children's attachment, social competence, and academic achievement?

2.1a. (Child care quality → Attachment) The higher the quality of child care is at 15 months, the higher the percentage of children securely attached to their mothers at 15, 24, and 36 months of age.

2.1b. [Exploratory question: The effect of child care quality on the changes of attachment security from 15 months to 36 months] The higher the quality of child care is at 15 months, the greater the stability of attachment security of children is from 15 to 36 months.

2.2a. (Child care quality → Social competence intercept) The higher the quality of child care is at 15 months, the likelier the children are to start with higher initial levels of social competence at 54 months.

2.2b. (Child care quality → Social competence slope) The higher the quality of child care quality is at 15 months, the likelier the children are to show steeper growth slopes of social competence from 54 months to 5th grade.

2.3a. (Child care quality → Academic achievement intercept) The higher the quality of child care quality is at 15 months, the likelier the children are to start with higher initial levels of academic achievement at 54 months.

2.3b. (Child care quality → Academic achievement slope) The higher the quality of child care is at 15 months, the likelier the children are to show steeper growth slopes for academic achievement from 54 months to 5th grade.

3. Attachment Continuity: Attachment as a predictor.

Question: Does the attachment security of a child influence the initial levels and growth rates of social competence and academic achievement of the child?

3.1a. (Attachment → Social competence intercept) Securely attached children at 15, 24, and 36 months are likelier to start with higher initial levels of social competence at 54 months.

3.1b. (Attachment → Social competence slope) Securely attached children at 15, 24, and 36 months are likelier to show steeper growth slopes of social competence from 54 months to 5th grade.

3.2a. (Attachment → Academic achievement intercept) Securely attached children at 15, 24, and 36 months are likelier to start with higher initial levels of academic achievement at 54 months.

3.2b. (Attachment → Academic achievement slope) Securely attached children at 15, 24, and 36 months are likelier to show steeper growth slopes of academic achievement from 54 months to 5th grade.

3.3 [Exploratory question: The effects of attachment changes on child outcomes]

Are attachment changes (i.e., the stability/the instability of attachment security) significantly predictive of subsequent growth outcomes of social competence and academic achievement? For example, is a child who is stable in attachment security from 15 to 36 months *more* likely to be socially competent and academically achieving at 54 months and show *steeper* growth slopes of social competence and academic achievement from 54 months to 5th grade?

4. *Within-child associations among social and the academic growth trajectories of children*

Question: Do children who are socially competent (SC) tend to be more academically (AA) achieving as well?

4.1. (SC intercept → AA intercept) The higher the child's initial level of social competence is at 54 months, the likelier the child's initial level of academic achievement is to be higher at 54 months.

4.2. (SC intercept → AA slope) The higher the child's initial level of social competence is at 54 months, the likelier the growth slope of child's academic achievement is to be steeper at 54 months.

4.3. (SC slope → AA slope) The steeper the child's growth slope of social competence is from 54 months to 5th grade, the steeper the child's growth slope of academic achievement is for that period.

5. *Direct and Indirect effects of early factors on child outcomes*

Question: Is the impact of early family income (from child's birth to 6 months) transferred to children's growth trajectories of attachment, social competence, and academic achievement *directly* and *indirectly* via early child care effects and attachment continuity?

5.1. *Child care quality as a mediator*: Early family income impacts children's growth outcomes of attachment, social competence, and academic achievement directly and indirectly through the early child care quality the child experienced at 15 months.

5.2. *Attachment as a mediator*: Early family income, child care quality, and maternal sensitivity impacts children's growth outcomes of social competence and

academic achievement directly and indirectly through the attachment securities of children at 15, 24, and 36 months.

5.3. *Social competence as a mediator*: Social competence mediates the effects of early child care experiences and attachment quality on the academic achievement of children.

6. *Group comparison: The moderating effects of ethnicity and poverty history of families on the growth outcomes of children, and on the phenomena of child care effects and attachment continuity on the growth outcomes of children.*

Question 1: Are growth trajectories of attachment, social competence, and academic achievement *invariant* across groups depending on the ethnicity and the poverty histories of families?

6.1. Significant differences exist in initial levels and the following growth rates of attachment, social competence, and academic achievement across ethnic and poverty history groups.

Question 2: Are child care effects and the attachment continuity on the child growth trajectories of social competence and academic achievement *invariant* across groups depending on the ethnicity and the poverty histories of families?

6.2.1. Significant differences exist in the direction and magnitude of child care effects and attachment continuity on the growth outcomes of children across ethnic groups (African American, White American, Hispanic American).

6.2.1 Significant differences exist in the direction and magnitude of child care effects and attachment continuity on the growth outcomes of children across poverty history groups (never poor, late poor, early poor, always poor).

CHAPTER FOUR

Results and Discussion

This chapter presents results of research questions and hypotheses found in chapter three. Multiple steps are necessary for analyses. Based on the hypotheses, they can be divided into major parts: The first part of the analysis is to utilize latent growth curve modeling (LGCM) to understand how children grow in the attachment relationship, both socially and academically, from their early lives (hypothesis 1). The second part of the analysis is a test of the theoretical model for *all* children (hypotheses 2, 3, 4). Mediation tests were also conducted to understand processes from early family income and leading up to the children's growth outcomes (hypothesis 5).

Effects of early child care experiences and attachment security on the growth of child outcomes are the major research focus, while the influences of mother (maternal sensitivity and mother's verbal intelligence), family income, child care hours, and child's gender are considered. The last part of the analysis will consider ethnicity and economic status with respect to child care effects and attachment continuity, using a multiple group comparison to discern inter-group differences or similarities in the phenomena of interest (hypothesis 6).

Descriptive analyses

Descriptive statistics and intercorrelations of variables are presented in Tables 2 and 3. In terms of the normality assumption, early family income (from birth to 6 months) was slightly skewed to the right tail (i.e., $M=3.36$, $Mdn=2.7$; skewness= 2.12), indicating that more families were recruited from the lower quarters of the income range.

Table 2. Descriptive statistics of variables

Variables	N	Mean	SD	Min	Max
<u>Early factors</u>					
Income (0-6m)	1192	3.36	2.65	0.09	19.76
Maternal sensitivity (15m)	1298	-0.01	0.85	-3.88	1.57
Mother's verbal IQ	1167	99.01	18.35	40	159
<u>Child care</u>					
Child care quality (15m)	656	14.64	2.84	6.25	20.00
Child care hours (0-15m)	1364	19.15	15.72	0	65.34
<u>Child outcomes</u>					
Attachment (15m)	1149	0.617	0.49	0	1
Attachment Q-sort (24m)	1197	0.291	0.21	-0.49	0.75
Attachment (24m)	1192	0.626	0.48	0	1
Attachment (36m)	1140	0.614	0.49	0	1
Social competence (54m)	1055	98.27	13.52	53	130
Social competence (K)	1055	102.68	14.73	56	130
Social competence (1st)	1029	105.25	14.93	50	130
Social competence (3rd)	1027	106.15	15.91	51	130
Social competence (4th)	1020	107.27	16.38	51	130
Social competence (5th)	1020	107.57	15.08	62	130
Academic achievement (54m)	1047	98.20	11.50	59.2	137.2
Academic achievement (1G)	1014	104.69	10.51	58.1	137.0
Academic achievement (3G)	1001	110.38	11.87	52.3	142.3
Academic achievement (5G)	988	107.92	12.15	28.0	151.9

Most correlations were significant with lower than an absolute value of .5 except for the repeated measures of child social and academic outcomes (Table 3). This indicates that multi-collinearity among variables would not be a major concern for the following analyses (Kline, 1998). Correlations among child outcomes of attachment, social competence, and academic outcomes were consistently significant, but those between child care variables (quality, hours) and child outcomes of attachment and social competence, were not, across time-points.

Table 3. Correlations of variables (N=1,364)

	1	2	3	4	5	6	7	8	9
1. Income	1								
2. CCqual	.17**	1							
3. CChour	.11**	-.14**	1						
4. Mat Sat	.35**	.13**	.01	1					
5. Mat IQ	.40**	.10*	.03	.47**	1				
6. Att15m	.05	-.01	-.01	.08**	.03	1			
7. AttQ24	.11**	.10*	.001	.23**	.26**	.03	1		
8. Att36	.07*	-.01	.03	.10**	.13**	.05	.13**	1	
9. SC_54	.16**	.01	.03	.20**	.24**	.06	.12**	.09**	1
10. SC_1G	.17**	.05	.03	.22**	.28**	.08*	.13**	.09**	.68**
11. SC_K	.19**	.02	.04	.20**	.27**	.06*	.16**	.11**	.64**
12. SC_1G	.17**	.04	.04	.26**	.31**	.07*	.17**	.14**	.56**
13. SC_4G	.18**	.09*	-.002	.26**	.32**	.07*	.19**	.11**	.54**
14. SC_5G	.16**	.09*	-.02	.22**	.28**	.08*	.16**	.12**	.50**
15. AA_54	.35**	.24**	.07*	.39**	.49**	.10**	.24**	.17**	.26**
16. AA_K	.32**	.13**	.10**	.33**	.47**	.07*	.21**	.19**	.25**
17. AA_3G	.30**	.17**	.07*	.32**	.49**	.02	.21**	.16**	.21**
18. AA_5G	.31**	.15**	.07*	.36**	.49**	.04	.21**	.17**	.22**

	10	11	12	13	14	15	16	17	18
10. SC_K	1								
11. SC_1G	.74**	1							
12. SC_3G	.67**	.71**	1						
13. SC_4G	.63**	.69**	.78**	1					
14. SC_5G	.59**	.64**	.74**	.77**	1				
15. AA_54	.22**	.23**	.23**	.23**	.22**	1			
16. AA_K	.22**	.24**	.27**	.24**	.24**	.74**	1		
17. AA_3G	.20**	.21**	.24**	.22**	.23**	.70**	.88**	1	
18. AA_5G	.24**	.25**	.27**	.25**	.25**	.67**	.80**	.87**	1

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

Note. 1. Income (0-6m), 2. Child care quality (15m), 3. Child care hours (0-15m), 4. Maternal sensitivity (6-15m), 5. Maternal verbal intelligence by PPVT scores, 6. Attachment (15m), 7. Attachment Q-set (24m), 8. Attachment (36m), 9. Social Competence at 54 months (SC_54m), 18. Academic Achievement at 5th grade (AA_5G)

Constructing growth curve models of child outcomes

To understand and explain developmental patterns of children's growth in attachment, social competence, and academic achievement by LGCM, first, the measurement models of each developmental outcome were established as an unconditional growth model (hypothesis 1). Among fit indices, χ^2 overall goodness-of-fit, comparative fit index (CFI), and root mean square error of approximation (RMSEA) were considered to determine adequacy of the model fit. A smaller and insignificant χ^2 statistic indicates a better model fit, but χ^2 statistic is sensitive to sample size. Thus, the value of χ^2 / df less than 3 can be considered as an acceptable fit, when the χ^2 statistic based on a large sample size results in a significant one. The CFI value greater than or equal to .95 and the RMSEA value less than or equal to .05 represent good fit (e.g., Hu & Bentler, 1999); but the CFI greater than .90 and RMSEA less than .10 are considered also as an acceptable fit (Steiger, 1989; Browne & Cudeck, 1993; Bollen and Long, 1993a). The width of the interval is also indicative of the precision of estimation of the parameter using data at hand. If the left endpoint of the 90% confidence interval (CI) of the RMSEA is smaller than .05, it can be argued that the model is a plausible means of describing analyzed data (Raycov & Marcoulides, 2006).

Growth modeling of attachment

The attachment growth model comprises three repeated measures of binary classifications observed at 15, 24, and 36 months - securely attached or not. For the 24 month, the converted attachment Q-set scores into the categories of more secure *versus* less secure (e.g., Teti & Ablard, 1989) were applied. The χ^2 statistic was equal to .68 with 2 degrees of freedom and the p-value was not significant. From the overall model fit

($\chi^2(2) = 0.68, p = 0.71, CFI = 1.00, RMSEA < .01$), the attachment growth model is assumed to fit data well as a free-loaded nonlinear trajectory model (see Appendix A for model estimation and figures).

Table 4 indicates the estimated growth model parameters of attachment from 15 to 36 months, based on the maximum likelihood (ML) estimation method. The mean intercept of trajectory for all children is 0.62, reflecting that, on average, 62% of children were securely attached to mother at the initial time-point of 15 months; however, the variance of initial levels and slopes, and the covariance between the initial level and slope factor were not significant at α of .05 level. This reflects that there are no estimable average rates of increase or decrease in the attachment changes over time for the period from 15 to 36 months. The low R^2 values also indicate that the trajectories have a weak impact on attachment data (see Appendix A).

Table 4. Parameter estimates of the unconditional growth curve model of attachment

	<i>Free-loaded model</i>	
	α	β
Means	<i>0.62^{***}</i>	0.004
Variance	<i>0.03[†]</i>	0.04
Covariance	-0.02	
	*** $p < .001$, $p^{\dagger} < .10$	

Note. α indicates the intercept as initial starting level in the growth model.
 β indicates the slope as changes or growth rate over the study period.
 Italicized values indicate that the values are statistically significant.

Taken together, although the overall model fit indices suggest that a nonlinear trajectory model fits the attachment data, the component fits for the ML estimator have shown that growth modeling of attachment for the 15 - 36 month period is insufficient to represent early attachment phenomena in the sample, specifically the change properties

(β) of attachment. Such few waves with the dummied property of different attachment measures across time points might be insufficient to define trajectories due to possible shrinkage in variations or unlawful fluctuations in the changes of attachment (see Table 14 for the percentage of attachment changes, p.94). Thus, the hypothesis 1.1 which asked the relationship between initial attachment security at 15 months and following changes in the attachment securities, could not be answered through growth modeling of attachment.

Table 5. Means and correlations of repeated measures of attachment

	15 month (N=1149)	24 month (N=1192)	36 month (n=1140)
Means	0.617	0.626	0.614
Correlations	15 month	24 month	36 month
15 month	-		
24 month	0.03	-	
36 month	0.05	0.13**	-
Kappa	15 month	24 month	36 month
15 month	-		
24 month	0.02	-	
36 month	0.05	0.10**	

Nonsignificance of parameters does not necessarily imply that there are no significant inter-individual differences, or that the changes of attachment do not meaningfully covary over the period. As shown in Table 4, mean scores, a rate of security indicating the average percentage of securely attached children, were consistent over time, around 62%; however, low correlations and low and insignificant agreement indexes (Kappa) among attachment measures indicated that varied changes exist (Table 5). Further investigations are necessary to understand interindividual and intraindividual differences in attachment changes.

Growth modeling of social competence

Growth modeling of social competence is composed of six assessments, observed at 54 months, kindergarten, 1st, 3rd, 4th, and 5th grades. The growth of social competence from 54 months to 5th grade was characterized by a linear increase throughout the primary school years and a nonlinear decrease in the magnitude of growth rates. Two forms of growth pattern could be considered a reasonable approximation of the social growth of children. Table 8 presents two aspects of the findings by (1) the free-loaded model which describes the children's social growth by initial level and the following nonlinear growth in which factor loadings are freely set and (2) the quadratic model which describes them by initial level and two properties of following growth in which factor loadings are fixed both as linear and quadratic (see Appendix A for model estimation and figures).

Table 6. Parameter estimates of the unconditional growth curve model of social competence (N=1162)

	<i>Free-loaded model</i>			<i>Quadratic Model</i>		
	α	β		α	β_1	β_2
Means	98.35	8.91		93.84	5.07	-0.47
Variance	154.11	115.72		165.54	40.55	0.63
Covariance	-37.80		$\alpha_ \beta_1$	-32.34		
			$\alpha_ \beta_2$	2.59		
			$\beta_1_ \beta_2$	-4.75		

Note. α indicates the intercept as initial starting level in the growth model.
 β_1 indicates the slope as changes or growth rate over the study period.
 β_2 indicates the change of growth rate (=change of change).
Italics indicate the value is statistically significant at $\alpha=.01$ level.

The model fit of the free-loaded model was fair according to the moderate RMSEA index ($\chi^2(12)=121.57, p<.0001, CFI=0.975, RMSEA=0.089 [CI: .075, .103]$).

The quadratic curve model fits the data better ($\chi^2(12)=59.47, p<.0001, CFI=.989$,

RMSEA=0.058 [CI: .044, .074]). The significant slope estimates (β_1 , β_2) from the quadratic model clarified the growth patterns of social competence. This indicates that, on average, children have a positive linear growth component (β_1) in their trajectories. The mean of the quadratic latent growth curve factor (β_2) is -0.47, indicating that, on average, the curve increases less steeply as age increases. As depicted in factor loadings of the free-loaded model as well (see Appendix A), there is a positive increase in social competence from 54 months to 5th grade, but the time adjacent increases of the means are not equal over time and become smaller in magnitude in later years than in earlier years. By looking into the two forms of growth modeling for social competence, the growth pattern of social competence was better understood: Initial points of social competence at 54 months were significant precursors of social growth of children in the following years. It is understood that children starting with higher social competence stay high in social growth throughout the following years. It was validated that the estimation by the free-loaded growth was a reasonable description of data as well, although fit indices of the free-loaded model were less favorable⁷.

Taken together, *both* trajectory models explain social competence in the data as follows in common: variance components show there are significant interindividual differences in both starting point and linear and nonlinear rates of change over time. The significant negative covariances among latent factors also imply that, on average, individual children who showed higher social competence at the initial time point of 54 months tended to report less steep slopes for the following school years. Children who

⁷ For analysis of the conditional full model in the next section parameters of the free-loaded model will be used for social competence, rather than using those from the quadratic model. This is for better model convergence and better interpretation of results.

showed larger increase rates in early years tended to show relatively smaller increases and stabilize in later years. Residual variances were all significant, and the high R^2 (from 0.67 to 0.84) indicate that the trajectories are a good prediction of the variances of social competence over time. Thus hypothesis 1.2 was supported.

Growth modeling of academic achievement

Growth curve modeling of academic achievement is comprised of four assessments, measured at 54 months, 1st, 3rd, and 5th grade. The free-loaded growth model of academic achievement fit data reasonably well [$\chi^2(3)=16.84, p=.0008$, CFI=.996, RMSEA=.063 [CI:.036, .094]].

Table 7. Parameter estimates of the unconditional growth curve model of academic achievement

	<i>Free-loaded model</i>	
	α	β
Means	<i>98.15</i>	<i>9.69</i>
Variance	<i>93.21</i>	<i>25.56</i>
Covariance	<i>4.27</i>	

Note. Italicized font indicates that the value is significant at $\alpha=.001$ level.

There were significant interindividual differences in the starting level at 54 months and the slope of academic achievement over time, but no significant associations were found between the starting level of academic achievement at 54 months and the following growth rate. The initial starting point of academic achievement at 54 months was not a significant barometer for the following academic growth rates of children during elementary school years. Thus the hypothesis 1.3 was not supported.

In summary, concerning hypothesis one, the parameter estimates by *nonlinear* LGCM provided useful information for describing the developmental process of social competence and academic achievement, but the three child outcomes seem to follow

different developmental patterns over time – i.e., varied attachment changes existing in the secure and insecure attachment quality, *quadratically* growing in social competence with significant relationship between initial level and following growth rate of social competence, but no specific relationship between initial level and growth rate in academic achievement. Those developmental domains have different growth patterns: While the social competence before school entry (54 months) is significant baseline for the following social growth of children during elementary school years, the academic achievement level at that point is not significantly critical for the following academic growth of children. Academic achievement seems relatively more open to influences of other ecological factors, rather than the earlier level of academic achievement of themselves.

In the following section, these established growth parameters will be connected to each other and to other factors of interest as regressed on child outcomes. This is to test the hypotheses of study (hypotheses 2, 3, 4). For the attachment outcomes, however, original separate measures of each assessment will be used to investigate theoretical models because the growth modeling of attachment failed to reflect the properties of attachment changes.

Constructing full theoretical model

The unconditional null model with only growth models of child outcomes fit the data well. As the regression impacts of predictors (income, child care, attachment) and covariates (maternal sensitivity, mother's verbal intelligence, etc.) were added to the child growth outcomes of attachment, social competence, and academic achievement, there were significant drops of chi-square values, and the model fits improved

(conditional model 1,2,3). This implies that child growth outcomes are explained reasonably well by predictors and covariates of this study.

Table 8. Constructing a full theoretical model

Model ⁸	χ^2 (df)	p-value	CFI	RMSEA [CI]	$\Delta\chi^2$ (Δdf)
Null model	320.44 (68)	< .0001	.969	.054 [.048, .060]	Not applied
Conditional model 1.	294.20(101)	< .0001	.978	.037 [.033, .042]	73.76(33) ***
Conditional model 2.	242.11 (92)	< .0001	.983	.035 [.029, .040]	52.09(9) ***
Conditional model 3.	244.90 (93)	< .0001	.984	.034 [.029, .040]	2.79 (1)
Final model	245.62 (94)	< .0001	.984	.034 [.029, .040]	0.72 (1)

*** $p < .001$

When the linear relationships among growth factors of social competence and academic achievement were specified as the slope was regressed on the initial starting level in the final model, it did not significantly improve chi-square model fits. However, by adding them, it clarified developmental associations between starting points and growth rates. Thus, the impact of initial starting level on later growth rate was incorporated into the final model.

To clarify the impact of mother's verbal intelligence on child outcomes, nested model comparisons with *versus* without the mother's verbal intelligence were implemented. This showed significant increases in chi-square values (i.e., $\Delta\chi^2$ (Δdf) = 26.93 (2), $p < .001$) by eliminating the impact of mother's verbal intelligence in the model. This means the model fit significantly worsened without the impact of mother's verbal

⁸

- Null model: Composed of repeated measures of attachment, growth models of social competence and academic achievement
- Conditional model 1: *Adding* regressions of attachment as outcome variable
- Conditional model 2: *Adding* regressions of social and academic growth as outcome variable
- Conditional model 3: *Adding* regressions of child care quality and maternal sensitivity as outcome variable
- Final model: *Adding* regressions between growth factors (specified as *slope regressed on initial level*)

intelligence on child outcomes, so mother's verbal intelligence was kept as an important covariate in the full model.

Adding an association from maternal sensitivity on child care quality was also tested as an exploratory alternative model. It was tested as a saturated partial model and there was no significant effect from maternal sensitivity (6-15 months) to child care quality (15 months) ($b=0.23$, $\beta=0.07$, $t=1.54$). Thus, it was not included in the final model.

The final model was constructed as hypothesized (Figure 2), dropping the growth modeling part of attachment. No further specification procedure was necessary. Overall, the model showed good fit ($\chi^2(94) = 245.62$, $p<.001$, CFI = .984, RMSEA = .034). The model accounted for sizable variance in the observed repeated measures of social competence and academic achievement (R^2 ranged from .67 to .96), and the moderate amount of latent variables of social and academic growth factors - for the initial level and the growth slope of social competence, $R^2 = .14$ and $.16$, and for the initial level and the growth slope of academic achievement, $R^2 = .47$ and $.07$, respectively.

Test of theoretical model

All direct impacts among variables were applied as hypothesized and tested in the full theoretical model for the whole sample. Table 12 presents standardized path coefficients of associations among factors and between early factors and child outcomes. In figures (Figures 3, 4, 5, 6), results are presented separately according to outcome variables, which were tested simultaneously in an analysis and, for better depiction of results, only significant paths are presented. Results are discussed according to main hypotheses of effects of child care and attachment on child outcomes. Influences of

maternal factors and other covariates also briefly are reported and compared to those of child care and attachment.

Table 9. Results of theoretical model test (N=1,364)
:Standardized coefficients (β) of direct associations among factors for all children ⁹

DV IV	MS	CCq	Att15	Att24	Att36	SCinl	SCslp	AAinl	AAslp
Income	0.19***	0.15***	0.04	-0.002	0.02	0.07[†]	0.03	0.14***	-0.06
MS			0.08[*]	0.13***	0.06[†]	0.10**	0.04	0.15***	-0.13[*]
MV	0.39***	0.04	-0.02	0.17***	0.10**	0.16***	0.18***	0.33***	0.11[†]
CCqual			-0.04	0.05	-0.02	0.001	0.03	0.15***	-0.06
CChour	-0.03	-0.17***	-0.02	-0.01	0.02	0.05	-0.03	0.08**	0.03
Gender	-0.04	-0.16***	-0.03	-0.09**	0.06[*]	0.19***	-0.07[*]	-0.03	0.06
Att15						0.06[†]	0.04	0.08**	-0.11[*]
Att24						0.09**	0.08[*]	0.09**	-0.03
Att36						0.04	0.07[*]	0.10**	-0.002
SCinl							-0.35***	0.18***	-0.09
SCslp									0.12[*]
AAinl									0.13

[†] $p < .10$, ^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$

Model fit: $\chi^2 = 245.62$ (94), $p < .0001$, CFI=.984, RMSEA=.034 [.029, .040]

Note. Blank means not applied. Bolded values are statistically significant.

Figure 3 indicates the part of results regarding child care quality and maternal sensitivity as outcomes. Early caregiving quality was measured by maternal sensitivity and nonmaternal care observations of caregiver's sensitivity (child care quality). Both child care quality at 15 months and maternal sensitivity from 6 to 15 months were significantly influenced by early family income from the child's birth to 6 months. More family income predicted children's receiving relatively more sensitive care both from their mothers and from caregivers in the child care setting.

⁹ Abbreviation:

Incom=Income(0-6m), MS=maternal sensitivity(6-15m), MV=mother's verbal intelligence, CCqual=child care quality(15m), CCh=child care hours(0-15m), Att15=attachment(15m), Att24=attachment(24m), Att36=attachment(36m), SCinl=initial level of social competence (54m), SCslp=growth slope of social competence (54m-5th), AAinl=initial level of academic achievement (54m), AAslp=growth slope of academic achievement(54m-5th).

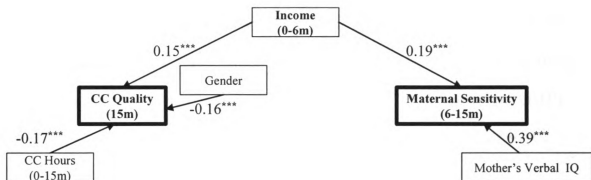


Figure 3. Results of theoretical model test: Part 1. Standardized direct effects for child care quality and maternal sensitivity (*continued*)

For child care quality, there were gender differences and the negative relationship with child care hours. Boys tended to receive less sensitive responses and care at child care centers at 15 months of age, and the more hours spent in child care, the less sensitive child care was observed. There were no significant associations between child care and maternal sensitivity, and no gender differences in the quality of maternal sensitivity, but the sensitivity was influenced largely by the mother's verbal intelligence.

Figure 4 presents part of the results on attachment as the outcome variable. For all children, there were no direct child care effects on attachment at 15, 24, and 36 months; nor was there direct effect of income on attachment. The effect of maternal sensitivity on attachment was consistently significant across assessments, but the effect sizes of the regression coefficients were modest and the effect on the 36 month attachment was marginally significant at $\alpha=.10$ level ($t=1.67$). Interestingly, mother's verbal intelligence was also directly associated with child's attachment at 24 and 36 months. Considering the direct impact from mother's verbal intelligence to maternal sensitivity (Figure 3), mother's verbal intelligence seems to have both direct and indirect effects, through

maternal sensitivity, on the attachment of children. However, explained variances of attachment outcomes were low ($R^2=.01, .09, .03$, respectively for 15, 24 and 36 months of attachment). Low R-squares of attachment variances explained by maternal sensitivity and direct associations between mother's verbal intelligence (PPVT scores) and child's attachment lead to a revision of the hypothesis of sensitivity-security in attachment formation.

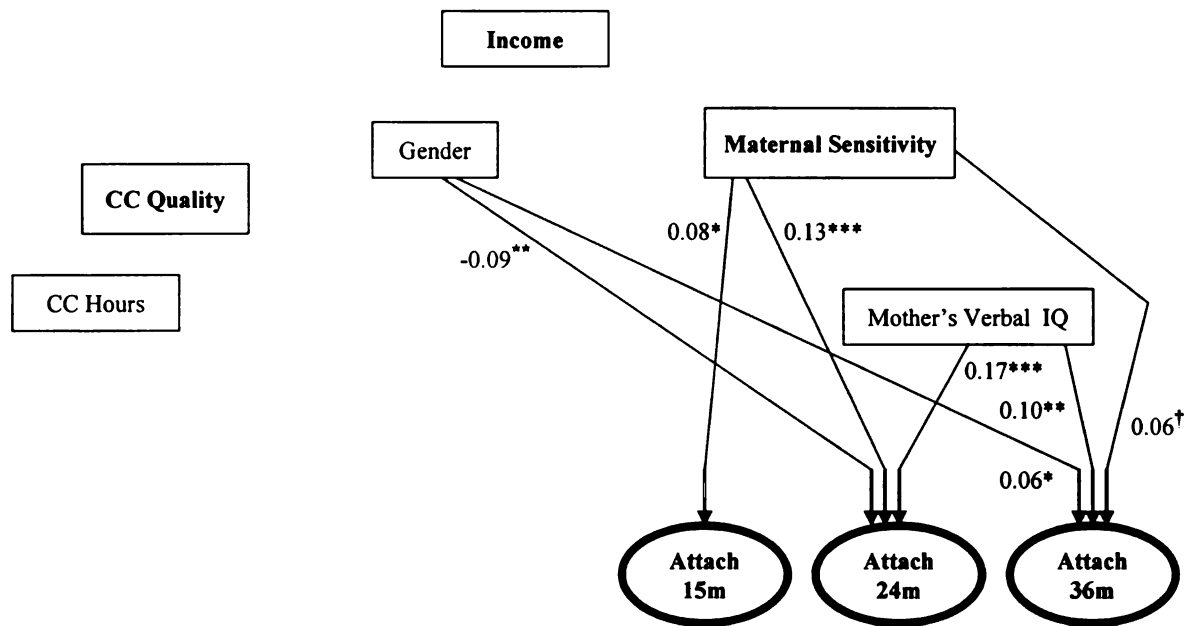


Figure 4. Results of theoretical model test: Part 2. Standardized direct effects for the attachment outcome (*continued*)

Gender was significant, but the relationship changed over time: A higher percentage of girls were securely attached to their mothers at 24 months, but at 36 months, relatively more boys were securely attached to their mothers. This implies there can be a different developmental maturation in the attachment formation for boys and girls as children become older and learn more language in the early years of child life. It

is assumed that the differences in the attachment measures across 15, 24, 36 months are also a reason for the gender effect on attachment.

For social competence (Figure 5) ($R^2=.14, .16$), there was no direct child care effect in terms of sensitive care quality and quantity. Early child care experience at 15 months was not sustained for the social growth outcomes of children from 54 months to 5th grade. Except for the child care effect, most predictors were associated positively with initial social competence at 54 months. There were significant direct impacts from early family income ($t=1.94$), maternal sensitivity and mother's verbal intelligence, gender, and attachment.

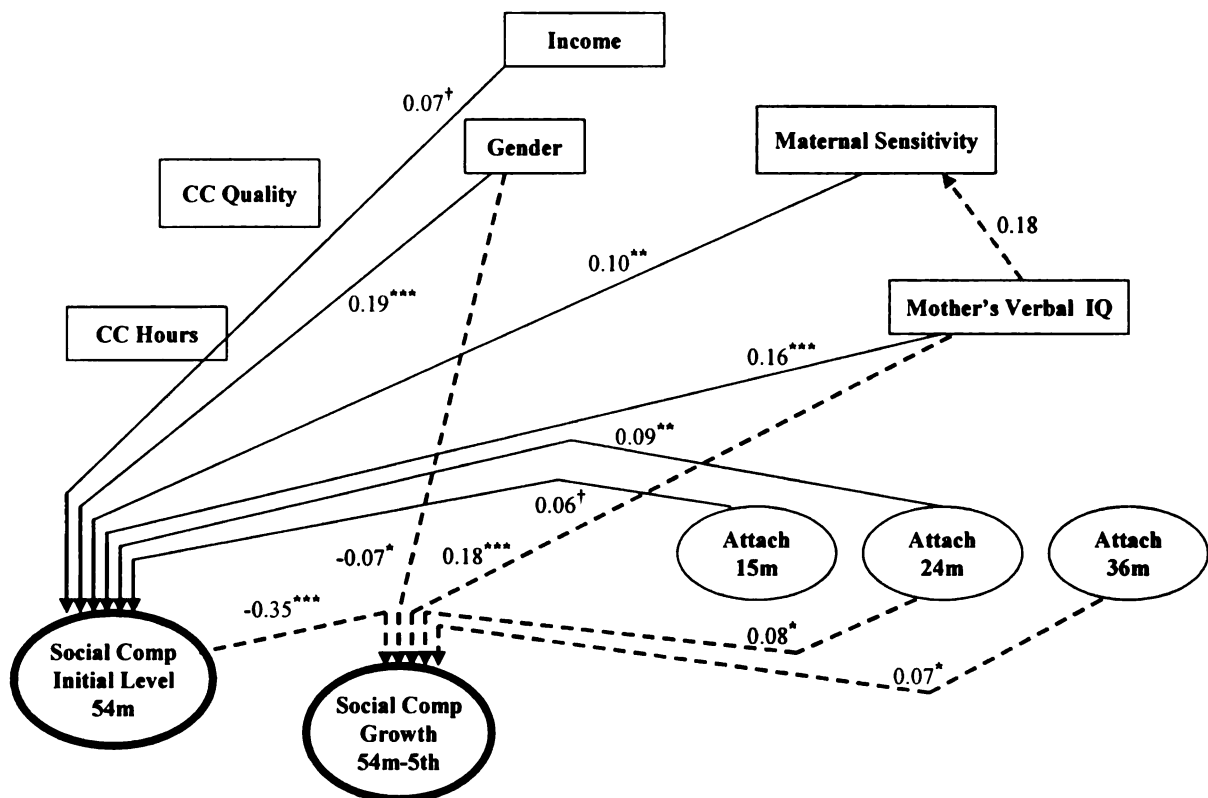


Figure 5. Results of theoretical model test: Part 3. Standardized direct effects for social competence (*continued*)¹⁰

¹⁰ For better presentation of results, the regression lines are differentiated as straight and dashed for each outcome.

The effect of attachment on social competence was significant not only for the initial level but also for the growth rate of social competence. Children securely attached at the earlier time periods were more socially competent at 54 months and in that respect growing even more rapidly from 54 months to 5th grade. The positive attachment continuity on social competence was supported from 15 month and 24 month attachments, but there was no significant effect of 36 month attachment on initial social competence. However, effect sizes of attachment were modest and smaller than those of mother's influences.

Maternal sensitivity and mother's verbal intelligence were positive predictors of initial social competence at 54 months, and mother's verbal intelligence also related to a steeper growth rate of the child's social competence. Considering the significant effects of maternal sensitivity and mother's verbal intelligence on the formation of *attachment* (Figure 4), the child's security seems to also work as a mediator of the effects of early mothering and early family income on social outcomes. However, there was no contribution of child care experience either for attachment formation or for social growth of children. Thus there was no mediating role of child care experiences for the child's attachment and social competence.

There were gender differences in the initial level and the growth of social competence. Initially, boys were more socially competent than girls, but the growth rate was slightly greater for girls. Thus, initial gender difference in social competence would be lessened or disappear in later school years (See Appendix D). Looking into the regression on initial level from growth rate, there was negative relationship between

initial social competence and following growth rate of social competence, as validated in the former analysis of hypothesis 1.2.

Concerning the outcomes related to academic achievement (Figure 6) ($R^2=.47, .07$ respectively for the initial level and the growth rate), unlike the non-significance of child care on social outcomes, both child care quality and hours had positive impact on the initial academic achievement of children at 54 months. Early attachment security also was positively associated with the initial academic achievement at 54 months, but there were no further positive effects of child care and attachment on the *growth slopes* of academic achievement.

The negative impact of attachment at 15 months on the growth slopes of academic achievement indicates that securely attached children at 15 months have started with higher academic achievement levels at 54 months and growth rates might become less steep, compared to those of insecure children who started with relatively lower achievement level at 54 months.

Maternal sensitivity and mother's verbal intelligence were also significant predictors of children's initial academic achievement at 54 months, and the effect size of mother's verbal intelligence was largest, even leading to steeper growth slopes of academic achievement. Early family income showed a direct impact on initial academic levels, too, but there were no gender differences in the initial level, or the growth rate of academic achievement.

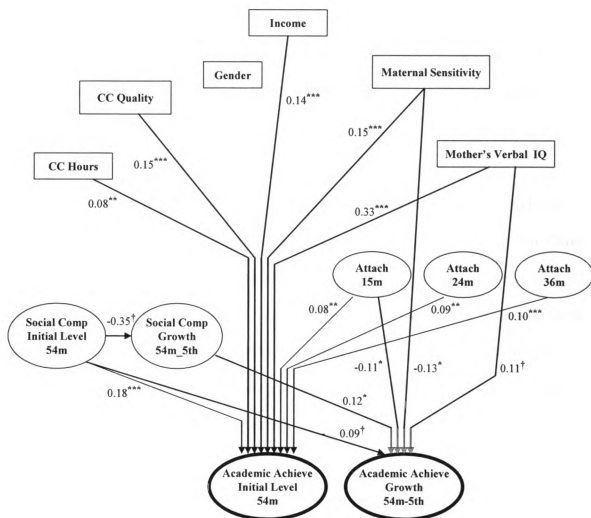


Figure 6. Results of theoretical model test: Part 4. Standardized direct effects for academic achievement

Concerning inter-domain associations within a child (hypothesis 4), social growth was related to academic growth of children. Those who started with higher social competence tended to higher academic achievement also, at the initial time point of 54 months; children socially growing fast for the following school years tended to academically achieve fast also; children who started with higher social competence at 54 months tended to have smaller growth rates of social competence and academic achievement compared to the rates of children who started with lower social competence.

This makes sense children starting at high levels of social competence or academic achievement tended to stay high in those levels. Therefore, developmental pathways among attachment, social competence, and academic outcomes seem significantly interrelated within a child.

Summary of full model analysis result for all children (Hypotheses 2,3,4)

Overall, there appear to be no substantial direct connections bridging child care influences and attachment continuity to the social and academic growth of children. Child care quality and hours were significant only for the initial academic achievement at 54 months, but not for attachment and social competence. Child care effects were not related to maternal factors, either. There were no discernible differences in the effect of child care quality and hours on child outcomes: For academic achievement, both quality and hours were significantly related; and for attachment and social competence, neither quality nor hours of child care were related.

Across time points, child's attachment security was a significant predictor not only for social (except for the 36 month attachment) but also for academic outcomes, even when the effects of maternal variables were controlled. As posited theoretically, sensitivity-security links were consistently significant for attachment outcomes, but R-squares were low. Mother's verbal intelligence has shown stronger influences in direct effects for all child outcomes (including attachment) than have those of maternal sensitivity. This seems to go further from the established knowledge of sensitivity-security associations in attachment literature. Based on results, a re-question arises regarding explanatory power and deeper mechanism of sensitivity-security link in the formation of attachment.

Growth of social competence was related significantly to academic achievement in a concurrent fashion in this study, meaning that an important pathways to children's academic achievement is via their social growth trajectories. Based on these results, the within-child developmental domains of attachment security, social competence, and academic achievement are assumed interdependent in child development, while each growth outcome was differently influenced by early factors of child care and maternal variables.

The impact of early family income continued to have a direct influence on the child's social and academic growth from 54 months through 5th grade, though not for attachment. It is assumed that the income effect is consistently significant for child growth and also working indirectly through mothering and child care experience onto child outcomes. Attachment and social competence are assumed to function as intra-child mediator transferring the early impact of the caregiving environment to their growth outcomes. To validate the mediated pathways and better understand processes leading to different starting points and growth rates of child outcomes, indirect paths were investigated in the following section.

Mediation analysis: Testing indirect effects

One of the purposes of this study is to understand major pathways leading to the social and academic growth of children who experienced early child care and maternal care and formed their own mental script of the attachment relationship. This study primarily questioned how attachment security plays an important developmental role linking early factors and child outcomes and how much the early factors are transferred

through the early child care experience in leading to children's growth trajectories (hypothesis 5).

A finding from the mediation test was that early child care experience and child's attachment security mediated the early influence of income and mother to children's social and academic growth, respectively. Overall, direct impacts of income, mothering, child care, and attachment on child outcomes were larger than indirect impacts as mediators, but the indirect paths provided the processes of influence in leading to the growth trajectories (Table 13).

For attachment outcomes, there were no direct effects of income; instead, the indirect effects through maternal sensitivity and the mother's verbal intelligence were considerable. For those fully mediated pathways, attachment security was a significant mediator for social and academic trajectories of children transferring the quality of earlier caregiving environment to their later growth, although the greater part of the early experiences was continued both directly from and indirectly through maternal factors. This matches earlier parenting studies (e.g., Bradley et al., 1989, 2001; Morrison & Cooney, 2002; Shonkoff & Philips, 2000, NICHD-ECCRN, 2002b, 2003a) and the attachment hypothesis of maternal sensitivity (e.g., Ainsworth et al., 1978; DeWolff & van IJzendoorn, 1997; Main et al., 1985).

Table 10. Standardized estimates for selected direct, indirect, and total effects

Paths in the model	Total	Direct	<u>Indirect</u> <u>Total</u> Indirect Specific
1. In the final full model			
Income → Initial AA	0.22***	0.14***	0.08***
Income → Mat Sen → Initial AA			0.03***
Income → CC Qual → Initial AA			0.02**
Income → Initial SC → Initial AA			0.01 [†]
Income → Mat Sen → Att24m → Initial AA			0.002 [*]
Income → Mat Sen → Initial SC → Initial AA			0.003 [*]

<u>Mat Sen</u> → Initial AA	0.20 ^{***}	0.15 ^{***}	0.04 ^{***}
Mat Sen→ Att15m → Initial AA			0.006 [†]
Mat Sen→ Att24m → Initial AA			0.012 [*]
Mat Sen→ Initial SC → Initial AA			0.017 [*]
Mat Sen→ Att24m →Initial SC → Initial AA			0.002 [*]
CC Qual→ Initial AA	0.15 ^{***}	0.15 ^{***}	0.00
CC Qual→ Growth AA	-0.03	-0.06	0.03
CC Qual→ Initial SC	0.002	0.001	0.001
CC Qual→ Growth SC	0.03	0.03	0.00
2.When adding indirect paths via <i>mother's verbal IQ</i>			
<u>Income</u> → Initial AA	0.41 ^{***}	0.14 ^{***}	0.27 ^{***}
Income→ Mat Sen→Initial AA			0.03 ^{***}
Income→ <u>CC Qual</u> →Initial AA			0.02 ^{**}
Income→ Mother's Verb IQ→Initial AA			0.13 ^{***}
Income→ Mother's Verb IQ→ Mat Sen→Initial AA			0.03 ^{***}
Income→ Mother's Verb IQ→ Att24m→Initial AA			0.01 ^{***}
Income→ Mother's Verb IQ→ Initial SC →Initial AA			0.01 ^{**}
Income→ Initial SC →Initial AA			0.01 [†]

Note. This table does not show all significant indirect paths. Paths are selected, based on hypotheses.

As the significance of the child care context was revealed only with respect to children's academic achievement, the impact of early family income was transferred to the academic growth of children through their earlier experiences of sensitive child care (child care quality). These relations did not hold for social competence in children. There was no indirect effect through child care hours.

Children's social competence was also a significant mediator transferring effects of early factors - income and maternal sensitivity - to children's academic outcomes but not early child care experience. It appears that the child care effect is independent of the attachment phenomena and has separate pathways of influence with children's academic growth.

When adding the association between income and mother's verbal intelligence, the indirect effect size enlarged. Although specific effect sizes were small, there were

consistent pathways starting from the early family income and influencing the mother's verbal intelligence and then maternal sensitivity, finally leading to children's social and academic outcomes. Pathways through the mother's verbal intelligence for attachment formation and attachment continuity, though not hypothesized in this study, seem to imply a further mechanism beyond the sensitivity-security associations in attachment formation and accordingly in attachment continuity.

Summary of mediation tests (Hypothesis 5)

No definitive conclusions about causation or direction of effects are drawn from these indirect pathways; however, from this mediation analysis, separate direct associations between early factors and child outcomes were understood as coherently interconnected in a fully mediated and time-ordered way. Attachment and social competence were significant within-child developmental mediators between early factors and child (social and) academic outcomes. This also shows attachment continuity to social and academic development and the sensitivity-security hypotheses were validated in data, as hypothesized by attachment theory. But the effect of the mother, specifically the mother's verbal intelligence, was stronger and appeared to have a more direct influence on child outcomes (including attachment). There was also an indirect effect on the attachment phenomena. Overall, the process of attachment effect on child's growth outcomes – 'attachment continuity' – was different and independent from the process of child care effects in leading to the children's social and academic growth. The growth of academic achievement seems to be influenced by nonmaternal child care experiences and the child's own developmental base – i.e., earlier attachment security and social competence.

In the single model analysis, distinctions among groups have not been made, and this has assumed that the sample is homogeneous, in which a single model and single set of parameters are appropriate. Growth patterns and processes for social and academic outcomes might differ across ethnic and socioeconomic groups. Ignoring group differences has the potential for biased and inconsistent estimators. Thus, investigation of processes across ethnic and socioeconomic subsets of families will clarify when and how children's gaps in initial levels and in growth rates differ or are invariant in being traced back to early experiences of child care and attachment security.

Group comparison by ethnicity and poverty history

Growth outcomes of attachment, social competence, and academic achievement of children are compared across groups to assess whether there are significant group differences in initial levels and growth rates of children according to ethnicity and the poverty history of families. Then, group comparisons of the full model are implemented to assess whether there are significant differences in the nature and degrees of child care effects and attachment continuity across groups (hypothesis 6).

Table 11. Frequencies of the child's ethnicity and the poverty history of families¹¹

<i>Child's Ethnicity</i>	<i>Frequency</i>	<i>%</i>
African American	173	12.7
White American	1,042	76.4
Hispanic American	83	6.1
Others	66	4.8
Total	1,364	100.0

¹¹ 1. The 'others' category includes Native American (N=2), Asian (N=19), and others (N=45). Due to the small sample size and the different background characteristics, the 'others' group was not included in the ethnic group analyses.

2. The distinction between early and late is the 3 year time-point. 'Early poor' indicates that the family was in poverty from child's birth to 36 months old, but not after 36 months. 'Late poor' indicates that the family was not poor until the child was 3 years old, but, after the first 3 years, the family sank below the poverty line and was poor until the child was 6 years old (3–6 years old).

<i>Poverty history of Family</i> (0-6 years)	<i>Frequency</i>	<i>%</i>
Never Poor	706	51.8
Poor Late (Early not poor)	73	5.4
Poor Early (Late not poor)	82	6.0
Always Poor	224	16.4
Total	1,085	79.5
Missing	279	20.5

Criteria for group comparisons for this study are ethnicity and the poverty history of families as experienced during the first six years. Table 14 presents frequencies of ethnicities and the poverty histories of families. Three ethnic groups –African American, White American, and Hispanic American - will be used for group comparisons by ethnicity. Poverty history is based on the timing and duration of having experienced poverty in the first six years of child life. Four groups of never poor, poor late, poor early, and always poor were used for group comparisons by poverty history. Mean comparisons of early factors are presented in Tables 15 and 16. Averaged growth curves of social competence and academic achievement across groups are presented in Figures 7, 8, 9, 10.

Table 12. Mean comparison of early factors for ethnic groups

Groups	African American (N=173)	White (N=1,042)	Hispanic (N=83)	ANOVA F (df=2)
Variables				
Income (0-6m)	1.52	3.66	2.52	44.80 ^{***}
Maternal Sensitivity (6-15m)	-0.78	0.15	-0.23	98.28 ^{***}
Child care quality (15m)	13.28	14.85	13.45	13.02 ^{***}
Mother's verbal intelligence	80.40	102.69	90.94	115.10 ^{***}
Child care hours (0-15m)	19.57	18.94	19.42	0.144 ^{ns}

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

Note. See Appendix B for post-hoc tests.

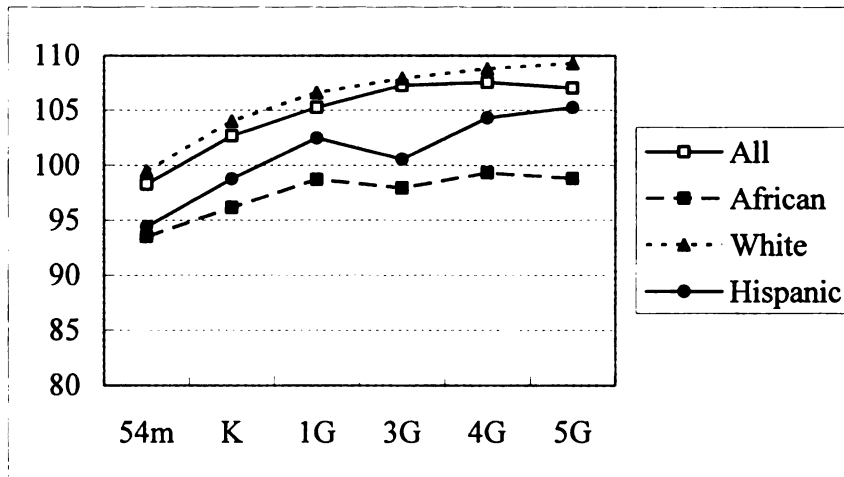


Figure 7. Growth of social competence by ethnicity

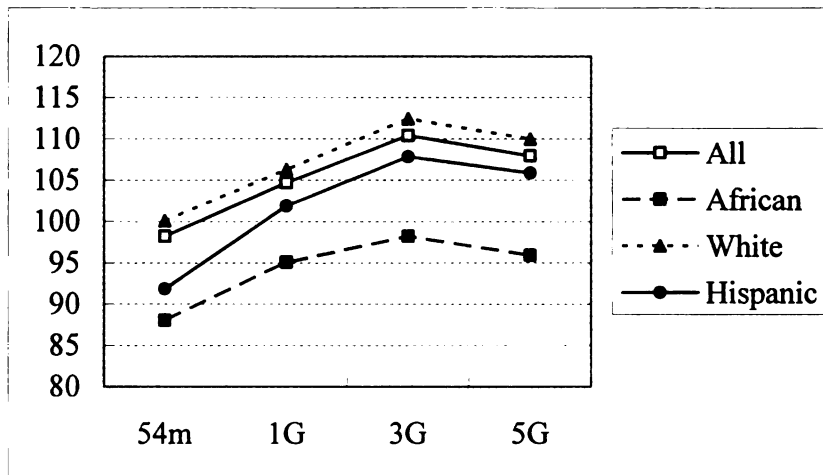


Figure 8. Growth of academic achievement by ethnicity

There were consistent differences in the mean levels of variables across ethnic and poverty history groups, except for child care hours for ethnic groups and child care quality and hours for poverty groups (see Appendix B for full results of mean comparisons and post-hoc tests). Specifically, African American children in ethnic groups and always-poor children in poverty history groups were placed in the relatively lowest position in the mean values, in terms of low-income, comparatively lower quality of child care and mother's sensitivity, as well as lower scores on child outcome measures.

Table 13. Mean comparisons of early factors for poverty history groups

Variables	Groups	Never poor (N=706)	Early poor (N=73)	Late poor (N=82)	Always poor (N=224)	Mean Comparison ANOVA F (df=3)
Income (0-6m)		4.39	1.56	2.29	1.11	131.28***
Mat sen (6-15m)		0.23	-0.21	-0.16	-0.50	52.47***
Child care quality (15m)		14.92	15.19	14.10	13.66	5.29***
Mother's verbal IQ		104.58	93.99	94.17	86.87	64.80***
Child Care hours (0-15m)		22.04	18.23	19.77	13.64	17.53***

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

Note. See Appendix B for post-hoc tests.

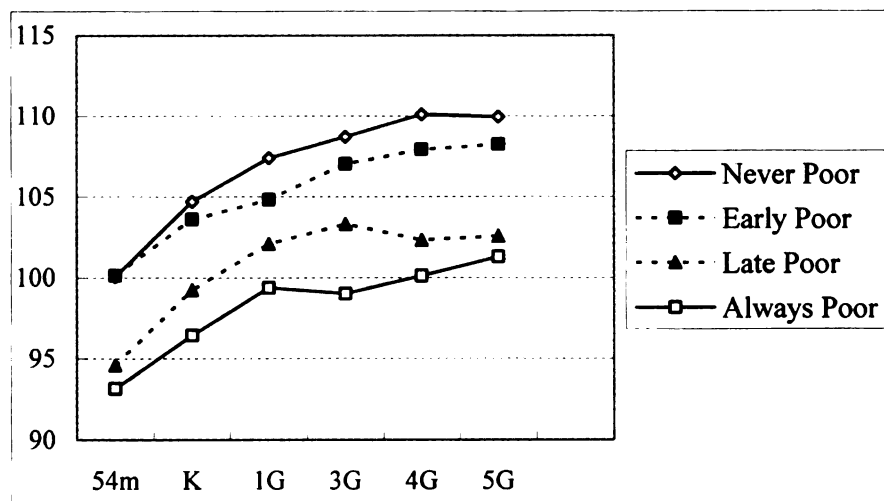


Figure 9. Growth of social competence by poverty history

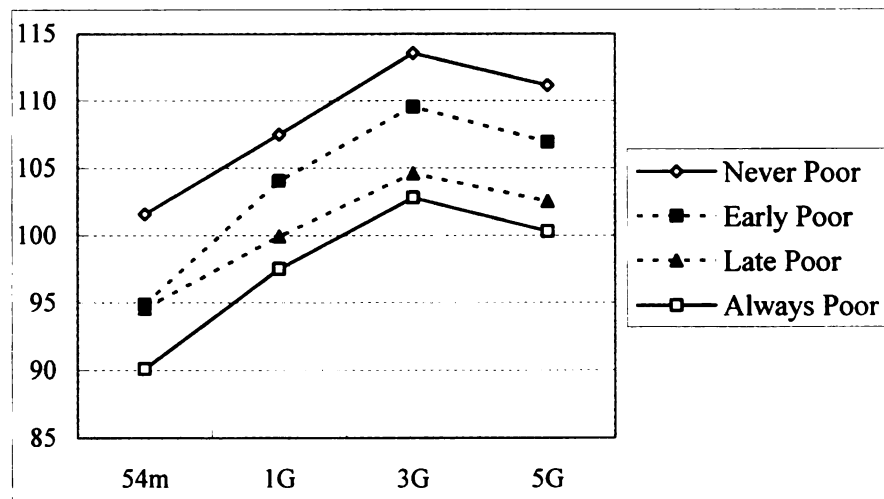


Figure 10. Growth of academic achievement by poverty history

The NICHD data collections were based on random selection at each sampling site, but that does not necessarily mean that subjects are representative of a population. This consistent lower position of African American group means needs to be considered for the analysis and interpretation of results. Inherent socioeconomic gaps and cultural differences may not be fully controlled and separated in this study's model despite analytic controls and separate group analysis having been conducted.

Because the growth modeling of binary attachment was inadequate to read the attachment's variances and changes over time, comparison of attachment growth factors could not be implemented. Instead, the 'attachment change' as stability and instability of attachment security at 15 months and 36 months was added as group criteria by categorizing samples into groups according to nominal change patterns of securities– e.g. stably secure, secure at 15 months but insecure at 36 months. This is applied as an alternative way of parameterizing the properties of attachment change over time as an overarching moderator for the social and academic growth of children. Table 17 shows the frequencies of each category of the (in)stability of attachment quality.

Table 14. Four categories of attachment changes (15-36m) and its frequencies ¹²

<u>Categories</u>	<u>Securites at 15m-36m</u>	<u>Frequency</u>	<u>%</u>
0-0	Insecure - Insecure	164	15.5
0-1	Insecure - Secure	242	22.9
1-0	Secure - Insecure	235	22.1
1-1	Secure - Secure	419	39.6
Total		1,060	100.0
Kappa=.045 ($p=0.15$)			

¹² Crosstabulation of attachment changes (15-36m) by ethnicity

	<u>0-0</u>	<u>0-1</u>	<u>1-0</u>	<u>1-1</u>
African American	32	24	31	33
White	116	191	185	341
Hispanic	9	19	8	23
(Total N=1,012)	(157)	(234)	(224)	(397)

Note. 0 indicates insecurely attached, 1 securely attached at the assessment.

Forty percent of the children were stably observed as securely attached to their mothers for 15 and 36 months, but 45% underwent unstable changes between security and insecurity for the time-points. Fifteen percent of children were stably insecure in their relational securities with mothers. The agreement index by Kappa statistic was low and statistically insignificant.

Mean comparisons of attachment change group are presented in Table 18 (See Appendix B for post-hoc comparisons). Averaged growth curves of social competence and academic achievement by attachment change are described in Figures 11, 12.

Table 15. Mean comparisons of attachment change groups

Groups:	0-0 (N=164)	0-1 (N=242)	1-0 (N=234)	1-1 (N=419)	ANOVA (df=3) ^{***}
Income (0-6m)	2.94	3.51	3.26	3.60	2.66 [*]
Mat sensitivity (6-15m)	-0.28	0.09	0.03	0.08	8.74 ^{***}
Child care quality (15m)	14.70	14.91	14.90	14.61	0.45
Mother's verbal IQ	94.37	101.71	97.78	100.55	6.58 ^{***}
Child Care hours (0-15m)	18.29	21.04	19.61	19.59	1.04

^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$

According to the attachment changes, some significant differences exist in the means of predictors and child outcomes, except for child care quality and hours. Post-hoc pairwise comparisons (Appendix B) have shown that the differences in child social and academic outcomes resulted mostly from pairs of stably secure and stably insecure, but also partially from pairs of 0-1 and 1-0 groups. The maternal sensitivity of stably insecure group was significantly different from those of mothers in other groups of children.

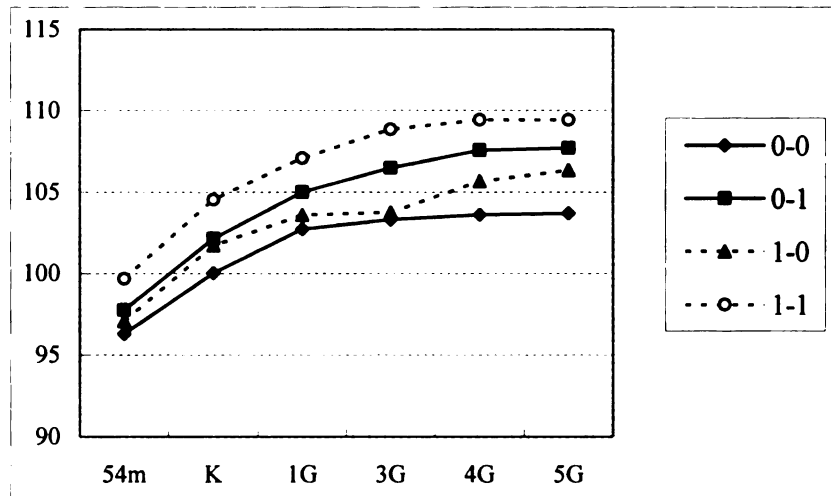


Figure 11. Growth of social competence by attachment change at 15-36 months
 Note. 0-0 indicates stably insecure, 0-1 insecure to secure, 1-0 secure to insecure, 1-1 stably secure at 15 months and 36 months.

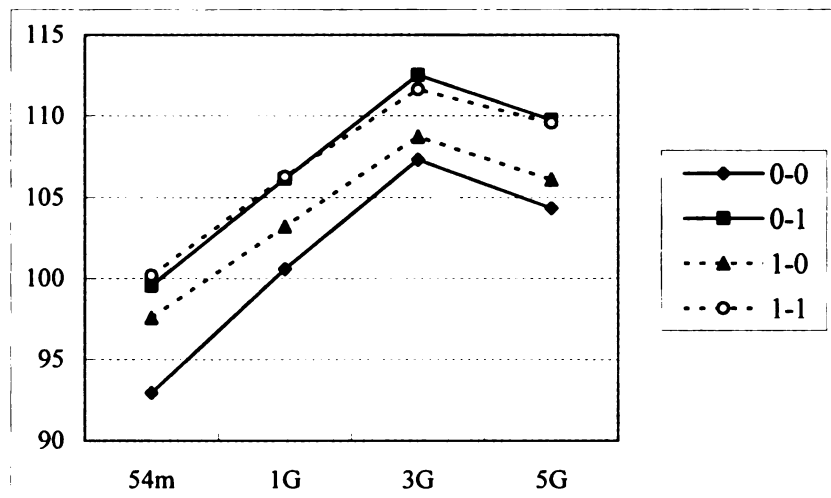


Figure 12. Growth of academic achievement by attachment change at 15-36 months

Group comparisons of growth factors

Comparison of growth outcomes by ethnicity

Mean initial levels and mean growth rates of child outcomes were significantly different depending on children's ethnic backgrounds. Concerning social growth outcomes, the White American children started with the highest social competence

scores; African American and Hispanic children started with similarly lower levels of social competence; and African American children showed the lowest growth rate of social competence per period for the following school years.

The initial social competence of White American children differed significantly from those of African American ($\Delta\chi^2(\Delta df)= 15.10(1)$, $p<.001$) and from Hispanic American ($\Delta\chi^2(\Delta df)= 5.59(1)$, $p<.05$) groups. The smallest social growth rate of African American children differed from those of White American ($\Delta\chi^2(\Delta df)= 12.77(1)$, $p<.001$) and Hispanic ($\Delta\chi^2(\Delta df)= 6.14(1)$, $p<.05$) groups.

Table 16. Growth factors of child outcomes for ethnic groups¹³

Group	Social Competence		Academic Achievement	
	initial level ^a	slope ^b	initial level ^c	slope ^d
African American	93.94	4.11	87.58	8.14
White American	99.50	9.56	100.15	9.61
Hispanic American	94.65	10.08	91.78	13.79

Note. Bold font indicates mean values to be statistically significant at $\alpha=.05$ level.

Model fits: $\chi^2(36)=127.68$, $p<.0001$, CFI=.977, RMSEA=.083.

$\chi^2(9)=20.07$, $p=0.018$, CFI=.996, RMSEA=.058.

Concerning academic growth outcomes, White American children started with the highest level of academic achievement; African American children had the lowest level

¹³ 1. In the chi-square difference test, if the $\Delta\chi^2(\Delta df=1) > 3.84$, it means the differences between two groups are significant at $\alpha=.05$ level.

2. Pairwise group comparison results by chi-square difference tests

a. Means of initial social competence:

African American \neq White, $\Delta\chi^2(\Delta df)= 15.10(1)$; African American \equiv Hispanic, $\Delta\chi^2(\Delta df)=0.10(1)$; White \neq Hispanic, $\Delta\chi^2(\Delta df)=5.59(1)$.

b. Means of social growth slope:

African American \neq White, $\Delta\chi^2(\Delta df)=12.77(1)$; African American \neq Hispanic, $\Delta\chi^2(\Delta df)=6.14(1)$; White \equiv Hispanic, $\Delta\chi^2(\Delta df)=0.07(1)$.

c. Means of academic achievement: African American \neq White, $\Delta\chi^2(\Delta df)= 111.60(1)$; African American \neq Hispanic, $\Delta\chi^2(\Delta df)=5.03(1)$; White \neq Hispanic, $\Delta\chi^2(\Delta df)=6.21(1)$.

d. Means of academic growth slope: African American \neq White, $\Delta\chi^2(\Delta df)=6.84(1)$; African American \neq Hispanic, $\Delta\chi^2(\Delta df)=10.37(1)$; White \neq Hispanic, $\Delta\chi^2(\Delta df)=6.69(1)$.

among groups; Hispanic children were between the two groups in the scores. African American children's growth rate was also relatively lower than the growth rates of the other groups. It is assumed that significant differences not only in the initial starting point but also in the growth slope reflect the persistent (or widening) gaps in academic achievement across racial groups during primary school years, as referenced in the literature (e.g., Burchinal et al., *in press*).

Comparison of growth outcomes by poverty history

Table 17. Growth factors of child outcomes for poverty history groups¹⁴

Group	Social Competence		Academic Achievement	
	initial level ^a	slope ^b	initial level ^c	slope ^d
Never poor	100.14	9.70	101.71	9.47
Late poor	94.62	7.83	94.14	8.38
Early poor	100.65	6.98	94.99	12.03
Always poor	93.07	7.39	90.01	9.74

Note. Bold font indicates mean values to be statistically significant at $\alpha=.05$ level.

Model fits. $\chi^2(48)=141.71, p<.0001$, CFI=.976, RMSEA=.085.

$\chi^2(12)=22.02, p=.037$, CFI=.997, RMSEA=.056.

¹⁴ Pairwise group comparison results by chi-square difference tests

a. Means of initial social competence:

Never \neq Late, $\Delta\chi^2(\Delta df)=11.55(1)$; Never \equiv Early, $\Delta\chi^2(\Delta df)=0.11(1)$; Never \neq Always, $\Delta\chi^2(\Delta df)=35.37(1)$; Late \neq Early, $\Delta\chi^2(\Delta df)=8.22(1)$; Late \equiv Always, $\Delta\chi^2(\Delta df)=0.73(1)$; Early \neq Always, $\Delta\chi^2(\Delta df)=17.27(1)$.

b. Means of social growth slope

Never \equiv Late, $\Delta\chi^2(\Delta df)=1.10(1)$; Never (\neq) Early, $\Delta\chi^2(\Delta df)=3.01(1), p<.01$; Never (\neq) Always, $\Delta\chi^2(\Delta df)=3.15(1), p<.01$; Late \equiv Early, $\Delta\chi^2(\Delta df)=0.15(1)$; Late \equiv Always, $\Delta\chi^2(\Delta df)=0.05(1)$; Early \equiv Always, $\Delta\chi^2(\Delta df)=0.05(1)$.

c. Means of academic achievement:

Never \neq Late, $\Delta\chi^2(\Delta df)=29.61(1)$; Never \neq Early, $\Delta\chi^2(\Delta df)=24.91(1)$; Never \neq Always, $\Delta\chi^2(\Delta df)=142.57(1)$; Late \equiv Early, $\Delta\chi^2(\Delta df)=0.21(1)$; Late \neq Always, $\Delta\chi^2(\Delta df)=8.33(1)$; Early \neq Always, $\Delta\chi^2(\Delta df)=11.31(1)$.

d. Means of academic growth slope:

Never \equiv Late, $\Delta\chi^2(\Delta df)=0.99(1)$; Never \neq Early, $\Delta\chi^2(\Delta df)=5.16(1)$; Never \equiv Always, $\Delta\chi^2(\Delta df)=0.00(1)$; Late \neq Early, $\Delta\chi^2(\Delta df)=5.33(1)$; Late \equiv Always, $\Delta\chi^2(\Delta df)=0.79(1)$; Early \neq Always, $\Delta\chi^2(\Delta df)=4.07(1)$.

The poverty history that the family experienced for the first six years after the child's birth influenced the child growth of social competence and academic achievement. Social growth outcomes differed according to timing and duration of poverty. The never-poor group of children started with the highest social competence and showed the largest growth slope. Early-poor and never-poor groups of children reported similarly high starting position of social competence at 54 months, while late-poor and always-poor groups of children started with similarly lower level of social competence. It is understood that relatively recent, time-adjacent poverty is more critical and detrimental in its effect on children's social growth (e.g., Ackerman et al., 2004a, 2004b; NICHD-ECCRN, 2005a). If children's families are not currently in poverty, negative effects of earlier poverty before three years old seem not to continue to influence their developmental trajectories.

Children's academic growth was also differently revealed according to the timing and duration of poverty as experienced in their first six years. For the initial academic achievement, the never-poor group children was the highest, the always-poor group was the lowest; the late-poor and early-poor were similarly between. The slope was highest for the early-poor group, and there were no significant differences in growth slopes among other groups.

From the comparisons, it seems that early poverty's negative effects on children's academic achievement before three years fade away, too, if economic status improves beyond poverty. Furthermore, escape from poverty appears related to the growth rate in their academic achievement. *Recent* and *chronic* poverty negatively influence not only

initial levels of academic achievement at 54 months, but also the child's academic growth rate during primary school years.

Comparison of growth outcomes by attachment changes

Differences of the means of initial social competence and growth rates were significant but with small magnitudes according to the (in)stability of attachment security. Always-securely attached children showed the highest initial social competence at 54 months and the largest growth rate, while always-insecurely attached children showed the lowest initial competence and the smallest growth rate. Differences between always-secure and always-insecure groups were consistent and statistically significant, and there were no significant differences in growth outcomes among attachment groups (0-1, 1-0) demonstrating instability.

Table 18. Growth factors of child outcomes for attachment change groups¹⁵

Group	Social competence		Academic achievement	
	initial level ^a	slope ^b	initial level ^c	slope ^d
Insecure-Insecure (0-0)	95.89	6.89	92.49	11.79
Insecure-Secure (0-1)	98.06	9.44	99.55	9.65
Secure-Insecure (1-0)	97.03	8.73	97.67	8.30
Secure-Secure (1-1)	99.83	9.64	100.12	9.76

Note. Bold font indicates the mean values to be statistically significant at $\alpha=.05$ level.

¹⁵ Pairwise group comparison results by attachment changes through chi-square difference tests

a. Means of initial social competence:

00 \equiv 01, $\Delta\chi^2(\Delta df)=2.33$ (1); 00 \equiv 10, $\Delta\chi^2(\Delta df)=0.66$ (1); 00 \neq 11, $\Delta\chi^2(\Delta df)=10.03$ (1); 01 \equiv 10, $\Delta\chi^2(\Delta df)=0.57$ (1); 01 \equiv 11, $\Delta\chi^2(\Delta df)=2.21$ (1); 10 \neq 11, $\Delta\chi^2(\Delta df)=5.74$ (1).

b. Means of social growth rate:

00 \equiv 01, $\Delta\chi^2(\Delta df)=2.65$ (1); 00 \equiv 10, $\Delta\chi^2(\Delta df)=1.28$ (1); 00 \neq 11, $\Delta\chi^2(\Delta df)=3.78$ (1); 01 \equiv 10, $\Delta\chi^2(\Delta df)=0.24$ (1); 01 \equiv 11, $\Delta\chi^2(\Delta df)=0.03$ (1); 10 \equiv 11, $\Delta\chi^2(\Delta df)=0.51$ (1).

c. Means of initial academic achievement:

00 \neq 01, $\Delta\chi^2(\Delta df)=29.34$ (1); 00 \neq 10, $\Delta\chi^2(\Delta df)=14.69$ (1); 00 \neq 11, $\Delta\chi^2(\Delta df)=39.14$ (1); 01 \equiv 10, $\Delta\chi^2(\Delta df)=2.83$ (1); 01 \equiv 11, $\Delta\chi^2(\Delta df)=0.40$ (1); 10 \neq 11, $\Delta\chi^2(\Delta df)=6.00$ (1).

d. Means of academic growth slope:

00 \equiv 01, $\Delta\chi^2(\Delta df)=3.62$ (1); 00 \neq 10, $\Delta\chi^2(\Delta df)=8.78$ (1); 00 \equiv 11, $\Delta\chi^2(\Delta df)=3.66$ (1); 01 \equiv 10, $\Delta\chi^2(\Delta df)=2.07$ (1); 01 \equiv 11, $\Delta\chi^2(\Delta df)=0.02$ (1); 10 \neq 11, $\Delta\chi^2(\Delta df)=2.87$ (1).

Model fits. $\chi^2(48)=130.15, p<.0001$, CFI=.979, RMSEA=.083, 90% CI= [.066, .100].
 $\chi^2(12)= 18.10, p=.113$, CFI=.998, RMSEA=.045

There were significant differences in academic growth outcomes also, depending on attachment stability. Always-securely attached (1-1) children and children who became securely-attached (0-1), started with similarly high levels of academic achievement at 54 months, while always-insecure children ('0-0') started with the lowest. The growth rate of children in 1-0 (became insecure) group was the lowest. Through the revealed differences in the social and academic growth of children by attachment stabilities, it is understood that not only the attachment security at specific time-points but also the (in)stability of securities over time are significant factors influencing children's social growth trajectories.

In summary, there were significant group differences in social and academic growth by ethnicity, poverty history, and attachment stability. This implies that children grow socially and academically, showing different growth patterns, initial levels, and growth rates; undergoing different growth principles according to cultural background of ethnicity, family experience of poverty, and attachment security in early childhood. Those cultural, economic, and security factors are important influences on the child's growth trajectories of social competence and academic achievement. Followed by comparisons of growth outcomes that were done, analysis of the full theoretical model across groups is implemented in the next section.

Group comparisons of child care effects and attachment continuity

In the former analysis of the full theoretical model for all samples (Figure 6-2, 6-3), there were no direct effects of early child care experience for social competence, but there were for academic achievement. Attachment continuity was significant for both

social and academic outcomes. Looking into each group according to ethnic background and the poverty history of families, however, associations between early factors and child outcomes of the social competence and academic achievement differed.

Group comparison by ethnicity

To understand group-specific processes, first, the full theoretical model for the total samples (N=1,364) was applied separately for *each* ethnic group of African American, White American, and Hispanic American children. Second, multiple group comparisons were applied to test statistical significances in group differences of child care effects and the attachment continuity on the social and academic growth of children.

Table 12. Mean comparisons of early factors across ethnic groups

Groups	All	African American	White	Hispanic	ANOVA F-test (df=2)
Income (min – max)	3.36 (.09-19.76)	1.52 (.09-8.75)	3.66 (.16-19.76)	2.52 (.22-9.01)	44.80***
Mat Sensitivity	-0.01	-0.78	0.15	-0.23	98.28***
Mother's Verbal IQ	99.01	80.40	102.69	90.94	115.10***
Child care quality	14.64	13.28	14.85	13.45	13.02***
Child care hours	19.15	19.57	18.93	19.42	0.14
Total N	1364	173	1042	83	

$p^* < .05$, $p^{**} < .01$, $p^{***} < .005$

Descriptive statistics of early factors for each ethnic group are presented in Table 15. Group differences in those factors were examined using one-way ANOVAs and revealed as consistently significant across groups. Post-hoc analyses (Appendix B) indicated that groups differed significantly in factors of early family income, maternal sensitivity, mother's verbal intelligence, and child care quality through paired mean comparisons (e.g., mean difference in maternal sensitivity between White vs. African American = 0.92, S.E.=0.07, $d=1.08$), but there were no significant differences in child

care hours across all groups or in child care quality between African American and Hispanic American groups (e.g., mean difference=0.17, S.E.=0.56, $d=.007$).

In summary, it was found that the White American group had the highest scores in the early factors, while the African American group had the lowest scores with the exception of child care hours. Analysis of the full model results for each group is presented separately according to outcomes of social competence and academic achievement of the children.

Analysis on the outcome of social competence across ethnic groups

Table 19. Group analysis result on social competence as outcome by ethnicity - Standardized coefficients (β)¹⁶

DV	Initial level of Social competence				Growth slope of Social competence			
Groups	All	African American	White	Hispanic	All	African American	White	Hispanic
N	1,364	173	1,042	83	1,364	173	1,042	83
Income	0.07 [†]			0.29 [*]				
Mat Sens	0.10 ^{**}		0.11 ^{**}			0.22 [*]		-0.30 [†]
Mat Verb	0.16 ^{***}	0.27 [*]	0.11 ^{***}		0.18 ^{***}	0.27 ^{**}	0.14 ^{**}	
CC quality		-0.32[*]						0.52 [†]
CC hours								
Attach(15m)	0.06 [†]			0.23 [†]				-0.42 [*]
Attach(24m)	0.09 ^{**}		0.07 [†]		0.08 [*]			
Attach(36m)		-0.26[*]	0.08 [*]		0.07 [*]			
Gender	0.19 ^{***}		0.19 ^{***}	0.31 [*]				-0.51 ^{**}
R ²	0.14	0.25	0.11	0.46	0.16	0.43	0.15	0.45

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

Note. Bolded values indicate key interest of group comparison in the analysis, i.e., phenomena of child care effect and attachment continuity.

¹⁶ Model fits for each ethnic group:

1. African American group: $\chi^2 = 123.00$ (94), $p = 0.024$, CFI=.971, RMSEA=.042
2. White American group: $\chi^2 = 192.84$ (94), $p < .0001$, CFI=.985, RMSEA=.032
3. Hispanic American group:
 - Stage I. Saturated: $\chi^2 = 0.00$ (0), $p = 0.00$, CFI=1.00, RMSEA=0.00
 - Stage II. $\chi^2 = 127.63$ (90), $p = 0.006$, CFI=.928, RMSEA=.071, 90% CI: [.040, .098]

African American group. There were significant but negative effects of early child care quality of 15 months and attachment of 36 months on the initial social competence. For African American children, direct influence of the mothers' verbal intelligence was a positive predictor not only for the initial levels of social competence but also for growth slopes. However, the experience of sensitive care in the early child care setting at 15 months and the attachment security the child formed at 36 months were *not positively* related to the initial social competence at 54 months for the following period from 54 months to 5th grade. There were no significant associations between child care hours and the social competence outcomes.

White American group. For White American children, there was no significant child care effect for social competence, but attachment positively influenced the initial level of social competence, although effect sizes were smaller than the maternal variables. Effects of maternal sensitivity and the mother's verbal intelligence were both significant for initial social competence, and the mother's verbal intelligence was positive enough to even lead to the steeper growth slope of social competence.

Hispanic American group. Although there was an analytic limitation to finding statistical significances due to the small sample size of Hispanic children, attachment security at 15 months was positively associated with the initial social competence. But the positive effect of child care was not revealed in the initial social competence scores of Hispanic American children at 54 months.

From these within-group investigations by ethnicity, the continuity of early child care effects and early attachment security were revealed differently across ethnic groups. The positive continuity of early child care quality and attachment security was not

manifested in *social* growth outcomes of the African American group for the period from 54 months to 5th grade, although the impact of income and maternal factors were controlled. The negative effect of child care quality on the social competence of African American children appears to be indicative of (1) the *suppressing* effect of the relatively lower quality of sensitive care they received in child care, as associated with African American families' low income circumstances (McLoyd, 1990), and (2) culturally adaptive childrearing (other than sensitivity) focusing on the child's independence for functional advantage of African American children. The negativity in attachment continuity on the social competence is assumed associated with not only (1) the relatively lower level of maternal sensitivity, as associated with their low-income conditions, but also presumably (2) *cultural uniqueness* as related to African American families' collective childrearing and diffused household composition within extended families (i.e., multiple attachment figures), and with culturally different agendas for maternal sensitivity and child's security (e.g., Jackson, 1993). Sensitive behaviors of mother and secure behaviors of child may work differently in the African American context of ethnic minority and economic disadvantages.

There were no significant child care effects on the social outcomes of White Americans. For a better understanding of group differences by ethnicity, multiple group comparisons were implemented through chi-square difference testing. The former analysis being based on separate within-group analyses of the full theoretical model, the following group comparisons test for statistically significant differences in the nature and degree of child care effects and attachment continuity.

Multiple group comparison¹⁷ of child care effects and attachment continuity on the growth of social competence across ethnic groups

Child care effects. When the effect of child care quality was compared between White American group (N=1,042) ($b=0.16^{ns}$, S.E.=0.22) and African American group (N=173) ($b=-1.49^*$, S.E.=0.73), the chi-square difference test was significant ($\Delta\chi^2(\Delta df)=4.91(1)$), but there was no significant difference between the African American and Hispanic groups ($\Delta\chi^2(\Delta df)=0.88(1)$). Primarily, it is understood that the effect of child care quality (as sensitivity) is associated with the *low-income* family environment of African American and Hispanic groups. If the family experience low income, thus accordingly if the child care quality was lower than other groups, their experiences of (low-quality) sensitive care in early child care at 15 months were *negatively* related with their later starting point of social competence as 54 months.

Table 20. Multiple group comparison of child care effects and attachment continuity on social competence across ethnic groups

Groups	African American	White	Hispanic
N	173	1,042	83
SC_initial as outcome	$R^2=0.23$	$R^2=0.11$	$R^2=0.47$
CC quality	<i>-1.49[*]</i>	0.16 ^b	-0.37 ^a
Attachment-36m	<i>-7.24^{**}</i>	<i>2.01[*]</i>	-1.75 ^a
SC_slope as outcome	$R^2=0.26$	$R^2=0.05$	$R^2=0.45$
Attachment-36m	4.58	0.71	2.43 ^a

$p^* < .05$, $p^{**} < .01$

Note 1. Model fits: $\chi^2 = 334.30(240)$, $p = .0001$, CFI=.976, RMSEA=.040

Bolded and italicized values are statistically significant ones.

a implies that there is no significant difference when compared to the African American group's.

b implies that there is significant difference when compared to the African American group's.

¹⁷ Analysis results across groups were not optimal for multiple group comparisons due to lack of statistical significances of coefficients for comparison. But (1) considering analytic limitations of the small sample sizes in ethnic minority groups and (2) considering that the group comparison is based on the changes of chi-square index as overall model fit, multiple group comparisons were not strictly limited to statistically significant coefficients. Rather, comparisons were applied as theory-driven understanding for substantial group differences in phenomena of interest.

Considering significant differences in family income and maternal factors between African American and Hispanic groups (see Appendix B), it is also assumed that African American and Hispanic group cultures relate to this negative effect of early child care quality. Based on this result, early child care quality in both *low-income* and *ethnic minority* circumstances of African American and Hispanic groups seems not to buffer positively against their economic and minority disadvantages for children's initial social competence at 54 months for the following school years. There were no considerable differences in the effect of child care hours on social growth across ethnic groups.

Attachment continuity. Whites and non-Whites showed different patterns in their attachment continuity on initial social competence at 54 months. For the African American group, this relation was negative; but it was positive in the White American group, and this difference was statistically significant ($\Delta\chi^2(\Delta df)=7.50(1)$). There was no difference between African American and Hispanic groups ($\Delta\chi^2(\Delta df)=1.20(1)$). It is understood that the 36 month attachment effect was positively influencing later social competences of White American children but not necessarily for the African American group (or the Hispanic group), and not across all time-points in the NICHD samples. Since difference exists in early family income and early factors between African American and Hispanics, perhaps the most plausible explanation is culture and also partially economics¹⁸.

¹⁸ Considering the limitation of data (i.e., small sample sizes of African American and Hispanic groups), additional *ad-hoc* analysis of group comparison was implemented by incorporating income levels of White American group. This is to disentangle the effect of income in the ethnic group comparisons, better to understand and discern group differences by ethnicity versus income in the child care effects and attachment continuity (see Appendix C for details).

There have been arguments of cultural difference in African American family functioning (Hunter et al., 1992, 1998; Jackson, 1993). An empirical study reported this kind of negative finding (Youngblade & Belsky, 1992, p15 in this study). This result matches with the revealed differences in the 24 month AQS scores between African American and White children in the NICHD study (Bakermans-Kranenburg et al., 2004, p.14 in this study). Nevertheless, it seems still counterintuitive in terms of attachment literature (e.g., Sroufe, 1996; Bohlin et al., 2000).

There were no significant differences in attachment effect as of 15 and 24 months on initial social competence across groups, while many coefficients were not significant (See the Appendix E for full results). There might be developmentally more converging timing in the phenomena of attachment continuity. As children acquire language proficiency and form more stable working models of self and the outer world through the maturation process of attachment formation, the 36-month attachment seems to work noticeably in its continuing effects, based on this result.

In sum, the child care effect and attachment continuity on social outcomes of children was revealed differently across ethnic groups. The effects of child care quality and attachment security on social competence seemed to be dependent not only on income but also considerably on the cultural background of ethnicity. The hypothesis of buffering by early child care experiences in socioeconomic adversities (e.g., Burchinal et al., 1997; Campbell et al., 2001) and the positive attachment continuity on social outcomes of children (e.g., Ainsworth et al., 1978; Sroufe et al., 1990; Bohlin et al., 2000) was not supported fully by the African American and Hispanic groups in the

NICHD study. Also there seem to be more converging and sensitive timing (i.e., 36 months) in its continuing effects.

Analysis on the outcome of academic achievement across ethnic groups

Table 21. Group analysis result on academic achievement as outcome by ethnicity

DV	Initial level of Academic achievement				Growth slope of Academic achievement			
Groups	All	African American	White All	Hispanic	All	African American	White All	Hispanic
N	1,364	173	1,042	83	1,364	173	1,042	83
Income	0.14***		0.16***				-0.11 [†]	
Mat Sens	0.15***		0.12***	0.38*	-0.13*	-0.30 [†]		
Mat Verb	0.33***	0.39***	0.29***		0.11 [†]		0.17*	
CC quality	0.15***	0.31*	0.14**					
CC hours	0.08**	0.19 [†]	0.06 [†]					
Attach(15m)	0.08**		0.09**	0.26 [†]	-0.11*		-0.11*	
Attach(24m)	0.09**	0.19 [†]	0.08*					
Attach(36m)	0.10***	0.16 [†]	0.09**					
Gender								
R ²	0.46	0.60	0.34	0.62	0.07	0.32	0.08	0.65

$p^* < .05$, $p^{**} < .01$, $p^{***} < .005$

Note. Only statistically significant coefficients were presented.

African American group. Both the effects of the early child care *quality* and *hours* were linked positively to the initial academic achievement of African American children at 54 months. Their attachment security at 24 and 36 months was also associated positively with their initial level of academic achievement, even when the mother's factors were considered. No significant factors further explained academic growth rates of African American children.

White American group. For White American children, most predictors were associated positively with initial academic achievement at 54 months. Thus, effects of early child care in terms of its quality and quantity, and attachment effects were related positively to the initial academic achievement of White American children; meanwhile

mother's verbal intelligence was most predictive of academic achievement, not only for the initial level but also for the academic growth slope.

Hispanic American group. For Hispanic American children, the effect of attachment security at 15 months was significantly linked to the initial academic achievement of Hispanic children at $\alpha=.10$ level; the effect of maternal sensitivity was highly predictive of the academic outcome. However, child care factors were not revealed as significant.

Multiple group comparison of child care effects and attachment continuity on the academic achievement across ethnic groups

Child care effects. Effects of child care quality and hours were both significant predictors of initial academic achievement in African American and White American children. When applying a multiple group comparison, no significant differences in the effects of child care quality and hours were shown across the three ethnic groups ($\Delta\chi^2(\Delta df)=2.54(2)$; $\Delta\chi^2(\Delta df)=0.85(2)$). No significant differences were found in the child care effects on the growth rate of academic achievement, either ($\Delta\chi^2(\Delta df)=1.16(2)$; $\Delta\chi^2(\Delta df)=2.37(2)$).

Table 22. Multiple group comparison of child care effects and attachment continuity on academic achievement across ethnic groups

Groups	African American	White	Hispanic
N	173	1,042	83
<u>AA initial as outcome</u>			
Child Care quality	1.13**	0.44**	
Child Care hours	0.11 [†]	0.04 [†]	
Attachment-15m		1.62*	4.40 [†]
AttachmentQ-24m	7.17*	3.44*	
Attachment-36m	3.73*	1.70**	

$p^{\dagger} < .10$, $p^* < .05$, $p^{**} < .01$

Note. Only statistically significant coefficients were presented.

Attachment continuity. There were no significant differences in the positive continuity of attachment on the academic achievement of children across groups. In summary, the *positive* continuity of early child care experience and early attachment security on the *academic* achievement of children seems to be solid and prevails across groups. There were no considerable differences in the *positive nature* of early child care effects and attachment continuity on academic achievement across groups. It is understood that both early child care experiences and early attachment security are promoting parameters for child trajectories of academic achievement, regardless of ethnic backgrounds of children; but not in the outcome of social competence.

Investigation of Sensitivity-Security hypothesis between African American and White American groups

For a better understanding of the continuity of early effects, the sensitivity-security hypothesis were also investigated via group comparison.

Table 23. Multiple group comparison of the sensitivity-security association

Groups	All	African American	White	
			All	Low-income ¹⁸
Total N	1364	173	1042	314
Child Care Quality(15m) N	571	66	485	127
Attachment-15m as outcome	R ² =.01	R ² =.09	R ² =.01	R ² =.03
Mat Sensitivity	0.08*	0.20*	0.03	0.07
Mother's Verbal IQ	-0.02	-0.02	-0.02	-0.07
AttchmentQ-24m as outcome	R ² =.09	R ² =.06	R ² =.08	R ² =.08
Mat Sensitivity	0.13***	0.14	0.13***	0.07
Mother's Verbal IQ	0.17***	-0.05	0.19***	0.19**
Attachment -36m as outcome	R ² =.03	R ² =.08	R ² =.02	R ² =.03
Mat Sensitivity	0.06 [†]	-0.05	0.06	0.06
Mother's Verbal IQ	0.10**	0.27**	0.10**	0.09

$p^{\dagger} < .10$, $p^* < .05$, $p^{**} < .01$, $p^{***} < .005$

Sensitivity-Security hypothesis. The role of maternal sensitivity in forming the child's attachment security is a solid predictor in literature. Looking into each group with income effect considered (Appendix C), effects of maternal sensitivity were significant. But variances (R^2) of attachment outcomes explained by this model were pretty low; although the predictive power of sensitivity-security association was expected to contribute to the R-square index. No significant differences appeared, however, in sensitivity-security associations across groups, although the significance was not supported across all groups and time points. In addition, the significance of the mother's verbal intelligence was consistent and comparable to the effect of maternal sensitivity. This result is congruent with the sensitivity-security hypothesis in attachment formation, but leads to questioning of the exclusive role of maternal sensitivity and the impact of shared genes as manifested in a construct like intelligence in the formation of attachment.

Group analysis by poverty history

In former analyses by income-considered ethnic groups, low-income did not necessarily mean poverty as defined by the poverty threshold. To better understand the effect of (low) income and ethnicity, the timing and the duration of *poverty as experienced* in early years of child life, which is differentiated from the effect of early family income at specific time points, was considered. Samples were divided into four categories of poverty history: (1) never poor during the first six years from child's birth to first grade of school age (never poor), (2) not poor through three years old of child age but became poor by 54 months (late poor), (3) poor through three years old but became not poor by 54 months (early poor), and (4) chronically poor during the entire first six years (always poor).

Table 13. Mean comparison of early factors across poverty history groups¹⁹

Groups:	All	Never poor	Late poor	Early poor	Always poor	ANOVA (df=3)
Total N	1364	706	73	82	224	
Income	3.36	4.39	2.29	1.56	1.11	131.28***
Maternal sensitivity	-0.01	0.23	-0.16	-0.21	-0.50	52.47***
Child care quality	14.64	14.92	14.10	15.19	13.66	5.29**
Mother's verbal IQ	99.01	104.58	94.17	93.99	86.87	64.80***
Child care hours	19.15	22.04	19.77	18.23	13.64	17.53***

$p^{**} < .01$, $p^{***} < .005$

From the mean comparisons, early factors associated with the never-poor group had the highest values and the always-poor group was positioned with the lowest scores and child outcomes. Post-hoc mean comparisons (Appendix B) revealed the following results: there were no significant differences of early family income (0-6 months) in late vs. early, early vs. always poor groups; there were consistent differences according to the poverty history in maternal sensitivity and the mother's verbal intelligence except for the late vs. early poor groups; there were no consistent differences in child care quality except for never vs. always, early vs. always; there were no consistent differences in child care hours except for in the never vs. always, late vs. always, because the always-poor group's child care quality and hours were lowest. There were no differences between late and early poor groups in all aspect of early factors. These mean comparison results need to be considered for the following group analyses.

¹⁹ Cross-tabulation of poverty history groups by ethnicity

Poverty history Groups:	Never	Late	Early	Always	Subtotal
N	706	73	82	224	1085
African American	26	13	12	71	122
White American	617	51	62	122	852
Hispanic American	29	5	7	22	63

Analysis on the outcome of social competence and academic achievement across poverty history groups

Never poor group. Under the environment of stably non-poor, mother's verbal intelligence and child's attachment security were associated significantly with child growth outcomes of social competence and academic achievement. Child care effects persisted overtime to academic outcomes, but there were no significant effect on social competence. Early child care experiences seem more influential for academic outcomes. Attachment continuity was significant both for the social and the academic outcomes of children, although significance was not revealed across all time points.

Late poor group. For children who experienced poverty from 3 to 6 years, the secure attachment at 24 months (when the family was not in poverty) positively affected social competence at 54 months. However, attachment security at 36 months (presumably when they turned into poverty) *negatively* affected the initial social competence of children at 54 months. Loss of earlier resources and the experience of the negative changes associated with falling into poverty appear to discontinue positive effect of early attachment. Children appear more susceptible to the continuity of attachment effect on *social* competence. Findings showed that attachment continuity with respect to social competence was associated with environmental changes into and out of poverty.

Concerning child care effects, there were no significant effects of child care experience at 15 months (when the families were not in poverty) that affected the social growth of children, but there were positive effects on academic outcomes.

Table 24. Group analysis result on social competence and academic achievement as outcome by poverty history²⁰

DV	Initial level of Social Competence				Growth rate of Social Competence			
Groups	Never	Late	Early	Always	Never	Late	Early	Always
N	706	73	82	224	706	73	82	224
Income			0.41**					
MS		0.27*						
MV	0.08†			0.34***	0.11*			
CCqual			-0.30*	0.15*				
CChour			0.30**				-0.27*	
Att15m	0.08*							
Att24m	0.07†	0.40†					0.21†	
Att36m	0.11**	-0.34**		-0.13†				0.30**
Gender	0.23***	0.27*			-0.19***			
R ²	0.11	0.45	0.39	0.19	0.05	0.12	0.27	0.16
DV	Initial level of Academic Achievement				Growth rate of Academic Achievement			
Groups	Never	Late	Early	Always	Never	Late	Early	Always
Income	0.09*		0.29*	0.18*				
MS	0.14**				-0.18**			
MV	0.36***	0.32*	0.37**	0.32***	0.12†	0.36*		0.19†
CCqual	0.13*	0.52**	0.27†	0.27*				
CChour		0.27*	0.21†					
Att15m	0.08†				-0.11†			
Att24m	0.09*							
Att36m		0.40**		0.21**				
Gender							0.42**	
R ²	0.27	0.49	0.46	0.43	0.05	0.20	0.25	0.08

$p^{\dagger} < .10$, $p^* < .05$, $p^{**} < .01$, $p^{***} < .005$

Note. To render the table more readable, only significant coefficients are presented; and the key values of comparisons were presented in bold in boxes.

²⁰ Model fits: $\chi^2(376) = 524.72$, $p < .0001$, CFI=.980, RMSEA=.038.

1. Never poor group: $\chi^2 = 159.51$ (94), $p < .0001$, CFI=.987, RMSEA=.031
2. Late poor group: Stage I. $\chi^2 = 0.94$ (1), $p = .332$, CFI= 1.00, RMSEA=0.00
Stage II. $\chi^2 = 123.63$ (92), $p = .016$, CFI=.939, RMSEA=.069
3. Early poor group: Stage I. $\chi^2 = 1.12$ (1), $p = .290$, CFI=.993, RMSEA=0.038
Stage II. $\chi^2 = 124.80$ (90), $p = .009$, CFI=.945, RMSEA=.069
4. Always poor group: $\chi^2 = 137.71$ (101), $p = .009$, CFI=.979, RMSEA=.040

Early poor group. For children who experienced poverty in the first three years but not after then upto six years old, there were different phenomena of child care effects and attachment continuity. Independent child care effects in terms of its *quality* and *quantity* characterized social outcomes in poverty. More hours in the early child care up to 15 months (when families were in poverty) buffered against (negative) influences of early poverty which are known to be associated with lower social competence and academic achievement. However, child care quality at 15 months in poverty negatively influenced initial social competence, while the effects of child care quality and quantity were both positive influences on academic outcomes of children. *Sensitivity* in caregiving may not work as a universal quality index for a child's social outcomes; it seems dependent on the economic context of families.

Concerning attachment continuity in the early-poor group, there was no significant attachment continuity on social and academic outcomes of children, except for the social growth *slopes*. It may not be possible to discuss attachment continuity in relation to the social competence growth slope without understanding the preceding relationship to the initial social outcome. It is understood, however, that the negative attachment effect for the social competence outcome was not revealed for the early-poor group of children. The influence of early-poverty on attachment continuity appears to differ from that of late-poverty, although there were no significant differences in early factors between early and late poor groups. Thus, the *timing* of poverty is shown to be a significant factor influencing the attachment effect on the child's social competence.

Always poor group. In the chronic poverty group, the impact of early child care experience, in terms of both quality and quantity, was positively associated with initial

academic achievement at 54 months. For social outcomes of children, more hours in early child care were significantly continued to social competence at 54 months, but from child care quality there was no negative impact on initial social competence (as likely as shown in the *early* poor group and formerly in the *African American* group).

Two speculations are possible for this difference in the (negative vs. no) associations between child care quality and later social competence of children in the early-poor and always-poor groups. First, the severity of poverty might be considerably different in nature between transient-early poverty and chronic poverty. The effects of child care quality under poor environment can vary according to timing and duration, thus the depth and nature of poverty as experienced. Second, there might be public (i.e., public policy) support for children in chronic poverty, so the negative association between (low) child care quality and social outcomes of children can be confounded with the impact of public assistance and mitigated in the always-poor group.

Attachment continuity under the chronic poor condition was revealed to be as likely as in the late-poor group: The 36 month attachment effect on initial social competence was negative with marginal significance ($\beta=-0.13$, $b=-3.43$, $SE=2.11$, $t=-1.63$), but positive on the initial academic achievement at 54 months. The positive attachment continuity on the social competence of children appears to be dependent on the poverty experience also. Based on this result, chronic poverty and recent poverty after three years old negatively influence the phenomenon of attachment continuity on social outcomes of children.

Via within-group analyses by poverty history, it could be understood how families differently undergo processes of influences and how different growth outcomes of

children are related to poverty history. Phenomena of child care effects and attachment continuity were considerably different or similar across groups, depending on the timing, duration, *and presumably the severity of poverty* that families experienced. It is understood that the (negative) effects of child care quality and attachment security on initial social outcome of children also are dependent on the timing and duration of poverty in early childhood.

Multiple group comparison of child care effects and attachment continuity across poverty history groups

Table 25. Multiple group comparison of the child care effects and attachment continuity across poverty history groups

DV	Initial level of Social Competence				Growth rate of Social Competence			
Groups:	Never	Late	Early	Always	Never	Late	Early	Always
CCqual	c		-1.34*	c				
CChour			0.25**	0.14*			-0.18*	
Att-15m	2.00*							
Att-24m	4.24†	11.97†					10.53†	
Att-36m	2.74** ^b	-7.39** ^a	^b	-3.43 ^{†a}				6.75**
DV	Initial level of Academic Achievement				Growth rate of Academic Achievement			
Groups:	Never	Late	Early	Always	Never	Late	Early	Always
CCqual	0.38*	1.56**	0.89†	0.87*				
CChour		0.16*	0.13*					
Att-15m	1.39†				-1.03†			
Att-24m	3.57*							
Att-36m		6.87**		4.01**				

$p^{\dagger} < .10$, $p^* < .05$, $p^{**} < .01$, $p^{***} < .005$

a, b indicate that there are no significant difference in the attachment impacts between a's (underlined), and between b's (in the box).

c indicates it is significantly different when compared to the early poor group's $b = -1.34^*$ (in the box).

For perceived group differences in child care effects and attachment continuity by poverty history, statistical significances were investigated by multiple group comparisons.

Child care effects. Negative effects of early child care *quality* on the initial social competence in the early-poor group differed significantly from the no effect of

the always-poor group ($b=0.65$, $S.E.=0.70$; $\Delta\chi^2(\Delta df)=4.12(1)$, $p<.05$) and marginally from that of the never-poor group ($b=-0.10$, $S.E.=0.21$; $\Delta\chi^2(\Delta df)=3.20(1)$, $p<.10$). The positive effects of child care *hours* on the initial social competence of children in the *early*-poor and *always*-poor groups differed significantly from the non-existent effects in the never-poor group ($b=-0.03$, $S.E.=0.03$), respectively ($\Delta\chi^2(\Delta df)=9.62(1)$; $\Delta\chi^2(\Delta df)=4.71(1)$). Between early and always poor groups there was no difference in the positive effect of child care hours under poverty ($\Delta\chi^2(\Delta df)=0.94(1)$). It is understood that the beneficial buffering effect of early child care on the social outcomes under poverty comes from the child care quantity – i.e., the child care experiences in terms of other unknown factors - rather than by the sensitive care quality. These findings regarding the negativity of child care quality and the positivity of child care quantity in near-poor families (i.e., early-poor group) provide different implications from findings in the NICHD study of poverty groups (NICHD-ECCRN, 2005a): Early child care experiences at 15 months were significant factors for the child's social competence in early-poor group, while showing conflicting functions of quality and quantity.

The negative effect of child care quality was limited to the early-poor group, who experience early, transient poverty and have *modest* levels of low maternal sensitivity. The negative effect of child care quality was not revealed in the always-poor group, who were embedded in chronic poverty with the *lowest* levels of maternal sensitivity. It is understood that the suppressing effect of low-income or poverty exists, but interactions with child care experiences under poverty *varied* according to severity of poverty (i.e., poor family vs. near-poor family), family's functioning as related to the poverty (i.e., different levels of maternal sensitivity), and presumably public assistance of child care

(i.e., high quality intervention programs). Negative experiences of environmental changes falling into poverty might work more negatively on later social competence of children. Concerning the outcome of academic achievement, there were no substantial quality and/or quantity differences in the positive nature of child care effects across poverty history groups.

Attachment continuity. Phenomena of positive attachment continuity of 36 months on social outcomes were significantly revealed only for the children who never experienced poverty. Through multiple group comparisons, however, the positive effect of 36 months attachment on the initial social competence in the never-poor group was not significantly different from that of the early-poor group ($b=3.69$, $S.E.=2.75$, $t=1.34$; $\Delta\chi^2(\Delta df)=0.02(1)$). The negative effect in the late-poor group was not different from that of the always-poor group ($\Delta\chi^2(\Delta df)=1.11(1)$) – (i.e., Never=Early; Late=Always). Thus, the positive attachment continuity on social competence was dependent on the poverty experiences of families. Families in transient or no poverty had positive attachment continuity on the social competence of children, but the families losing economic ground or in chronic poverty had the most negative attachment consequences on the social outcomes.

There were no notable differences in attachment continuity on academic achievement by poverty history. There were no significant differences in the 15 month and the 24 month attachment effect for both social and academic outcomes of children across poverty history groups, while the 36 month attachment revealed considerable differences in the nature of attachment continuity on social outcome.

In summary, the timing and duration, thus the depth and experience of poverty differently influenced the directions of child care effects and attachment continuity. Children appear to undergo different processes of child care effects and attachment continuity according to poverty history, specifically for their *social* growth trajectories.

CHAPTER FIVE.

Conclusion

This study was conducted to address children's social and academic growth trajectories. Two pillars of literature, attachment and child care effects, were integrated to investigate child growth processes. The method of growth curve modeling enabled this researcher to look into child growth differently, by providing latent constructs of baseline starting points before school entry (54 months) for the following school years and the growth rate of child outcomes of that period (54 months – 5th grade). Still challenging questions are how the early experience of nonmaternal care in infancy is associated with far later trajectories of child, and how children's securities formed in their very early years work as schema for child development. Specifically when children and families live with disadvantages associated with minority status and economic adversity, predicting and explaining their growth trajectories are demanding tasks. Literature on child care and attachment characterizes the field in particular ways which with better methods may be confirmed or challenged. This researcher undertook an integrative longitudinal investigation to refine assessment of child care effects and attachment consequences towards a more nuanced and illuminated analysis.

Summary of findings and discussions

The theoretical model proposed by this study was supported and revalidated previous findings of child care (NICHD-ECCRN, 1997b, 2004a, Belsky et al., 2007) and attachment (Sroufe, 2000). Results of analyses indicated that early child care experiences and early attachment securities were linked directly to the growth outcomes of children, as hypothesized. However, the nature and the extent of the relationships were manifested

differently according to child care quality and hours; social and academic outcomes; significantly dependent on both cultural background of ethnicity and poverty history of families; and the relationships with poverty were not linear (Bradley & Corwyn, 2002; NICHD-ECCRN, 2005a). While children's academic achievement was significantly influenced by early child care experiences and attachment security with no substantial group differences by ethnicity and poverty history, for children's social growth the effects differed and were susceptible to ethnicity and the duration and timing of poverty.

Unexpected findings deviated from the literature. First, the negative influence of attachment (36 months) and child care quality (measured by caregiver sensitivity at 15 months) on the initial social competence of children as baseline at 54 months were found in ethnic minority (African American and Hispanic groups) and poverty groups (early-poor group in child care effects; late- and always-poor groups in attachment continuity). Second, among the effects of early maternal factors on child growth, mother's verbal intelligence was larger and more consistent than maternal sensitivity (6-15 months), specifically on attachment security.

Based on the above study results, it is suggested that cultural, economic, and genetic factors (such as intelligence) of family are fundamental in understanding the growth of children (Bronfenbrenner & Ceci, 1994; Scarr, 1981; Turkheimer et al., 2003). Those forces interact nonlinearly with specific principles of processes within the environment, and the interactions profoundly influence and determine child growth outcomes. Direct impacts of behavioral manifestations of child and caregiver in *security* and *sensitivity* seem dependent on those factors of culture, economic context, and genes (e.g. , Ainsworth, 1990; Aviezer et al., 2003; Bakermans-Kranenburg et al., 2004;

DeWolff & van Ijzendoorn, 1997; Ispa et al., 2004; McLoyd, 1990, 1998; Meins, 1997; NICHD-ECCRN, 2002b; Raikes & Thompson, 2005).

‘Sensitivity’ is likely a product of cultural norms and environmental resources. Thus qualitatively different agendas seen as optimal caregiving may exist across cultural family groups. Lack of specific sensitive behaviors in caregiving may not indicate a low quality of care, especially for families in specific cultural and economic niches (Garcia-Coll et al., 1996; Ogbu, 1981). Marginality also may shift parenting strategies for competence (Deater-Deckard, Dodge, Bates, & Pettit, 1996). Likewise, modest levels of sensitive caregiving within the context of adversity associated with minority and low-income experiences may not necessarily work toward positive child outcomes (Fagan, 2000). Rather, the modest level of low sensitivity in nonmaternal care seems to influence the social competence of children negatively in minority- and low-income contexts at the baseline time point of 54 months in this study.

When disentangling the effect of low income in the ethnic group comparison through ad-hoc analysis (Appendix C), negative effect of 15-month child care quality seems more dependent on low-income context; while negativity of 36-month attachment seems relatively more dependent on the cultural context of families. The effect of early transitory poverty (i.e., early-poor group) was less detrimental on later social competence of children than long-term or concurrent poverty (i.e., always-, late- poor groups), as found in the NICHD study of poverty groups (NICHD-ECCRN, 2005a). Concerning the effect of child care hours, however, the result of this study is differentiated from previous findings (NICHD-ECCRN, 2003a, 2005a): In near-poor families such as early-poor group, child care quality was significant negative factor on the initial social competence

of children, but child care quantity was positive. Other factors of early child care experiences which were not clearly revealed as related to child care *hours* may work as buffers against poverty's negative influences.

As Urie Bronfenbrenner noted in his bioecological framework, child growth is an ongoing process in which genetic and environmental factors interact and dynamically converge toward optimal adaptation and development of children (e.g., Bronfenbrenner and Morris, 1998). As attachment theory also explained, the development of attachment behavior and the related functioning of children are organizational in maturation processes over time (e.g., Greenberg, Cicchetti, & Cummings, 1990; Sroufe, 1996). Organizational and reorganizational processes of child growth can be unique according to cultural, economic, and genetic factors. Incorporating a universal quality index, such as sensitivity, into child care quality may not work for all children similarly, not only in terms of its consequences on child outcomes, but also in terms of optimal functions in context.

Likewise, lack of specific attachment behaviors of children observed in the mother-child reunions at the Strange Situation at a specific time point may not necessarily influence later child functioning negatively. Based on the bioecological perspective, negative associations between attachment and social competence in African American and late-, always- poor children is understood to reveal different family processes across cultural and SES groups. This negativity supports long arguments in attachment theory that the sensitivity construct is biased toward European and middle-class family norms (e.g., Rothbaum et al., 2001). This negativity cannot simply be understood, however, to mean that attachment security negatively influence the social

functioning of African American children or children in poverty. Rather, the necessary approach ought to be that African American children or children in recent or chronic poverty may go through different maturational and organizational processes of attachment continuity, influencing what we assume to be socially desirable competence in their behaviors. Their earlier security in attachment toward mother at 36 months was not a positive precursor for socially competent behaviors at 54 months before school entry as envisioned for the following school years. Meanwhile, there were no differences across groups in the phenomena of attachment continuity to the *academic* achievement of children.

Although we understand the attachment paradigm to be one that should work biologically in similar ways for universal reasons for all parents and children, the fact is that the core mechanism of attachment security was for ‘adaptation for survival’ in the outer world (Bowlby, 1969, 1982). Cultural and socioeconomic adaptations can provide valid reasons and variations to change relations under specific circumstances, more so if they concern attachment continuity extending into later socioemotional functioning; but neither on the academic outcomes nor the attachment formation itself. For instance, the school context may be so different for lower-income African American children that the typical boosting effect of attachment and the structures that accompany them may have been altered to function more efficiently in a context perhaps less supportive of these families lacking economic resources. Exclusive attachment to mother may work more as a safe haven for retreat in unfamiliar social activities at school or preschool, rather than as a secure base for active participation and competent exploration of environment for African American children or children in poverty. Minority status and family economic

adversities may work as strong forces challenging theoretical associations between attachment security and social competence.

Looking into *African American families* in more detail, there is evidence that the attachment figures of African American children may be more diffuse, thus multiply attached (e.g., Jackson, 1993). In African American households, particularly multigenerational households where parents engage in shift work, there may be several mothers, cousins, grandmother, aunts, older siblings, etc. (Hunter & Ensminger, 1992). In addition, household fluidity secures the need for more diffuse attachment figures as households can expand or shrink and change members in a child's early life. This would be particularly true of *lower income* families, as with African Americans in the current dataset. The literature and data collection process within the NICHD study depend heavily on a single primary attachment figure – mother. Thus the exclusive monotropic attachment of child to a mother in the African American extended family system may not work positively or adaptively for the social development of children. A secondary but related argument that exists culturally across many African American families is that they highly value *independence* in children and that this emphasis appears to be a functional and social advantage. However, some features of attachment require more measure or bounded willingness to explore. This feature may conflict with the stronger cultural imperative toward independence at younger ages and may lodge itself subtly in this finding.

In further speculations of the African American group, if the secure base attachment figures still struggle with cultural oppression and economic deprivation for survival and adaptation into the larger society, and if their culture has a history of

suffering from repercussions and alienations from that society, socially less competent behaviors in a specific setting may have been internalized and worked as adaptive strategies of survival (e.g., Garcia-Coll et al., 1996). Thus, in African American children and in children of late- and always-poor groups from NICHD data, negative revelations of attachment effect at a time point in early childhood may not be a spurious bounce during analyses. Rather, they may be supportive empirical evidence for the long argument of cultural difference and socioeconomic variation in attachment phenomena and the necessity of emic perspective in applying and understanding those.

Meanwhile, in this study, maternal influences (maternal sensitivity and the mother's verbal intelligence) were most predictive of children's growth outcomes. Especially the mother's verbal intelligence was the most consistent and strongest, even leading to steeper growth slopes of both social competence and academic achievement. This greater salience of mother's verbal intelligence by PPVT scores than those of maternal sensitivity on child outcomes (including attachment) indicates that *genetic* and *cognitive* factors importantly interact with social environment for child growth, especially for the formation of attachment security (Crandell & Hobson, 1999; van IJzendoorn, Dijkstra, & Bus, 1995). Again, rather than mother's sensitive behaviors, mother's genetic and cognitive factors (i.e., verbal intelligence) for understanding child's needs for security and for responding appropriately thereto, may be more fundamental and important. Alongside this result, findings of no considerable group differences in the attachment effect on the academic achievement of children, can be another supportive evidence of the significant impact of genetic and cognitive factors for attachment formation and child growth.

This does not dispute the significance of the sensitivity-security hypothesis, but it elaborates and deepens the underlying mechanism of the hypothesis. A deeper mechanism for revealed or established associations between mother's sensitivity and child's security at behavioral level seems to exist. What we call the quality of parenting and the sensitivity of mothering may be molded fundamentally by genes (i.e., intelligence), cultural agendas, and availability of economic resources.

It was also found that poverty influences on child care effects and attachment continuity were not simply linear according to income levels. As mentioned, (1) Early child care quality at 15 months under poverty of early-poor group was associated negatively with initial social competence of children, while there was no significant relationship between child care quality and later social competence of children in other poverty groups. (2) The attachment effect at 36 months on initial social competence was reported in the groups of late- and always- poverty. Effects of child care quality and early attachment on social outcomes (negative or not) were related but *not linearly* dependent on levels of family income. This is understood as contingent on interactions of timing, duration, and severity of poverty and the quality of family functioning such as maternal sensitivity and mother's verbal intelligence. Further studies are necessary for this discussion, but it is assumed that interactions (or convergences) between the depth and nature of poverty and family functioning is another parameter in which to understand poverty's impact, specifically on *social* outcomes of children. All pertinent mysteries and ambiguities cannot be resolved here, but these are some considerations in that direction. Future studies are necessary to understand the effect of sensitive care and secure attachment on later child outcomes across different cultural and economic environments.

Although predictions of growth rates were limited compared to those of initial levels, this reflects that the following growth rates were highly contingent on preceding initial levels – i.e., prevalence of developmental regression (i.e., starting high, growing less) phenomena in the prediction of social growth. In the analysis, social growth patterns were regressive, and academic growth patterns seemed exponential, but it was not significant across groups. Thus, the starting points of social competence and academic achievement (as measured at 54 months in this study) were an important barometer to predict the developmental trajectories that followed. If an early factor influences an initial level critically at some time points, for example at school entry, it means the effects will continue with following growth patterns and rates for an extended time also. If children started with lower social competence and academic achievement at some points of school entry measured, the lower positions continued, or were enormously influenced by and determined the growth trajectories that followed. The enhancement of a child's school readiness before school entry both in social and academic aspects was important to reducing persistent inter-individual and inter-group gaps. Also considering the interconnections among attachment-social, competence-academic achievement of a child, certain aspects of a child's social development need to be more carefully programmed and emphasized in child care and in the child's later educational program. Children's social outcomes were not constrained into the social domain of child trajectories, but the interrelation to other domains are continuous in the child's general function.

Hypotheses guiding these analyses were tested and proved systematically. Having now analyzed the data, several findings emerge as more notable than others: (1) concerning attachment phenomena, there might be sensitive developmental timing in its

revelation or salience. Early attachment quality continues in its effect, but it also undergoes developmental changes with variations. In this study, 36 month attachment showed more converging and differentiating consequences in the effects. (2) The effect of gender was significant and different in outcomes, although it was controlled in this study: Initial gaps in attachment between girls and boys changed developmentally over time, lessening in social growth and with no gender difference in academic growth.

Limitations of study

There were a number of limitations in the study that could not be resolved. First, the low power of analyses resulting from small sample sizes of ethnic minorities was the foremost limitation. Accordingly, unbalanced design across groups was a major weakness in interpreting group analyses and influencing a decision to conduct multiple group comparisons. Statistical significances of the specific analyses of interest were not supported, possibly because of low power.

Considering the unbalanced small sample sizes of African American and Hispanic groups, additional *ad-hoc* analysis of group comparison was implemented by incorporating income levels of the White American group. This was to disentangle the effect of income in the ethnic group comparisons, better to understand and discern group differences by ethnicity *versus* income in the child care effects and attachment continuity. When the income effect was considered in the ethnic group comparison, the effects of child care quality were likelier to be dependent on early family income levels, and attachment continuity on social competence depended not only on income but also considerably on the cultural background of ethnicity. The hypothesis of positive attachment continuity on social competence was not supported fully by the African

American group in the NICHD study; and phenomena of attachment continuity of White American children differed somewhat according to family income levels, in that the positive attachment continuity on social growth outcomes differed in its pattern for low-income White American children (see Appendix C for details).

Second, the group comparison procedure based on the likelihood ratio test or chi-square difference test provided a most useful tool of significance tests for the revealed group differences, but the comparison itself did not tell in detail the nature of difference and was technically quite sensitive to model complexity, degrees of freedom, and the imposed series of constraints. Thus, further replication studies in the field as well as advances in the application of comparison methods are necessary for the revealed group differences in this study.

Third, although group comparisons were implemented to identify better the group-specific cultural processes, the application of a unified single model with no incorporation of different group processes was not a culturally sensitive approach. From the emic perspective, if the parameters of culturally-unique and socioeconomically sensitive mechanisms (Johnson et al., 2003) were included in the model for each group, mechanisms of the revealed group differences could be identified better.

Fourth, similarly, this study could detect and validate socioeconomic variations and cultural differences in the phenomena of child care effects and attachment continuity and lack of explanations for the effects of income when based on the family stress model. However, the theoretical model of this study could not *explain* the mechanisms of revealed differences among ethnic and poverty groups. The family stress model, on which the theoretical model of this study was based originally, explains group differences

as initiated by (low) income and associated (low) caregiving quality links, and considerably contributes to understanding of invariances among diverse strata of families. But it still leaves much unexplained and an unparameterized portion of income, especially in interactions with culture.

Fifth, criteria of group classifications was applied based on characteristics and distribution of NICHD samples. This data is a nonrandom sample with an under-representation of high-risk families, hence is likely to underestimate some effects that may operate at more extreme ends of the sociodemographic spectrum. Thus, each subgroup may not represent appropriately the specific populations. For example, due to small sample sizes, there were no considerations of variations within African American and Hispanic American groups.

Sixth, from the attachment arena, the dummied categorization of attachment has lost considerable information and variances of diverse attachment properties. Also, the failure of attachment growth modeling was another weakness of this study; detected differences in the phenomena of attachment continuity between 15, 24, and 36 month attachment could not be discussed definitively in this study, although the 36 month attachment effect was understood to be associated with family poverty status and implied the possibility of sensitive timing in the maturation of attachment and its continuing effect.

Seventh, the ratings of social competence at individual child's behaviors in overall interactions with other children might differ qualitatively from those in dyadic interactions with best friend of target child. Those differentiations in the unit of analysis and the intact relationships were not considered in this study (Kuczynski, 2003).

Contribution to the field and future implications

This was an integrative investigation of the effects of *attachment* and *child care* experience on the *social* and *academic* trajectories of children. The results revalidated the continuity of early experiences on the children's growth trajectories and provided an understanding of the flows of influences through those early experiences in leading to the academic achievement of children.

First, the processes of influences of child care experience and attachment security were *independent* for children's social and academic outcomes with no considerable interconnections between the phenomena. But the growth outcomes that resulted were coherently interrelated within a child. The effects of child care and attachment were positive on the *academic* outcomes buffering against poverty or low-income disadvantages, but negative on the social outcomes of children. Considering inter-domain relations between social and academic growth, the revealed negativity in attachment continuity and child care quality effects for the social growth of children needs to be addressed carefully in policies and programs. For example, to enhance child care effects on children's social competence, rather than focusing on caregiver training for better behavioral sensitivity of caregiver-leading instructions, more exposures to child-oriented activities and peer-leading play would benefit the social development of children, especially for children in economic adversity. Also, the social competence of children in minorities and poverty needs to be emphasized in the timing of before and toward school entry.

Second, through multiple group comparisons by ethnicity and poverty history over merged population analyses, the dynamic forces of socioeconomic factors were

demonstrated across groups. Poverty groups seem to have a wide range of variations in family processes and child development. It was discovered that the effects of low-income or poverty varied multiplicatively under poverty type or history, and certain levels of caregiving quality (i.e., maternal sensitivity) for the growth of children, not by the absolute degree of poverty or behavioral sensitivity. Poverty effect was more manifested in children's *social* outcomes, in transient, near-poor families, rather than in academic outcomes or for children in chronic deep-poor families. Variations near the poverty threshold (i.e., near-poor *versus* deep-poor) influenced more strongly the maternal sensitivity and, accordingly, child's social outcomes.

There was an implication of non-universality of attachment continuity on *social* competence. Rather, universal attachment continuity on *academic* achievement was validated in the study. This raises many issues for attachment phenomena in future studies. This result also presents a question of the inclinations on positive attachment continuity toward the interpersonal and social functioning in the literature, of the lack of studies toward cognitive mechanisms and academic outcomes in attachment studies. How early securities (formed in childhood) function and continue to later developmental trajectories as maturational processes, specifically under socioeconomic adversities and with cultural differences, needs more addressing.

Third, strong predictions of child outcomes by mother's verbal intelligence were found for child care effects and attachment formation, although they were not hypothesized in this study. Further studies are necessary to identify the role of *intelligence* or the effect of mother's *verbal* orientations for child outcomes in the context of child care effect and attachment phenomena.

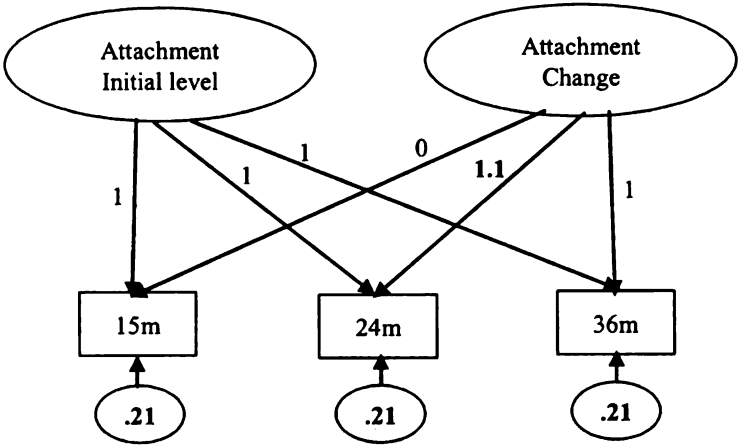
Fourth, the revealed continuity of earliness and the importance of initial starting levels for following trajectories of children have many implications for child care policies and anti-poverty interventions, including the earlier the better, in the timing of onset for children in disadvantaged family environments.

In sum, this study discovered the existence of differences and universality in child care effects and attachment continuity in diverse group strata. More emic and microscopic investigations should follow for revealed group differences in the social development of children. Further studies of why and how variations by environments work beyond common biological agendas are necessary to understand child life trajectories.

APPENDICES

APPENDIX A. Estimation of growth curve models and the diagrams of child outcomes

A-1. Growth model of Attachment



Free-loaded growth modeling of Attachment

Estimation of free-loaded growth model for attachment (N=627)

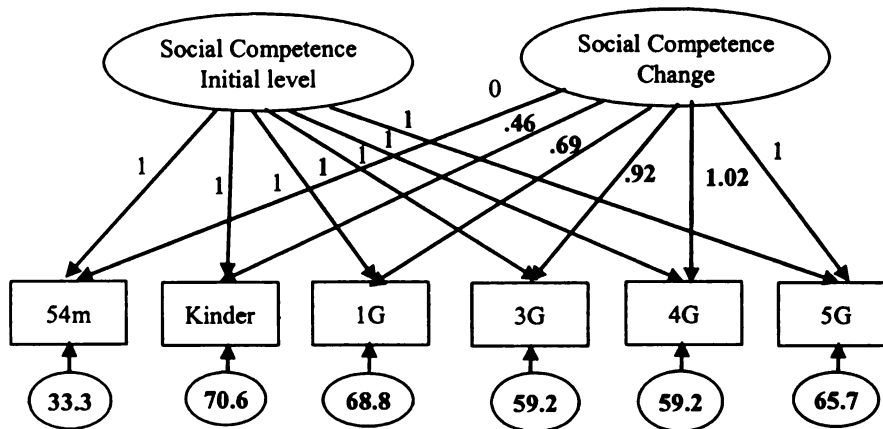
	15 month	24 month	36 month
α	1.00	1.00	1.00
β	0.00	<i>1.09</i>	1.00
Residual Variance	<i>0.21</i>	<i>0.21</i>	<i>0.21</i>
R^2	0.11	0.11	0.10
Model fits	$\chi^2(2)=0.68, p=0.71, CFI=1.00, RMSEA=0.00$		

Note. α indicates the intercept as initial starting level in the growth model.

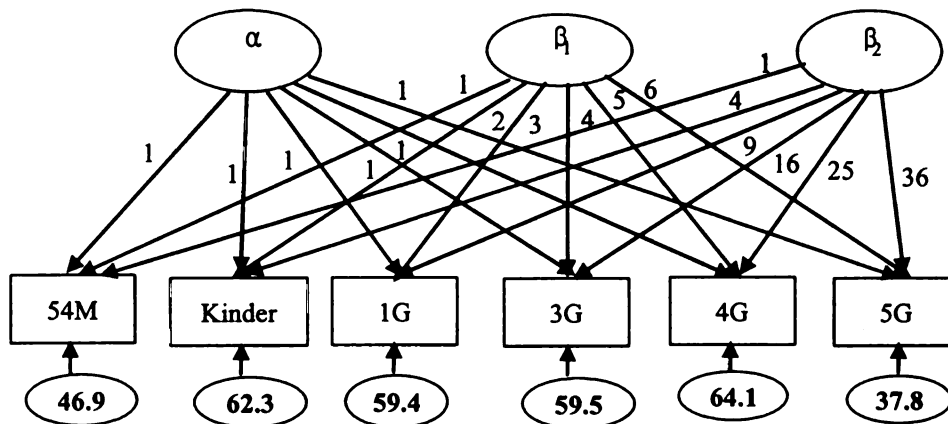
β indicates the slope as changes or growth rate over the study period.

Italics indicate the value is statistically significant at $\alpha=.01$ level.

A-2. Growth model of Social competence



Free-loaded growth modeling of Social Competence



Quadratic Growth modeling of Social Competence

Estimation of free-loaded and quadratic growth curve models for social competence (N= 1162)

	54 M	Kinder	1G	3G	4G	5G
<i><u>Free-loaded model</u></i>						
α	1.00	1.00	1.00	1.00	1.00	1.00
β	0.00	0.46	0.69	0.92	1.02	1.00
Residual Variance	33.27	70.59	68.82	59.17	59.24	65.67
R ²	0.82	0.67	0.70	0.76	0.77	0.75
Model fits	$\chi^2(12)=121.57, p<.0001, CFI=.975, RMSEA=.089 [.075, .103]$					
<i><u>Quadratic model</u></i>						
α	1.00	1.00	1.00	1.00	1.00	1.00
β_1	1.00	2.00	3.00	4.00	5.00	6.00
β_2	1.00	4.00	9.00	16.00	25.00	36.00
Residual Variance	46.93	62.25	59.41	59.45	64.13	37.84
R ²	0.75	0.71	0.75	0.77	0.75	0.84
Model fits	$\chi^2(12)=59.47, p<.0001, CFI=.989, RMSEA=.058 [.044, .074]$					

Note. α indicates the intercept as initial starting level in the growth model.

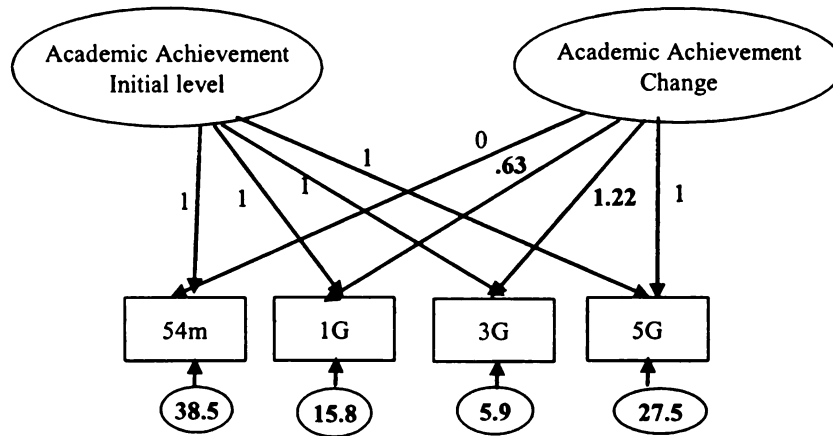
β_1 indicates the slope as changes or growth rate over the study period.

β_2 indicates the change of growth rate (=change of change).

Italicized font indicates the value is statistically significant at $\alpha=.001$ level.

[] means the 90% confidence interval for the RMSEA.

A-3. Growth model of Academic achievement



Free-loaded growth modeling of Academic Achievement

Estimation of free-loaded growth model for academic achievement (N=1154)

	54 M	1G	3G	5G
A	1.00	1.00	1.00	1.00
β	0.00	<i>0.63</i>	<i>1.22</i>	1.00
Residual variance	<i>38.50</i>	<i>15.83</i>	<i>5.88</i>	<i>27.49</i>
R^2	0.71	0.88	0.96	0.82
Model Fits	$\chi^2(3) = 16.84, p=.0008, CFI=.996, RMSEA=.063$ [.036, .094]			

Note. Italics indicate that the value is significant at $\alpha=.001$ level.

APPENDIX B. Mean comparisons of variables by ethnicity, poverty history, and attachment changes

B-1. Mean comparisons of variables for ethnic groups

Variables	African American	White American	Hispanic American	ANOVA F (df=2)	Post-hoc tests
N	173	1042	83		
Income	1.52	3.66	2.52	44.80 ^{***}	A<H<W
Mat Sensit	-0.78	0.15	-0.23	98.28 ^{***}	A<H<W
CC quality	13.28	14.85	13.45	13.02 ^{***}	A<W, A≡H, W>H
Mat verb IQ	80.40	102.69	90.94	115.10 ^{***}	A<H<W
CC hours	19.57	18.94	19.42	0.144 ^{ns}	A≡W≡H
Att (15m)	0.53	0.63	0.52	4.26 [*]	A(<)W, A≡H, W≡H
Att (24m)	0.20	0.31	0.30	15.89 ^{***}	A<W, A<H, W≡H
Att (36m)	0.49	0.63	0.68	5.31 ^{**}	A<W, A(<)H, W≡H
SC (54m)	93.50	99.44	94.40	13.19 ^{***}	A<W, A≡H, W>H
SC (K)	96.15	104.02	98.76	17.38 ^{***}	A<W, A≡H, W>H
SC (1G)	98.70	106.62	102.48	15.40 ^{***}	A<W, A≡H, W≡H
SC (3G)	97.93	107.91	100.56	25.57 ^{***}	A<W, A≡H, W>H
SC (4G)	99.31	108.79	104.32	19.33 ^{***}	A<W, A≡H, W≡H
SC (5G)	98.80	109.29	105.27	27.87 ^{***}	A<W, A<H, W≡H
AA (54m)	88.05	100.08	91.82	76.55 ^{***}	A<W, A(<)H, W>H
AA (1G)	95.05	106.24	101.88	66.04 ^{***}	A<H<W
AA (3G)	98.21	112.41	107.80	85.75 ^{***}	A<H<W
AA (5G)	95.89	109.95	105.85	82.75 ^{***}	A<H<W

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

Abbreviation. A=African American group; W=White American group; H=Hispanic American group;

Note. '≡' means there was no significant difference in the means at $\alpha=.05$ level.

'<,>' means there was significant difference in the means at $\alpha=.05$ level.

'()' means there was significant difference in the means at $\alpha=.10$ level.

B-2. Mean comparisons of variables for poverty history groups

Variables	Never Poor	Late Poor	Early Poor	Always Poor	ANOVA F (df=3)	Post-hoc tests
N	706	82	73	224		
Income	4.39	2.29	1.56	1.11	131.28***	L=E, E=A
Mat Sens	0.23	-0.16	-0.21	-0.50	52.47***	L=E
CC qual	14.92	14.10	15.19	13.66	5.29***	N>A, E(>)A
Mat Verb	104.58	94.17	93.99	86.87	64.80***	L=E
CC hour	22.04	19.77	18.23	13.64	17.53***	N>A, L>A
Att (15m)	0.65	0.53	0.74	0.51	6.18***	N>A, L(<)E, E>A
Att (24m)	0.32	0.33	0.27	0.21	16.78***	N>A, L>A,
Att (36m)	0.66	0.50	0.62	0.49	8.28***	N(>)L, N>A
SC (54m)	100.01	94.60	100.14	93.17	16.79***	N(>)L, N>A, L(<)E, E>A
SC (K)	104.70	99.24	103.60	96.46	18.47***	N=E, L=E, L=A
SC (1G)	107.40	102.09	104.83	99.39	16.52***	N>L, N>A, E(>)A
SC (3G)	108.71	103.32	107.03	99.03	20.35***	N=E, L=E, L=A
SC (4G)	110.09	102.32	107.93	100.12	22.07***	N=E, L=E, L=A
SC (5G)	109.95	102.58	108.25	101.29	20.12***	N=E, L=E, L=A
AA (54m)	101.58	94.59	94.87	90.17	68.54***	L=E
AA (1G)	107.49	99.92	104.03	97.51	59.85***	L(<)E, L=A
AA (3G)	113.53	104.59	109.55	102.79	52.63***	L(<)E, L=A
AA (5G)	111.13	102.52	106.92	100.28	52.08***	L=E, L=A

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

Abbreviation. N=Never poor group; L=Late poor group; E=Early poor group;
A=Always poor group.

Note. 1. Post-hoc test results for poverty groups did not include all the pairs of mean comparisons for brevity of presentation. The pairs not presented here are the other relationship of pairs (*i.e.*, \equiv vs. \neq).

2. ' \equiv ' means there was no significant difference in the means at $\alpha=.05$ level.

'<,>' means there was significant difference in the means at $\alpha=.05$ level.

'()' means there was significant difference in the means at $\alpha=.10$ level.

B-3. Mean comparisons of variables for the *income-considered* ethnic groups

Mean comparisons of variables for the *income-considered* ethnic groups

	African American	White Low	White Middle	White High	Hispanic	ANOVA F (df=4)
N	173	314	317	312	83	
1. Income	1.52	1.52	3.02	6.48	2.52	413.54 ***
2. Mat Sen	-0.78	-0.19	0.23	0.45	-0.23	84.96 ***
3. Mat Verb	80.40	95.81	102.70	109.97	90.94	93.99 ***
4. CC qual	13.28	14.50	14.70	15.31	13.45	8.62 ***
5. CC hours	19.57	16.74	19.81	21.45	19.42	3.75 **
6. Att 15m	0.53	0.63	0.64	0.64	0.52	2.35 †
7. AttQ24m	0.20	0.28	0.32	0.33	0.30	11.15 ***
8. Att 36m	0.49	0.60	0.66	0.65	0.68	3.52 **
9. SC 54m	93.50	97.16	99.58	101.38	94.40	9.86 ***
10. SC K	96.15	100.56	104.56	106.18	98.76	13.46 ***
11. SC 1G	98.70	103.26	106.54	109.19	102.48	12.59 ***
12. SC 3G	97.93	104.25	108.34	110.27	100.56	17.40 ***
13. SC 4G	99.31	105.49	109.20	111.46	104.32	14.13 ***
14. SC 5G	98.80	107.34	109.23	110.99	105.27	15.60 ***
15. AA 54m	88.05	95.49	100.56	104.49	91.82	68.34 ***
16. AA 1G	95.05	102.70	106.77	109.12	101.89	48.96 ***
17. AA 3G	98.21	108.40	113.29	115.35	107.8010	60.05 ***
18. AA 5G	95.89	106.16	110.16	113.33	5.85	58.30 ***

Post-hoc tests of mean comparison across *income-considered* ethnic groups

Post-hoc tests

1. Inc: $A \equiv WL, A < WM, A < WH, A < H, WL < WM < WH, WL < H, WM \equiv H, WH > H$
2. MS: $A < H, A < WL < WM < WH, WL \equiv H, WM > H, WH > H$
3. MV: $A < H, A < WL < WM < WH, WL \equiv H, WM > H, WH > H$
4. CCq: $A(<)WL, A < WM, A < WH, A \equiv H, WL \equiv WM \equiv WH, WL \equiv WM \equiv H, WH > H$
5. CCh: $A \equiv WL, A \equiv WM, A \equiv WH, A \equiv H, WL \equiv WM, WL \equiv WH, WM \neq WH, WL \equiv H, WM \equiv H, WH \equiv H$
6. Att15: $A \equiv WL, A \equiv WM, A \equiv WH, A \equiv H, WL \equiv WM, WL \equiv WH, WM \equiv WH, WL \equiv H, WM \equiv H, WH \equiv H$
7. Att24: $A \neq WL, A \neq WM, A \neq WH, A \neq H, WL \equiv WM, WL(\neq)WH, WM \equiv WH, WL \equiv H, WM \equiv H, WH \equiv H$
8. Att36: $A \equiv WL, A \neq WM, A \neq WH, A \equiv H, WL \equiv WM, WL \equiv WH, WM \equiv WH, WL \equiv H, WM \neq H, WH \equiv H$
9. SC54: $A \equiv WL, A \neq WM, A \neq WH, A \equiv H, WL \equiv WM, WL \neq WH, WM \equiv WH, WL \equiv H, WM \neq H, WH \neq H$
15. AA54: $A \neq WL, A \neq WM, A \neq WH, A \equiv H, WL \neq WM, WL \neq WH, WM \neq WH, WL \neq H, WM \neq H, WH \neq H$

Abbreviation. A=African American group; WL=Low income White group; WM=Middle income White group; WH=High income White group; H=Hispanic group.

B-4. Mean comparisons of variables for attachment change groups

Variables	0-0 (N=164)	0-1 (N=242)	1-0 (N=234)	1-1 (N=419)	ANOVA (df=3) ^{***}	Post-hoc tests
Income	2.94	3.51	3.26	3.60	2.66 [*]	00(<)11
Mat Sensit	-0.28	0.09	0.03	0.08	8.74 ^{***}	00<01, 00<10, 00<11
CC quality	14.70	14.91	14.90	14.61	0.45	00≡01≡10≡11
Mat verb IQ	94.37	101.71	97.78	100.55	6.58 ^{***}	00<01, 00<11
CC hours	18.29	21.04	19.61	19.59	1.04 ^{ns}	00≡01≡10≡11
Attach (24m)	0.24	0.32	0.29	0.31	5.82 ^{**}	00<01, 00<11
SC (54m)	96.32	97.77	97.09	99.68	3.05 [*]	00(<)11
SC (K)	100.02	102.14	101.72	104.52	3.93 ^{**}	00<11
SC (1G)	102.72	105.00	103.58	107.08	4.01 ^{**}	00<11, 10(<)11
SC (3G)	103.31	106.48	103.74	108.85	6.43 ^{***}	00<11, 10<11
SC (4G)	103.61	107.57	105.65	109.44	5.01 ^{**}	00<11, 10(<)11
SC (5G)	103.68	107.71	106.34	109.43	5.28 ^{**}	00<11
AA (54m)	92.94	99.56	97.59	100.19	15.16 ^{***}	00<01, 00<10, 00<11, 10(<)11
AA (1G)	100.59	106.14	103.19	106.26	12.81 ^{***}	00<01, 00<10, 00<11, 10<11
AA (3G)	107.31	112.51	108.72	111.64	7.82 ^{***}	00<01, 00<10, 00<11, 10<11
AA (5G)	104.33	109.75	106.09	109.58	9.06 ^{***}	00<01, 00<10, 00<11, 10<11

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

Note 1. 0-0=secure(15m)-secure(36m); 0-1=insecure(15m)-secure(36m);

1-0=secure(15m)-insecure(36m); 0-0=insecure(36m)-insecure(36m).

2. '≡' means there was no significant difference in the means at $\alpha=.05$ level.

'<,>' means there was significant difference in the means at $\alpha=.05$ level.

'(')' means there was significant difference in the means at $\alpha=.10$ level.

APPENDIX C. Additional ad-hoc analysis: *Disentangling income effect in the ethnic group comparison*

To disentangle cultural effects of ethnicity from economic effects of income, it was necessary to adjust average family income (0-6 months) of a sub-group of White Americans to that of African Americans as a way of controlling for the (lower) income effect in comparing African American to White American groups.

When the White American group was divided into even three clusters of low-, middle-, high- income groups (i.e., *trichotomization* by income distribution), the average income of the lowest one-third of the White American samples –named the ‘low-income White American group’ in this study– was not different from that of the African American group. Thus, it is assumed that the (lower) income effect was minimized for ethnic group comparisons by incorporating early family income levels within White American families. Descriptive statistics of the income-considered ethnic groups are presented in Table 26.

C-1. Mean comparison of early factors across *income-considered* ethnic groups

	African American		White		Hispanic		ANOVA
Groups	All	Low income	Middle income	High Income	All	All	(df=4)
Income	1.52	1.52	3.02	6.48	3.66	2.52	413.54***
Mat Sen	-0.78	-0.19	0.23	0.45	0.15	-0.23	84.96 ***
MatVerb	80.40	95.81	102.70	109.97	102.69	90.94	93.99***
CCqual	13.28	14.50	14.70	15.31	14.85	13.45	8.62 ***
CChour	19.57	16.74	19.81	21.45	18.93	19.42	3.75**
Valid N:	130	314	317	312	943	65	
Crosstabulation							
By African American	98	22	7	-	-	-	

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

Note. Income range (min-max) for each group:

African American (0.09-8.75), low-income White (0.16-2.31), middle-income White (2.32-3.89), high-income White (3.90-19.7), Whites total (0.16-19.7); Hispanic (0.22-9.01).

Though the mean income level was adjusted to be the same between African

American and low-income White American groups, post-hoc mean comparisons (Appendix B) showed consistent differences in the means of other early factors across groups, specifically among African American, low-income White, and Hispanic groups.

The Hispanic's income was similar to the middle-income White's, and the Hispanic mother's sensitivity and verbal ability was similar to the low-income White mother's and higher than the African American mother's. In the mean comparisons of African American and low-income White American groups, child care quality was marginally different at α of .10 level and both maternal factors were significantly different at α of .05 level.

Although the Hispanic's income level was not statistically different from the middle-income White's, the maternal factors of the Hispanic group were similar to the low-income White's, and Hispanic children's social and academic outcome mean trend was close to or lower than those of low-income White's. It is assumed that different family processes exist for the Hispanic group (i.e., beyond being explained via economic factors). The *minority status* might work differentially not only as unique but also as a risk factor for caregiving environment and child growth.

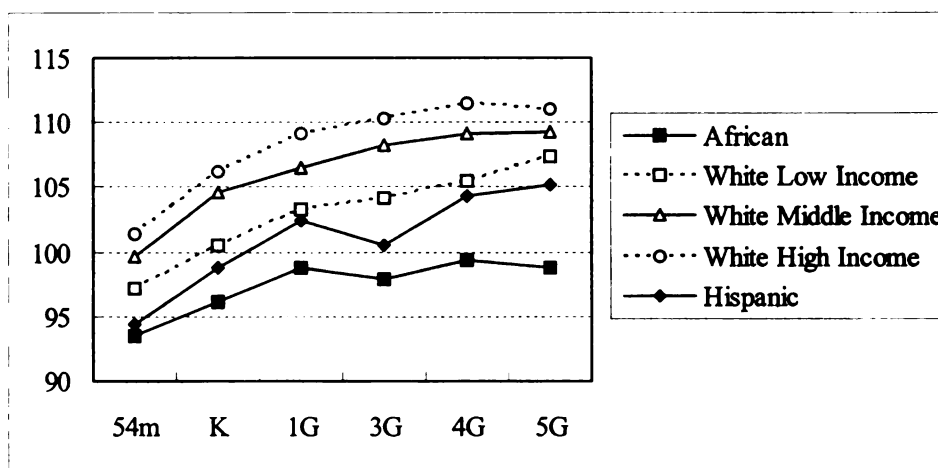


Figure 13. Growth of social competence by income-considered ethnic groups

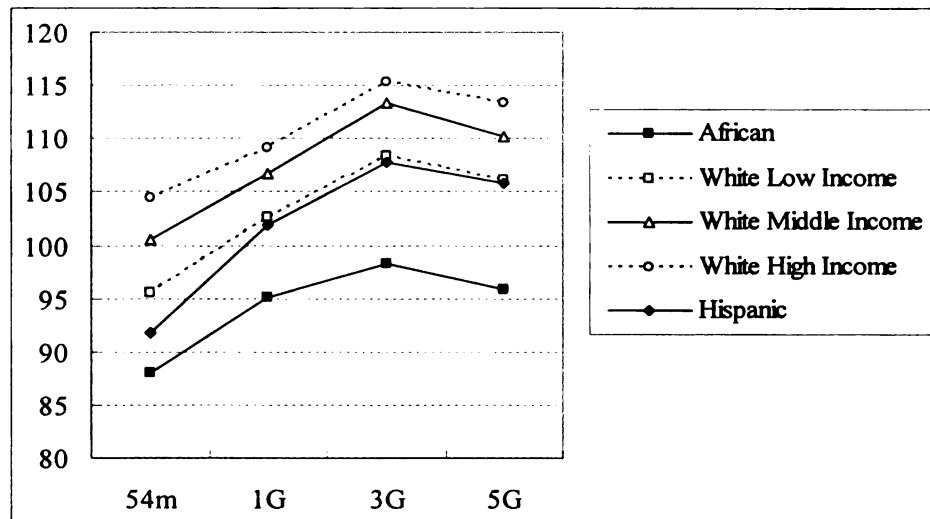


Figure 14. Growth of academic achievement by income-considered ethnic groups

In any further categorizations of low-income range for African American and low-income White American groups – i.e., applying the same poverty threshold or selection of same range of low-income, however, mean differences in early factors between African American and (low-income) White American groups did not disappear. Looking into income distribution, the African American group's income was positively skewed (skewness=2.09), while that of the low-income White American's was almost normally distributed (skewness=-0.51).

It is understood that the African American's income was more homogeneous at the lower quarters of income in the distribution. The low-income White American group was still economically more advantaged than were the African American group. African American families are likely to have less advantaged family factors as well, such as lower maternal sensitivity and lower mother's verbal intelligence scores, as the literature indicates (e.g., McLoyd, 1998). Due to embedded differences in nature, severity, and duration of poverty or (low) income across ethnic groups, any group-classification criteria across and within African American-White American groups seemed to hinder complete control of socioeconomic influences and the effects of third variables associated with socioeconomic disparities (e.g., Johnson et al., 2003) in ethnic group comparisons. Also, the Hispanic group's income range was not very low; rather it appeared to be working class or lower-middle circumstances in this sample. Thus the criteria of income-considered group analysis as an additional ad-hoc analysis look reasonable, but the interpretation of group comparisons needs be done with consideration of these embedded heterogeneous characteristics across groups.

Multiple group comparison¹ of child care effects and attachment continuity on the growth of social competence across income-considered ethnic groups

C-2. Multiple group comparison of child care effects and attachment continuity on social competence across income-considered ethnic groups

Groups	African American	White				Hispanic
		All	Low-income	Middle-income	High-income	
N	173	1,042	314	317	312	83
SC_initial as outcome	R ² =0.23	R ² =0.11	R ² =0.18	R ² =0.08	R ² =0.11	R ² =0.47
CC quality	-1.49[*]	0.16 ^b	-0.39 ^a	0.26 ^b	0.18 ^b	-0.37 ^a
Attachment-36m	-7.24^{**}	2.01[*]	2.94^{†b}	0.88 ^b	2.57^{†b}	-1.75 ^a
SC_slope as outcome	R ² =0.26	R ² =0.05	R ² =0.07	R ² =0.07	R ² =0.10	R ² =0.45
Attachment-36m	4.58	0.71	3.51^{†a}	-0.43 ^{bc}	-1.24 ^{bc}	2.43 ^a

$p^{\dagger} < .10$, $p^{\ast} < .05$, $p^{\ast\ast} < .01$

Note. Model fits: $\chi^2 = 334.30$ (240), $p = .0001$, CFI = .976, RMSEA = .040

Bolded and italicized values are statistically significant ones.

a implies that there is no significant difference when compared to the African American group's.

b implies that there is significant difference when compared to the African American group's.

c implies that there is significant difference when compared to the low-income White American group's.

Child care effects. When the effect of child care quality was compared between (*all*) White American group (N=1,042) ($b = 0.16^{ns}$, S.E. = 0.22) and African American group (N=173) ($b = -1.49^{\ast}$, S.E. = 0.73), the chi-square difference test was significant ($\Delta\chi^2(\Delta df) = 4.91$ (1), $p < .05$), but there was no significant difference between the African American and Hispanic groups ($\Delta\chi^2(\Delta df) = 0.88$ (1)). When the

¹ Analysis results across groups were not optimal for multiple group comparisons due to lack of statistical significances of coefficients for comparison. But (1) considering analytic limitations of the small sample sizes in ethnic minority groups and (2) considering that the group comparison is based on the changes of chi-square index as overall model fit, multiple group comparisons were not strictly limited to statistically significant coefficients. Rather, comparisons were applied as theory-driven understanding for substantial group differences in phenomena of interest.

African American group was compared to the triple-income groups of Whites, there were no significant differences in African American vs. low-income White groups ($\Delta\chi^2(\Delta df) = 1.55 (1)$ groups). Significant differences were found in African American vs. middle-income White ($\Delta\chi^2(\Delta df) = 3.92 (1)$, $p < .05$), and marginally in African American vs. high-income White ($\Delta\chi^2(\Delta df) = 3.74 (1)$, $p < .10$) groups.

There appears to be a tendency for the effect of child care quality (as sensitivity) to be associated with the *low-income* family environment. If the family experience low income, thus accordingly if the child care quality was lower than other groups, their experiences of (low-quality) sensitive care in early child care at 15 months were *negatively* related with their later starting point of social competence, irrespective of their ethnic background. Based on this result, early child care quality in low-income condition seems not to work positively as buffering against their economic disadvantage for initial social competence of children at 54 months for the following school years.

Attachment continuity. Whites and non-Whites showed different patterns in their attachment continuity on initial social competence at 54 months. For the African American group, this relation was negative; but it was positive among the White American group, and this difference was statistically significant ($\Delta\chi^2(\Delta df) = 7.50(1)$). There were no significant differences among income groups within the White American subsamples ($\Delta\chi^2(\Delta df) = 0.00(1)$; $\Delta\chi^2(\Delta df) = 0.54(1)$; $\Delta\chi^2(\Delta df) = 0.65(1)$). Also, there were consistent differences when the African American group was compared with each of the income groups in the White American subsamples ($\Delta\chi^2(\Delta df) = 6.56(1)$; $\Delta\chi^2(\Delta df) = 6.43(1)$; $\Delta\chi^2(\Delta df) = 9.65(1)$). There was no difference between African American and Hispanic groups ($\Delta\chi^2(\Delta df) = 1.20(1)$). It is understood that the 36 month attachment effect was positively influencing later social competences of White American children but not necessarily for the African American group (or the Hispanic group), and not across all time-points in the NICHD samples. Since difference exists in early family income between Blacks and Hispanics (see Appendix B), perhaps the most plausible explanation is culture and partially economics.

The effect of 36 month attachment on the social growth *slope* was differently revealed according to income levels *within* the White American group. There was a significant difference in the 36 month attachment effect on the social growth rate between low-income and middle-income White American groups ($\Delta\chi^2(\Delta df) = 4.21(1)$, $p < .05$) and marginally between low-income and high-income White American groups ($\Delta\chi^2(\Delta df) = 3.50(1)$, $p < .10$).

Considering the prevalent regression phenomena in social growth (i.e., starting high, growing less), the positive effect of attachment at 36 months in the low-income White American group both on the initial level and the growth slope of social competence, is different from the attachment phenomena of other groups. Early attachment security as measured at 36 months of child age might work differently for *low-income White American* children as an important developmental base or a buffer against low-income condition for their social growth.

There were no significant differences in attachment effect as of 15 and 24 months on initial social competence across groups, while most coefficients were not significant (See the Appendix D for full result). There might be developmentally more converging timing in the phenomena of attachment continuity. As children acquire language proficiency and form more stable working models of self and the outer world through the maturation process of attachment formation, the 36-month attachment seems to work noticeably in its continuing effects, based on this result

In sum, the attachment effect on social outcomes of children was revealed differently across income-considered ethnic groups. Both income and ethnicity significantly influenced the attachment continuity to the social growth outcomes of children. Based on the group comparison results with income effects minimized, if the effects of child care quality were likelier to be dependent on early family income levels, attachment continuity on social competence depended not only on income but also considerably on the cultural background of ethnicity for the 36 month attachment's effect. The hypothesis of positive attachment continuity on social competence was not supported fully by the African American group in the NICHD study; phenomena of attachment continuity of White American children differed somewhat according to family income levels, in that the positive attachment continuity on social growth outcomes differed in its pattern for low-income White American children.

Multiple group comparison of the child care effects on attachment between African American and White American groups

For a better understanding of the continuity of early effects, child care effects on attachment formation were also investigated via group comparisons.

Child care effects on attachment. For the all samples (N=1,364), there was no significant main effect of child care on attachment, as suggested by the literature (NICHD-ECCRN, 1997, 2001). When comparing across ethnic groups, overall there

were no direct child care effects on attachment across the groups, but in-group specific analysis revealed significant differences. There were negative effects of child care *hours* on the 15 month attachment for African American children. And it was significantly different from the no-effect in the White American ($\Delta\chi^2(\Delta df)=5.34(1)$, $p<.05$). This finding is congruent with literature indicating the negative effect of extended hours of early child care on attachment under low maternal sensitivity conditions (e.g., Egeland & Hiester, 1995; NICHD-ECCRN, 1997). However, findings in this study further indicate that it was specific to the African American group, not to the low-income White American group in the NICHD study.

C-3. Multiple group comparison of the child care effects on attachment

Groups	All	African American	White	
			All	Low-income
Total N	1364	173	1042	314
Child Care Quality(15m) N	571	66	485	127
Attachment-15m as outcome	$R^2=.01$	$R^2=.09$	$R^2=.01$	$R^2=.03$
Child Care Quality	-0.04	0.007	-0.09 [†]	-0.08
Child Care Hours	-0.02	-0.24[*]	0.00 ^a	0.00 ^a
AttachmentQ-24m as outcome	$R^2=.09$	$R^2=.06$	$R^2=.08$	$R^2=.08$
Child Care Quality	0.05	-0.08	0.05	0.13
Child Care Hours	-0.01	-0.01	0.00	0.07
Attachment -36m as outcome	$R^2=.03$	$R^2=.08$	$R^2=.02$	$R^2=.03$
Child Care Quality	-0.02	-0.06	-0.01	0.03
Child Care Hours	0.02	0.02	0.03	-0.01

$p^{\dagger}<.10$, $p^*<.05$, $p^{**}<.01$, $p^{***}<.005$

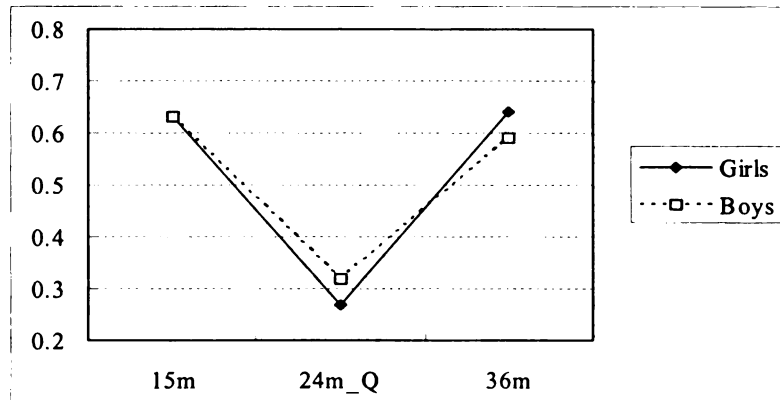
a implies that there is a significant difference when compared to the African American group's.

This is understood either as (1) a more refined validation of the *interaction* effects of child care according to the levels of maternal sensitivity, considering that the averaged African American mother's sensitivity was lower than the low-income White American mother's. Remembering the considerably lower position of sensitivity of the low-income White American mothers *within* the White American group, however, it can be also (2) a reflection of *cultural* difference between African American and White American groups in childrearing and the attachment formation – i.e., multiple attachment figures in the African American's extended family support

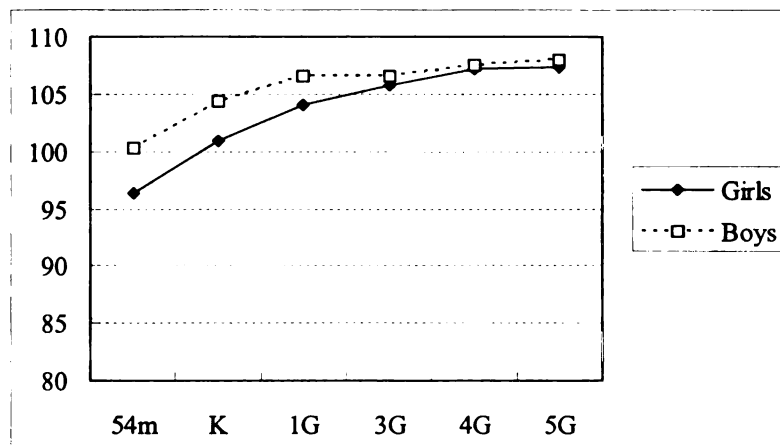
system for childrearing (Hunter et al., 1998; Jackson, 1993). Different mechanisms seem to work in the processes of attachment formation across ethnic groups according to their unique agenda of childrearing and family life. Concerning the effect of child care *quality* on attachment at 15, 24 and 36 months, there were no significant group differences via chi-square difference tests.

APPENDIX D. Mean trend of child outcomes by gender

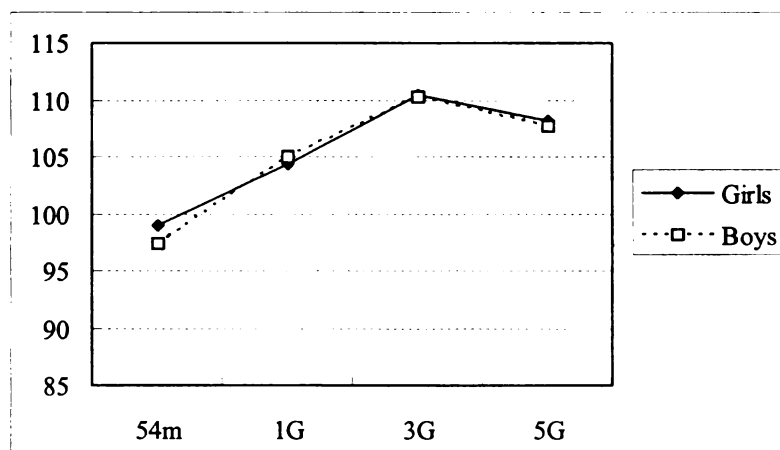
Attachment



Social competence



Academic achievement



APPENDIX E. Results on the growth outcomes of children across ethnic and income-considered ethnic groups

E-1. Results on the growth of social competence – β 's

	African American (N=176)	White All (N=1042)	White Low (N=314)	White Middle (N=317)	White High (N=312)	Hispanic (N=83)
<u>SC initial as DV</u>						
Income	-0.04	0.07	0.19**	0.08	-0.02	0.32*
Maternal Sensitivity	-0.07	0.12**	0.11	0.04	0.06	0.02
Child Care quality	-0.29*	0.04	-0.10	0.06	0.04	-0.10
Mat Verbal IQ	0.26*	0.11*	0.09	0.11	0.03	0.18
Gender	0.006	0.19***	0.15*	0.16*	0.27***	0.31*
Child Care hours	0.14	0.02	0.04	-0.08	-0.004	0.15
Attach-15m	0.12	0.06	-0.01	0.04	0.19**	0.20
AttachQ-24m	0.17	0.07 [†]	0.15*	0.07	0.03	0.12
Attach-36m	-0.26**	0.08*	0.12 [†]	0.04	0.11 [†]	-0.06
<u>SC slope as DV</u>						
Income	0.15	0.03	-0.05	0.03	0.05	-0.17
Maternal Sensitivity	0.24	-0.09 [†]	-0.04	-0.10	-0.09	-0.26
Child Care quality	0.23	-0.02	0.03	-0.003	-0.07	0.52
Mat Verbal IQ	0.14	0.10	-0.05	0.15 [†]	0.06	0.35
Gender	0.05	-0.15**	-0.10	-0.13 [†]	-0.25**	-0.52**
Child Care hours	0.03	-0.07	-0.13	-0.13	-0.03	-0.12
Attach-15m	-0.10	0.04	0.06	-0.13 [†]	0.09	-0.44*
AttachQ-24m	0.04	0.07	0.08	0.01	0.04	-0.02
Attach-36m	0.19	0.03	0.17 [†]	-0.02	-0.06	0.10

Model fit. χ^2 (240) = 334.30, $p < .0001$, CFI=.976, RMSEA=.040 [CI:.030, .050]

E-2. Results on the growth of academic achievement – β 's

	African American (N=176)	White All (N=1042)	White Low (N=314)	White Middle (N=317)	White High (N=312)	Hispanic (N=83)
<u>AA initial as DV</u>						
SC_initial	0.31**	0.15***	0.22**	0.09	0.08	0.34 [†]
Income	0.08	0.16***	0.12	0.01	0.05	0.07
Maternal Sensitivity	0.05	0.12**	0.008	0.07	0.16*	0.34*
Child Care quality	0.30**	0.14**	0.14	0.23*	0.04	-0.03
Mat Verbal IQ	0.33***	0.29***	0.25***	0.30***	0.36***	0.21
Gender	-0.09	-0.01	-0.08	0.04	0.01	-0.21
Child Care hours	0.17 [†]	0.06 [†]	0.04	0.04	0.07	0.08
Attach-15m	0.02	0.09*	0.11 [†]	0.08	0.08	0.20
AttachQ-24m	0.20*	0.08*	0.08	0.09	0.001	0.10
Attach-36m	0.18*	0.09**	0.13 [†]	0.08	0.04	0.20
<u>AA slope as DV</u>						
SC_initial	-0.12	-0.11*	-0.20*	-0.09	-0.08	-0.10
Income	0.03	-0.10	-0.02	0.16	0.002	0.33
Maternal Sensitivity	0.03	-0.07	0.07	-0.23*	-0.15 [†]	-0.50
Child Care quality	-0.15	-0.05	-0.09	-0.17	0.14	0.53
Mat Verbal IQ	-0.002	0.19***	0.14	0.44***	-0.01	-0.14
Gender	0.06	0.05	0.21**	0.01	-0.06	0.39
Child Care hours	0.114	0.04	0.07	0.06	0.03	0.06
Attach-15m	-0.10	-0.11*	-0.17*	-0.04	-0.09	-0.58*
AttachQ-24m	-0.12	-0.06	-0.08	-0.12	0.13	0.30
Attach-36m	-0.11	0.04	0.14 [†]	0.10	-0.13	-0.18

Model fit. χ^2 (474) = 708.28, $p < .0001$, CFI=.967, RMSEA=.045 [CI:.038, .052]

Appendix F. Mean comparison of 54 month social competence by 15, 36 month attachment security (secure vs. insecure groups) across ethnic groups

By 15 month attachment security

African American		White		Hispanic	
Secure	Insecure	Secure	Insecure	Secure	Insecure
N=57	N=53	N=493	N=283	N=29	N=24
93.98	91.87	99.63	98.81	96.69	90.75
$t(108) = .78, p = .44$		$t(774) = .85, p = .39$		$t(51) = 1.42, p = .162$	

By 36 month attachment security

African American		White		Hispanic	
Secure	Insecure	Secure	Secure	Insecure	Secure
N=55	N=53	N=507	N=294	N=38	N=19
91.27	94.58	100.63	97.48	95.10	93.21
$t(106) = -1.21, p = .231$		$t(799) = 3.34, p = .001$		$t(55) = .44, p = .664$	

Without extreme values of 54 month social competence in the African American children by 36 month attachment security (secure vs. insecure groups)

African American	
Secure	Insecure
N=45	N=49
90.49	94.65
$t(92) = -1.94, p = .056$	

Note. The averaged initial level of social competence at 54 months for the following school years (54 months – 5th grade) as latent growth factor is different from the above social competence scores at 54 months. However, as an additional analysis for the unexpected negative relations between attachment and social competence in the African American group, the mean comparisons of 54 month social competence in each ethnic group were implemented.

Descriptively, there were differences in the 54 month social competence scores and the percentage of secure/insecure classification in the African American group. The mean difference of 54 month social competence scores between secure and insecure groups at 36 months within African American group was not significant. However, when some extreme values (N=14) were not included, the difference got to be marginally significant.

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