The Effect of Pre-Institutional Family vs. No Family and Different Institutional Experiences on the Development of Residential Infants and Toddlers

by

Brandi Hawk

Bachelor of Science, University of Pittsburgh, 2009

Master of Science, University of Pittsburgh, 2013

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This dissertation was presented

by

Brandi Hawk

It was defended on

May 12, 2014

and approved by

Celia Brownell, Ph.D., Professor, Department of Psychology

Susan B. Campbell, Ph.D., Professor Emeritus, Department of Psychology

Christina J. Groark, PhD., Associate Professor, School of Education

Daniel S. Shaw, Ph.D., Professor, Department of Psychology

Dissertation Advisor: Robert B. McCall, Ph.D., Professor, Department of Psychology

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Brandi Hawk, PhD

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Young children living in traditional institutions are at risk for many negative outcomes, especially related to social-emotional and cognitive development. The current study addressed whether two institution-wide interventions in St. Petersburg, Russian Federation, that increased caregiver sensitivity (Training Only: TO) or both caregiver sensitivity and consistency (Training plus Structural Changes: T+SC) promoted better social-emotional and cognitive development than a No Intervention (NoI) institution during the first year of life for children who were placed soon after birth. It also assessed whether having spent less than 9 versus 9-36 months with a family prior to institutionalization was related to children's subsequent social-emotional and cognitive development within these three institutions. The Battelle Developmental Inventory and Parent-Child Early Relational Assessment were used to assess the social-emotional and cognitive functioning of children in NoI (n = 95), TO (n = 104), and T+SC (n = 86) at 2-3 time points during their first 6-12 months of residency. Results suggest that during the first year of life, improving caregiver sensitivity can positively impact infants' cognitive development, whereas improving caregiver consistency in addition to sensitivity is more beneficial for social-emotional development than sensitivity alone. Family effects in T+SC supported these conclusions; longer time with a family (consistent caregiver, unknown sensitivity) was associated with better social-emotional but not cognitive baseline scores and more rapid cognitive than social-emotional development during institutionalization. Spending more than nine months with a family also

seemed to prepare children for higher quality interactions with institutional caregivers, regardless of Baby Home.

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PREFACE

It is with great gratitude that I submit this document. I am so thankful that my amazing academic advisor, Dr. Robert McCall, took a chance on an undergraduate student and continued to support me every step of my academic career. He has always believed in me and has helped me develop not only as a researcher but also as a person who believes in herself. I am also extremely thankful for my committee members, Drs. Celia Brownell, Susan Campbell, Christina Groark, and Daniel Shaw, who have similarly supported my growth and influenced me immensely. They have pushed me to think in new and deeper ways, and their work and comments have consistently reminded me that research is meant to make a difference in people's lives. Dr. Elizabeth Votruba-Drzal's statistical knowledge and advice has also been invaluable. I am thankful for the St. Petersburg-USA Orphanage Research Team, who created and implemented an amazing intervention that has improved the lives of numerous children and who allowed me to benefit from their hard work. Even with all of the support of my academic family, I could not have made it this far without my husband, Matthew Hawk, who has loved and supported me unconditionally, my parents, Michael and Sharon Brunner, who have always encouraged me and made sure I knew how proud of me they were, and my daughter, Eliana, who has given me new purpose and a constant source of enjoyment and distraction. Above all, I am thankful for the God who has loved and blessed me so much that I have the freedom to love and to be a blessing for others.

1.0 INTRODUCTION

Most people would agree that families are the best place for children to live and to grow. However, millions of children worldwide are not able to live with their families of origin, most often due to parental death or incarceration, their parents' choice not to raise them, or removal from parental care because of neglect and/or abuse. Of these children, approximately 2-8 million live in institutional care of varying, often poor, quality (Engle, Groza, Groark, Greenberg, Bunkers, & Muhamedrahimov, 2011; UNICEF, 2009). The current study aims to determine whether interventions to improve care within these institutions can improve social-emotional and cognitive development for resident children and what (if any) association living with a family prior to institutionalization has with subsequent development within the institution.

1.1 ATTACHMENT THEORY

Attachment theory provides a framework for understanding early childhood development and the importance of the caregiving environment. A child's attachment to a caregiver is thought to be an evolutionary mechanism for keeping the child safe by promoting proximity to an adult (Bowlby, 1969). It includes behaviors that promote proximity (e.g., crying, smiling), a behavioral system that organizes these behaviors, and a persistent, emotionally significant bond that involves seeking comfort and security from the caregiver (Cassidy, 1999). Caregivers are primarily

responsible for creating an environment that facilitates the development of an organized behavioral system and a high-quality, secure attachment bond during the first years of a child's life (Bowlby, 1969; Cassidy, 1999). This task is highly important, as the organization of the behavioral system and the quality of the bond have been found to be associated with concurrent and subsequent child development in many domains, including social-emotional and cognitive functioning (Ainsworth, Blehar, Waters, & Wall, 1978; Sroufe, 2005).

During the first two to three years of life, children reared in typical families are hypothesized to transition through three phases of attachment development (Ainsworth, et al., 1978; Bowlby, 1969). Ainsworth and colleagues have found that until approximately 4.5 months, infants have little or no organized attachment behavioral system and direct attachment behaviors indiscriminately toward all humans. From approximately 4.5 to 6 months, they found that infants begin to direct attachment behaviors toward a discriminated attachment figure; however, the system is still not organized around a specific figure. Most infants show little to no fear of strangers and continue to accept comfort from most people. After about 6 months in a typical family environment, children begin to organize attachment behaviors around maintaining proximity to their discriminated attachment figure, indicating that they have formed a bond with that figure. Attachment theorists propose that caregivers are responsible for maintaining proximity in early infancy but that with the onset of locomotion, and especially by the second year of life, children take a more active role in proximity seeking and maintenance (Bowlby, 1969; Cassidy, 1999).

Theorists suggest that an attachment relationship has fully developed when 1) a *discriminated attachment figure* has been identified; 2) the child actively *seeks security and comfort* from this figure when distressed; and 3) the child experiences *intense distress upon*

separation from this figure, which is alleviated upon reunion (Ainsworth et al., 1978; Bowlby, 1969; Cassidy, 1999; Perry, 2002). For an infant to identify a discriminated attachment figure, a *consistent* (i.e., familiar and consistently available) figure must be present in the child's life. Further, it has been hypothesized that infants' expectations regarding when and how to seek security and comfort reflect a history of infant-caregiver interactions, including the *sensitivity* of the caregiver in those interactions (Ainsworth et al., 1978; Kobak, 1999). Sensitivity refers to the caregiver's ability to perceive accurately and to respond contingently and appropriately to the child's signals for comfort, social interaction, or basic needs (Ainsworth et al., 1978; De Wolff & van IJzendoorn, 1997). Finally, *separation distress* is hypothesized to be associated with a progression of negative emotional states, especially when no substitute attachment figure is available (Bowlby, 1973).

1.1.1 Caregiver Sensitivity

Researchers suggest that all children who have experienced a consistent parental presence will develop an attachment bond but that the attachment quality is related to the sensitivity of the caregiver (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003; De Wolff & van IJzendoorn, 1997; Moran, Forbes, Evans, Tarabulsy, & Madigan, 2008; NICHD Early Child Care Research Network, 1997; Sroufe, 2005; Stronach, Toth, Rogosch, Oshri, Manly, & Cicchetti, 2011). During the first six months of life, caregivers are primarily responsible for infants' regulation and social interactions (Bowlby, 2005; Marvin & Britner, 1999). These interactions help infants begin to develop expectations that are tied to their own sensorimotor actions and experiences (Ainsworth et al., 1978; Bowlby, 1969).

Around six months, attachment theorists suggest that behaviorally based internal working models of caregivers' availability and responsiveness during interactions begin to form and continue to mature into internalized representations of self, others, and the environment. These internal working models are influenced by past interactions with the caregiver and represent the child's expectations about the caregiver's future responsiveness and availability. Once formed, they are hypothesized to impact the way children think about their own abilities and how they behave and respond to others (Bowlby, 1969; Bretherton & Munholland, 1999). However, attachment theory is a transactional model, with early experiences and expectations directing children toward a particular path, and subsequent life experiences and interactions continuously updating internal working models and adjusting the path. Thus, early attachment experiences predict internal working models and behaviors in a probabilistic, rather than deterministic, manner (Bowlby, 1969; Sroufe, Carlson, Levy, & Egeland, 1999; Sroufe, Egeland, & Kreutzer, 1990; Weinfield, Sroufe, & Egeland, 2000).

In general, attachment theorists posit that sensitive caregiving, assuming a consistent relationship, should be associated with a secure attachment bond, positive internal working models, and the most positive child outcomes. With a history of sensitive caregiver interactions, children may be more likely to develop expectations of the caregiver as responsive and dependable and to develop internal working models of themselves as valuable and efficacious and others as safe and trustworthy. Their social behavior would be expected to convey their willingness to engage with and to trust others, and their cognitive development would reflect a greater readiness to explore the environment (Ainsworth et al., 1978; Bretherton & Munholland, 1999; Sroufe, 2005; Sroufe et al., 1999; Suess, Grossmann, & Sroufe, 1992). Conversely, children with a history of negative or unresponsive interactions with caregivers have a greater

potential to develop insecure attachment bonds. They may develop expectations of the caregiver as unavailable and unresponsive and internal working models of themselves as not valuable, or even worthless, and others as unsafe or untrustworthy. In this scenario, children may be expected to withdraw from social interactions or to display aggression toward others. Similarly, they may be less likely to spend as much time exploring their environments, an activity important for cognitive development, because they lack the secure base that would permit them to do so (Ainsworth et al., 1978; Bretherton & Munholland, 1999; Erickson et al., 1985; Sroufe et al., 1999; Suess et al., 1992).

The larger environment in which these experiences occur must also be considered. For instance, the association between less secure infant attachment quality and later child problem behaviors has been found to be stronger among higher versus lower risk samples (compare Fagot & Kavanagh, 1990, 1993; Lewis, Feiring, McGuffog, & Jaskir, 1984; versus Erickson, Sroufe, & Egeland, 1985; Lyons-Ruth, Alpern, & Repacholi, 1993; Shaw, Owens, Vondra, Keenan, & Winslow, 1996). Thus, caregiver sensitivity may be especially relevant to child outcomes in high-risk environments. Indeed, a great deal of work has described the quality of attachment relationships within neglectful or maltreating families, which would be considered extremely insensitive care and which often occurs within high-risk environments. This work describes higher proportions of insecure and disorganized attachments among maltreated children in contrast to those who have not been maltreated (Crittenden & Ainsworth, 1989; Cyr, Euser, Bakermans-Kranenburg, & van IJzendoorn, 2010; Stronach et al., 2011). Maltreatment and these attachment patterns are also related to poorer general development (Crittenden, 1985; Dietrich, Starr, & Weisfeld, 1983; Koski & Ingram, 1977), more immature socio-communicative and play abilities (Valentino, Cicchetti, Toth, & Rogosch, 2011), difficulties understanding and

processing emotions (Perlman, Kalish, & Pollak, 2008; Shackman et al., 2010), and other behavioral and social difficulties (Crittenden & Ainsworth, 1989; Putnam, 2006). A meta-analysis of attachment-based interventions found that those interventions that effectively enhanced parental sensitivity also improved attachment security (Bakermans-Kranenburg et al., 2003). These findings support the hypothesis that the quality of early interactions influences child development, especially for young children in high-risk environments.

1.1.2 Caregiver Consistency

Although any adults that interact with the children can be sensitive, promoting positive interactions, an affective bond can only develop when there is a consistent caregiver. Children would be unable to develop expectations and internal working models about a caregiver and especially could not develop a loving relationship with him/her if that caregiver was not consistently available (Ainsworth et al., 1978; Bowlby, 1969). Caregiver consistency has received less attention than sensitivity in the literature. Studies of maltreatment assess caregiver consistency in responses (e.g., sometimes responding warmly and other times harshly); however, this does not address the issue of not having a consistent *figure*. Children in childcare experience multiple caregivers, but parents remain consistent. Children in foster care also experience multiple caregivers (i.e., parents plus foster families). Children who experience more disruptions in care tend to have poorer outcomes; however, researchers suggest that these negative child behaviors are both a cause and consequence of disruptions (Newton, Litrownik, & Landsverk, 2000; Oosterman, Schuengel, Slot, Bullens, & Doreleijers, 2007). When the only disruption in care occurs before 18 months of age, children seem able to organize their attachment behaviors around their new caregiver, but the formation of this relationship depends as much on the foster

parents' beliefs and behaviors as the child's (Dozier, Stoval, Albus, & Bates, 2001). Even for foster children, the same figure is available for the duration of time in that person's care. Thus, the problem of consistency for foster children could be defined as serial relationships. Children in institutions, however, experience many, changing caregivers who are often not consistent from one day to the next due to caregivers' schedules and high rates of caregiver turnover (Chisolm, 1998). These children do experience true inconsistency, but it is often also accompanied by cold, unresponsive care and other depriving aspects of the institution.

1.1.3 Separation Distress

Nearly all children raised with a consistent caregiver, even a maltreating one, form an attachment bond and experience intense distress when separated from that figure (Bowlby, 1969, 1973). Prior to approximately 6 months, infants seem unaffected by caregiver separation because of their limited perceptual-cognitive abilities and lack of a discriminated attachment bond. After 6 months, children begin to show intense distress that resembles mature "mourning" when they are separated from their attachment figures for long periods of time (Bowlby, 1980). This response becomes more intense with age, especially increasing in intensity after 12-14 months of age for children raised in typical families. At this point, children generally proceed, at different speeds, through three phases of distress: 1) fear and anger, 2) despair, and 3) detachment. Once separation occurs, the quality of the new environment can influence their progression through these phases and can change the developmental trajectory originally formed by earlier experiences (Sroufe, Coffino, & Carlson, 2010). If children receive supportive, responsive care from a consistent caregiver following separation or loss, they should eventually direct their attachment behaviors toward and develop a bond with that figure. In that situation, children may

experience distress for a few days or weeks but eventually feel safe in the new environment and continue on their original developmental path or possibly progress to an even higher level of functioning. Conversely, if no consistent caregiver is available following separation or loss, most children would be expected to progress through all three stages, likely becoming increasingly withdrawn and self-focused and less able to develop deep relationships with others. Most children display hostility and despair following separation, but children in the latter condition may tend to continue with this hostility, to become highly anxious and/or phobic, and to display deficits in their emotional and social development (Bowlby, 1980).

1.1.4 Child Outcomes Related to Attachment

Researchers have documented the importance of early attachments and caregiver-child relationships for many areas of child development. Within the social realm, caregiver consistency and sensitivity relate to children's affective displays, approach, exploratory play, and joint attention/interactive play (Bigelow, MacLean, Proctor, Myatt, Gillis, & Power, 2010; Sroufe, 2005; Sroufe & Waters, 1977). Once the attachment behavioral system has become organized, children display different emotions and behaviors at different times based on expectations formed by caregivers' past responses to social bids and signs of distress (Ainsworth et al., 1978; Bowlby, 1969). Infants are more likely to approach the caregiver and to seek closeness and comfort if the caregiver has responded positively to distress or social bids in the past. Exploratory play is promoted when children have expectations that the caregiver will be available for support if needed. Joint attention/interactive play may be fostered by past experiences of the caregiver's responsiveness and attentiveness during play and other social interactions. Experiences during distress are especially relevant to the child's self-regulatory

abilities because children must learn how to regulate their distress and negative affect with their caregivers' help (Schore, 2001). Before 6 months, sensitive caregivers are able to provide comfort and to help children calm down when distressed, promoting the development of social-emotional functioning and self-regulation. However, after 6 months without a consistent relationship, attachment theorists hypothesize that attachment behaviors are unlikely to become organized and that children will likely remain distressed, inhibiting the development of affiliative and exploratory behaviors (Ainsworth et al., 1978; Supkof, Puig, & Sroufe, 2012).

Even though social-emotional and self-regulatory behaviors are the areas of development most obviously connected to attachment, the opportunity for consistent, sensitive interactions also facilitates development in other areas. Importantly, the attachment and exploratory behavioral systems are in opposition. When children's attachment behavioral systems remain activated and disorganized (i.e., the child remains distressed and unable to seek and to find comfort), such as in the context of inconsistent and/or insensitive care, the exploratory behavioral system is less consistently activated (i.e., the child does not explore the environment), limiting multiple aspects of sensorimotor development. Because exploration and sensorimotor development are foundational for later cognitive and language development, the continued activation of the attachment behavioral system is associated with poorer cognitive and language development (Bowlby, 1969; Cassidy, 1999; Lyons-Ruth, Connell, Grunebaum, & Botein, 1990; Perry, 2002). This relation between caregiving quality and cognitive development may be even stronger in high-risk environments. For example, in impoverished families, 7-year-old twins' IQs are related to family environment more than genes, whereas the reverse is true in affluent families (Turkheimer, Haley, Waldron, D'Onofrio, & Gottesman, 2003). Similarly, language development is dependent on the amount of communication directed toward the child, especially

during periods of social interaction and joint attention, which is fostered in a warm, responsive relationship (Bigelow et al., 2010; Glennen, 2002; Tomasello & Todd, 1983; van IJzendoorn, Dijkstra, & Bus, 1995).

1.2 CHILD DEVELOPMENT IN INSTITUTIONS

1.2.1 Attachment Theory in an Institutional Context

Researchers have documented disproportionately high rates of disorganized attachments using the Strange Situation Paradigm among children raised in typical institutions (Bakermans-Kranenburg et al., 2011; Smyke, Dumitrescu, & Zeanah, 2002). However, researchers propose that these children may actually *not* form any attachment at all and that paradigms created for parent-reared children may not be appropriate for institution-reared children (Bakermans-Kranenburg et al., 2011). Without a consistent caregiver, children have no attachment figure with whom to form even a disorganized or insecure attachment. Thus, these children might represent a qualitatively different group: one with no primary attachment relationship.

1.2.1.1 Sensitivity and Consistency

Institutions around the world vary greatly in their structure and the degree of deprivation the children experience. For example, the Romanian institutions of the 1990s are considered to be some of the most globally depriving institutions in the world. They had stark walls, were dirty, did not provide adequate sanitation or nutrition, and had caregiver-to-child ratios between 1:10 and 1:20. Children spent 20 hours per day in a crib, experienced little interaction with caregivers,

and received food from propped or self-held bottles (Fisher, Ames, Chisholm, & Savoie, 1997). More recently, Romanian institutions offer toys and playgrounds, at least five hours of free play and "stimulation" or education per day, and better sanitation and nutrition. However, the children still experience a high caregiver-to-child ratio, little interaction with caregivers, many changing caregivers, and a highly regimented daily schedule (Zeanah et al., 2003). Russian institutions tend to have adequate nutrition, sanitation, and stimulation; but children experience 60-100 different caregivers within 2 years, caregiver-to-child ratios range from 1:7 to 1:9, and caregivers rarely interact with children in a response-contingent manner (The St. Petersburg-USA Orphanage Research Team, 2005). In higher quality Greek institutions, caregiver-to-child ratios range from 1:4 to 1:6, and caregivers are instructed to form a "special relationship" with at least one infant. However, children still spend about 17.5 hours per day in bed, and the majority of children have a disorganized attachment to their "special" caregiver (Vorria et al., 2003).

Although orphanage care varies between and within countries, children in most institutions have limited ability to interact with and to form a relationship with one consistent and sensitive caregiver (Chisholm, 1998). Whether the structure of the institution, in which children see many changing caregivers, or the caregivers' cold and unresponsive behavior is more detrimental is unknown. However, within an attachment theory framework, it is important to consider both whether the child has the opportunity to form an attachment bond with a specific caregiver (*consistency*) and whether the attachment figure is responsive to the infant's social cues and needs for comfort and support (*sensitivity*). When raised in an institution without a consistent caregiver, children have little to no opportunity to form an attachment bond and may be more likely to have difficulty forming one if given the chance later in life (Ainsworth et al., 1978; Bakermans-Kranenburg et al., 2011; Bowlby, 1969). This lack of a consistent caregiver

may be less detrimental during the first 6 months of life when children readily accept comfort from anyone. However, it likely becomes more critical after 6 months, when children would be unable to organize their behaviors and expectations around a single figure or a few familiar figures. Moreover, in typical institutions, caregivers are not responsive to children's needs, suggesting that even during the first 6 months of life, the poor quality of interactions may be related to higher levels of distress and poorer development.

1.2.1.2 Separation Distress and Loss of Family

For many children, the institution is not their only early environment. Some children first live with their birth families, only to be surrendered to an institution later. Children can be voluntarily sent to the institutions by parents who feel unable or are unwilling to care for them, or they can be involuntarily relinquished, removed from parental care due to concerns for the child's safety. A description of these birth families is unavailable in most of the research on children in institutions; however, researchers have continuously documented the need to know more about pre-institutional experiences (McCall, 2011), with only two known studies fully addressing this issue (Hermanau, Hecker, Elbert, & Rug-Leuschner, 2014; Oliveira et al., 2012).

In one study (Hermanau et al., 2014), children who entered institutions in Sub-Saharan Africa before 4 years of age experienced or witnessed fewer types of abuse in their families but more types of abuse in the institution than children who entered institutions after 4 years of age. Even though there were no differences between those who entered the institution before versus after 4 years on lifetime types of abuse, those who entered before 4 years had higher levels of depressive, aggressive, internalizing, and externalizing behaviors in later childhood. These findings suggest that early institutional abuse is related to higher levels of behavior problems than early abuse in families, supporting the idea that children fare better in families than

institutions. In the second study, Oliveira and colleagues (2012) found that prenatal risk and pre-institutional emotional neglect were related to higher rates of indiscriminate behavior among institutionalized toddlers, suggesting that the quality of pre-institutional experience is relevant to behaviors within the institution. However, both studies assessed only one time point, not longitudinal development in the institution, and neither assessed potential separation distress in the months immediately following institutionalization.

1.2.2 Child Development within Institutions

To understand how the institutional environment relates to child development, researchers have examined children's attachment patterns and cognitive development within institutions, mainly in Eastern Europe. Bakermans-Kranenberg and colleagues (2011) concluded that, on average, 73% of children living in institutions have disorganized attachment patterns. However, because the caregiver and child may only have met a few times, the Strange Situation Paradigm (the most commonly used measure of attachment) may not be appropriate for these children. The authors suggest that the high percentage of disorganized ratings may actually represent undeveloped attachments. Indeed, using a new 5-point measure of attachment formation, researchers have found that only 3-24% of children in institutions have the fully formed attachment behavioral organizations that nearly all parent-reared children display (Dobrova-Krol, Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2009; Zeanah, Smyke, Koga, & Carlson, 2005).

Levels of reactive attachment disorder (RAD), both withdrawn/inhibited and indiscriminately social/disinhibited subtypes, have also been demonstrated to be higher in institution- than parent-reared children (Smyke et al., 2002; Zeanah et al., 2005). Although researchers debate whether it is a subtype of RAD or its own phenomenon, indiscriminate

friendliness has also been documented frequently in institutionalized children (Smyke et al., 2002; Bakermans-Kranenberg et al., 2011). It may be a learned strategy for emotion regulation and receiving attention, as the small amount of attention the caregivers show would most likely be directed toward smiling, happy children (Bakermans-Kranenberg et al., 2011).

Institutionalized children are also more likely than parent-reared children to be in the "mental deficiency" range on cognitive tests, with approximately 68% of children below the 10th percentile (Dobrova-Krol et al., 2010; Sloutsky, 1997; St. Petersburg-USA Orphanage Research Team, 2005). In a Central American orphanage, children's mean developmental quotient (DQ; *M* = 100, *SD* = 15) was 60, with a 1.3 to 2.3 point drop in DQ per year (Groark, McCall, Fish, & the Whole Child International Evaluation Team, 2011). Further, Romanian children randomly assigned to foster families had rapid increases in DQ/IQ, but those continuing in institutionalized treatment as usual had lower DQ/IQ scores than at baseline with more time in the institution (Nelson et al., 2007).

1.3 ST. PETERSBURG BABY HOME INTERVENTION

Baby Homes (i.e., institutions for children ages 0-4 years) in St. Petersburg, Russian Federation have been studied in depth and defined as selectively social-emotionally depriving (St. Petersburg-USA Orphanage Research Team, 2005). Because Baby Homes are federally funded and run by pediatricians, children receive adequate medical care, sanitation, nutrition, toys, and equipment. However, Baby Home structure and caregiver schedules create an environment of inconsistency. Children experience 60-100 different caregivers over the course of two years and rarely see the same caregiver on two consecutive days. The Baby Home culture and caregiver

beliefs also lead to insensitive care, with caregivers performing their duties in a perfunctory manner with few contingent interactions. When interactions do occur, they tend to be caregiver-directed rather than child-directed (St. Petersburg-USA Orphanage Research Team, 2005).

1.3.1 Baby Homes

The three institutions in the St. Petersburg-USA Orphanage Research Team's (2008) intervention offer a unique opportunity to assess the effects of caregiver sensitivity and consistency on children's development in a high-risk sample. A No Intervention (NoI) control Baby Home continued with care as usual, consisting of many, changing caregivers who were generally cold and unresponsive to the children and perfunctory in their care. Not only did children in this Baby Home not have the opportunity to form an attachment bond with a consistent figure, but they also did not experience sensitive care, opportunities for response-contingent interactions, or caregivers willing to comfort them when they were distressed. When assessed in the Strange Situation, 86% of children in NoI were coded as having a disorganized attachment (St. Petersburg-USA Orphanage Research Team, 2008). Thus, they likely did not identify a discriminated attachment figure and were unable to organize their exploration and sensorimotor experiences around predictable, positive interactions with caregivers.

In a Training Only (TO) intervention Baby Home, caregivers were trained to provide sensitive, response-contingent care, but their schedules remained inconsistent. Thus, children in TO did not have the opportunity to form an attachment bond with a discriminated figure, consistent with 85% of children receiving a disorganized attachment classification, but they did experience more sensitive caregiver-child social interactions. The intervention team taught caregivers to be more sensitive and responsive to the children's needs and to interact in a more

child-directed manner. Caregivers in TO displayed improvement in knowledge of the training content and some improvement in HOME scores (a measure of caregiving quality and environmental characteristics). Although caregiver behaviors changed, children displayed no more organized or secure attachment behaviors than those in NoI, perhaps due to the continued unavailability of a consistent attachment figure. Caregivers became more sensitive and supportive; however, the children still could not form affective bonds with caregivers (St. Petersburg-USA Orphanage Research Team, 2008).

Finally, a Training plus Structural Changes (T+SC) intervention targeted both sensitivity and consistency. The structural changes included reducing ward size and creating a family-like environment by having two primary caregivers per ward and integrating by age and disability. The total number of caregivers was reduced, and their consistency was increased. Caregivers showed large improvements in HOME scores, and assessments of structural changes confirmed fewer cumulative caregivers per child and more consecutive days worked in the same room. Children in T+SC also displayed more organized attachment behaviors than those in the other Baby Homes, although they still had much higher rates of disorganized attachment than non-institutionalized children (39% organized; St. Petersburg-USA Orphanage Research Team, 2008). The presence of familiar and consistent caregivers provided the children the opportunity to form attachment relationships with specific caregivers. They also experienced sensitive care from caregivers willing to provide comfort during distress. Although qualitative differences exist between the rearing environments of T+SC and a home with biological parents (e.g., biological relatedness, fewer total children and caregivers), this intervention was designed to mimic a positive family environment as closely as possible within the limitations of an institutional setting.

1.3.2 Pre-Institutional Experiences

In the Russian Federation, many parents sincerely want to raise their children well, but the financial burden of children and the limited governmental aid for families may become too overwhelming (Balachova, Bonner, & Levy, 2009). Indeed, the primary reason for relinquishment cited by a sample of Russian mothers was extreme poverty, often accompanied by unintended pregnancy, injection drug use, lack of familial social support, pressure from medical staff, and fear of disabilities (Isupova, 2004; Zabina et al., 2009).

The amount of time children spend with their families should affect whether they form attachment relationships, which would be disrupted upon institutionalization. Researchers suggest that attachment disruptions negatively affect adoptions if the adopted child is at least 12 months old when separated from familiar caregivers (Brodzinsky, 1987). Indeed, most studies of adopted children find higher than average rates of attachment, cognitive, and behavioral problems only in children adopted after 6, 12, or 18 months of age, depending on the researcher's choice of age cut-off and severity of the institutional deprivation (e.g., more depriving = earlier cut-off; Juffer et al., 2011). However, in most of these studies, age at adoption could represent many risk factors, including loss of attachment relationships and length of institutionalization. Most of these studies do not address whether children spent time with their families of origin prior to adoption. However, children who spent enough time with their families to have likely formed an attachment bond with parents may offer interesting insights; of specific interest is the role that the loss of attachment figures and early opportunities for one-on-one social interactions in subsequent development within institutions when compared with infants placed earlier. Because it is assumed that adoption is more difficult for children who are adopted after they have formed an attachment bond (Bodzinsky, 1987) and that children experience

prolonged separation distress following the loss of an attachment figure (Bowlby, 1980), it is predicted that children who enter institutions after having spent enough time with a family to develop an attachment relationship will likewise have more difficulty with the transition, especially in social-emotional realms, than children who do not experience that same loss.

2.0 SPECIFIC AIMS

The overarching goal of this study was to examine the association of three aspects of attachment theory - caregiver sensitivity, consistency, and loss - with social-emotional and mental development within a high-risk sample of institutionalized children. To address the roles of caregiver sensitivity and consistency, infants who entered institutions immediately following birth or post-natal hospitalization were followed longitudinally during their first year of residency in one of three St. Petersburg, Russian Federation Baby Homes. These Baby Homes, part of a quasi-experimental intervention, included a No Intervention (NoI) Baby Home in which children experienced neither sensitivity nor consistency, a Training Only (TO) Baby Home in which children experienced sensitivity but not consistency, and a Training plus Structural Changes (T+SC) Baby Home in which children experienced both sensitivity and consistency. To address caregiver loss, children who entered these three Baby Homes after first living with their families of origin were followed longitudinally during their first year of institutionalization. Importantly, ability scores are norm standardized. Thus, *stability* in scores refers to typical rates of development (e.g., consistently 1 SD below average), not lack of development, whereas *improvement* refers to faster than typical rates (e.g., improving from 1 SD below average to .5 SDs below). Specific aims and hypotheses are as follows:

2.1 AIM 1: ASSESS THE IMPACT OF THREE INSTITUTIONAL ENVIRONMENTS THAT VARY IN CAREGIVER SENSITIVITY AND CONSISTENCY DURING THE FIRST YEAR OF LIFE ON CHILDREN'S SOCIAL-EMOTIONAL DEVELOPMENT.

Attachment theory (Ainsworth et al., 1978; Bowlby, 1969) posits that the sensitivity and consistency of caregivers during the first year of life should be especially important for infants' social-emotional development. Children tend to enter institutions with much lower than average functioning in all areas, including social-emotional abilities (St. Petersburg-USA Orphanage Research Team, 2005, 2008). When neither consistency nor sensitivity is available, children should show no faster than typical rates of social-emotional development, maintaining their below average functioning. Children should show some benefits of sensitive but inconsistent caregiving during the first year of life, when they are still willing to accept care from most people. Social-emotional development should be especially positive in a family-like environment of both consistent and sensitive caregivers. The first aim of this study was to assess how children who have no other early rearing environments develop in both the quality of their interactions with caregivers and in the acquisition of age-appropriate social-emotional skills as a function of these three different caregiving environments (NoI, TO, T+SC) during their first year of life.

2.1.1 Aim 1 Hypotheses

Assumption of non-selective placement: Children could not be randomly assigned to conditions but are assumed to enter the Baby Homes with similar social-emotional abilities.

Hypothesis 1a: Children in NoI will show stable developmental trajectories, maintaining their low levels of assessed social skills and quality of interactions.

Hypothesis 1b: Children in TO will show moderate developmental growth, with progressively better social skills and interaction quality than children in NoI but not as much improvement as children in T+SC.

Hypothesis 1c: Children in T+SC will show rapid developmental growth in social-emotional skills and the quality of their interactions, in contrast to children in both NoI and TO.

2.2 AIM 2: ASSESS THE IMPACT OF THREE INSTITUTIONAL ENVIRONMENTS THAT VARY IN CAREGIVER SENSITIVITY AND CONSISTENCY DURING THE FIRST YEAR OF LIFE ON CHILDREN'S MENTAL DEVELOPMENT.

Because children learn through social interactions, the quality of caregiver-child interactions during the first year of life should be related to children's mental development. This reflects the caregiver's role in helping infants manage distress, promoting exploration, and providing high quality perceptual-linguistic experiences to children in the context of response-contingent interactions. Thus, children's mental development (including general-DQ, cognitive, and communication) should be similar to social-emotional development in these Baby Homes during the first year of life. The second aim of this study was to examine whether Baby Home environments that differ only in the social-emotional aspects (i.e., sensitivity and consistency of caregivers) of care are associated with children's mental development during the first year of life for children who have experienced no other early environment.

2.2.1 Aim 2 Hypotheses

Assumption of non-selective placement: Children are assumed to enter the Baby Homes with similar mental abilities.

Hypothesis 2a: Children in NoI will show stable developmental trajectories, maintaining low mental scores.

Hypothesis 2b: Children in TO will show moderately faster than typical rates of mental development, more improvement than children in NoI but less than children in T+SC.

Hypothesis 2c: Children in T+SC will show rapid developmental gains in relative mental abilities, improving at faster rates than children in NoI and TO.

2.3 AIM 3: ASSESS THE IMPACT OF PREVIOUS FAMILY EXPERIENCE AND LOSS OF FAMILY ON CHILDREN'S SOCIAL-EMOTIONAL DEVELOPMENT DURING THE FIRST YEAR OF RESIDENCY IN THREE INSTITUTIONAL ENVIRONMENTS THAT VARY IN CAREGIVER SENSITIVITY AND CONSISTENCY.

Although Bowlby (1969) first proposed his theory of attachment based on descriptions of child behavior following prolonged separations from parents, few contemporary studies have addressed this phenomenon. Further, even in the initial descriptions, children were either reunited with parents after a period in a residential nursery, or other family members raised them following the death of a parent. The current study offers a unique opportunity to study children who spent time with their biological families and were later relinquished to institutions. In the St.

Petersburg Baby Homes, most biological parents who do not immediately terminate parental rights rarely, if ever, visit their children. Thus, *Family* children are those who were with their biological families prior to Baby Home entry. Because attachment theory suggests that discriminated attachments are not formed until 6-12 months of age, object permanence does not fully develop until approximately 9 months of age, the somewhat delayed nature of the children in this sample, and the number of the children who arrived at different ages, Family children were divided into those who entered the Baby Home before 9 months of age and those who entered at or after 9 months of age. These children entered a new environment with no continuity of persons from the family to the Baby Home, and for those who spent more than nine months with their family, they also presumably lost their primary attachment figure(s). It is expected that this loss will be associated with more negative social-emotional functioning (i.e., separation distress) soon after institutionalization and continued social-emotional difficulties when no consistent caregiver is available around whom to organize attachment behaviors and expectations. This study's third aim is to assess how early family experience and the loss of familial relationships relate to social-emotional development within the three different Baby Home environments.

2.3.1 Aim 3 Hypotheses

Hypothesis 3a: Separation from parents after 9 months should lead to a distress reaction, resulting in the appearance of poorer social-emotional skills when assessed soon after institutionalization for children who spent more than 9 months with their families.

Hypothesis 3b: Family children in NoI will show developmental declines in interaction quality and social skills due to the inconsistent and insensitive care. This decline will be steeper for

children who spent more than 9 months with their families because of the disruption and loss of attachment relationships.

Hypothesis 3c: Children in TO who spent less than 9 months with their families will show developmental increases in social-emotional scores over time (similar to No-Family children), whereas children who spent more than 9 months with their families will show less change due to the loss of attachment relationships and no new consistent caregivers.

Hypothesis 3d: All children in T+SC will show quickly improving social-emotional abilities. If Hypothesis 3a is confirmed, and children who spent more than 9 months with their families have lower scores at baseline, they are expected to show faster rates of social-emotional development, related to forming new relationships in T+SC and overcoming their separation distress.

2.4 AIM 4: ASSESS THE IMPACT OF PREVIOUS FAMILY EXPERIENCE AND LOSS OF FAMILY ON CHILDREN'S MENTAL DEVELOPMENT DURING THE FIRST YEAR OF RESIDENCY IN THREE INSTITUTIONAL ENVIRONMENTS THAT VARY IN CAREGIVER SENSITIVITY AND CONSISTENCY.

Family experience presumably offers more opportunities for one-on-one interactions, which are important for mental development in infancy and should be related to better mental functioning. Following institutionalization, prolonged separation distress with no new consistent or sensitive caregiver is expected to be associated with poorer subsequent mental development due to the continued activation of the attachment behavioral system (Ainsworth et al., 1978; Bowlby, 1969; Sroufe et al., 2010). However, the acute separation distress is not expected to be associated with baseline measures of mental functioning that test cognitive and communicative abilities that the

children have already learned in their families. Further, because the quality of interactions and perceptual-linguistic experiences may be more related to cognitive development than caregiver consistency (Rutter, 1979), the Baby Home environments that promote sensitive, response-contingent, and child-directed interactions (TO and T+SC) are expected to be related to continued growth in these areas, similar to that seen for children without family experience. The fourth aim of this study was to assess the association between pre-institutional family experience of less versus more than nine months and mental development within the three Baby Homes.

2.4.1 Aim 4 Hypotheses

Hypothesis 4a: Regardless of Baby Home, children who spent more than 9 months with their families will enter the Baby Home (i.e., baseline assessment at two months post-intake) with higher mental ability scores than children who spent less than 9 months or no time with a family, related to the cognitive opportunities afforded by attachment relationships.

Hypothesis 4b: In NoI, children who spent less than 9 months with their families will show similar developmental trends to No-Family children (i.e., stable scores). Children who spent more than 9 months with their families will show slower rates of mental development than children who spent less time or no time with families due to their initial high scores but lack of cognitive stimulation in the institution.

Hypothesis 4c: In TO, mental abilities will reveal similar developmental trajectories for children who did and did not spend time with families prior to Baby Home entry, related to the quality of caregiver-child interactions.

Hypothesis 4d: In T+SC, children who spent time with their families prior to entry will show similarly faster than typical rates of mental development as No-Family children.

3.0 METHODS

3.1 PARTICIPANTS

Data were collected on 989 children residing in three Baby Homes in St. Petersburg, Russian Federation. Of these, 416 were excluded because they entered the Baby Homes prior to full intervention implementation, 16 were excluded for missing crucial demographic data, 6 were excluded for entering the Baby Home after three years of age, 24 were excluded because their pre-institutional environment was unknown, 18 were excluded due to disabilities, 22 were excluded because they were in a children's hospital for more than 3 months before the Baby Home, and 5 were excluded as outliers because there were more than 12 months between their first two assessments. Thus, 285 children (147 male) participated, all of whom completed at least two assessments; 170 children completed three assessments (see assessment timeline below). Children entered the Baby Homes at different ages, with a mean age at intake of 4.54 months (*SD* = 7.75). All children entered the Baby Home before three years of age.

3.2 PROCEDURE

3.2.1 Baby Home Interventions

The interventions took place in three independent Baby Homes, and each condition was implemented throughout an entire Baby Home (The St. Petersburg-USA Orphanage Research Team, 2008). The *Training plus Structural Changes* (T+SC) intervention involved both a caregiver training and structural change component. This intervention was incorporated into the Baby Home from September 4, 2000 to October 1, 2001. The *Training Only* (TO) intervention involved only the caregiver training component, with no structural changes. It was incorporated into the Baby Home from January 14, 2002 to December 17, 2002. Finally, the *No Intervention* (NoI) Baby Home received no structural changes or trainings; rather, children within this Baby Home received care as usual. Testing of this group began on October 18, 2002. All children in the current sample arrived at the Baby Home after the interventions were completely implemented (T+SC: October 1, 2001; TO: December 17, 2002; NoI: October 18, 2002).

3.2.1.1 Training Component

The training component sought to teach new information to caregivers and to encourage behaviors more similar to those of Russian birth parents. Specific goals included increasing warm and responsive interactions with the children, increasing child-directed activities, promoting independence and creativity in the children, becoming more sensitive and responsive during care, and learning how to care for and to position children with disabilities to promote development. The training emphasized a general way of interacting with children rather than providing specific behaviors or routines to perform. Caregivers were taught to be flexible and to

match their behavior with the children to the specific child and situation. The information in the curriculum was influenced by many theories. From psychoanalytic theory, it emphasized the importance of allowing children to choose their own activities and to form relationships and representations of self and others (Anastasiow & Nucci, 1994; A. Freud, 1937; Mahler, Pine, & Bergman, 1975). Infant mental health research underscored the importance of attachments with consistent caregivers (Ainsworth et al., 1978; Bowlby, 1969). Environmental approaches suggested the importance of teaching caregivers to engage in child-directed activities (Peterson, 1987). Due to research in behavioral approaches, the curriculum included behavioral contingencies and instruction to maintain a positive behavioral environment (Strain et al., 1992). Finally, developmental approaches emphasized the importance of matching teaching to the children's developmental abilities (Safford, Sargent, & Cook, 1994).

A "train-the-trainer" model was used in which the researchers trained St. Petersburg Baby Home professionals as "trainers", who then trained and supervised the Baby Home caregivers. There were 14 professionals trained as trainers in T+SC and 12 in TO. The training included instruction with the curriculum materials, modeling and demonstrations with children in the Baby Homes, training videos, and ward observations and feedback. Curriculum instruction included both the materials that would be taught to the caregivers and materials to aid the trainers in their instruction. These professionals then led the training for the Baby Home caregivers (N = 76 in T+SC and N = 108 in TO), which included 12-14 sessions and totaled approximately 60 hours. This approach provided the benefit of having trainers capable of fitting the training material to the specific needs of the caregivers, capable of training replacement staff, and available to provide supervision to the caregivers.

To evaluate the effectiveness of the training, two parallel versions of 40-item multiple-choice tests were administered to caregivers at the beginning and the end of training. Caregivers and trainers in both TO and T+SC had higher post-test than pre-test scores, indicating that they learned the training materials (partial η^2 = .66). Caregiver HOME scores were higher in T+SC than TO and NoI during the first year post-intervention and remained high (partial η^2 = .41). During the second year, HOME scores in NoI decreased, while scores in TO increased modestly, resulting in higher HOME scores for TO than NoI caregivers during the second year of intervention. During this time, caregivers in TO continued to show lower scores than caregivers in T+SC. HOME scores, especially the variety of experiences, were indeed found to mediate intervention effects for children's general development (Rosas, 2011; for further fidelity results see St. Petersburg-USA Orphanage Research Team, 2008).

3.2.1.2 Structural Change Component

The structural change component altered physical structure, work schedules, and procedural circumstances to encourage caregiver consistency and attachment with the children. Physical structure was adjusted to lower group sizes from 10-14 children to 5-7 children per group. Before the change, wards consisted of one sleeping room, an eating room, a living/play room, a bathroom, a small kitchen where pre-made food was distributed to the children, and a small area with lockers and chairs where children prepared to go outside. After the intervention, the eating room and living/play room were divided by a wall, creating a dining/living/play room for each subgroup. The whole group (10-14 children) continued to share the sleeping room, bathroom, kitchen, and locker area, but each subgroup (5-7 children) had their own space. Large playpens were removed from the main rooms to prevent caregivers from placing children in the playpens and ignoring them.

The structure of caregivers' work schedules was also changed. Before changes, caregivers would work one very long shift (10, 14, or 24 hours), then not work for two to three days. Caregivers also received 52-56 vacation days per year, and staff turnover was approximately 15-30% per year. When there were not enough caregivers in a ward due to vacation, resignation, or illness, openings were filled by staff members willing to work overtime but who may have never been in that ward before. These staffing structures resulted in children receiving care from approximately 9-12 caregivers per week, 60-100 different caregivers during their first two years, and rarely the same caregiver on two consecutive days. To create more caregiver consistency, a primary caregiver position was created. Two primary caregivers were assigned to each subgroup and required to work in that room five days per week in staggered shifts so that one was on duty nearly all of the children's waking hours seven days per week. Four secondary caregivers were allocated to each subgroup, working a 24-hour shift once every four days in the same room. All other staff maintained their current schedules; however, replacement and substitute staff was assigned to subgroups so that the same substitute would consistently work with the same children. These changes adjusted the number of caregivers per week from 9 to 6, and created consistency by allowing children to see at least one of their two primary caregivers every day.

The Baby Home was also reorganized to integrate children by age and disability status in order to create a more family-like environment. Prior to the intervention, children periodically "graduated" to new groups with new children and caregivers, for example at the onset of crawling, the onset of walking, and again at about 24 months. After the structural changes, children no longer graduated to new age groups but remained in their same group from arrival until departure, decreasing the total number of caregivers they experienced by a factor of about

two or three. This “looping” necessitated integrating subgroups by age and by disability status, resulting in groups with children ranging in age from birth to 4 years and with varying levels of disabilities. A “family hour” was also established, consisting of one hour in the morning and one hour in the afternoon during which doors were closed and staff and children played in their group rooms. Pull-out programs were reduced as well by incorporating specialized instruction (e.g., massage, special education activities) into the subgroup space and by organizing some ongoing groups by age or disability (e.g., music, gymnastics, theater, sign language) so that most children remained in their subgroup and the others experienced more time with same-aged peers outside of their subgroup. Finally, teams of staff were created and met weekly to discuss needs that they considered important, and a system of in-house monitoring and supervisory support of caregivers was created.

To evaluate intervention fidelity, official employment records were examined to determine the total number of hours and days staff members worked and which caregivers and children were assigned to which ward each day. In T+SC, children saw approximately six caregivers per month after changes were implemented, in contrast to the 10-12 caregivers per month seen by children in both NoI and TO. Including staff turnover, graduations, and reassignments, but not daily substitutions or special service providers, children who spent 19+ months in T+SC received care from approximately 30+ caregivers, whereas those in TO and NoI received care from 60-100 different caregivers. After the intervention, caregivers in T+SC had approximately six children at a time versus 12-14+ children in NoI and TO. Primary caregivers in T+SC worked approximately 3.5 days in a row; whereas secondary caregivers in T+SC and all caregivers in TO and NoI worked only 1.2 days in a row. There were no differences in staff turnover between the Baby Homes. Over time, the mean age of children in each ward in T+SC

converged on the mean for the entire Baby Home (i.e., age integration), but each ward in TO and NoI maintained stable mean age differences over time as a result of graduations (for further fidelity results see St. Petersburg-USA Orphanage Research Team, 2008).

3.2.2 Child Assessment Schedule

At intake, Baby Home workers obtained medical and legal records of the child and interviewed birth parents if possible about the child's history. Children were assessed at 3, 6, 9, 12, 18, 24, 36, and 48 months (St. Petersburg-USA Orphanage Research Team, 2008). For children arriving after three months, an intake assessment was completed 1-2 months after arrival. Children who left the Baby Home before 48 months were assessed prior to discharge. During these assessments, trained independent examiners administered the tests to children accompanied by the caregiver the child knew best. Importantly, especially in NoI and TO, where caregivers changed frequently, the accompanying caregiver may have been different at each assessment. Although a number of assessments were administered, the current study focused only on the Battelle Developmental Inventory and the Parent-Child Early Relational Assessment. The Functional Abilities Index, as measured at the intake assessment, was also used to exclude children with disabilities and to control for functional ability level in analyses.

3.3 MEASURES

3.3.1 Demographic Variables

All demographic variables were collected from Baby Home records and are presented in Table 1. Some of this information, including gender and date of arrival, was assessed and recorded at Baby Home intake. Other information was obtained from hospital records (i.e., birth date, height and weight at birth, Apgar scores, gestational age, and mother's alcohol and drug use during pregnancy) and legal records (i.e., pre-Baby Home location, reason for Baby Home entry) and added to the Baby Home records. Age at intake was calculated by the difference in dates between birth date and date of arrival; time in the Baby Home was calculated by the differences in dates between date of arrival and date of assessment. Maternal alcohol and drug use was noted in narrative hospital records by the obstetrician, but not for all children, and for research purposes was coded as a binary variable (alcohol/drug use vs. none). Birth weight, birth height, and gestational age were highly correlated (r = .72 - .91), raising the risk of collinearity. Because of the negative consequences associated with prematurity and the large range of gestational ages (27 – 42 weeks), gestational age was chosen, in combination with Apgar score, to represent birth characteristics.

Table 1. Descriptive Statistics

	N	Mean	SD	Range
Battelle Developmental Inventory				
Total DQ (1)	265	60.23	22.47	20.00-115.38
Total DQ (3)	170	69.87	17.25	16.67-111.11
Personal-Social (1)	260	56.69	23.19	10.53-115.79
Personal-Social (3)	170	59.17	17.71	8.33-100.00
Communication (1)	264	64.67	27.87	16.67-133.33
Communication (3)	170	62.17	21.53	11.11-122.22
Cognitive (1)	239	69.22	28.90	14.29-133.33
Cognitive (3)	169	79.64	19.37	11.11-125.00
PCERA				
Child Total (1)	285	3.55	0.52	2.13-4.80
Child Total (3)	170	3.56	0.42	1.70-4.62
Caregiver Total (1)	285	3.88	0.46	2.29-5.00
Caregiver Total (3)	170	3.73	0.46	2.43-4.85
Dyadic Engagement (1)	284	2.95	0.71	1.25-4.75
Dyadic Engagement (3)	170	2.94	0.65	1.00-4.50
Baby Home and Family				
NoI	95			
TO	104			
T+SC	86			
No-Family	195			
Family < 9 Months	41			
Family ≥ 9 Months	49			
Age at Intake (months)	285	4.54	7.75	0.00-35.88
Months in the Baby Home (1)	285	1.97	0.87	0.23-7.59
Months in the Baby Home (2)	284	5.01	1.28	1.87-11.37
Months in the Baby Home (3)	170	7.83	1.24	5.16-12.02
Child/Birth Characteristics				
Male	147			
Female	138			
Maternal Substance Use	153			
FAI Total	285	1.96	0.40	1.11-3.00
Gestation Length (weeks)	285	37.75	2.62	27.00-42.00
Apgar 10 min	285	8.28	0.68	5.00-10.00

Note. For categorical variables, only the number of participants fitting that description is shown. (1) (2) (3) – Correspond to assessment number 1, 2, or 3; NoI – No Intervention; TO – Training Only; T+SC – Training plus Structural Changes; FAI – Functional Abilities Index.

Pre-Baby Home location was coded in the records as 1) Baby Home from hospital, 2) biological parents, 3) relative kinship care, 4) foster care, 5) children's hospital, 6) transferred from another Baby Home, and 7) unknown. A binary pre-Baby Home location variable was created by coding Baby Home and children's hospital as *No-Family* (*N* = 195); coding biological parents and kinship care as *Family* (*N* = 90); and excluding those who were transferred or unknown. None of the children had been in foster care. No-Family children entered the Baby Home before 3 months of age, whereas Family children arrived between 1 and 36 months of age. Family children were divided into those who entered the Baby Home before 9 months of age (*Family <9 Months, N* = 41) and those who entered at or after 9 months of age (*Family ≥9 Months, N* = 49).

Children enter the Baby Homes for a variety of reasons. Although the current study does not address these issues, the reasons for involuntary relinquishment and for parents' voluntarily sending their children to the Baby Home are shown in Table 2. The primary reason for involuntary relinquishment was neglect, whereas the primary reason for voluntarily sending children to the Baby Home was insufficient financial resources. Twenty-one children had more than one reason for involuntary relinquishment, presumably suggesting a more negative early experience. When two reasons were cited, they were financial reasons plus drugs/alcohol (*n* =1), physical abuse plus neglect (*n* = 1), neglect plus drugs/alcohol (*n* = 4), neglect plus incompetence (*n* = 7), or drugs/alcohol plus other (*n* = 1). Both children with three reasons were relinquished due to neglect, drugs/alcohol, and incompetence. All five children with four reasons were relinquished due to financial reasons, neglect, drugs/alcohol, and incompetence. Almost half of the involuntarily relinquished children were No-Family children, possibly as a result of parents' previous involvement with child services or issues that arose during pregnancy or quickly

following birth. Even though children with functional ability scores high enough to indicate a disability were removed from the current sample, 10 children in this sample were voluntarily given to the Baby Home due to the parents' not wanting to raise a child with a disability.

Table 2. Reasons for Involuntary and Voluntary Baby Home Entry by Baby Home and Family Experience.

	No-Family	Family <9	Family ≥9	No-Family	Family <9	Family ≥9	No-Family	Family <9	Family ≥9
Reasons for Involuntary Relinquishment									
Financial	1	0	0	0	1	4	0	0	1
Physical Abuse	0	0	2	0	0	0	0	0	0
Neglect	19	6	10	17	2	8	5	3	5
Drugs/Alcohol	2	2	3	4	1	5	0	1	1
Incompetence	0	0	0	8	3	6	2	0	0
Other	4	1	0	2	0	0	1	0	0
Reasons for Voluntarily Giving Child to Baby Home									
Financial	17	3	2	57	4	7	11	11	10
Child Disability	1	1	0	2	0	0	5	0	1
Child Unwanted	22	0	0	0	0	0	14	2	0
Other/No Info	3	0	0	1	0	0	9	5	0

Note. Some children had multiple reasons for involuntary relinquishment. No children had sexual abuse as an identified reason for involuntary relinquishment.

3.3.2 Functional Abilities Index

The Functional Abilities Index (FAI; Muhamedrahimov, Palmov, & Istomina, 2000) is a modification of the Abilities Index (Simeonsson & Bailey, 1991) designed to be specific to the institutional context. The FAI assesses nine domains and associated subdomains of physical and behavioral disability, including audition, behavior and social skills, intellectual functioning, motor functioning (right and left hands, arms, and legs scored separately), intentional

communication, tonicity (tightness and looseness of muscle tone), integrity of physical health, eyes (right and left scored separately), and structural status (shape, body form, and structure). Ratings for each subdomain are made using a 6-point scale (normal/typical, suspected problems, mild problems, moderate problems, severe problems, profound/extreme problems).

The FAI was used to exclude children with disabilities severe enough to interfere with growth or behavioral development. Disability was defined as having at least one of the nine FAI domain ratings equal to 5 or higher (severe or profound/extreme) or four or more scores rated 4 or higher (moderate problems). The current sample includes only those children *not* identified as having a disability; however, average FAI scores were still used as covariates in analyses to control for variability in functional abilities. Although the FAI was performed at each assessment, only scores on the first FAI are used here because change in disabilities is not the focus and the FAI classification showed substantial stability over time (St. Petersburg-USA Orphanage Research Team, 2008).

No reliability or validity information is available for the FAI. However, in the intervention study, agreement between an expert in motor behavior and Special Teachers (the Russian equivalent of special education teachers) was 85% identical and 98.8% within one point, and agreement between the expert and Baby Home neuropathologists were 73% identical and 97% within one point. The correlation between the two sets of raters (Special Teachers and neuropathologists) for the FAI total score was .99.

3.3.3 Battelle Developmental Inventory

The Battelle Developmental Inventory (Newborg, Stock, & Wnek, 1988) measures the developmental progress of children in multiple domains. It is appropriate for use with children

birth to 95 months and provides a total score (DQ) and subscale scores including Gross Motor (muscular control, body coordination, locomotion), Fine Motor (fine muscle, perceptual motor), Adaptive Behavior (attention, eating, dressing, personal responsibility, toileting), Cognitive (perceptual discrimination, memory, reasoning and academic skills, conceptual development), Communication (receptive, expressive), and Personal-Social (adult interaction, peer interaction, expression of affect, self-concept, coping, social role). Each domain includes multiple test items, which are scored based on a combination of structured test administration, interviews with caregivers, and observations of children. The test administrator sits in a room with the child and caregiver with standard materials for the structured items (e.g., form board). Items are scored on a three-point scale (0 – rarely or never, 1 – 50% or more of the time, 2 – 90% or more of the time) and are ordered by age appropriateness. Test administrators begin the test with items in the child's age level and then move to progressively less difficult items if the child does not receive a score of 2, or to progressively more difficult items until the child receives a score of 0 on two consecutive items. The current study uses the Battelle Total, Personal-Social, Communication, and Cognitive scales due to their relevance to the study questions. Appendix A describes the individual test items, their modality, and their age level for the three subscales used in this study. Appendix C shows correlations among the Battelle subscales and between these and the PCERA subscales.

Standard scores for the Battelle Total and subscales were created by converting the raw scores to mental age using Battelle conversion tables then dividing the mental age by chronological age multiplied by 100. Unfortunately, available norms were based on a 1988 sample of approximately 50 children for each 6-month age range and were not judged to be especially relevant to the Baby Home population. Thus, although the DQs provide an age-

invariant score for comparisons across age, they cannot be judged against the mean and percentiles used for IQ scores based on non-institutionalized USA children.

Test-retest reliabilities of the Battelle subscale scores in the original sample were almost all in the .90s, with total score reliabilities ranging .97-.99 across the age span (Newborg et al., 1988). In the current sample, inter-observer reliability was assessed by agreement between an expert administrator and two trained assessors. One assessor administered the Battelle while the expert and other assessor scored the child through a one-way window. Reliability was established in this way with 19 children aged 10 months to 5 years during baseline at T+SC. Over all the subscales, 93% of scores were within one point of one another (range: 87% for Motor to 100% for Communication), and 87% of the total score pairs were within two points. The median pairwise correlation for total score and subscales across examiners was .99.

3.3.4 Parent-Child Early Relational Assessment

The Parent-Child Early Relational Assessment (PCERA; Clark, 1985) assessed the social-emotional behaviors of the child, caregiver, and caregiver-child dyad. Children were assessed with the caregiver with whom they had the best relationship, who knew the child best, or who spent the most time with the child. Dyads were assessed in a room equipped with a video recorder, standard materials, and toys. The assessment included three parts, each focusing entirely on interactions between the child and caregiver, and proceeded in a standard order. First, the caregiver fed the child 100g of fruit puree, and then engaged in an age-appropriate structured task (e.g., diapering, getting the child to use a rattle, having the child find a block hidden under a cup, building a tower of blocks, etc.). The dyad then engaged in a 5-minute free-play session during which they sat on a blanket on the floor with a variety of standard toys. Caregivers were

instructed (in translated Russian), “We are interested in seeing you and [infant’s name] during a free play time together. Please be with [infant’s name] as you usually would. After the taping, I will ask you how this was alike or different from how things usually go.” Interactions were video recorded and later coded by trained individuals.

The five-minute free play interaction was reviewed on video, and coders made global ratings for caregiver, child, and dyadic characteristics. Importantly, all ratings are global, not based on time sampling or frequencies of individual behaviors. Ratings were based on a 5-point Likert scale (1-2 = areas of concern, 3 = area of some concern, 4-5 areas of strength), assessing intensity, duration, and frequency of behavioral characteristics. Each scale point was defined with specific examples to aid in coding. Coders watched the video approximately 7-9 times, each time coding approximately 8-10 variables. In total, 29 caregiver characteristics, 28 child characteristics, and 8 dyadic characteristics were assessed (see Appendix B). The caregiver characteristics refer to tone of voice, affect, mood, attitudes expressed toward the child, affective and behavioral involvement, and style. The child characteristics describe mood and affect, behavioral/adaptive abilities, activity level, and communication. The dyadic characteristics describe the affective quality of interactions and mutuality.

Factor analyses based on the total sample of PCERA assessments of the child, caregiver, and dyadic ratings were conducted to form subscales (The St. Petersburg-USA Orphanage Research Team, 2008). For the child characteristics, six ratings were eliminated because 7-13% of children were missing those ratings. Of the remaining, three factors were created: 1) Quality of play, alertness, self-regulation – 10 items, 2) Positive affect, social initiative, communication – 7 items, and 3) Emotional stability, not affectively negative – 3 items. These factors accounted for 40.5%, 9.9%, and 6.7% of the total measurement variance, respectively. Three caregiver

characteristic factors were created: 1) Positive social-emotional engagement – 7 items, 2) Responsiveness, child-directed – 8 items, and 3) No negative affect, hostility – 7 items. These accounted for 33%, 13% and 6% of measurement variance, respectively. All of the dyadic characteristic ratings loaded onto one factor: Mutual, positive, reciprocal engagement (52% of variance). Subscales were created using the unweighted sum of scores of the items in each factor.

In the current study, caregiver and child total scores were created due to correlations between subscales and the small number of items in some subscales. Correlations between caregiver subscales ranged from .284 to .671; those between child subscales ranged from .221 to .704 (all $p < .001$). Correlations between caregiver subscales and the total score ranged from .776 to .916; those between child subscales and total score ranged from .698 to .911 (all $p < .001$; see Appendix C).

Previously, inter-rater reliability of the PCERA was demonstrated with pairs of raters agreeing on 82-89% of the items for 12-month-old infants and their biological parents (Clark, 1999). Discriminate validity between high-risk and well-functioning parent-infant dyads has been demonstrated in studies comparing mothers with and without psychiatric diagnoses, low-income failure to thrive children and parents of children with adequate growth, and mothers with and without histories of drug abuse during pregnancy (Clark, 1999). Concurrent validity has been demonstrated by correlations with the Attachment Q-Sort, Strange Situation, Maternal Internal Working Models, Parenting Expectations Profile, Early Coping Inventory, and Parental Stress Index (Clark, 1999). In the current study, one of the primary investigators and one coder were trained by Pia Mothander, a Swedish expert, in the administration and scoring of the PCERA. They were then considered the experts and trained other assessors in group sessions. The assessors practiced coding videotapes of children from other Baby Homes until they reached

90% agreement on all items on three of four consecutive assessments. Inter-rater reliability was determined with a sample of 20 children aged 3 months to 5 years. The expert and four coders viewed the same videotapes and coded 58% of items identically and 95% of items within one point of each other. Correlations between pairs of coders on the subscales ranged from .55 to .86.

4.0 ANALYTIC PLAN

To answer research questions regarding the development of children within institutions, hierarchical linear modeling was chosen as the analytic strategy. Analyses were run using HLM 7 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) and used data from children's first two (N = 285) or three (N = 170) assessments in the Baby Home. Participants were included if they had at least two assessments, but a third assessment was not imputed. The outcome variables included Battelle Total, Cognitive, Communication, and Personal-Social scales; and PCERA Child Total and Dyadic Engagement scales. Preliminary analyses addressed whether the two primary variables of interest (i.e., Baby Home and Family Experience) differed as a function of potential control variables. Specifically, ANOVAs assessed whether birth weight, gestational age, functional ability scores, and Apgar scores differed as a function of Baby Home or Family Experience. Chi-square analyses assessed whether gender and maternal substance use differed by these groups. Variables that were related to the two primary variables were included as covariates.

For the primary HLM analyses, an unconditional growth model was first fit to the data using Full Information Maximum Likelihood Estimation to determine the amount of variability within the data that could potentially relate to the variables of interest (equation 1).

1) $Y_{ij} = \pi_{0i} + \pi_{1i} (BHMONTHS_{ij}\text{-}2) + \varepsilon_{ij}$

$\pi_{0i} = \gamma_{00} + \zeta_{0i}$

$$\pi_{1i} = \gamma_{10} + \zeta_{1i}$$

In this equation, i represents individuals, and j represents occasions. The variable BHMONTHS-2 represents the number of months each child has spent in the Baby Home. This amount is centered at 2 months because the mean of children's first assessment was about two months after intake. The error term of level-1, ε_{ij}, describes residuals, or the differences between individual i's score at time j and his/her predicted score. In the level-2 models, the equations predict the level-1 intercept (representing scores at two months post-intake) and slope. The error terms, ζ_{0i} and ζ_{1i}, represent differences between individual i's true initial status or slope and the population average of these. Because Full Information Maximum Likelihood Estimation was used, the Deviance statistic computed for each model describes the fit of the entire model, including both fixed effects and stochastic effects. Chi-square tests of Deviance were used to determine model fit. Because a large proportion of participants had only two data points, the minimum number of possible assessments for HLM, and none had more than three, quadratic functions could not be tested.

Chi-square tests of homogeneity of variance were computed with the unconditional growth model. For models predicting PCERA measures, the assumptions of homogeneity of variance were upheld (both $p > .50$). For the models predicting Battelle measures, however, these assumptions were violated (all $p < .001$). In each of these models, age at assessment was entered as a predictor of level 1 variance (equation 2):

2) $\text{Var}(R) = \sigma^2$ and $\log(\sigma^2) = \alpha_0 + \alpha_1(\text{ASSESSMENT AGE})$

Adding this predictor improved model fit for all outcomes (all $p < .001$); thus, it was included in all subsequent models predicting Battelle measures.

Because all unconditional growth models included unexplained variability, a three-step model building approach was used. In the first step, two time-varying predictors were added to the level 1 equation. For most outcome measures, these predictors were PCERA Caregiver Total (CG) and Dyadic Engagement (DYAD) scores; however, for the model predicting Dyadic Engagement, the two predictors were PCERA Caregiver Total and Child Total. These variables were modeled as static predictors *without* random error terms (equation 3):

3) $Y_{ij} = \pi_{0i} + \pi_{1i} (BHMONTHS_{ij}\text{-}2) + \pi_{2i} (CG_{ij}) + \pi_{3i} (DYAD_{ij}) + \varepsilon_{ij}$

$\pi_{0i} = \gamma_{00} + \zeta_{0i}$

$\pi_{1i} = \gamma_{10} + \zeta_{1i}$

$\pi_{2i} = \gamma_{20}$

$\pi_{3i} = \gamma_{30}$

The second step addressed Aims 1 and 2. The two primary variables of interest, Baby Home and Family Experience, were entered along with covariates as determined in preliminary analyses (Equation 4):

4) $Y_{ij} = \pi_{0i} + \pi_{1i} (BHMONTHS_{ij}\text{-}2) + \pi_{2i} (CG_{ij}) + \pi_{3i} (DYAD_{ij}) + \varepsilon_{ij}$

$\pi_{0i} = \gamma_{00} + (\gamma_{01}T\text{+}SC_i + \gamma_{02}TO_i) + (\gamma_{03}FAMILY\text{<}9_i + \gamma_{04}FAMILY\geq 9_i) + \gamma_{05}CHILD/BIRTH\text{+} \zeta_{0i}$

$\pi_{1i} = \gamma_{10} + (\gamma_{11}T\text{+}SC_i + \gamma_{12}TO_i) + (\gamma_{13}FAMILY\text{<}9_i + \gamma_{14}FAMILY\geq 9_i) + \gamma_{15}CHILD/BIRTH\text{+} \zeta_{1i}$

$\pi_{2i} = \gamma_{20}$

$\pi_{3i} = \gamma_{30}$

In this model, T+SC and TO represent the Baby Home Intervention dummy variables, with children in NoI as the reference group. FAMILY<9 and FAMILY≥9 represent the Family Experience dummy variables, with children who went directly to the Baby Home from the hospital as the reference group. Finally, CHILD/BIRTH refers to the group of covariates related to child characteristics and birth circumstances, all of which were centered. Importantly, with the addition of these variables, the level-2 intercepts refer to children in NoI who had no family experience, and the Baby Home variables refer to children within those Baby Homes with no family experience (i.e., direct from hospital to Baby Home).

In the third step, interaction terms were added to address Aims 3 and 4 (Equation 5):

5) $Y_{ij} = \pi_{0i} + \pi_{1i} (BHMONTHS_{ij}\text{-}2) + \pi_{2i} (CG_{ij}) + \pi_{3i} (DYAD_{ij}) + \varepsilon_{ij}$

$$\pi_{0i} = \gamma_{00} + (\gamma_{01}T\text{+}SC_i + \gamma_{02}TO_i) + (\gamma_{03}FAMILY\text{<}9_i + \gamma_{04}FAMILY\geq 9_i) + \gamma_{05}BHxFAMILY + \gamma_{06}CHILD/BIRTH + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + (\gamma_{11}T\text{+}SC_i + \gamma_{12}TO_i) + (\gamma_{13}FAMILY\text{<}9_i + \gamma_{14}FAMILY\geq 9_i) + \gamma_{15}BHxFAMILY + \gamma_{16}CHILD/BIRTH + \zeta_{1i}$$

$$\pi_{2i} = \gamma_{20}$$

$$\pi_{3i} = \gamma_{30}$$

The term BHxFAMILY refers to four dummy codes created by multiplying the two Baby Home dummy codes by the two Family Experience dummy codes. The Deviance statistic of this nested model was compared to that of the main effect only model. If the addition of the interaction terms did not improve model fit, they were not included in the final model and are left blank in the tables. Baby Home x Family interactions added significantly to the prediction of the Battelle Total Score, $\chi^2(8) = 24.17$ $p = .002$, Personal-Social subscale, $\chi^2(8) = 29.32$, $p = .002$, and Communication subscale, $\chi^2(8) = 42.82$, $p < .001$, models but not to the PCERA Child Total,

$\chi^2(8) = 13.86$, $p = .09$, or Dyadic Engagement scales, $\chi^2(8) = 10.40$, $p = 0.24$. For the Battelle Cognitive subscale, Baby Home x Family interactions improved model fit significantly when they were added to the slope term, $\chi^2(4) = 11.60$, $p = .02$, but not the intercept (baseline) term, $\chi^2(4) = 7.06$, $p = .13$. Thus, interpretations of the variables differ between the outcome measures. For the PCERA measures and Battelle Cognitive subscale intercept, Family effects are consistent across Baby Homes and additive to main effects of Baby Home. In contrast, for the Battelle Total, Personal-Social, and Communication subscales and the Cognitive subscale slope, interactions are significant, and Family effects differ across Baby Homes.

Hypothesis testing within the final models differed for Aims 1 and 2 vs. Aims 3 and 4. Aims 1 and 2 addressed the question of whether children within the three Baby Homes who did *not* spend time with their families differ at baseline and in their development with time in the Baby Home. The significance of the T+SC and TO coefficients address whether children in those Baby Homes differ from children in NoI. Post-hoc Chi-square tests compared T+SC and TO.

Aims 3 and 4 addressed two separate questions: 1) within a Baby Home, did Family children differ from No-Family children at baseline or in their developmental growth, and 2) did children who spent more versus less than 9 months with their families differ at baseline or in their developmental growth. For models in which the interaction terms did *not* improve model fit (i.e., PCERA measures and Battelle Cognitive intercept), the two Family Experience coefficients address the first question, and post-hoc Chi-square tests compared children who spent more and less than nine months with their families. To address these questions for measures in which the interaction terms *did* improve model fit (i.e., Battelle Total, Personal-Social, and Communication subscales, and Battelle Cognitive slope), the same model was run three times with each Baby Home as the reference group. In the tables, NoI is the reference group. The significance of the

Family <9 Months and Family ≥9 Months coefficients (*t*-tests) address the first question of comparison to No-Family children in the same Baby Home. Post-hoc hypothesis tests (Chi-square tests) contrast the two Family variables to address the second question of their differences. By making TO and T+SC reference groups, the simple effects within these Baby Homes can be assessed the same way without compromising the model or inflating Type 1 error.

Importantly, Family children by definition differ in age at assessment by whether they entered the Baby Home before or after 9 months. Battelle scores are age-corrected, and the Total ($r = .27$, $p < .001$), Communication ($r = -.01$, $p > .50$), Cognitive ($r = .10$, $p = .01$), and Personal-Social ($r = .17$, $p < .001$) subscales have only modest correlations with age. Both PCERA Child Total and Dyadic Engagement scores are based on overall quality of interactions, which should be affected less by age at assessment than the more behavior-specific measures. Indeed, both have modest correlations with age at assessment (Child: $r = .25$, $p < .001$; Dyad: $r = .23$, $p < .001$; see Appendix C). Although neither age at assessment nor reason for Baby Home entry was included in the final analyses, Appendix D further describes why they were not included and some of their effects in preliminary analyses.

5.0 RESULTS

5.1 PRELIMINARY ANALYSES

5.1.1 Descriptive Results

At the time of baseline, second, and third testing, children had been in the Baby Home for 1.89 months (*SD* = 0.88), 5.06 months (*SD* = 1.54), and 8.18 months (*SD* = 2.26), respectively. Mean ages at assessment for these three testing periods were 7.83 months (*SD* = 9.16), 10.54 months (*SD* = 8.96), and 11.56 months (*SD* = 7.21), respectively (see Table 1). Thus, assessments roughly correspond to 2, 5, and 8 months of institutional exposure. Table 3 presents descriptive statistics for the outcome measures at assessment numbers one and three for children in each Baby Home x Family Experience condition. The general developmental trends for each outcome measure are further described with their unconditional growth models (Table 4). Across the entire sample, children had average baseline Battelle scores approximately 2-3 standard deviations *below* children in the standardization sample (*M* = 100; *SD* = 15). These average scores increased by approximately 1 point per month *more* than typical; however, the communication scores showed typical developmental rates, and PCERA scores tended not to change over time. The scores in Table 3 suggest that these trajectories may differ by Baby Home and Family Experience.

Table 3. Mean (SD) of Battelle and PCERA Scores for Children in Each Baby Home with Varying Amounts of Family Experience.

	NoI			TO			T+SC		
	No-Family	Family <9	Family ≥9	No-Family	Family <9	Family ≥9	No-Family	Family <9	Family ≥9
N Assessment 1	67	12	16	81	7	16	47	22	17
N Assessment 3	47	9	5	47	6	3	32	20	1
Age (months)	3.45	6.32	19.20	3.08	6.65	21.30	3.25	4.32	22.68
Assessment 1	(0.85)	(2.18)	(7.43)	(0.41)	(3.24)	(7.13)	(0.56)	(1.83)	(7.97)
Age (months)	9.25	12.43	22.86	8.71	12.55	23.94	8.99	10.05	31.11
Assessment 3	(0.84)	(3.42)	(2.50)	(0.97)	(5.01)	(0.16)	(0.65)	(1.50)	(0.00)
Battelle Total	58.67	51.55	71.32	53.97	71.11	73.79	55.11	62.20	76.32
Assessment 1	(23.62)	(17.31)	(16.63)	(20.15)	(18.27)	(22.18)	(24.26)	(18.29)	(15.37)
Battelle Total	60.31	59.88	78.89	69.14	75.42	76.39	77.60	82.64	90.32
Assessment 3	(16.39)	(14.44)	(5.14)	(15.13)	(15.74)	(15.77)	(19.15)	(11.88)	(0.00)
Cognitive	70.66	58.46	80.20	59.85	86.35	72.31	65.77	79.89	79.25
Assessment 1	(30.19)	(31.77)	(16.40)	(25.71)	(17.80)	(17.89)	(39.57)	(24.63)	(15.27)
Cognitive	72.71	76.85	77.22	80.58	77.89	79.17	83.90	88.67	100.00
Assessment 3	(20.08)	(24.06)	(10.83)	(19.65)	(5.42)	(21.65)	(21.99)	(12.44)	(0.00)
Communication	62.59	54.79	56.03	64.71	62.86	65.38	69.25	78.18	66.45
Assessment 1	(27.83)	(18.45)	(19.37)	(17.66)	(29.72)	(22.32)	(30.66)	(25.82)	(16.72)
Communication	48.05	50.31	66.67	60.91	70.74	62.50	77.13	78.96	67.74
Assessment 3	(12.87)	(16.04)	(11.79)	(17.66)	(19.96)	(12.50)	(27.65)	(21.82)	(0.00)

Personal-Social	62.80	46.78	55.93	52.60	57.62	58.48	51.74	53.77	69.38
Assessment 1	(26.71)	(19.24)	(19.95)	(21.41)	(13.94)	(24.83)	(23.19)	(18.65)	(17.33)
Personal-Social	48.94	51.85	62.78	58.05	61.39	70.83	67.71	73.61	90.32
Assessment 3	(15.78)	(16.61)	(6.16)	(19.14)	(14.55)	(16.67)	(15.73)	(11.73)	(0.00)
PCERA Child	3.30	3.27	3.74	3.56	3.39	3.96	3.54	3.90	3.72
Assessment 1	(0.57)	(0.47)	(0.41)	(0.46)	(0.47)	(0.41)	(0.42)	(0.55)	(0.50)
PCERA Child	3.38	3.51	3.91	3.52	3.79	3.75	3.67	3.68	4.06
Assessment 3	(0.47)	(0.38)	(0.27)	(0.38)	(0.39)	(0.30)	(0.40)	(0.39)	(0.00)
PCERA Dyad	2.70	2.38	3.10	2.86	2.68	3.38	3.01	3.50	3.47
Assessment 1	(0.73)	(0.57)	(0.54)	(0.67)	(0.43)	(0.51)	(0.61)	(0.66)	(0.64)
PCERA Dyad	2.71	2.53	3.35	2.93	3.13	3.17	3.20	3.10	3.00
Assessment 3	(0.73)	(0.52)	(0.34)	(0.55)	(0.47)	(0.80)	(0.65)	(0.60)	(0.00)

Note. Family <9 and Family ≥9 refer to children who spent less and more than nine months with their families prior to Baby Home entry. Battelle measures are on a standardized scale (M = 100; SD = 15). PCERA measures are the averages of raw scores on a 1-5 point scale.

Table 4. Unconditional Growth Models for Battelle and PCERA Totals and Subscales.

	β	*SE*	Deviance
Battelle Total			6122.56
Intercept	62.09***	1.21	
Slope	1.79***	0.22	
Cognitive			6322.46
Intercept	73.19***	1.37	
Slope	1.29***	0.27	
Communication			6413.48
Intercept	64.69***	1.35	
Slope	-0.15	0.29	
Personal-Social			6261.44
Intercept	57.20***	1.25	
Slope	0.88**	0.28	
PCERA Child Total			976.96
Intercept	3.55***	0.03	
Slope	0.01	0.01	
PCERA Dyadic Engagement			1507.26
Intercept	2.99***	0.04	
Slope	0.003	0.01	

Note. Deviance – a measure of model fit, lower numbers refer to a better fit (more explained variance) but only within a single model (i.e., compare Deviance here with that in the final model – Tables 5 & 6).
*$p < .05$
**$p < .01$
***$p<.001$

5.1.2 Baby Home

Analyses of variance (ANOVAs) were conducted to compare children in different Baby Homes on control variables. Contrasts compared T+SC vs. NoI + TO (combined) and NoI vs. TO. Children in different Baby Homes did not differ on birth weight or gestational age. Chi-square tests of gender and maternal substance use were also not significant. Regarding children's 10-minute Apgar scores, $F(2, 208) = 7.69$, $p = .001$, children in T+SC had lower (i.e., poorer) mean scores (M= 7.97, SD = .91) than children in TO (M = 8.42, SD = .61) and NoI (M = 8.43, SD =

.79), $t(208) = -3.92$, $p < .001$, but there was no difference between children in TO and NoI, $t(208) = .10$, $p = .92$. Regarding functional ability total scores, $F(2, 282) = 30.29$, $p < .001$, children in T+SC had lower scores (i.e., fewer functional ability problems; $M = 1.82$, $SD = 0.34$) than the combined TO and NoI, $t(282) = 19.05$, $p < .001$; and children in TO ($M = 1.86$, $SD = 0.37$) had lower scores than children in NoI ($M = 2.19$, $SD = 0.37$), $t(282) = 42.92$, $p < .001$. These findings essentially oppose each other. Whereas children in T+SC tended to have poorer birth circumstances (lower Apgar scores), those in NoI tended to have higher disability ratings, excluding children with diagnosed disabilities. Apgar and functional ability variables are included in primary analyses to control for differences in initial scores and developmental change due to birth circumstances rather than Baby Home.

5.1.3 Family Experience

ANOVAs and Chi-square analyses compared children with different amounts of family experience on control variables. Contrasts compared children with no family vs. any family (<9 and ≥9 months combined) experience and children with less vs. more than nine months of family experience. Amount of family experience was not related to gender, birth weight, or Apgar scores ($p > .05$). Children with no family experience had more functional disabilities ($M = 2.05$, $SD = 0.35$) than children with any family experience, $F(1, 282) = 31.10$, $p < .001$, and children who spent less than nine months with their families had more functional disabilities ($M = 1.94$, $SD = 0.35$) than children who spent more than nine months with their families ($M = 1.63$, $SD = 0.43$), $F(1, 282) = 15.68$, $p < .001$. Children with no family experience had gestation ages approximately 1 month younger than children with any family experience, $F(1, 282) = 9.05$, $p = .003$, but there was no difference between children with more vs. less family experience, $F(1,$

282) = 0.004, $p > .50$. Children who spent time with families were also more likely to have mothers with a history of substance use (63%) than children with no family experience (49%), $\chi 2(1) = 4.93$, $p = .03$, but maternal substance use history did not differ between children with more vs. less family experience, $\chi 2(1) = 3.04$, $p = .08$. Thus, functional abilities, gestational age, and maternal substance use history were added as covariates in primary analyses.

5.2 AIM 1: IMPACT OF CAREGIVER SENSITIVITY AND CONSISTENCY ON SOCIAL-EMOTIONAL DEVELOPMENT.

Table 5 displays the HLM analyses predicting Battelle Personal-Social, PCERA Child Total, and PCERA Dyadic Engagement scores. Aim 1 focuses only on the first three variables (*Intercept*, *T+SC*, and *TO*), which represent children who spent no time with their families prior to entering NoI, T+SC, and TO, respectively. Because all No-Family children entered the Baby Homes before 3 months of age, the slope term (*Time in the Baby Home*) corresponds both to their first year in the Baby Home and to their first year of life.

Table 5. HLM Analyses Predicting Social-Emotional Outcomes.

	Battelle Personal-Social		PCERA Child Total		PCERA Dyadic Engagement	
	β	SE	β	SE	β	SE
Fixed Effects						
Initial status, π_{0i}						
Intercept	66.99***	2.55	3.41***	0.05	2.79***	0.05
T+SC	-16.02***	4.19	0.19**	0.06	0.31***	0.07
TO	-13.58***	3.49	0.16**	0.05	0.1	0.07
Family <9 Months	-16.27**	5.72	0.03	0.06	0.02	0.07
Family ≥9 Months	-6.06	4.49	0.27***	0.06	0.36***	0.08
T+SCxFamily<9	18.05*	7.24				
TOxFamily<9	17.95*	7.42				
T+SCxFamily≥9	24.37***	6.44				
TOxFamily≥9	6.99	7.03				
Gender (ce)	-2.57	2.28	0.03	0.04	0.03	0.05
M. Substance (ce)	-5.81*	2.36	-0.01	0.04	0.07	0.06
FAI total (ce)	-8.38*	3.49	-0.11†	0.06	-0.19*	0.09
Gestation Age (ce)	2.18***	0.43	0.02*	0.01	-0.002	0.02
Apgar 10 Min (ce)	1.57	1.49	0.04	0.03	0.02	0.04
Time in the Baby Home, π_{1i}						
Intercept	-2.20***	0.63	0.02†	0.01	-0.001	0.01
T+SC	5.34***	0.88	-0.01	0.01	0.02	0.01
TO	3.33***	0.87	-0.02*	0.01	0.02	0.01
Family <9 Months	2.71**	1.04	0.01	0.01	-0.02†	0.01
Family ≥9 Months	3.48***	0.82	-0.01	0.01	-0.001	0.02
T+SCxFamily<9	-2.79*	1.38				
TOxFamily<9	-3.64*	1.46				
T+SCxFamily≥9	-5.45***	1.05				
TOxFamily≥9	-3.86**	1.31				
Gender (ce)	1.04*	0.45	0.01	0.01	-0.005	0.01
M. Substance (ce)	0.5	0.49	0.01	0.01	-0.02†	0.01
FAI total (ce)	-1.16†	0.67	-0.02†	0.01	0.02	0.02
Gestation Age (ce)	-0.19*	0.09	-0.003†	0.002	0.01*	0.002
Apgar 10 Min (ce)	0.29	0.34	-0.01	0.01	<0.001	0.01
PCERA Caregiver Total, π_{2i}						
Intercept	0.17	2.28	0.07†	0.04	0.41***	0.05
PCERA Child Total, π_{3i}						
Intercept					0.97***	0.04

PCERA Dyadic Engagement, π_{4i}				
Intercept	2.13	1.55	0.52***	0.03
Goodness of Fit				
Deviance	6061.92***	409.63***	876.73***	

Note. The intercept term refers to No-Family children in NoI (No Intervention). The darker boxes highlight statistics related to the primary questions of Aim 1, while the lighter boxes highlight statistics related to the primary questions of Aim 3. T+SC = Training plus Structural Change intervention. TO = Training only intervention. Family <9 Months = children who spent some time but less than 9 months with a family before Baby Home entry. Family ≥9 Months = children who spent 9 or more months with a family before Baby Home entry. (ce) denotes variables that have been centered. M. Substance = documented maternal substance use during pregnancy. FAI total = Functional Abilities Index Total Score. Blank cells occur when including interactions did not improve model fit.

*** $p < .001$
** $p < .01$
* $p < .05$
† $p < .10$

5.2.1 Baseline Baby Home Effects – Assumption of Non-Selective Placement

Although children were expected to have similar social-emotional scores at baseline assessments regardless of Baby Home (non-selective placement), this was not the case. Two months after entering the Baby Home, children in TO and T+SC had Personal-Social scores approximately 1 SD *lower* than children in NoI (see Table 5 – Initial Status); however, children in TO and T+SC did not differ, $\chi^2(1) = 0.35$, $p > .50$. Conversely, children in TO and T+SC displayed *higher* (approximately .5 SD) quality social behaviors in an interaction with caregivers than children in NoI two months post-intake. Children in TO and T+SC did not differ, $\chi^2(1) = 0.32$, $p > .50$. The quality of dyadic engagement in T+SC was approximately .25 to .5 SD *higher* than that of dyads in both NoI (see Table 5) and TO, $\chi^2(1) = 9.96$, $p = .002$, while dyads in TO and NoI did not differ.

5.2.2 Hypothesis 1a – NoI

Children in NoI will show stable developmental trajectories, maintaining their low levels of assessed social-emotional skills and quality of interactions.

This hypothesis was supported for the PCERA Child Total and Dyadic Engagement scales; however, for the Battelle Personal-Social scale children's standard scores *decreased* with more time in NoI (see Table 5 – Time in the Baby Home Intercept). The Personal-Social scores of children in NoI *decreased* by 2.20 points per month (see Figure 1). Thus, their standardized scores decreased by 1 SD within 7 months, suggesting that they develop these skills more slowly than same-aged non-institutionalized peers of similar starting skill levels.

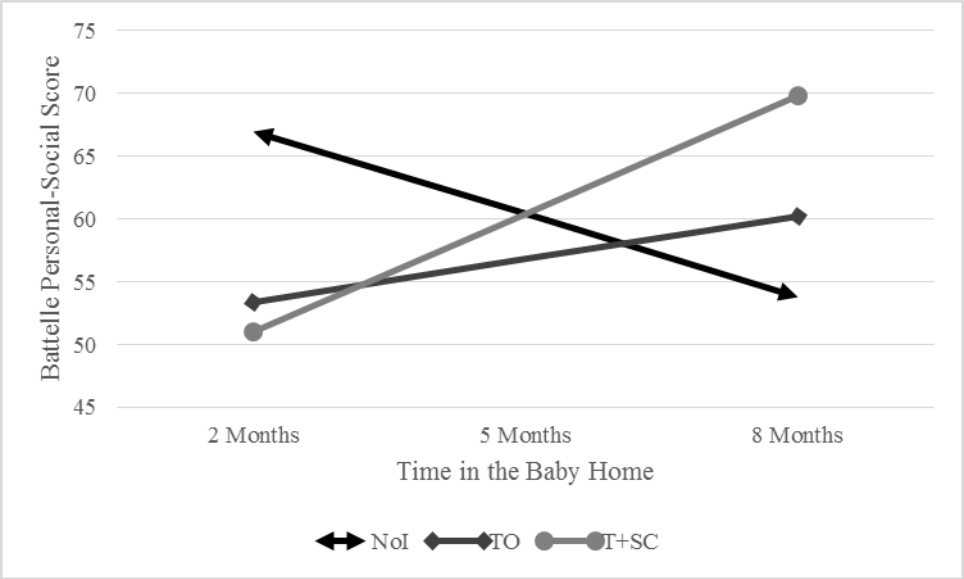

Figure 1. Developmental trajectories (predicted values based on HLM analyses) of Battelle Personal-Social scores during the first eight months of residency for children with no family experience in NoI, TO, and T+SC. At baseline, children in NoI had higher scores than children in TO and T+SC. Over time, children in NoI had progressively lower standard scores; children in TO had stable standard scores; and children in T+SC had progressively higher standard scores.

5.2.3 Hypothesis 1b – TO

Children in TO will show moderate developmental growth, with progressively better social skills and interaction quality than children in NoI but not as much improvement as children in T+SC.

This hypothesis was not supported because children in TO showed *no change* over time on social-emotional measures (see Table 5 – Time in the Baby Home TO). On the Battelle Personal-Social scale, children in TO had typical rates of development (simple slope = 1.13), $t(271) = 1.77$, $p = .08$, as opposed to the decreases seen in NoI (see Figure 1). With the decreases in NoI, the baseline 1 SD difference between children in NoI and TO was reversed (i.e., children in TO 1 SD above those in NoI) after approximately 12 months in the Baby Home.

Although statistically the overall quality of TO children's positive social behaviors during free play with a caregiver showed *less* improvement than that of children in NoI (see Table 5), this difference is not meaningful. Both children in NoI and TO, $t(275) = -1.16$, $p = .25$, show *no change* over time. Instead, the baseline differences between the intervention and control Baby Homes was maintained over the first year of residency (see Figure 2 – all simple slopes n.s.). Dyads in TO also showed no change in the quality of their interactions during free play over time, maintaining their lower scores than dyads in T+SC (see Table 5).

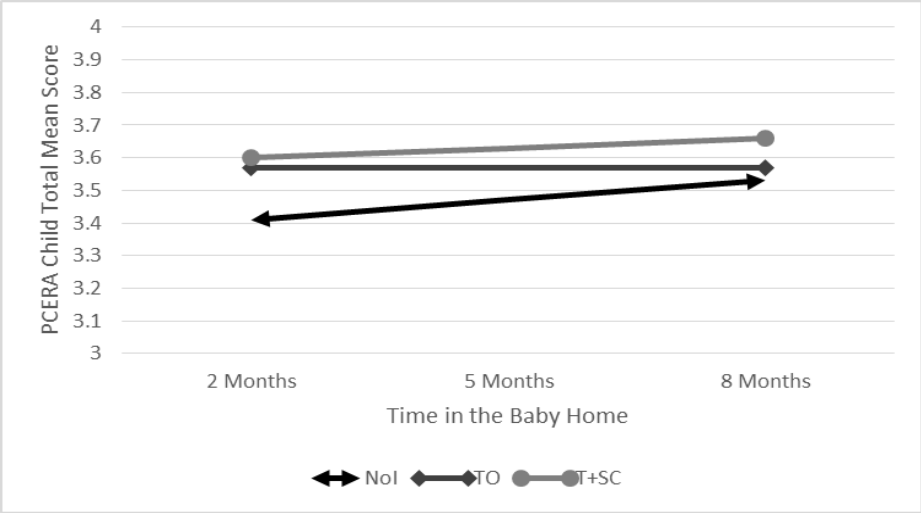

Figure 2. Developmental trajectories (predicted values based on HLM analyses) of PCERA Child Total scores during the first eight months of residency in NoI, TO, and T+SC. At baseline, children in TO and T+SC had higher scores than children in NoI. All simple slopes were equal to zero (i.e., no change over time).

5.2.4 Hypothesis 1c – T+SC

Children in T+SC will show rapid developmental growth in social-emotional skills and the quality of their interactions, more than children in both NoI and TO.

This hypothesis was supported for the structured assessment of personal-social skills; however, in observed interactions with caregivers, children in T+SC continued to have higher quality scores than children in the other Baby Homes (see Table 5 – Time in the Baby Home T+SC). The Battelle Personal-Social standard scores improved for children in T+SC at a rate of 5.34 points per month *more* than children in NoI and 2.01 points per month *more* than children in TO, $\chi^2(1) = 4.95$, $p = .02$ (see Figure 1). Thus the baseline 1 SD difference between children in NoI and T+SC was reversed (i.e., children in T+SC 1 SD above those in NoI) after only 6 months in the Baby Home. Although children in TO and T+SC had similar scores at baseline,

children in T+SC had Personal-Social scores 1 SD higher than those in TO after approximately 8 months in the Baby Home.

The overall quality of child positive social behaviors and dyadic engagement during free play with a caregiver, however, did not change over time (see Table 5, Figure 2). Thus, children in T+SC displayed higher quality interactions with caregivers after only two months in the Baby Home, and this quality remained high.

5.2.5 Child Characteristics/Birth Circumstances

As expected, children with a history of prenatal substance exposure, higher levels of assessed functional disabilities, and younger gestational ages had lower scores two months after Baby Home arrival (see Table 5 – Initial Status control variables). Interestingly, child characteristics also had some association with developmental change. Boys' Personal-Social skills (but not PCERA quality scores) increased at a rate of 1.04 points per month more than girls', corresponding to a .5 standard deviation difference in scores between boys and girls after 7 months of Baby Home exposure. Younger than average gestational age was also related to faster rates of growth than older gestational age, possibly due to catch-up. However, on the Dyadic Engagement scale, children with older gestational ages had moderately *faster* rates of improvement in quality of dyadic reciprocal engagement than those with younger gestational ages (see Table 5 – Time in Baby Home control variables).

5.2.6 Caregiver Behaviors and Dyadic Engagement

The quality of caregiver positive social behaviors and dyadic engagement during a free play session, time-varying predictors, were not related to Personal-Social skills, as assessed with structured questions, interviews, and observations, above and beyond differences accounted for by Baby Home (see Table 5). However, 1 point higher reciprocal engagement between children and caregivers was related to 0.52 points higher positive child emotional and social behaviors during the same five-minute free play session. Higher quality caregiver social behaviors did not, however, relate to higher quality child behaviors. As expected by the nature of the task, 1 point higher quality child and caregiver positive social behaviors during the free play were associated with 0.97 and 0.41 points, respectively, higher quality dyadic reciprocal engagement during the same task (see Table 5).

5.3 AIM 2: IMPACT OF CAREGIVER SENSITIVITY AND CONSISTENCY ON MENTAL DEVELOPMENT.

Table 6 displays the HLM analyses predicting Battelle Total, Communication, and Cognitive scores. Aim 2 focuses only on the first three variables (*Intercept, T+SC,* and *TO*), which represent No-Family children in NoI, T+SC, and TO, respectively. Because all No-Family children entered the Baby Homes before 3 months of age, the slope term (*Time in the Baby Home*) corresponds both to their first year in the Baby Home and to their first year of life.

Table 6. HLM Analyses for Mental Development Measures.

	Battelle Total		Battelle Cognitive		Battelle Communication	
	β	SE	β	SE	β	SE
Fixed Effects						
Initial status, π_{0i}						
Intercept	63.01***	2.38	73.10***	3.11	68.45***	3.24
T+SC	-6.74	4.14	0.3	3.69	-3.09	5.52
TO	-7.96*	3.11	-8.09*	3.66	-3.49	4.36
Family <9 Months	-5.20	4.84	5.5	3.99	-11.00†	5.8
Family ≥9 Months	10.26*	4.13	1.26	3.67	-7.76	4.95
T+SCxFamily<9	11.41†	6.71			17.64*	8.28
TOxFamily<9	17.70*	7.15			4.07	10.81
T+SCxFamily≥9	7.99	5.75			5.79	6.97
TOxFamily≥9	0.25	6.31			-3.97	6.99
Gender (ce)	-1.90	2.09	-0.39	2.53	-0.002	2.63
M. Substance (ce)	-2.40	2.19	-0.22	2.67	-0.50	2.79
FAI total (ce)	-11.44***	3.41	-11.83**	3.93	-14.78***	4.06
Gestation Age (ce)	2.04***	0.38	2.66***	0.53	1.48**	0.56
Apgar 10 Min (ce)	1.76	1.39	3.68†	1.91	0.94	1.69
Time in the Baby Home, π_{1i}						
Intercept	0.37	0.51	0.39	0.7	-2.67***	0.68
T+SC	3.67***	0.76	1.91*	0.94	4.44***	1.11
TO	2.64***	0.66	3.22***	0.86	2.51*	0.99
Family <9 Months	0.36	0.74	-0.64	0.92	2.18*	1.1
Family ≥9 Months	0.51	0.7	0.53	1	3.88***	1
T+SCxFamily<9	-1.13	1.15	-0.05	1.15	-3.56*	1.81
TOxFamily<9	-3.19*	1.3	-2.69*	1.32	-1.43	2.36
T+SCxFamily≥9	-3.78***	0.96	-1.71	1.05	-4.88***	1.35
TOxFamily≥9	-3.71***	0.98	-4.11***	1.05	-3.53**	1.35
Gender (ce)	0.37	0.37	0.11	0.49	0.03	0.52
M. Substance (ce)	0.15	0.4	-0.35	0.62	-0.22	0.61
FAI total (ce)	-0.80	0.58	-1.72*	0.78	0.71	0.85
Gestation Age (ce)	-0.03	0.08	-0.19	0.12	-0.09	0.11
Apgar 10 Min (ce)	0.38	0.28	-0.16	0.4	0.78*	0.37
PCERA Caregiver Total, π_{2i}						
Intercept	-2.00	1.72	-7.44*	2.91	-0.88	2.76
PCERA Dyad, π_{4i}						
Intercept	2.27†	1.16	5.09*	2.09	0.46	1.69
Goodness of Fit						

Deviance	5879.97***	6163.86***	6251.16***

Note. The intercept term refers to No-Family children in NoI (No Intervention). The darker boxes highlight statistics related to the primary questions of Aim 2, while the lighter boxes highlight statistics related to the primary questions of Aim 4. T+SC = Training plus Structural Change intervention. TO = Training only intervention. Family <9 Months = children who spent some time but less than 9 months with a family before Baby Home entry. Family ≥9 Months = children who spent 9 or more months with a family before Baby Home entry. (ce) denotes variables that have been centered. M. Substance = documented maternal substance use during pregnancy. FAI total = Functional Abilities Index Total Score. Blank cells occur when including interactions did not improve model fit.

*** $p < .001$
** $p < .01$
* $p < .05$
† $p < .10$

5.3.1 Baseline Baby Home Effects – Assumption of Non-Selective Placement

Children had similar baseline communicative abilities across Baby Homes (all $p > .05$), but contrary to expectations, children in the three Baby Homes did not have similar Battelle Total or Cognitive scores at baseline assessments (see Table 6 – Initial Status). Children in TO displayed general development scores 7.96 points and cognitive ability scores 8.09 points *lower* than children in NoI, corresponding to approximately .5 SD differences for both measures (see Table 6). The total DQ scores of children in T+SC were similar to those of children in NoI and TO, $\chi^2(1) = 0.09$, $p > .50$; whereas their cognitive ability scores were 8.39 points *higher* than those in TO, $\chi^2(1) = 5.38$, $p = .02$, but no different than children's scores in NoI.

5.3.2 Hypothesis 2a – NoI

Children in NoI will show stable developmental trajectories, maintaining low mental scores.

This hypothesis was supported for Battelle Total and Cognitive scores, but children in NoI showed *decreases* in Battelle Communication standard scores with time (see Table 6 – Time in the Baby Home). Regarding their total DQ and cognitive abilities, children's rates of developmental change in NoI were not significantly different than 0 (see Figures 3 & 4). Their standard communication scores *decreased* by 2.67 points per month, decreasing by 1 SD within approximately 6 months of Baby Home residency (see Figure 5).

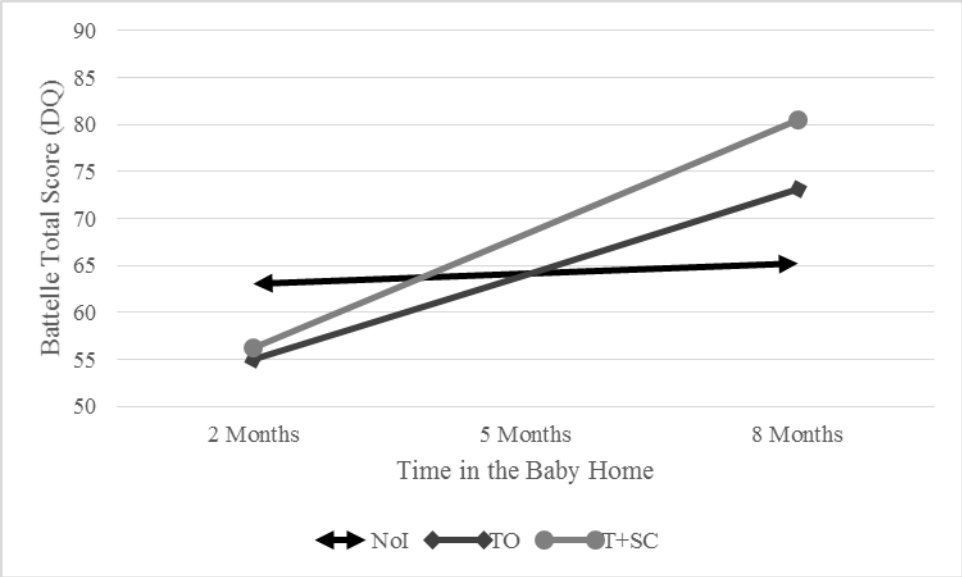

Figure 3. Developmental trajectories (predicted values based on HLM analyses) of Battelle Total scores during the first eight months of No-Family children's residencies in NoI, TO, and T+SC. At baseline, children in NoI had higher scores than children in TO; all other differences n.s. Over time, children in NoI had stable standard scores; whereas children in TO and T+SC had progressively higher standard scores.

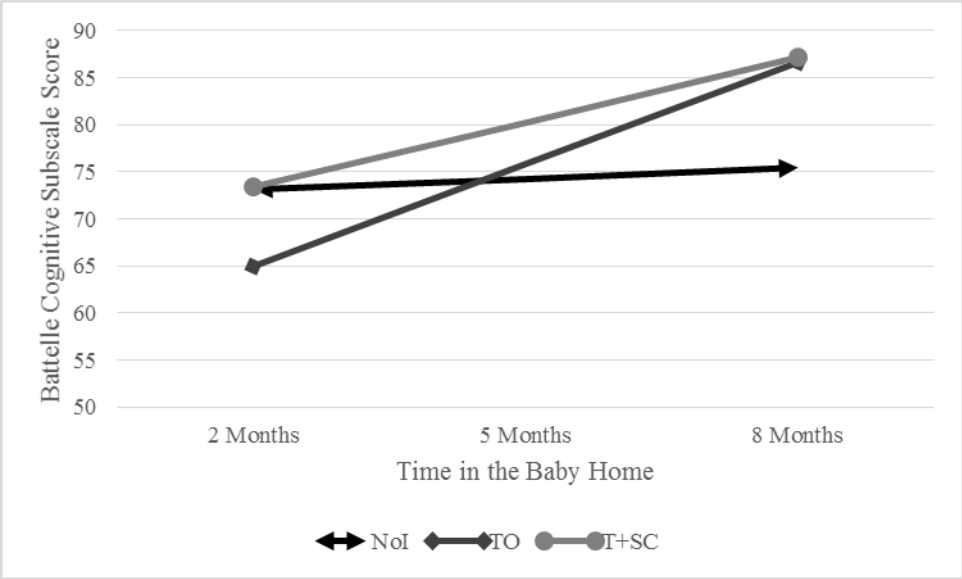

Figure 4. Developmental trajectories (predicted values based on HLM analyses) of Battelle Cognitive scores during the first eight months of No-Family children's residencies in NoI, TO, and T+SC. At baseline, children in NoI and T+SC had higher scores than children in TO. Over time, children in NoI had stable standard scores; whereas children in TO and T+SC had progressively higher standard scores.

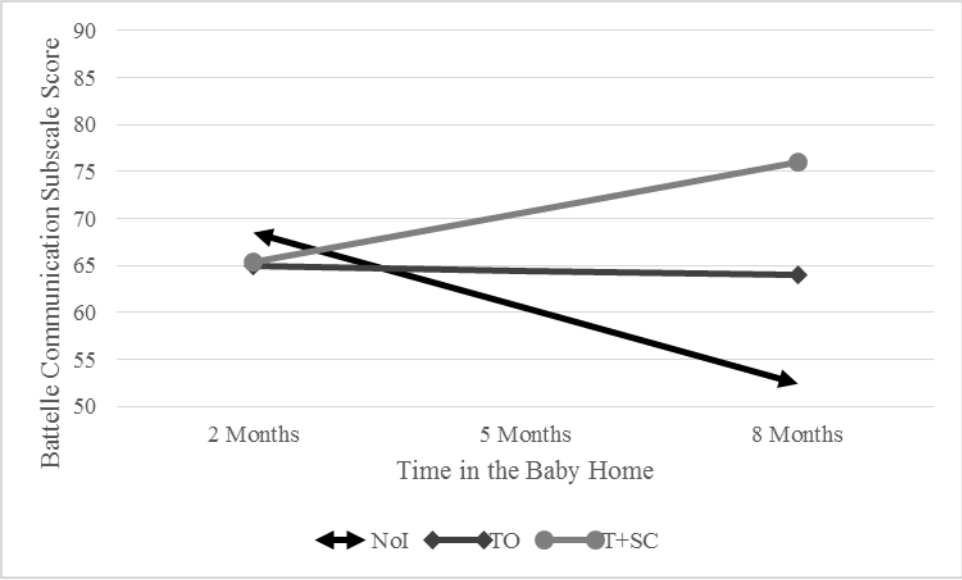

Figure 5. Developmental trajectories (predicted values based on HLM analyses) of Battelle Communication Subscale scores during the first eight months of No-Family children's residencies in NoI, TO, and T+SC. There were no baseline differences. Over time, children in NoI had progressively lower standard scores; children in TO had stable scores; and children in T+SC had progressively higher standard scores.

5.3.3 Hypothesis 2b – TO

Children in TO will show moderately faster than typical rates of mental development, more improvement than children in NoI but less than children in T+SC.

This hypothesis was partially supported for all measures, with children in TO showing more improvement than children in NoI on all measures but no differences compared to children in T+SC (see Table 6 – Time in the Baby Home). Regarding total, cognitive, and communication abilities, children in TO improved 2.64, 3.22, and 2.51, respectively, standard points per month *more* than children in NoI (see Figures 3, 4, & 5). For total and cognitive measures, the .5 SD difference at baseline was reversed (i.e., TO .5 SD above NoI) after approximately 5-6 months in the Baby Home. In the same period of time, children in TO gained 1 SD over children in NoI on the communication measure. There was no difference over time between children in TO and T+SC for total, $\chi^2(1) = 1.92$, $p = .16$, cognitive, $\chi^2(1) = 1.92$, $p = .16$, or communication development, $\chi^2(1) = 2.93$, $p = .08$. Although children in TO had faster than typical rates of DQ and cognitive development, their communication scores did *not* have a rate of change different than typical (simple slope: -0.15), $t(271) = -0.21$, $p > .50$ (see Figure 5).

5.3.4 Hypothesis 2c – T+SC

Children in T+SC will show rapid developmental gains in relative mental abilities, improving at faster rates than children in NoI and TO.

This hypothesis was partially supported, with children in T+SC showing a rate of developmental change faster than typical on all measures, improving faster than children in NoI but not TO (see Table 6 – Time in the Baby Home). Children in T+SC showed faster rates of

development in total (3.67 points/month), cognitive (1.91 points/month), and communication (4.44 points/month) abilities than children in NoI (see Figures 3, 4, & 5). At this rate, children in T+SC improved their DQ and communication scores by 1 SD and their cognitive scores by about .5 SD above children in NoI after 5 months of Baby Home residency. Children in T+SC did not, however, improve at a faster rate than children in TO on these measures (see above). Although the comparison with TO was not significant, T+SC children's standard communication scores increased by 1.77 points/month, $t(271) = 2.08$, $p = .04$.

5.3.5 Child Characteristics/Birth Circumstances

As expected, higher levels of functional disability and younger gestational ages were related to lower mental scores at baseline (two months post-intake; see Table 6). However, they were not generally associated with developmental change. A notable exception was higher levels of functional disabilities relating to 1.72 *fewer* cognitive ability points per month change. For example, a child with a score of one on the FAI (no disabilities present) gained approximately 3 *more* points per month than a child with a score of 3 (mild problems), resulting in a 1 SD difference between those children after 5 months of residency.

5.3.6 Caregiver Behaviors and Dyadic Interactions

The quality of caregiver positive social behaviors and dyadic engagement during a five-minute free play session were not associated with total DQ or communicative abilities (see Table 6). Both were related to cognitive ability, but the relation is not readily interpretable. One point higher dyadic engagement quality was associated with 5.09 points higher cognitive scores, but 1

point higher quality scores for caregiver social behaviors were associated with 7.44 points *lower* cognitive scores. The caregiver and dyadic engagement scores are moderately correlated (r = .63). Although dyadic engagement is correlated with cognitive scores (r = .14, p < .001), caregiver behaviors are not (r = .04, p = .31). Thus, this relation may be spurious, associated with collinearity, or a true effect; however, an explanation is not obvious.

5.4 AIM 3: INTERACTION OF FAMILY EXPERIENCE AND BABY HOME INTERVENTIONS RELATED TO SOCIAL-EMOTIONAL DEVELOPMENT

Aim 3 addresses two important questions. First, how does spending more or less than nine months with a family relate to social-emotional functioning soon after entering a Baby Home? And second, how does that early experience and loss interact with caregiver sensitivity and consistency in the Baby Home to predict change in social-emotional abilities over the first year of institutionalization? Lines 4 through 9 of both Initial Status and Time in the Baby Home in the HLM analyses (Table 5) address these questions. The Analytic Plan describes the process of hypothesis testing for Aim 3.

Because these are the same models that were used to address Aim 1, child characteristics/ birth circumstances and caregiver and dyad effects on outcomes are not discussed again.

5.4.1 Hypothesis 3a - Baseline Family Effects

Separation from parents after 9 months should lead to a distress reaction, resulting in the appearance of poorer social-emotional skills when assessed soon after institutionalization for children who spent more than 9 months with their families.

This hypothesis was not supported, with no differences among Family groups in NoI and TO for the Battelle Personal-Social scale but with the opposite effect (i.e., children who spent more than 9 months with families *higher* than the other groups) in T+SC for the Personal-Social scale and in all Baby Homes for the PCERA measures (see Table 5 – Initial Status). On the structured assessment of personal-social development, there were no differences between children who were with families for more versus less than 9 months in NoI, $\chi^2(1) = 2.42$, $p = .12$, or TO, $\chi^2(1) = 0.01$, $p > .50$. In TO, No-Family children also did not differ from children who spent time with their families (both $p > .50$). Children who entered NoI after less than 9 months with their family, however, had scores approximately 1 SD *lower* than No-Family children (see Table 5), whereas there was no difference between those who spent no time versus more than 9 months with their families.

Children in T+SC who spent less than 9 months with their families had similar baseline Personal-Social scores as No-Family children, $t(271) = 0.39$, $p > .50$. Contrary to hypotheses, children who spent more than 9 months with their families had Personal-Social scores over 1 SD *higher* than children who both spent no time, $t(271) = 3.74$, $p < .001$, or less than nine months, $\chi^2(1) = 12.70$, $p < .001$, with their families. Similarly, during a five minute free play with a caregiver, children in all Baby Homes who spent more than 9 months with their families had *higher* quality child-specific positive social behaviors (.5 SD), $\chi^2(1) = 11.85$, $p < .001$, and *higher*

quality dyadic engagement (.67 SD), $\chi^2(1) = 14.26$, $p < .001$, than children who spent less than 9 months with their families and No-Family children (see Table 5).

5.4.2 Hypothesis 3b – NoI

Family children in NoI will show developmental declines in interaction quality and social skills due to the inconsistent and insensitive care. This decline will be steeper for children who spent more than 9 months with their families because of the disruption and loss of attachment relationships.

This hypothesis was partially supported, with children in NoI who spent any amount of time with families showing no increase or decrease over time in their social-emotional scores (see Table 5 – Time in the Baby Home). On the Battelle Personal-Social scale, children who spent more or less than 9 months with their families did not differ, $\chi^2(1) = 0.53$, $p > .50$. However, they had rates of development approximately 3 points/month *higher* than children who spent no time with a family by *not* showing the decline over time seen in No-Family children (see Figure 6 - panel 1). Thus, children who spent less than 9 months with their families eliminated their 1 SD deficit after approximately 6 months. In the same period of time, children who spent more than 9 months with their families had scores approximately 1 SD above both other groups. Children who spent more vs. less time with families did not differ from No-Family children or each other in the change over time of the quality of their positive social behaviors, $\chi^2(1) = 1.04$, $p = .31$, or the quality of their dyadic interactions with caregivers, $\chi^2(1) = 1.65$, $p = .20$, maintaining baseline differences.

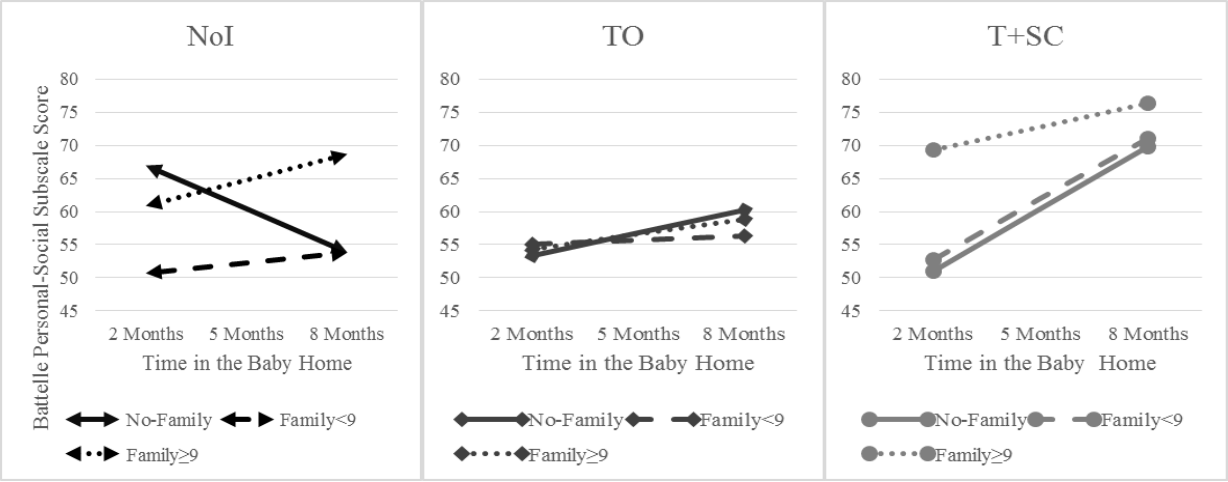

Figure 6. Developmental trajectories (predicted values based on HLM analyses) of Battelle Personal-Social scores for children in NoI, TO, and T+SC with varying family experiences. Panel 1: At baseline, children in NoI who spent less than 9 months with a family had lower scores than No-Family children; all other contrasts n.s. Over time, No-Family children in NoI had progressively lower standard scores, but Family children had stable scores. Panel 2: All effect in TO n.s. Panel 3: At baseline, children in T+SC who spent more than 9 months with a family had higher scores than those with less experience. Over time, these children had slower growth rates than children with less than 9 months or no family experience.

5.4.3 Hypothesis 3c – TO

Children in TO who spent less than 9 months with their families will show developmental increases in social-emotional scores over time (similar to No-Family children), whereas children who spent more than 9 months with their families will show less change due to the loss of attachment relationships and no new consistent caregivers.

This hypothesis was partially supported, with all children in TO showing no change over time in social-emotional abilities, regardless of family experience. Children who spent less than 9 months with their families did not differ from No-Family children on Battelle Personal-Social,

$t(271) = -0.88$, $p = .38$, or either PCERA measure (see Table 5, Figure 6 – Panel 2). However, on no measure of social-emotional skills did children show the expected difference based on amount of time with their families (all $p > .20$). These simple effects suggest that children in TO, regardless of family experience history, developed at a similar rate as typical children in the standardization sample on a structured measure of personal-social skills and showed no change over time in the quality of their positive social behaviors and dyadic engagement with caregivers.

5.4.4 Hypothesis 3d – T+SC

All children in T+SC will show quickly improving social-emotional abilities. If Hypothesis 3a is confirmed, and children who spent more than 9 months with their families have lower scores at baseline, they are expected to show faster rates of social-emotional development, related to forming new relationships in T+SC and overcoming their separation distress.

This hypothesis was not supported, with smaller slopes for children who spent more than 9 months with their families for the Battelle Personal-Social scale and no effect of family experience on the PCERA measures (see Table 5 – Time in the Baby Home). Regarding Battelle Personal-Social scores, children who spent less than 9 months with a family showed similar increases in standard scores over time as No-Family children, $t(271) = -0.08$, $p > .50$ (see Figure 6 – Panel 3). However, children who spent more than 9 months with their families improved by about 2 points/month *less* than children who spent less, $\chi^2(1) = 5.19$, $p = .02$, or no time with families, $t(271) = -2.47$, $p = .01$. Thus, children in T+SC had similar scores, regardless of family experience, after only 8 months in the Baby Home. Contrary to expectations, there was no change over time in the quality of positive social behaviors or the quality of dyadic interactions, suggesting that children in T+SC, especially those who spent more than 9 months with their

families, had high scores 2 months after arriving at the Baby Home that remained high during their residency.

5.5 AIM 4: INTERACTION OF FAMILY EXPERIENCE AND BABY HOME INTERVENTIONS RELATED TO MENTAL DEVELOPMENT.

Aim 4 addresses two important questions. First, how does spending more or less than nine months with a family relate to general and cognitive functioning soon after entering a Baby Home? And second, how does that early experience and loss interact with caregiver sensitivity and consistency in the Baby Home to predict change in general and cognitive abilities over the first year of institutionalization? Lines 4 through 9 of Initial Status and Time in the Baby Home in the HLM analyses (Table 6) address these questions. The Analytic Plan describes the process of hypothesis testing for Aim 4.

Because these are the same models that were used to address Aim 2, child characteristics/ birth circumstances and caregiver and dyad effects on outcomes are not discussed again.

5.5.1 Hypothesis 4a - Baseline Family Effects

Regardless of Baby Home, children who spent more than 9 months with their families will enter the Baby Home (i.e., baseline assessment at two months post-intake) with higher mental ability scores than children who spent less than 9 months or no time with a family, related to the cognitive opportunities afforded by attachment relationships.

This hypothesis was mostly supported for total DQ, but no differences were found for cognitive or communicative abilities (see Table 6 – Intercept). Specifically, children who spent more than 9 months with their families had higher baseline DQs than No-Family children in NoI (~.67 SD), TO (~.67 SD, marginal), $t(271) = 1.91$, $p = .057$, and T+SC (~1 SD), $t(271) = 3.97$, $p < .001$. They also had scores about 1 SD higher than children who spent less than 9 months with their families in NoI, $\chi^2(1) = 7.23$, $p = .007$, and T+SC, $\chi^2(1) = 7.46$, $p = .006$, but not in TO, $\chi^2(1) = .09$, $p > .50$.

In contrast, there were no differences between children who had and had not spent time with a family (see Table 6) or between children who spent more vs. less than nine months with their families (all $p > .05$) on age-corrected cognitive or communication abilities at baseline. The single exception was that children who spent more than nine months with their families before entering TO had age-corrected communication scores approximately .67 SD *lower* than children who had entered TO with no family experience, $t(271) = -1.99$, $p = .047$.

5.5.2 Hypothesis 4b – NoI

In NoI, children who spent less than 9 months with their families will show similar developmental trends to No-Family children (i.e., stable scores). Children who spent more than 9 months with their families will show slower rates of mental development than children who spent less time or no time with families due to their initial high scores but lack of cognitive stimulation in the institution.

This hypothesis was not supported; all children in NoI who spent any time with a family displayed typical rates of general, cognitive, and communication development (see Table 6 –

Time in the Baby Home). Family children showed similar, stable developmental trends as No-Family children on Total and Cognitive scales (all $p > .25$; see Figures 7 & 8 – Panel 1).

In contrast, on the communication scale, children who spent less and more than nine months with their families *gained* 2.18 and 3.88 standard points, respectively, per month over No-Family children (see Figure 9 – Panel 1). There was no difference between children who spent more or less time with their families, $\chi^2(1) = 1.99$, $p = .15$. Children who entered NoI directly from the birth hospital had *slower* than typical rates of communication development, but those who spent time with families did not, resulting in communication scores about 1 SD higher than children with no family experience after 5-6 months in the Baby Home.

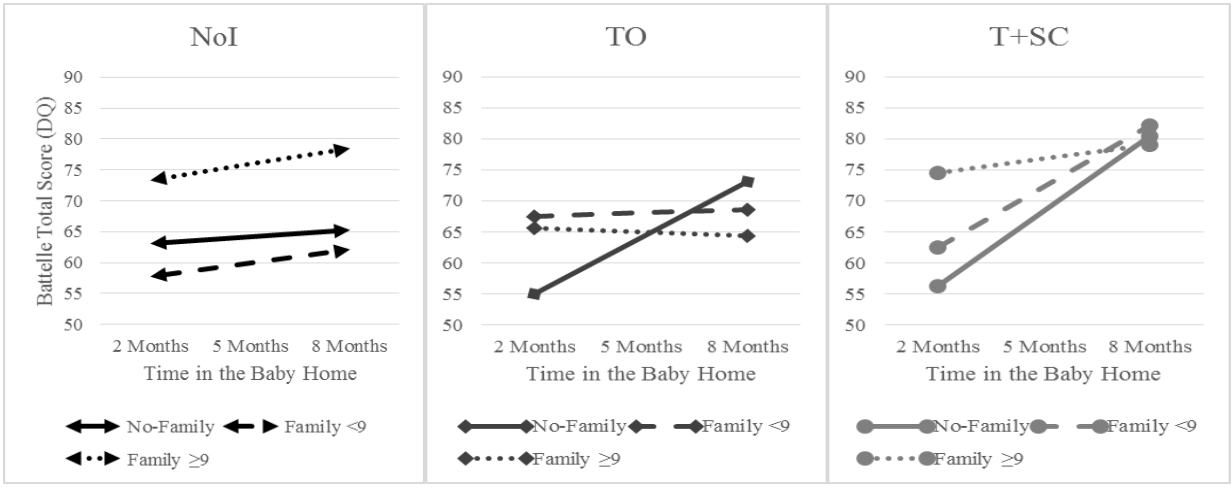

Figure 7. Developmental trajectory (predicted values based on HLM analyses) of Battelle Total (DQ) scores of children in NoI, TO, and T+SC with varying family experiences. Panel 1: At baseline, children in NoI with more than 9 months of family experience had higher scores than children with less experience. All slope effects in NoI n.s. Panel 2: At baseline, children in TO with family experience had higher scores than No-Family children. Over time, No-Family children had progressively higher standard scores; whereas children with family experience had stable standard scores. Panel 3: At baseline, children in T+SC with more than 9 months of family experience had higher scores than children with less experience. Over time, these children had slower growth rates than children with less than 9 months or no family experience.

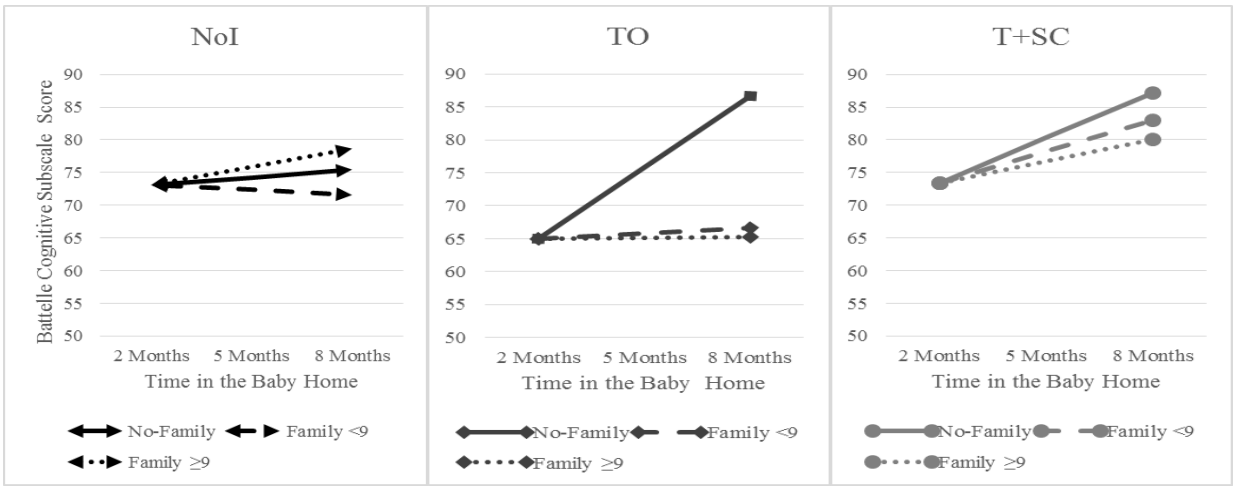

Figure 8. Developmental trajectories (predicted values based on HLM analyses) of Battelle Cognitive scores of children in NoI, TO, and T+SC with varying family experiences. Panel 1: All NoI effects n.s. Panel 2: No TO baseline differences. Over time, No-Family children had progressively higher standard scores, but Family children had stable standard scores. Panel 3: No T+SC baseline difference. Children had faster than typical rates of cognitive development (all contrasts n.s.).

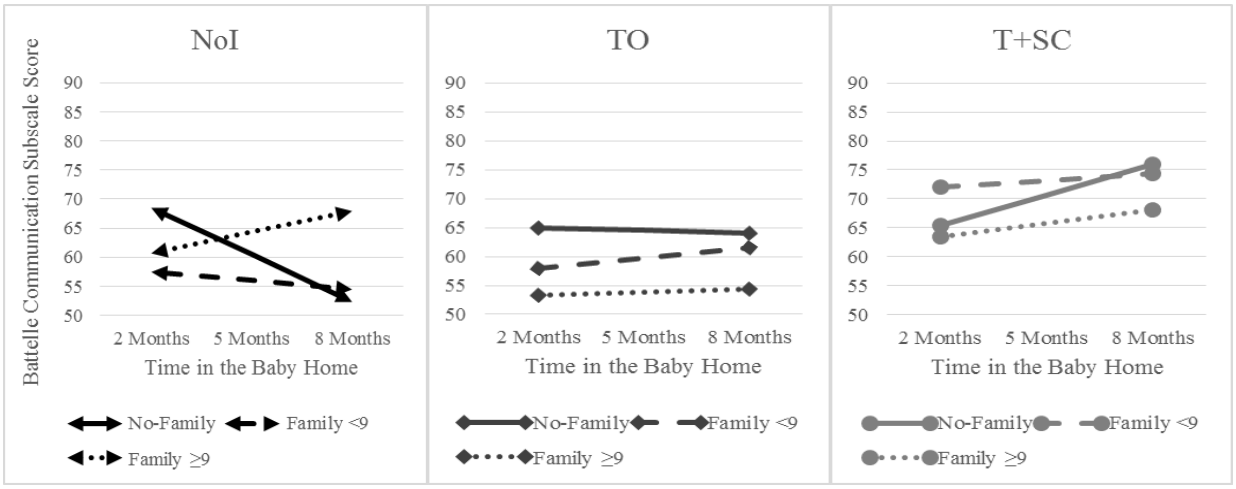

Figure 9. Developmental trajectory (predicted values based on HLM analyses) of Battelle Communication scores of children in NoI, TO, and T+SC with varying family experiences. Panel 1: No baseline differences in NoI. Over time, No-Family children had progressively lower standard scores, but Family children had stable standard scores. Panel 2: Children in TO who spent more than 9 months with a family had lower baseline scores than No-Family children. All slope effects n.s. Panel 3: No baseline differences in T+SC. Children had faster than typical rates of communication development (all contrasts n.s.).

5.5.3 Hypothesis 4c – TO

In TO, mental abilities will reveal similar developmental trajectories for children who did and did not spend time with families prior to Baby Home entry, related to the quality of caregiver-child interactions.

This hypothesis was supported for communication, but not total or cognitive development. For all measures, children in TO who spent any amount of time with a family displayed typical rates of development on all Battelle measures (see Table 6 – Time in the Baby Home). Children who spent more and less time with families maintained standardized communication scores over time, similar to No-Family children and each other (all $p > .50$; see Figure 9 – Panel 2), suggesting that children with more than 9 months of family experience maintained *lower* scores than other children. On the Battelle Total and Cognitive scales, children who spent time in a family similarly maintained initial standard scores over time, approximately 3 points/month *less* than the increase in scores seen for No-Family children (all $p < .008$; see Figures 7 & 8 – Panel 2). There was no difference between children who spent more or less than nine months with their families (both $p > .50$).

5.5.4 Hypothesis 4d – T+SC

In T+SC, children who spent time with their families prior to entry will show similarly faster than typical rates of mental development as No-Family children.

This hypothesis was supported for communication and cognitive development, but not for total DQ, on which children who spent more than 9 months with their families did *not* show the increases over time that the other children displayed (see Table 6 – Time in the Baby Home).

Children who spent more and less time with their families showed similarly faster than typical rates of cognitive and communication development as No-Family children and each other (all $p > .22$; see Figures 8 & 9 – Panel 3). Children who spent less than nine months with their families displayed the same increasing DQ scores as No-Family children, $t(271) = -0.86$, $p = .39$. However, children who spent more than nine months with their families gained 3.27 *fewer* points per month than No-Family children, $t(271) = -4.34$, $p < .001$, and 2.51 *fewer* points per month than children who spent less than nine months with their families, $\chi^2(1) = 10.55$, $p = .002$. Thus, children who spent more than nine months with their families entered with higher scores but had scores similar to the other children within approximately 5-6 months in the Baby Home (see Figure 7 – Panel 3).

6.0 DISCUSSION

This study had two primary goals. First, it assessed how three Baby Home environments that were quasi-experimentally manipulated to differ in the consistency and sensitivity of their caregivers were related to social-emotional and mental development during the first year of residency for children who entered the Baby Home without spending any time with their families. Second, it investigated whether having experience in a family and the possibility of forming an attachment prior to intake moderated the association between these three Baby Home environments and children's social-emotional and mental development. In addition, access to Baby Home records and concurrent assessments of child and caregiver interactions allowed an evaluation of the role child-specific characteristics and caregiver behaviors play in these children's social-emotional and mental development.

Three findings emerged in response to the first goal (Aims 1 & 2). First, the quality of children's behaviors during a one-on-one play interaction was higher among children who experienced sensitive caregivers (TO and T+SC), whereas the quality of dyadic engagement with the caregiver was higher only among children who experienced sensitive and consistent caregivers (T+SC). These intervention effects were apparent after only two months of institutionalization and were maintained throughout the first year. Second, children who experienced sensitive and consistent caregivers gained social-emotional skills more quickly than children who experienced sensitive but inconsistent care. Finally, sensitive care, regardless of

caregiver consistency (TO and T+SC), supported improvements in mental abilities during the first year of life equally and more than cold, unresponsive and inconsistent care.

Three findings also emerged in response to the second goal (Aims 3 & 4). First, children who spent more than 9 months with their families prior to institutionalization had higher quality interactions with new caregivers than children with less family experience in all Baby Homes. Second, children with any amount of family experience who entered NoI or TO displayed typical (i.e., stable) rates of social-emotional and mental development during their first year of institutionalization, showing neither the slower than typical rates of other children in NoI nor the faster than typical rates of other children in TO. Finally, children who spent more than 9 months with their families before entering T+SC had higher standardized social-emotional and DQ scores at baseline than children with less or no family experience but showed a slower rate of development than other children in T+SC; whereas, they had similar baseline levels and similarly faster than typical rates of cognitive and communication development as children with less or no family experience.

Negative birth circumstances were associated with poorer scores at intake but were not consistently associated with developmental change. In addition, neither the quality of caregiver behaviors nor the dyadic engagement during a play interaction was consistently related to children's social-emotional or mental performance on structured tasks.

6.1 SENSITIVITY AND CONSISTENCY DURING THE FIRST YEAR OF LIFE IN INSTITUTIONS

A primary goal of this study was to assess the relative influence of institutional caregiver sensitivity and consistency during the first year of life on social-emotional and mental development. By assessing only children who entered the Baby Homes within three months of birth without having spent time with a family, these analyses more directly address how interventions that manipulated the consistency and sensitivity of caregiving were related to social-emotional and mental development during the first year of life while controlling for age at exposure and assessment and for pre-institutional environment (i.e., all children were similar ages and differed only in prenatal environment).

6.1.1 Quality of Interactions vs. Social-Emotional Skills

The pattern of results differed between the two types of social-emotional assessments. The Battelle Personal-Social, PCERA Child Total, and PCERA Dyadic Engagement scales were expected to show similar developmental trends. However, the two PCERA measures revealed Baby Home differences that were apparent by two months after intake (~ 3 months of age) and remained stable over time, whereas the Battelle measure showed Baby Home differences in the rates of developmental change. This difference may stem from the assessment methods.

The PCERA (Appendix B) is a measure of the global quality of child, caregiver, and dyadic social and emotional behaviors during a 5-minute free play session. Although the quality ratings are rooted in behavioral descriptions, they are not as tied to age as items on the Battelle, and thus may be able to describe differences at younger ages. Further, the nature of the task may

make differences between Baby Homes apparent at earlier ages. For this task, one child and one caregiver sit alone in a room and have five minutes to play together. This type of interaction has no precedence for children in any Baby Home, but especially not for children in NoI. Children in Baby Homes are constantly surrounded by peers, and the only one-on-one time with caregivers that children in NoI receive occurs during feeding or changing, which are performed in a perfunctory manner (St. Petersburg-USA Orphanage Research Team, 2005, 2008). Thus, children in NoI who never spent time with a family can reasonably be assumed never to have experienced the type of interaction that the PCERA assesses and, understandably, would not display behavioral patterns related to high quality interactions in this situation. Children in TO do experience one-on-one interactions with warm and sensitive caregivers; therefore, they could reasonably be expected to have developed some behavioral patterns related to appropriate social skills in a one-on-one free play situation. However, the "caregiver they know best" is still likely to be one caregiver among many, which could be expected to have limited benefits for their ability to engage in high quality reciprocal interactions with this caregiver. In contrast, children in T+SC do experience one-on-one interactions with the caregiver they know best on nearly a daily basis. For these children, the PCERA assessment would be odd because their peers were not around, but the premise of the task would be one with which they are familiar. These aspects of the assessment can easily explain the unexpected findings that children in TO and T+SC had higher child behavior scores than children in NoI after only two months in the Baby Home, that children in T+SC had higher dyadic engagement scores than children in TO and NoI after only two months, and that these scores did not change much during the first year of residency.

In contrast, the Battelle (Appendix A) uses structured assessments, interviews with caregivers, and observations of the children to determine whether or not each child has mastered

certain social-emotional behaviors that other non-institutionalized children of the same age are generally able to perform (e.g., looks at adult's face, responds to his/her name, enjoys playing with peers). Because the number of assessed behaviors increases with age, differences in child abilities may become more apparent as they get older (e.g., possible total of 9 items for 0-5 month olds, 15 items for 6-11 month olds, and 21 items for 12-17 month olds). On this measure, children in T+SC gained more behavioral skills per month than children in NoI and TO, consistent with hypotheses. These skills are precisely the types of behaviors that the intervention targeted and that would be expected to flourish within an environment of caregiver consistency and sensitivity (Rutter, 1979; St. Petersburg-USA Orphanage Research Team, 2008).

Caregiver sensitivity without consistency (TO) was also better able to support the development of personal-social behavior than insensitive and inconsistent care (NoI) for children who had not spent time with their families and entered the intervention before 3 months of age. Sensitivity alone was enough for children to develop skills at a rate similar to that of non-institutionalized children their age and starting ability level, at least for the first year of life, but not to increase beyond their initial place in the distribution. While the position of children in TO relative to those in NoI and T+SC was consistent with hypotheses, their rate of development was slower than expected. Perhaps the warmth and sensitivity of caregivers in TO was less genuine than that of caregivers in T+SC because it was directed at all children rather than fostered within relationships with only a few children, consistent with less improvement in HOME scores after intervention implementation in TO than T+SC. Because caregivers in T+SC had consistent contact with the same children, they were more likely to develop relationships and more motivated to engage sensitively and more often with these children, whereas in TO, children were still unable to develop affective bonds with a few caregivers (The St. Petersburg-USA

Orphanage Research Team, 2008). Moreover, the variety of caregivers in TO means that children experienced many different idiosyncratic interaction styles, which likely made developing consistent expectations and basic strategies for interactions more difficult. These results suggest that caregiver consistency is highly important for social-emotional development. Conversely, without sensitivity or consistency, children in NoI developed fewer skills with age than non-institutionalized children, a worse outcome than hypothesized, supporting the proposition that social-emotional neglect not only does not support contemporaneous functioning, but actually impedes children's subsequent social-emotional development (Naughton et al., 2013; van IJzendoorn et al., 2011).

6.1.2 Mental Development

This strictly social-emotional intervention produced consistent changes not only in children's social-emotional but also in their cognitive skills. In NoI, the passive exposure to language without interactions resulted in slower than typical rates of communication development, a worse outcome than hypothesized but consistent with the literature (Sachs & Johnson, 1976; Snow et al., 1976). Children in NoI displayed typical rates of cognitive development; however, they maintained very low standard scores (nearly 2 SD below average) and developed more slowly than children in TO and T+SC. Children learn through interactions (Bigelow et al., 2010; McCall, 2011; Meltzoff, Kuhl, Movellan, & Sejnowski, 2009; Weinfield, Sroufe, Egeland, & Carlson, 1999), and without this basic foundation, many areas of development seem to suffer.

The T+SC intervention produced the hypothesized faster than typical rates of cognitive development, but the TO intervention also produced faster rates of development than expected. In TO and T+SC, caregivers were trained in attitudes and styles of behavior that support warm,

sensitive, and response-contingent interactions with children, but they were not taught specific behaviors and were not given a curriculum. Thus, the fact that this intervention positively impacted children's cognitive, communication, and general (DQ) development supports the literature documenting direct associations between parent-infant interactions and later intelligence and language abilities (Bornstein, 2014; Coates & Lewis, 1984; Lunden & Silven, 2011; Pearson et al., 2011). Interestingly, these findings do not suggest that the discriminated attachment relationship or the affective bond is the principle root of this association; rather, sensitive and response-contingent interactions with adults *in general* seem to be primary contributors to the observed association between caregiver-child interactions and mental development during the first year of life.

6.1.2.1 Timing of the Sensitivity Intervention

In these analyses, all children entered the Baby Homes directly from the hospital. The oldest age at assessment for these children was 12 months at the third assessment, and most children had their final assessment around 9 months of age. Attachment theory posits that discriminated attachments do not form for children in typical rearing environments until approximately 6 months of age and that there is a sensitive period between approximately 6 and 18 months, during which discriminated attachment relationships can still form fairly easily (Ainsworth et al., 1978; Bowlby, 1969; Zeanah, Gunnar, McCall, Kreppner, & Fox, 2011). Before 6 months, the *quality* of interactions should be more important to behavioral development than the presence of one or two primary caregivers because infants readily engage with most adults. The current results in TO suggest that this period extends beyond six months, especially for cognitive development. For children with the opportunity to engage with one or two consistent caregivers, the formation of a discriminated attachment marks a turning point in which their attachment

behaviors are directed toward and can generally only be soothed by the specific preferred attachment figure(s), whereas unfamiliar adults are met with fear and are less able to soothe them (Bowlby, 1969). After this formation, the association between interactions with caregivers and mental development presumably depends more on the quality of interactions with the attachment figure(s) than other unfamiliar adults. However, for children in institutions without the opportunity to form a discriminated attachment, the quality of interactions in general may continue to support mental development, at least through approximately 12 months of age.

Because caregivers in both TO and T+SC were trained to engage with children in a sensitive, response-contingent, child-directed manner, children in both Baby Homes may have had good enough quality interactions and perceptual-linguistic experiences to support faster than typical rates of cognitive development during this first year, even though this was not the case for social-emotional development. Potentially, children have more difficulty forming expectations about and consistent ways of behaving in social interactions when the person with whom they interact changes constantly. The lack of consistency may create difficulty for infants to learn how to discriminate between familiar and unfamiliar persons, to express different emotions, or to show affection (items from the Battelle Personal-Social scale) because caregivers generally are unfamiliar and may express and respond to emotions and affection differently. However, the child-directedness and response-contingency in their interactions, even with many different caregivers, may more easily support the learning of familiar words, expressive utterances, understanding the uses of objects, and a desire to explore new objects (items from Battelle Cognitive and Communication scales), especially if the period of time during which children readily accept care from any responsive adult is extended through 12 months of age. Although these conclusions are consistent with development from birth to 9-12 months of age,

the current study cannot address how consistency vs. sensitivity may influence development beyond 12 months of age for children who have not experienced any other environments. Importantly, the discriminated relationship and affective bond with a caregiver may be more important for later mental development when children require more input from others versus gaining skills through their own sensorimotor experiences.

In short, three findings emerge. First, children who experience sensitive caregivers quickly learn to display higher *quality* behaviors and emotion regulation in a play scenario than children with insensitive caregivers, whereas only children who experience sensitivity within the context of consistent relationships are able to engage with their caregivers in a more reciprocal and mutually responsive manner than other children. Second, social-emotional *skills* are supported more when caregivers are both sensitive and consistent than sensitive but inconsistent. Finally, sensitive and response-contingent interactions support mental development during the first year of life regardless of caregiver consistency.

6.2 FAMILY EXPERIENCES AND LOSS PRIOR TO INSTITUTIONALIZATION

For many children, institutions are not their only residential experience, and the second primary goal of this study was to investigate whether children with a history of family experience responded differently to the Baby Home interventions than children for whom the Baby Homes were their only early environments. These findings inform not only the understanding of the impact of caregiver loss for institutionalized children but also the interpretation of results from studies of children residing in institutions. Three primary findings are discussed: 1) the transfer of behavioral patterns from interactions with parents to interactions with caregivers, 2) the

relative lack of influence of the NoI and TO Baby Home environments on children with family experience, and 3) the relative benefits of prior family experience, even if high risk, in contrast to T+SC experience for social-emotional and mental development.

6.2.1 Family Experience and Interaction Quality

Children in all Baby Homes who spent more than 9 months with their families appeared capable of transferring behavioral patterns they learned within relationships with their family members to interactions with Baby Home caregivers during the PCERA assessment. Attachment theory posits that most children who have consistent contact with a few caregivers will develop a discriminated attachment with a caregiver by approximately 6-12 months of age (Ainsworth et al., 1978; Bowlby, 1969). Thus, children who spent more than 9 months with their families can reasonably be expected to have formed a discriminated attachment of unknown quality with at least one family member. A major component of a discriminated attachment is developing a behavioral repertoire that permits children both to maintain (e.g., smiling, babbling) and to gain (e.g., crying, crawling) proximity to this caregiver. This experience of interacting with a consistent caregiver and developing behavior patterns to initiate and to maintain social interactions likely contributed to the higher quality behaviors and dyadic engagement shown by these children on the PCERA measures.

At the same time, this pattern of findings is contrary to what was hypothesized from an attachment theory perspective on loss. Specifically, Bowlby (1980) wrote that children who were admitted to a hospital or residential nursery progressed through three stages following separation from parents: fear/anger, despair, and detachment. In an environment with less responsive caregivers, this progression should last longer, and subsequent social-emotional development

should follow a more negative trajectory than in an environment with consistent and responsive caregivers (Sroufe et al., 2010). However, current findings suggest that this hypothesized distress was not apparent during a 5-minute interaction with a caregiver two months after Baby Home intake. After two months of residency, children may have adapted to their new life, not showing acute separation distress. However, even though they lose their attachment relationships and enter institutions, they do not decline over time to the level of other institutionalized children but maintain their higher quality social behaviors and dyadic engagement. Because of their repertoire of attachment and play behaviors learned in the family, they may have had more tools for seeking attention, comfort, and/or interactions than children without similar amounts of family experience. Thus, the early social experiences in a family seemed to give children an advantage over other institutionalized children on the PCERA measures likely because of their familiarity with one-on-one interactions and their larger, more developed repertoire of relevant behaviors.

6.2.2 Maintenance of Standard Ability Levels in TO and NoI

Children who spent any amount of time with their families and then entered an environment without consistent caregivers (TO & NoI) showed typical rates of development on Battelle measures, inconsistent with the hypothesized slower than typical rates in NoI and faster than typical rates in TO. The early family experience seemed both to protect children from the negative effects of NoI and to hinder children from attaining the positive effects of TO. The behavioral patterns that children who entered NoI learned in their families, even in as few as 3 months, may have promoted caregiver interaction or individual exploration at least enough to acquire new social-emotional and mental skills at the same rate as non-institutionalized children their age and initial ability level rather than acquiring these skills at slower rates and falling

behind peers. Indeed, these may be the children who use their social abilities to initiate interactions and to make interactions more rewarding for caregivers or who, through fussiness, demand the attention they need from caregivers (Bakermans-Kranenburg et al., 2011). Conversely, children in TO who spent time with their families did not obtain the same cognitive benefits from the caregiver's sensitive and response-contingent interactions as children who had only known the TO environment. Perhaps the loss of consistent family interactions followed by the confusion of having many changing caregivers held them back from learning how to excel within this environment. However, even though they did not show the same increases, they also did not show developmental declines with time in a Baby Home with inconsistent caregivers.

These findings could also suggest that the institutional environment has a larger effect on development during the first 6-9 months of life than at later ages. Indeed, for children who spent more than 9 months with their families, they also by definition did not experience the institution during the first 9 months of life and were older at assessment. Perhaps the timing of institutional exposure is more important to development than family experience *per se*. It is also possible that children without family experience would show the same developmental trends if assessed during the second year of life. However, some children with less than 9 months of family experience did overlap with No-Family children on both timing of exposure and age at assessment. That these children showed rates of development more similar to children with more family experience than to children without family experience suggests that spending time with a family is an important predictor beyond timing of exposure and age.

6.2.3 Family Care before Sensitive and Consistent Institutional Care

Children who spent more than 9 months with their families benefitted more from their families but less from the T+SC intervention on social-emotional but not cognitive measures than children with no family experience. This conclusion is consistent with findings about the relative impact of caregiver sensitivity versus consistency in the sample of children without pre-institutional family experience. Specifically, cognitive skills improved over time with sensitive caregiving, regardless of caregiver consistency for children with no family experience in TO and T+SC (see above). Children who spent more than 9 months with their families by definition entered the T+SC Baby Home at older ages than other children, and mental development scores increased with age for children in T+SC who entered at younger ages. Therefore, children with over 9 months of family experience were hypothesized to enter the Baby Home with *higher* scores than other children, assuming their early development followed similar trajectories. Instead, children in T+SC had similar mental scores two-months after entry and gained cognitive and communication skills at a similar rate during their Baby Home residency, regardless of family experience, although DQ scores followed a pattern more similar to social-emotional development. Perhaps this can be interpreted as more evidence that caregiver sensitivity and the quality of response-contingent interactions are more associated with early cognitive development than the consistency of caregivers (Rutter, 1979). Whereas caregiver consistency of unknown quality in a family did not promote faster than typical rates of cognitive development, beyond the average starting level of other children in this sample (although the cognitive abilities of these children before entry is unknown), continued caregiving that was both consistent and sensitive did. In TO, however, children who first spent time with a family did *not* continue to improve at faster than typical rates. Perhaps the quality of interactions is more important to cognitive

development than consistency in general; but when children lose consistency, it may be too difficult to create new behavior patterns and expectations to benefit from sensitive care from many, changing caregivers.

Similar to children with no family experience, social-emotional skills showed a different association with caregiver consistency and sensitivity than cognitive skills for children who spent pre-institutional time with their families. In the sample of children without family experience, caregiver sensitivity plus consistency (T+SC) led to faster personal-social skill acquisition than caregiver sensitivity alone (TO). Attachment theory predicts that the combination of consistency and sensitivity is the best environment for social-emotional skill development, but that of the two, consistency may be more important in this domain (Ainsworth et al., 1978; Bowlby, 1969; Rutter, 1979). The current findings support this assertion. The environment of consistency with unknown caregiver sensitivity in a family (e.g., reasons for relinquishment) offered the opportunity to develop a discriminated attachment of unknown quality for children who remained with their families for at least 9 months. Within the context of this relationship, children gained social-emotional skills at a pace presumably similar to children living in T+SC because children who spent more than nine months with their families had higher scores at baseline. Again, these children did not display the hypothesized separation distress related problems with social-emotional skills. However, once these children entered T+SC, they did not gain skills at the same rate as their Baby Home peers but also did not decline over time. This finding may be due to the loss of their attachment figure(s) and their difficulty gaining as much from new relationships in the Baby Home as children for whom the caregivers constituted their only primary relationships.

Thus, the unique opportunity to assess children based on the amount of pre-institutional family experience they had afforded insight into the role early opportunities to engage in interactions with a consistent parent plays in both the skills with which children enter institutions and their subsequent development. First, behaviors learned through early one-on-one interactions likely transferred to children's behaviors with caregivers in the institutions. Second, early family experience was associated with typical rates of development rather than faster or slower than typical rates in TO and NoI. Third, children who spent more time with families benefitted more from those family interactions but less from the T+SC intervention on social-emotional but not mental measures than children without these opportunities.

6.3 EXPANSION OF THE ORIGINAL INTERVENTION REPORT

The current study expands upon and specifies the original intervention report by using an analytic method that assessed developmental trajectories of individual children and by including amount of family experience as a predictor. The initial intervention report compared children when they had 4-9 months of Baby Home exposure and 9+ months of exposure (St. Petersburg-USA Orphanage Research Team, 2008). In these analyses, children in T+SC had higher scores on all Battelle scales than children in NoI and TO, and they improved more with longer exposure. Children in T+SC also had higher scores than children in NoI and TO on all PCERA scales. Whereas scores on the Dyadic Engagement scale increased with longer exposure to T+SC, child behaviors showed no longitudinal effects. In addition, children in TO had similar scores to children in NoI on all Battelle and PCERA measures except for two PCERA child

behavior subscales and the Dyadic Engagement scale, on which children in TO had higher scores than children in NoI when assessed after more than 9 months of exposure.

In the current study, the intervention effects were *more prominent*, especially in TO, during the first year of life among children whose only early rearing environment was the Baby Home. Conversely, children with family experience performed better over time than children without this experience in NoI, *increasing* their average scores, whereas, children with family experience performed more poorly over time than children without this experience in TO, *decreasing* their average scores. Thus, when pre-institutional family experience is not considered, the true beneficial effects of training caregivers to be more sensitive, responsive, and child-directed in their interactions is masked in TO. In addition, during the first year of life, children may be more likely to benefit from enhanced institutions and to respond poorly to depriving institutions, making the intervention effects more prominent in this sample.

6.4 IMPLICATIONS

Most professionals would agree that the best place to raise a child is in a warm, loving family; however, when living with one's family of origin is not feasible or desirable, child welfare systems often must provide for children either by supporting reunification with their families or by placing them into foster care or institutions. Children in foster care tend to have better developmental outcomes than children in institutions (Julian & McCall, 2011; Zeanah et al., 2005), and a transition to entirely family-based care (biological, foster, and adoptive care) would be the most inexpensive and developmentally beneficial long-term solution for orphaned children (Engle et al., 2011; McCall, 2011). Some government-level transitions to family-based

rather than institutional care have been quite successful, such as in the Republic of Georgia (Greenberg & Partskhaladze, 2014) and in parts of Russia (Johnson, Dovbnya, Morozova, Richards, & Bogdanova, 2014). However, such successes require a variety of supportive circumstances that will not likely be met in most countries, and therefore many children likely will be reared in institutions in the foreseeable future.

The current study supports the argument that family care is preferable to institutional care because children in these institutions performed extremely poorly on measures of mental and social-emotional functioning very shortly after birth and over their first year of residency. However, it also demonstrates that institutional environments can be improved to foster better social-emotional and mental development if caregivers become more sensitive and consistent. Teaching caregivers what research has revealed about the best ways to interact with children and training them to incorporate these values and attitudes into their daily interactions with the children in their care can stop some of the deleterious aspects of institutional care and can even promote gains in some areas of mental development. If the structure of the physical environment and caregiver schedules can be adjusted to promote consistency and a more family-like atmosphere, children display gains in even more mental and social-emotional domains. These findings suggest that every effort should be made to transition children out of institutional care into high-quality foster or adoptive homes, but that during this transition, the quality of life for children who must remain in institutions can be improved.

The current findings also offer insights to researchers, clinicians, and parents about the importance of considering prior and current context when assessing development. Depending on the new environment, early experiences in a high-risk family can serve as both protective and risk factors. For non-institutionalized children, early positive relationships have been found to

protect children against the negative effects of later trauma and stress (Sroufe et al., 1999; Wright & Masten, 2005). Conversely, young children who enter supportive foster or adoptive homes following maltreatment in their family of origin tend to have more difficulties by six years of age than children without that history (Cicchetti & Toth, 1995; Klee, Kronstadt, & Zlotnick, 1997; Ruff, Blank, & Barnett, 1990). Findings from the current study similarly suggest that considering context is extremely important when making predictions about the association of early high-risk family experience with development within institutions. When the new environment is social-emotionally depriving or neglectful, early experiences within a family, even when the quality of those experiences is unknown, can act as a buffer, protecting children against some of the deleterious effects of this extreme environment. Conversely, the early experience with relationships seems to make it more difficult for children to learn how to utilize positive interactions when caregivers are constantly changing than it is for children who never had a consistent caregiver. Finally, children who enter a warm, family-like environment after separation from their families of origin are able to benefit from their new environment, especially in mental domains; however, they do not progress as quickly as children who had lived with those caregivers for their whole lives in some social-emotional domains.

Thus, researchers who study institutionalized and post-institutionalized children should consider not only the quality of institutions in which children were raised but also the kind of pre-institutional environment the children they study experienced. This knowledge can affect both the interpretation of child development within typical institutions and the effectiveness of interventions, both in and out of the institutions. Adoptive parents and clinicians should consider the quality and consistency of care their children received in the institution as well as whether they had any family experiences, both of which could impact the way children respond to their

new environment. Although some researchers argue that individual parenting characteristics have limited effects beyond genetic contributions to outcomes that are not relationship-specific (Harris, 2002), this is clearly not the case in extreme institutional environments and also may not be the case for children transitioning out of these extreme environments.

6.5 STRENGTHS, LIMITATIONS, AND FUTURE DIRECTIONS

The current study uses data from the only intervention to date that has manipulated care within three working institutions. This design is superior to "add-on" interventions (e.g., Brossard & Decarie, 1971; Sparling, Dragomir, Ramey, & Florescu, 2005; Taneja et al., 2002) because it changes the institutional culture and the quality of care children receive from the institutional staff rather than only during specific designated intervention activities. It is also a better test of theory than some interventions (e.g., Smyke et al., 2002; Lecannelier, Silva, Hoffmann, Melo, & Morales, 2014) because the inclusion of both the TO and T+SC interventions can address the relative impact of caregiver sensitivity versus sensitivity in the context of consistency. Further, it demonstrates that it is feasible to implement interventions to improve child outcomes within the institutional context, not only in foster care (Zeanah et al., 2005).

These strengths are possible only because of the applied nature of the work; however, applied fieldwork always has its limitations. Specifically, sample sizes in the current study are small, especially in certain family groups (e.g., TO Family<9 Months, n = 7) and for the third assessment. Children cannot be randomly assigned to enter the Baby Home after birth vs. spending different amounts of time with their families. Thus, not only can the number of children in these groups not be controlled, but neither can the child and family characteristics that lead to

these placements. Children's birth and disability characteristics were included statistically to address group differences; however, other unmeasured factors may impact results. Children also leave the Baby Homes for adoption or reunification, great outcomes for the children, but they complicate research. Thus, many children had only two assessments during their Baby Home residency. Although selective adoption, which could lead to biased results, is possible, a study of children in these Baby Homes found that the length of institutionalization and pre-institutional family experience (e.g., children arrive later and are adopted at older ages) were the only factors related to age at adoption (Hawk et al., 2012). The HLM analyses are able to compensate for missing data, mitigating the effects of the limited number of children with three assessments.

As noted, this is one of few studies of early childhood development that manipulated caregiver sensitivity and consistency to determine the relative effect of each. Unfortunately, a fourth Baby Home that had structural changes but no training was not included in the design. If an intervention study of this magnitude can be replicated in the future, the researchers should attempt to include this structural changes only condition to better describe the impact of caregiver consistency alone. In the current study, the baseline scores of children who spent time with families can approximate this condition (i.e., consistent but likely not sensitive) because the families, by nature of having children who move to the Baby Homes, are high risk. However, the actual sensitivity of the parents is unknown and could vary widely, and baseline assessments measure not only the impact of children's early environments but also their ability to overcome the loss of their families and to adapt to a new environment. Including a structural changes only Baby Home would allow a true comparison of the individual impacts of caregiver sensitivity and consistency and their additive influences. Of course, the nature of the structural changes could

result in better caregiver-child interactions and relationships without training due to the daily interactions and smaller groups (St. Petersburg-USA Orphanage Research Team, 2008).

There were also changes in T+SC that supported caregiver consistency and sensitivity but addressed other aspects of care. Notably, group sizes and caregiver-to-child ratios were decreased in T+SC, and classes were age and disability integrated. It is unknown whether improving caregiver consistency without these other changes would have been as beneficial or whether making these changes without addressing consistency would have shown similar benefits. If an intervention study of this magnitude is feasible again, researchers could attempt to change group size, class integration, and caregiver consistency separately to assess the relative effects of each.

Finally, this is one of the few studies of institutionalized children that has good data on pre-institutional factors, such as birth circumstances, length of time with families, pre-institutional environment, and reasons for Baby Home entry. Indeed, the current results suggest that these factors, especially pre-institutional environment, are important to consider when interpreting results. Interestingly, most of the birth circumstances were related to baseline scores but not to developmental growth, suggesting that the Baby Home environment has a stronger influence on subsequent development than early birth complications.

Researchers should continue to follow children in these and other interventions to determine their development with more time in the Baby Homes and/or after adoption. Indeed, researchers are currently analyzing data from follow-up studies of children from these Baby Homes who were placed into families in Russia or adopted into USA families. Within these studies, if possible, researchers should include more nuanced assessments of children's development, including peer relationships, attention, inhibitory control, and measures of

attachment development, such as Zeanah and colleague's (2005) 5-point scale of attachment formation.

6.6 CONCLUSION

The current study assessed the effects of an intervention that improved caregiver sensitivity only or sensitivity plus consistency within Baby Homes for children who experienced only these environments versus those who lived with families prior to institutionalization. For children without family experience, the interventions provide one of the purest assessments of the impact of caregiving on development within a high-risk sample. The interventions had fairly immediate positive effects on infants' behaviors during interactions with caregivers and provided environments in which infants' mental abilities improved during residency. Consistent with attachment theory (Ainsworth et al., 1978; Bowlby, 1969), social-emotional abilities only improved at faster than typical rates in the intervention that increased caregiver consistency. Thus, during the first year of life, the quality of interactions with adults may be more important than consistency for mental development, but caregiver consistency is very important for social-emotional development.

Children in this study who lived with families prior to institutionalization had more opportunities to engage in one-on-one interactions with consistent adults; however, the quality of these interactions is unknown and likely poor, and the children suffered the loss of these relationships upon institutionalization. Interestingly, both the positive and negative aspects of family experience seem to be related to development within the Baby Homes, but the associations depend upon the subsequent environment. For children in all Baby Homes, having

more than 9 months of one-on-one relationship experience seemed to prepare them to have higher quality interactions with Baby Home caregivers, at least during a 5-minute observed free play session. This early family experience appeared to protect children from the negative effects of a social-emotionally depriving Baby Home environment. However, for children who entered the intervention Baby Homes, the quality of interactions in the family, the loss of these relationships, their age upon entry, and/or other aspects of family and Baby Home life kept these children from benefitting from the enhanced caregiving quality as much as children without family experience.

These findings have a number of implications for research and practice. Specifically, researchers who work with both institutionalized and post-institutionalized children should try to gain as much information as possible about their participants' pre-institutional experiences. The effects of social-emotional neglect and of potential interventions are likely moderated by whether or not children spent time with their families prior to entering those environments and the quality of those experiences. Finally, these results demonstrate the benefits of improving institutional care. Even as policy makers strive to transition all orphaned children into family-based care, the quality of life and many mental and behavioral outcomes can be improved for children who must continue to live in institutions until this transitions is fully realized.

APPENDIX A

ITEMS ON THE BATTELLE DEVELOPMENTAL INVENTORY

O – Observation
I – Interview with caregiver
S – Structured task

Personal-Social Subscale
Adult Interaction
0-5 months
- O, I The child shows awareness of people.
- S The child looks at an adult's face.
- S, I The child smiles or vocalizes in response to adult attention.
- S, I The child explores adult facial features.
- O, I The child shows a desire to be picked up or held by familiar persons.

6-11 months
- O, I The child shows desire for personal attention
- S The child plays peekaboo.
- S, I The child discriminates between familiar and unfamiliar persons.

12-17 months
- O, I The child continues to vocalize when imitated.
- S, I The child response to the naming of a familiar person.

18-23 months
- O, I The child response to adult praise, rewards, or promise of rewards.
- I The child helps with simple household tasks.

24-35 months
- O, I The child greets familiar adults spontaneously.

36-47 months
- O, I The child responds to social contact made by familiar adults.
- O, I The child separates easily from the parent.

48-59 months
- None

Expression of Affect

0-5 months

O, I	The child shows anticipatory excitement.
S, I	The child shows pleasure in frolic play.
O, I	The child expresses emotions.

6-11 months

O, I	The child shows affection toward people, pets, or possessions
O, I	The child enjoys playing with other children.

18-23 months

O, I	The child enjoys having simple stories read.

24-35 months

O, I	The child expresses affection toward or a liking for a peer.

36-47 months

O, I	The child expresses enthusiasm for work or play.
O, I	The child shows sympathy toward others.

48-59 months

O, I	The child comforts peers in distress.
S, O, I	The child describes his/her feelings

Self-Concept

0-5 months

O, I	The child shows awareness of his/her hands.

6-11 months

S	The child responds to his/her name

12-23 months

O, I	The child expresses ownership or possession
S	The child identifies self in a mirror.

24-35 months

O, I	The child shows pride in achievements.
S	The child knows his/her first name.
O, I	The child uses pronouns or his/her name to refer to self.
O, I	The child speaks positively of self.
S	The child knows his/her age.

36-47 months

O, I	The child calls attention to his/her performance.
S	The child knows his/her first and last names.

48-59 months

O, I	The child asserts self in socially acceptable ways.

Peer Interaction

0-11 months

None

12-17 months

O, I	The child initiates social contacts with peers in play.
O, I	The child imitates another child or children at play.

18-23 months

O, I The child plays independently in the company of peers.

O, I The child plays alongside another child.

24-35 months

O, I The child participates in group play.

O, I The child shares property with others.

36-47 months

O, I The child interacts with peers.

48-59 months

O, I The child has special friends.

I The child chooses his/her own friends.

O, I The child plays cooperatively with peers.

O, I The child cooperates in group activities.

O, I The child takes turns and shares.

Coping

0-17 months

None

18-23 months

I The child generally follows directions related to daily routine.

24-35 months

O, I The child follows the rules that are given by an adult for playing simple childhood games.

36-47 months

None

48-59 months

O, I The child complies with adult directives.

Social Role

0-23 months

None

24-35 months

O, I The child engages in adult role-playing.

O, I The child dramatizes in play.

36-47 months

S The child knows whether he/she is male or female.

S The child is aware of difference between male and female.

48-59 months

S The child recognizes the facial expressions of primary emotions.

O, I The child engages in adult role-playing and imitation.

O, I The child recognizes another's need for help and gives assistance.

O, I The child respects property and rights of others.

O, I The child asks permission to use others' possessions.

Communication Subscale

Receptive

0-5 months

S The child responds to a nonspeech sound outside his/her field of vision.

S The child responds to a voice outside his/her field of vision.

S The child turns his/her head toward the source of a sound outside his/her field of vision.

6-11 months

S, I The child responds to different tones of a person's voice.

S The child associates spoken words with familiar objects or actions.

12-23 months

S The child follows three or more familiar verbal commands.

S The child responds to simultaneous verbal and gestural commands.

24-35 months

S The child responds to the prepositions *in, out, on, in front of, toward,* and *behind.*

S The child understands simple possessive forms.

36-47 months

S The child responds to the adverbs *softly* and *loudly*.

S The child follows two-step verbal commands.

S The child understands the superlatives *biggest* and *longest.*

S The child responds to *who, what, where,* and *when* questions.

48-59 months

S The child discriminates between real words and similar nonsense words.

S The child understands simple negations.

S The child understands regular plural forms.

Expressive

0-5 months

O, I The child produces one or more vowel sounds.

O, I The child vocalizes sounds to express his/her feelings.

6-11 months

O, I The child produces one or more single-syllable consonant-vowel sounds.

O, I The child repeats one or more single-syllable consonant-vowel sounds in close succession.

12-23 months

O, I The child uses gestures to indicate his/her wants or needs.

S, O, I The child imitates speech sounds.

O, I The child uses 10 or more words.

O, I The child uses variations in his/her voice.

O The child initiates sounds, words, or gestures that are associated with objects in the immediate environment.

24-35 months

O, I The child uses the pronouns *I, you,* and *me*

O, I The child uses two-word utterances to express meaningful relationships.

O, I The child uses three-word phrases meaningfully.

36-47 months

S The child responds “yes” or “no” appropriately.
S The child labels his/her creations.
O, I The child asks questions that begin with *who, what, where, why,* and *how*
S The child uses plural forms ending with the “s” or “z” sound.
S, O The child relates his/her experiences.
S The child uses the articles *the* and *a.*

48-59 months

S The child uses the regular past tense of verbs ending in *ed*.
S The child repeats familiar words with clear articulation.
S, O The child uses five- or six-word sentences.
S, O The child communicates effectively.

Cognitive Subscale

Perceptual Discrimination

0-5 months

O, I The child explores the environment visually.
O, I The child shows awareness of new situations.
S The child feels and explores objects.

6-11 months

O, I The child physically explores or investigates his/her surroundings.

12-23 months

S The child places a circle and a square in a form board.

24-35 months

S The child matches simple geometric forms.
S The child matches a circle, square, and triangle.

36-47 months

S The child identifies simple objects by touch.

Memory

0-5 months

S The child follows an auditory stimulus.
S The child follows a visual stimulus.

6-11 months

S The child uncovers a hidden toy.
S The child searches for a removed object.

24-35 months

S The child repeats two-digit sequences.
S The child selects the hand hiding a toy.

36-47 months

S The child recalls familiar objects.

48-59 months

None

Reasoning and Academic Skills

0-5 months

None

6-11 months

S The child pulls a string to obtain a toy or ring.

12-23 months

S The child reaches around a barrier to obtain a toy.

24-35 months

None

36-47 months

S The child responds to *one* and *one more*.

48-59 months

S The child identifies sources of common actions.
S The child gives three objects on request.
S The child answers simple logic questions.
S The child completes opposite analogies.
S The child identifies the larger of two numbers.

Conceptual Development

0-11 months

None

12-23 months

O, I The child recognizes self as the cause of events or happenings.

24-35 months

S The child identifies familiar objects by their use.

36-47 months

S The child identifies big and little shapes.

48-59 months

S The child identifies the longer of two sticks.
S The child sorts forms by shape.
S The child compares the sizes of familiar objects not in view.

APPENDIX B

ITEMS ON THE PARENT-CHILD EARLY RELATIONAL ASSESSMENT

Caregiver Scale Items

No angry, hostile tone of voice.
No flat, unemotional tone of voice.
Expressed positive affect.
No expressed negative affect.
No angry/hostile mood.
No depressed or withdrawn/apathetic mood.
No anxious mood.
No displeasure, disapproval, or criticism.
Enjoyment/pleasure.
Quality and amount of physical contact: Negative.
Amount and quality of visual contact.
Amount of verbalization.
Quality of verbalization.
Social initiative.
Continuing response to child's negative/ unresponsive behavior.
Structures and mediates.
Not insensitive/unresponsive to child's cues.
Mirroring.
No rigidity.
Creativity/resourcefulness.
No intrusiveness.
No inconsistency/unpredictability.

Child Scale Items

Expressed positive affect.
No expressed negative affect.
Happy, pleasant, cheerful mood.
No apathetic, withdrawn mood.
No irritability or angry mood.
No sober, serious mood.
Emotional liability.
Alertness/interest.
Social behavior: initiates.
No aggressiveness.
Motoric competence and quality.
Quality of exploratory play.
Attentional abilities.
Robustness.
Persistence.
No impulsivity.
Self-regulation/organization.
Visual contact.
Communicative competence.
Readability.

Dyadic Scale Items

No anger/hostility/irritability.
No flat, empty constricted affect.
No tension, anxiety.
Enthusiasm, mutual enjoyment.
Joint attention, activity.
Reciprocity.
No dyadic disorganization/dysregulation.
State similarity.

APPENDIX C

CORRELATIONS BETWEEN BATTELLE AND PCERA SCALES

Table 7. Correlations Between Age, Battelle Scales, and PCERA Scales.

		Battelle				PCERA		
	1. Age	2. Total	3. Cog	4. Comm	5. Per-Soc	6. Child	7. Caregiver	8. Dyadic
1.	1.00	.27***	.10*	-.01	.17***	.25***	.04	.23***
2.		1.00	.73***	.59***	.78***	.23***	.04***	.18***
3.			1.00	.39***	.56***	.19***	.04	.14***
4.				1.00	.49***	.14***	.10**	.12***
5.					1.00	.22***	.10**	.18***
6.						1.00	.49***	.79***
7.							1.00	.63***

Note. Age = Age at Assessment (months); Cog = Cognitive Subscale; Comm = Communication Subscale; Per-Soc = Personal-Social Subscale; Child = Child Total Scale; Caregiver = Caregiver Total Scale; Dyadic = Dyadic Engagement Scale
*$p < .05$
**$p < .01$
***$p < .001$

APPENDIX D

AGE AT ASSESSMENT AND REASONS FOR BABY HOME ENTRY

Age at assessment was not included in the final analyses because it made interpretations of the intercept difficult and because it did not change any of the reported findings. By centering the time variable (Time in the Baby Home) at two months, analyses of the intercept were meaningful as children's scores two months after entering the Baby Home. The average age at baseline assessment was approximately 6 months. When age at assessment was centered at 6 months and added to the model, the intercept term became children's scores two months after entering the Baby Home when they were 6 months of age. Thus, the intercept term became uninterpretable for No-Family children, who were 3 months old at baseline assessment and for children who spent more than 9 months with their families, who were at least 10 months old at their first assessment.

Adding age at assessment improved model fit for the Battelle Personal-Social, $\chi^2(1) = 5.71$, $p = .02$, and Total, $\chi^2(1) = 6.66$, $p = .01$, scales. On the Personal-Social and Total scales, scores increased by 3.03 and 2.66 points per month, respectively, with increasing age; however, the Time in the Baby Home coefficients became larger so that the same overall effects were seen. There was no effect of age at assessment for the PCERA Child Total, $\chi^2(1) = 0.20$, $p > .50$,

or Dyadic Engagement, $\chi^2(1) = 2.87$, $p = .09$, scales, and adding it *decreased* model fit for the Battelle Cognitive, $\chi^2(1) = 14.53$, $p < .001$, and Communication, $\chi^2(1) = 22.08$, $p < .001$, scales.

Reasons for Baby Home entry were also not included in the final models because they made interpretation of the coefficients difficult. When this variable was added to the model, the level 2 intercepts referred to No-Family children in NoI who were voluntarily given to the Baby Home. Its addition also decreased already small sample sizes so that other interactions became unstable. Adding involuntary vs. voluntary entry and its interaction with Family experience improved model fit for the Battelle Cognitive scale, $\chi^2(6) = 13.08$, $p = .04$. Involuntarily relinquished children had higher baseline cognitive scores, except for involuntarily relinquished children who spent more than 9 months with their families, who had lower baseline scores. Whereas involuntarily relinquished children with no family experienced had slower cognitive development than voluntarily relinquished children, this was not true for involuntarily relinquished family children. There was no effect of reasons for entry for the Battelle Personal-Social, $\chi^2(6) = 12.09$, $p = .06$ (all coefficient $p > .10$), Total, $\chi^2(6) = 12.22$, $p = .06$ (all coefficient $p > .10$, except involuntarily relinquished children who spent more than 9 months with a family, who had *lower* baseline scores but *faster* slopes), Communication, $\chi^2(6) = 7.80$, $p = .25$ (all coefficients $p > .05$), PCERA Child Total, $\chi^2(6) = 5.94$, $p > .50$ (all coefficients $p > .10$), or Dyadic Engagement, $\chi^2(6) = 2.24$, $p > .50$ (all coefficients $p > .20$), scales.

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