DOES THE CAREGIVING ENVIRONMENT MEDIATE THE ASSOCIATION BETWEEN AN INSTITUTIONAL INTERVENTION AND CHILDREN'S DEVELOPMENTAL OUTCOMES?

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Johana Maria Rosas

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This thesis was presented

by

Johana Maria Rosas

It was defended on

December 3, 2010

and approved by

Susan B. Campbell, PhD, Department of Psychology

Elizabeth Votruba-Drzal, PhD, Department of Psychology

Thesis Director: Robert B. McCall, PhD, Department of Psychology

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Johana M. Rosas, M.S.

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Most institutions described in the literature do not provide rearing environments conducive to promoting typical development (e.g., Rosas & McCall, in review; Van IJzendoorn, Bakermans-Kranenburg, & Juffer, 2007a). Institutions typically lack adequate structural (low child-caregiver ratios, small group sizes and trained caregivers) and process (responsive and positive interactions with caregivers) quality characteristics known to contribute to children's overall development. A socio-emotional institutional intervention combining caregiver training (to encourage caregivers to be more socially responsive in their interactions with infants and young children in every aspect of life in the orphanage) and structural changes (i.e., group size, caregiver-child ratios, and constant caregivers) aimed to create an environment in which caregiver-child relationships were more likely to develop. Results indicate that intervention-produced changes in caregiving quality significantly mediated the intervention effects on children's developmental outcomes. It is notable that the overall caregiving quality accounted for almost half the variance (43%) of the total effect of the intervention on children's developmental scores. Reduction of group size and children-to-caregiver ratios, fewer more consistent caregivers, and other factors providing a more family-like environment appear to support improvements in process quality which in turn had positive effects on children's development.

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1.0 INTRODUCTION

Institutions have become the primary form of alternative care in many countries where foster care or adoption may not be suitable alternatives for financial reasons or cultural aversion (Aboud, Samuel, Hadera, & Addus, 1991; Bledsoe, Ewbank, & Isiugo-Abanihe, 1988; Wolff & Fesseha, 1998, UNAIDS, UNICEF, USAID, 2004). A report on the number of children under three years of age living in institutions in 27 countries of Central and Eastern Europe and the Commonwealth of Independent States estimated a range from 29.7 per 100,000 in Armenia to 1,176.5 per 100,000 in Bulgaria (UNICEF, 2004).

Most institutions described in the literature do not provide rearing environments conducive to promoting typical development (e.g., Rosas & McCall, in review; Van IJzendoorn, Bakermans-Kranenburg, & Juffer, 2007a). Institutions differ in the level of deprivation to which infants and young children are exposed (Gunnar, 2001; Rutter & The ERA Study Group, 1998). *Globally depriving* institutions are deficient in providing medical, sanitary, nutritional, social, and psychological care to children. In addition to the physical deficiencies, infants in these institutions spend most of their time in cribs or cots, do not have many toys available, and experience few one-to-one caregiver-child interactions. In contrast, *social-emotionally depriving* institutions are minimally acceptable at meeting children's basic medical and nutritional needs but, similar to those in globally depriving institutions, caregivers are business-like and perfunctory when performing routine caretaking activities and do not provide much interaction with children (Gunnar, 2001).

More specifically, common characteristics of most published accounts of institutional care are that children are exposed to multiple and rotating caregivers, large group sizes, and large children-to-caregiver ratios (Rosas & McCall, in review), which contribute to a lack of individualized care and social-emotional deprivation (Carlson & Earls, 1997). Most information on institutional caregivers' responsiveness to children is anecdotal or observational, but lack of

responsiveness towards children is commonly reported. Most infants are not talked to, touched, or held (except when being fed, bathed, or changed), and children play by themselves with little interaction or conversation between caregivers and children (e.g., Hakimi-Manesh, Mojdehi, & Tashakkori, 1984; Harden, 2002; Levin & Haines, 2007; Nelson III, Zeanah, Fox, Marshall, Smyke, & Guthrie, 2007; The St. Petersburg-USA Orphanage Research Team, 2005, 2008).

In the few empirical studies with information on caregiver-child interactions, institutional caregivers score significantly lower than parents on measures of sensitivity, stimulation of development, positive regard for the child, affect, and engagement; and even in cases in which caregivers and biological mothers display the same amount of interaction with children, sensitivity is lower in institutional caregivers than in parents (Vorria, Papaligoura, Dunn, Van IJzendoorn, Steele, Kontopoulou et al., 2003). For example, McCall, Groark, and Fish (2010) and McCall, Groark, Fish, and the Whole Child International Team (in press) found lower scores on a measure of positive caregiver behavior assessed in three institutions in Central America and one in the Russian Federation relative to a Russian institution that had been given a social-emotional intervention. In general, caregivers were not responsive to children's cues and expressed little emotion, either positive or negative.

In addition, institutional caregivers often prefer to limit their socio-emotional interactions and relationships with children, because they want to avoid attachment followed by subsequent separation; they also have concerns that early close relationships are not good for children who will move to a different institution, get adopted, or return to their biological parents; and they feel that emotional distance is a coping mechanism to deal with job demands and stress (The St. Petersburg-USA Orphanage Research Team, 2005, 2008, Sloutsky, 1997).

Collectively, these characteristics mean that children receive little individual attention; limited social, emotional, cognitive, and language stimulation; and no caregiver-child relationship experience; and these caregiving deficiencies can be presumed to contribute to delayed development in nearly all domains.

1.1 CAREGIVER-CHILD INTERCATIONS AND CHILDREN'S DEVELOPMENT

1.1.1 Theory

For decades, researchers have theorized about the importance of caregiver-child relationships, and empirically the lack of early relationships has been associated with adverse consequences in infants' and young children's development (Ainsworth, Blehar, Waters, & Wall, 1978; Bornstein & Tamis-LeMonda, 1989, Landry, Smith, Swank, Assel, & Vellet, 2001). Bowlby (1951) concluded that for healthy development to occur "the infant and young child should experience a warm, intimate, and continuous relationship with his mother" (1951, p.13) and that "prolonged deprivation of the young child of maternal care may have grave and far-reaching effects on his character and so on the whole of his future life" (1951, p.46). More recently, these issues have been understood as the importance of a stimulating early environment in which a few consistent caregivers (not specifically the mother) provide infants with warm, sensitive, responsive, one-to-one interactions (Rutter, 1995).

Early caregiver-child interactions are theorized to play an essential role in the cognitive, language, and social-emotional development of infants and young children (Ainsworth, Bell, & Stayton, 1974; Bakeman & Brown, 1980; Bee et al., 1982; Beckwith, 1971). The quality of the caregiver-child relationship is thought to cultivate a set of expectations that the child internalizes about him/herself and others, known as internal working models of relationships. These mental representations are developed early in life and are modified as the individual interacts and relates to significant individuals in his/her life. This set of expectations influences present and future relational experiences and forms the basis of later social and attachment relationships. Children who experience positive, warm, and affectionate relationships with their caregivers develop a sense of trust and security, and they perceive their caregivers as a secure base from which they can explore the world. This exploration provides children with opportunities for learning and exercising cognitive skills.

The theoretically ideal caregiver-child relationship is fostered by several specific characteristics of caregiver-child interactions. For example, contingent caregiver responsiveness to the infant's initiatives is important in children's development and socialization progress

(Bigelow, 2009). Responsiveness to the child's signals of distress is especially important in stressful circumstances, because it leads to a sense of protection and, thus, the infant learns to expect that he/she can access assistance from the caregiver when needed (Bornstein & Tamis-LeMonda, 1997). In addition, caregivers' responses to other child signals provide the child with a sense of control and agency over the environment (Kochanska & Aksan, 2004; Lewis & Goldberg, 1969; Thompson, 2006; Watson, 1995).

A similar but more complex component of effective caregiver-child interactions is sensitive responsiveness, which has been defined as a set of caregiver behaviors that are prompt and contingent on the child's behavior and that are appropriate to the child's age and developmental status (Ainsworth et al., 1978; Bornstein & Tamis-LeMonda, 1989, Landry et al., 2001). This concept involves both contingency and appropriateness.

Both observational and experimental evidence show that warm, sensitive, responsive caregiving is associated with positive developmental outcomes, whereas lack of those caregiver-child interaction components is related to poor child outcomes. Observationally, caregiver sensitive responsiveness in particular is associated with the development of physical growth, secure attachment, emotion regulation, language acquisition, and social and cognitive skills (Bornstein & Tamis-LeMonda, 1997; Tamis-LeMonda & Bornstein, 2002). For example, Landry et al. (2001) studied the role of early versus ongoing responsive parenting in full-term and low-birth-weight children assessed at 6, 12, and 24 months and again at 3 ½ and 4 ½ years of age. Results showed that children parented by highly responsive mothers over the first four years of life showed higher levels of cognitive skills and greater increases in those skills over time than children who experienced low levels of responsive parenting. Also, pre-term children increased their cognitive skills at close to the expected rate of 12 months of mental age per year if their mothers were in the highly responsive cluster (11.40 months per year) than if their mothers were in the low responsive group (9.20 months per year); similar trends were found for physical growth. The benefit of caregiver responsiveness has long-term effects as well. For example, Bradley (1989) showed that parental responsiveness measured when the child was 1 and 2 years of age was significantly correlated with achievement scores at 7 years of age (Bradley, 1989).

In contrast, the effects of insensitive, inconsistent, non-contingent caregiving may be especially evident during the first years of life because young children are more dependent upon stimulation, warm and affectionate emotional care, and scaffolding from primary caregivers (Masten & Coatsworth, 1998). Specifically, lack of response to the child's signals leads to feelings of helplessness in the child that could actually result in a decrease in signaling. Attachment theory suggests that children experiencing this kind of negative care are likely to develop insecure attachment styles, and insecure attachment has been found to be a risk factor for later psychological and social problems as well as delayed physical growth (Blizzard, 1990; Goldberg, 2000; Johnson, 2000). A substantial body of literature has documented more cognitive, emotional, social, and behavior problems in children exposed to these components of negative parenting (Bates, Pettit, Dodge, & Ridge, 1998; Bradley, Caldwell, & Rock, 1988; Beckwith, Rodning, & Cohen, 1992; Landry et al, 2001). For example, Rodriguez, Ayduk, Aber, Mischel, Sethi and Shoda (2005) found that maternal unresponsiveness in a highly stressful situation predicted children's subsequent problems with self-regulation.

A literature review of experimental interventions improving responsive parenting shows that these skills can be learned and parental improvements are associated with children's general developmental improvements (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003; Eshel, Daelmans, Cabral de Mello, & Martiness, 2006). For example, Landry, Smith, and Swank (2006) implemented two interventions to examine whether changes in the range of parental responsiveness, emotional-affective support of the child, and other maternal behaviors (i.e., warmth) resulted in increases in pre-term and full-term infant's skills. After 10 weekly home visits, target mothers improved in responsiveness toward their children and increases in maternal responsiveness facilitated greater growth in children's social, emotional, and cognitive competence. Landry et al. (2006) concluded that the results support a causal role of parental responsiveness on infant development.

In sum, caregiver-child relationships are important contributors to the cognitive, language, and social-emotional development of infants and young children. Research has found that positive interactions with a few, stable caregivers who respond to infant signals in sensitive responsive ways are associated with better developmental outcomes in children. On the other hand, negative or poor caregiver-child interactions lead to decreases in signaling from the infant, a sense of helplessness, and poor developmental outcomes in children. Elements that contribute

to positive caregiver-child interactions include contingent caregiver responsiveness and sensitive responsiveness as well as few, more stable caregivers. However, these are precisely the characteristics of caregiver-child interactions that are typically lacking in orphanage environments.

1.2 CHILD CARE QUALITY AND CHILDREN'S DEVELOPMENT

Researchers have identified two sets of indicators of child care quality. The first indicator is *structural quality*, which encompasses aspects of the child care setting and caregiver's characteristics such as child-adult ratios, group size, and training of the caregivers. The second indicator is *process quality*, and it refers to the children's experiences in child care, such as interactions that they have with their caregivers, provision of learning materials, physical space, and safety (Phillipsen, Burchinal, Howes, & Cryer, 1997). Together, these indicators are referred as the caregiving environment in this paper.

Previous research has consistently found that structural characteristics are related to and predict caregiver-child interactions (process quality). Specifically, group size has been found to be uniquely associated with positive caregiving (NICHD ECCRN, 1996, 2000), child-caregiver ratios have been associated with global process quality scores (Howes, Phillips, & Whitebook, 1992; Whitebook, Howes, & Phillips, 1990), and a study using repeated-measures analyses found that group size and child-caregiver ratio were strong predictors of process quality for toddlers (NICHD ECCRN, 2000). When child-care centers have low child-caregiver ratios and small group sizes, caregivers offer more stimulating, responsive, and supportive care (Clarke-Stewart, Gruber, & Fizgerald, 1994; Clarke-Stewart, Vandell, Burchinal, O'Brien, McCartney, 2002; Howes, & Hamilton 1993; NICHD ECCRN, 1996, 2000; Phillipsen et al., 1997; Whitebook et al., 1990). In addition, caregiver stability (e.g., consistent caregivers and low staff turnover) is associated with children spending more time in social activities with peers, and with higher language scores, and fewer peer problems (Howes & Hamilton, 1993; Whitebook et al., 1990). These structural factors are key elements in facilitating an atmosphere where children and caregivers can develop positive relationships.

Correlational studies have reported associations between structural characteristics of child-care centers and children's development. Parent-reared infants attending centers with small child-to-adult ratios are found to have better receptive and expressive language skills (Burchinal, Roberts, Nabors, & Bryan, 1996), higher scores on the Bayley Scale of Infant Development (Burchinal, Roberts, Riggins, Zeisel, Neebe, & Bryan, 2000), and better social knowledge and social behaviors (Holloway & Reichhart-Erickson, 1988).

In addition to structural characteristics, researchers also have found significant relations between process quality and children's development. Specifically, children showed closer and more secure attachment relationships with their caregivers when the caregivers displayed more positive social interactions and were responsive to the children's needs (Howes & Smith, 1995); children who had more positive interactions with their caregivers displayed more prosocial behavior with their peers (Holloway & Reichhart-Erickson, 1998; Howes et al., 1992), and children who attended centers with higher process quality scores performed better on the Bayley than infants in poorer-quality centers (Burchinal et al., 1996).

In sum, both the structural and process qualities of child-care centers have been associated with parent-reared children's cognitive, behavioral, and socio-emotional development. Lower children-caregiver ratios, smaller group sizes, and more responsive and positive interactions with caregivers seem to have positive effects on these important developmental outcomes (Fixsen, Naoom, Blasé, Friedman, & Wallace, 2005). Again, these are characteristics typically lacking in most institutions.

1.3 LINK BETWEEN QUALITY OF INSTITUTIONAL CAREGIVING AND CHILDREN'S DEVELOPMENT

Given the poor structural and process quality of most institutions, attachment theory would predict that children reared in institutions would be delayed relative to parent-reared and foster care children in nearly every developmental domain, including cognitive, language, motor, social-emotional development, attachment, and physical growth, even when health and nutritional needs are met in the institution (Gunnar, 2001; Johnson, 2000; The St. Petersburg-

USA Orphanage Research Team, 2005, Van IJzendoorn, Luijik, & Juffer, 2007b). Meta-analyses on cognitive development have shown that on average, children raised in institutions are delayed more than one standard deviation when compared to parent-reared children (Van IJzendoorn et al., 2007b). Institutionalized children have lower language scores (Goldfarb, 1945), show higher levels of maladaptive and atypical behaviors (Smyke et al., 2007), lower levels of social relatedness (Smyke et al., 2007), more aggressive behavior (Vorria et al., 2003), and more emotional and behavioral problems (Vorria, Rutter, Pickles, Wolkind, Hobsbaum, 1998) than parent-reared and foster care children (Ahmad & Mohamad, 1996).

Researchers have, therefore, examined whether children's developmental delays are associated with the quality of the institutional environment. Zeanah, Smyke, Koga, Carlson, and the BEIP Core Group (2005) examined the association between quality of caregiver behaviors (as measured by the Observational Record of the Caregiving Environment; ORCE) and attachment classification in institutionalized and parent-reared children between 12 and 31 months of age. Results showed that 12% of institutionalized children displayed so little attachment behavior towards their "favorite caregiver" that they could not be assigned one of the usual A, B, C, or D attachment classifications and were rated as unclassifiable while none of the parent-reared children were unclassifiable. Importantly, unclassifiable children received poorer quality of caregiving than children in the other four classification groups. Further, better quality of caregiving in the institution was significantly related to lower reactive attachment disorder (withdrawn/inhibited) scores (r = -.32), and a one unit increase in quality of institutional caregiving environment was associated with a 30% increase in the odds of an institutionalized child having an organized attachment rating.

In a subsequent study using the same sample of children, Smyke and colleagues examined whether individual differences in caregiving quality (provided by the favorite caregiver) were associated with individual differences in institutionalized children's development. Behaviors measured in the caregiver included sensitivity to child's non-distress signals, stimulation of child's development, positive regard toward child, detachment (reverse), and flatness of affect (reverse). In addition, various aspects of children's development (physical growth, emotional expression, developmental quotient (DQ), and problem behaviors and competencies) were assessed. High quality caregiving was a significant predictor of children's

higher DQ (Total $\Delta R^2 = .54$) and competencies (Total $\Delta R^2 = .25$) while poor caregiving quality was associated with negative behavior (Total $\Delta R^2 = .18$) in children (Smyke et al., 2007).

Dobrova-Krol and colleagues examined parent-reared and institutionalized children with HIV infected status and compared the quality of the rearing environment assessed with the Home Observation for Measurement of the Environment (HOME Inventory) at home with the mother and in the institution with the favorite caregiver, respectively. Results showed that for institutionalized children, higher cognitive scores were related to better overall quality of the environment (Total HOME scores). In addition, higher cognitive scores in children were associated with higher scores in the caregiver ratings on Language Stimulation and Acceptance subscales of the HOME (Dobrova-Krol, Van IJzendoorn, Bakermans-Kranenburg, & Juffer, 2010).

In sum, in the few observational research studies examining the association between quality of institutional caregiving and children's development, higher quality caregiving that emphasizes positive, responsive, and warm caregiver-child relationships and individualized care is positively associated with children's general development including cognitive, social, and emotional development. However, in these studies, caregiver-child interactions are measured with only one caregiver (a "favorite caregiver" or the "caregiver who knows the child best"), ignoring the quality of caregiving provided by the several other caregivers who care for the child on his or her ward.

1.4 INSTITUTIONALIZED CHILDREN'S DEVELOPMENT AND INSTITUTIONAL INTERVENTIONS

Over the last four decades, researchers have occasionally intervened in institutions to promote the development of children (Rosas & McCall, in review). Early interventions focused on providing a limited set of specific sensory stimulating activities lasting from 5 to 60 minutes per day for two to ten weeks (Brossard & Décarie, 1971; Casler, 1965; Hakimi-Manesh et al., 1984; Kim, Shin, & White-Traut, 2003; Sayech & Dennis, 1965). Results from these studies showed that extra noncontingent visual, auditory, and tactile stimulation provided inanimately or by a

human produced small gains or prevented decline in physical and behavioral development in young infants residing in otherwise markedly unstimulating institutions. However, the effects were often small and faded in the weeks after the interventions terminated.

Later interventions concentrated on education and structured caregiver-child interactions provided by high school graduates, elderly persons, or the researchers themselves (Rheingold, 1956; Saltz, 1973; Smyke, Dumitrescu & Zeanah, 2002; Sparling, Dragomir, Ramey, & Florescu, 2005; Taneja, Beri, & Puliyel, 2004; Taneja, Sriram, Beri, Sreenivas, Aggarwal, Kaur, & Puliyel, 2002; Zeanah, Smyke, Dumitrescu, 2002). These interventions were more intensely administered over longer but defined periods of time. Results showed slight improvements in mental, motor, and social development, or the interventions prevented the decline in general mental development and disturbed attachment behaviors observed in control children.

More recently, interventions have been conducted on the entire institution and were designed to improve permanently the caregiver's socio-emotional behaviors towards the children (process quality) and aspects of the structural and administrative institutional environment (The St. Petersburg-USA Orphanage Research Team, 2008; Wolff, Dawit, & Zere, 1995a; Wolff & Fesseha, 1999; Wolff, Tesfai, Egasso, & Aradomt, 1995b). This kind of intervention produced improvements in nearly every aspect of children's physical, mental, and social-emotional development, and the more intensive and comprehensive the intervention, the larger the gains.

More specifically, some institutional interventions have attempted to temporarily improve the structural factors. As in the child-care literature for parent-reared children (NICHD ECCRN, 2000), improvements in these structural factors in the institutions predicted improvements in children's outcomes. For example, institutions that reduced group size and children-to-caregiver ratios demonstrated improvements in children's general development (Nelson III et al., 2007; Smyke et al., 2002; Sparling et al., 2005; Wolff et al., 1995a, 1995b). Also, when Smyke et al. (2002) reduced group size and children were consistently cared for by the same few caregivers, 76% of children in the intervention showed no attachment disorders compared to 44% of children receiving standard institutional care that consisted of 20 different caregivers working rotating shifts and with a high children-to-caregiver ratio of 30:3. These structural changes supplied institutionalized children with a more organized and stimulating environment provided by fewer and more consistent caregivers.

In terms of process quality, some interventions have implemented activities to increase caregiver-child interactions, but only a few have aimed to improve ongoing caregiver behaviors towards children. For example, The St. Petersburg-USA Orphanage Research Team (2008) found improvements in quality and quantity of stimulation and social-emotional support provided to children by the caregivers when both caregiver training and structural changes (T+SC) were implemented, while caregiver training alone was not successful in increasing process quality (as measured by the HOME inventory). In addition, children exposed for more than 9 months to the T+SC intervention showed DQ improvements (as measured by the Battelle) of about 45 DQ points (from 57 to 92), while children in a no-intervention control group improved about 9 DQ points (from 65 to 74). Overall, results showed parallel improvements for T+SC in HOME and Battelle scores. The T+SC intervention also increased children's height, weight, and chest (but not head) circumference. Children in the T+SC intervention were more mature in their social and emotional behavior and they were more likely to display some organized attachment behavior with their caregivers (i.e., A, B, C vs. D) than children in the control group (The St. Petersburg-USA Orphanage Research Team, 2008). The T+SC intervention made it possible for children to have fewer, more consistent caregivers and more positive, sensitive, responsive, one-to-one interactions, factors found to be essential for healthy developmental outcomes in children.

Overall, institutional intervention studies show that more intensive and comprehensive interventions, smaller groups of children, fewer and more consistent caregivers, and more positive caregiver-child interactions produce developmental improvement in the children (Rosas & McCall, in review). However, while the empirical evidence from institutional intervention studies shows parallel improvements in structural and process indicators of quality in orphanages and improvements in resident children's developmental outcomes, this literature does not specifically demonstrate that the caregivers' behaviors mediate the effect of intervention improvements on children's outcomes.

1.5 THE CURRENT STUDY

As seen above, the literature suggests that the link between institutionalization and children's development may operate at least in part through caregiving quality. The present study relied on the largest, most comprehensive social-emotional intervention in orphanages and investigated if intervention-produced differences in the caregiving environment (i.e., responsive caregiver-child interactions) mediated the intervention's effects on resident children's outcomes. Specifically, it was expected that improvements in the overall caregiving environment for infants and young children produced by the interventions and reflected on the Infant/Toddler-Child-Care-HOME Inventory (IT-CC-HOME) would mediate much of the improvement observed in children's general development as measured by the Battelle Developmental Inventory (BDI). In addition, the quality of particular aspects of the environment, specifically Responsiveness, Acceptance, Involvement, Organization of the environment, Leaning Materials, and Variety of the environment (IT-CC-HOME subscales) and the number of caregivers were explored as possible mediators of the association between the intervention and children's development. Finally, in contrast to several previous studies, the current investigation used caregiving quality scores from all the major caregivers who cared for a specific child, not just his or her favorite or the one who knew the child best. This measure of caregiving more closely represents the total caregiving experience of the child.

2.0 METHOD

Data for this study came from the St. Petersburg-USA Orphanage Research Team (2005, 2008) intervention study of children residing in three Baby Homes (BHs) in St. Petersburg, Russian Federation. These BHs fall into the social-emotionally depriving category, because they provide minimally adequate care with respect to medicine, nutrition, safety, hygiene, toys and play equipment, adult contact hours, and caregiver-to-child ratios, but are deficient in socially-responsive, developmentally-appropriate caregiving behaviors.

2.1 INTERVENTIONS

One BH implemented both a Training (T) and Structural Change (SC) intervention (T+SC), a second BH was given training only (TO), while the third BH served as a no-intervention (NoI) control condition.

2.1.1 The Training intervention (T)

The primary purpose of Training was to teach caregivers to be more socially responsive in their interactions with infants and young children in every aspect of life in the orphanage. Consistent with the process quality literature reviewed above, the training taught caregivers information on child care and development and encouraged behaviors more typical of Russian birth parents but that were less frequently exhibited by BH caregivers, such as: a) being more warm, affectionate, and responsive to individual children; b) being more child-directed (i.e., responsive) than adult-directed; c) promoting more independence and creativity in children rather than obedience and

conformity; d) being more emotionally available, sensitive, and responsive during all aspects of care; and e) learning how to care for and position children with a variety of disabilities in ways that would allow these children to participate more fully in developing relationships with caregivers and experiencing the perception of effectance that comes with a socially-responsive environment (details of the training are given in The St. Petersburg-USA Orphanage Research Team, 2008).

2.1.2 The Structural Change intervention (SC)

The structural changes were intended to complement the training by changing a variety of structural, employment, and procedural circumstances that the structural quality literature reviewed above and best practice suggest should encourage closer and more consistent relationships between children and caregivers. Structural changes consisted of a set of changes, including the following.

2.1.2.1 Group size.

Groups of 10-14 children who lived together in a single suite of rooms were divided into subgroups of 5-7 children. The large group continued to sleep in one room, but two separate rooms were assigned, one to each subgroup, to serve as a dining/living/play room for that subgroup.

2.1.2.2 Fewer Caregivers.

A central part of the intervention was to provide individual children with closer and more frequent and consistent contact with fewer caregivers by reducing the number of different caregivers children experienced each week and by providing more contact with fewer selected caregivers who would be present every day. Two Primary Caregivers were assigned to each subgroup and were instructed to stay in the room assigned to that subgroup. Primary caregivers were required to work 5 days a week, 4 days for 7 hours a day and 1 day for 12 hours (a day the other primary caregiver had off). They were assigned staggered shifts, so that one of them was available to the children for 12-13 hours every day, or most of the children's waking hours.

2.1.2.3 No graduations.

Before the intervention, when a child reached a certain developmental level, the child was transferred to a new group of caregivers and peers with the same developmental level (i.e., walking). This "graduation" practice was eliminated.

2.1.2.4 Integration by age and disability status.

Children were integrated by age and disability. This was accomplished by assigning new arrivals to whichever subgroup had a vacancy. This allowed the subgroups to maintain a constant number of children and to have the same caregivers over the child's entire residency.

2.1.2.5 Family hour.

"Family hour" was established to ensure that children and caregivers spent at least 2 hours each day interacting with each other, under the assumption that warm, responsive, reciprocal interactions would promote relationship building and improve the children's social and mental development (e.g., DeWolff & Van IJzendoorn, 1997; Stams, Juffer, & Van IJzendoorn, 2002; Van IJzendoorn & Sagi, 1999).

2.1.2.6 Pull-out groups.

The practice of pulling children out of their subgroups for specialized services was minimized to maintain the subgroups as a child's main residence and to encourage coordinated team work among diverse staff. More specialized instructional services were delivered in the subgroup (e.g., massage, and some special education activities), although other pull-out activities were organized by age and disability status.

2.2 ASSESSMENTS

Baseline assessments were administered to caregivers and children in residence before any interventions were implemented. After both interventions were implemented, assessments were conducted annually for caregivers and at specific ages for children. Children were assessed during physical exams at intake and departure, and at 3, 6, 9, 12, 18, 24, 36, and 48 months of age.

2.3 PARTICIPANTS

Participants included 396 children between 5 and 72 months of age (*M* = 21.36 months), who were judged to be without a serious disability (see FAI criteria), living in the three BHs for at least three months after the interventions were implemented (see Table 1). However, 28 children had missing information (T+SC = 5, TO = 14, NoI = 9). The final sample included 368 children: 116 from T+SC (47 males), 121 from TO (66 males), and 131 from NoI (74 males). Participants in this study are a subsample of those included in The St. Petersburg-USA Orphanage Research Team (2008) because only those who met the inclusion criteria were analyzed in the present study.

Table 1: Demographic characteristics of children

	Training + Structural Changes (T+SC)	Training Only (TO)	No Intervention (NoI)
Total number of children	116	121	131
Percentage of males	41	55	56
Percentage of females	59	45	44
Age at final Battelle assessment *M* (SD)	23.35 (15.68)	19.97 (14.05)	20.89 (14.46)

2.4 MEASURES AND PROCEDURES

2.4.1 Caregiver measure

The Infant-Toddler Child Care HOME Inventory (IT-CC-HOME; Bradley, Caldwell, & Corwyn, 2003) was used to assess caregiver behavior with the children. The IT-CC-HOME was derived from the HOME inventories developed by Caldwell and Bradley (1984) to measure quality and quantity of stimulation and social-emotional support available in group care. The IT-CC-HOME (24-month version) was used for all wards because it represented the modal age of children in the BHs. The IT-CC-HOME consists of a *Total Score* and seven subscales: *Responsivity* (e.g., caregiver permits child to engage in "messy" play); *Acceptance* (e.g., caregiver does not shout at child); *Organization* (e.g., caregiver tries to organize an environment for each child in the group); *Learning Materials* (e.g., complex eye-hand coordination toys); *Involvement* (e.g., caregiver consciously encourages developmental advancement); and *Variety* (e.g., child eats meal with caregiver at least once a day). Each subscale has 5 to 11 items that are scored yes or no.

The IT-CC-HOME, originally in English, was translated into Russian by a professional translator who was also a psychologist, and the translation was checked and discussed by the bilingual members of the St. Petersburg Team. Another bilingual psychologist reviewed the translation and practiced administering the scale. Wording of items was modified slightly in consultation with Robert Bradley to fit the BH environments.

Individual caregivers were assessed while working with the entire group of 5 to 14 children depending on the BH. The IT-CC-HOME assessment consisted of 60 minutes of observation time, 15 minutes during routine caregiving activities (i.e., feeding, bathing) and 45 minutes when children were not asleep and the caregiver was not performing routine caregiving activities. If the caregiver performed an item at least once focused on at least one child, the caregiver was given credit for that item. Thus, the IT-CC-HOME scores are not based on behavior with an individual child, but rather reflect the caregiver's behaviors toward all the

children in the group. It is assumed that if a caregiver, for example, talks to one child that she will talk to all children under her care. As a result, scoring reflected the "presence" of the target behavior rather than its "extent."

IT-CC-HOME assessments were conducted at up to five time points, baseline (approximately 3 months before implementing any intervention), Post 0-1 (conducted within 3-9 months of the completion of the intervention for T+SC and TO groups and within a year after baseline for NoI), and Post 1-2 (approximately 12 months following Post 0-1). Two other assessments Post 2-3 and Post 3-4, were given only to T+SC approximately 12 months after the preceding assessment; the T+SC intervention was implemented before TO and NoI started, and only T+SC had time for additional assessments. However, this does not mean that T+SC children were exposed to the intervention longer, since children residing in BHs arrive and depart at different individual time points.

The IT-CC-HOME properties have been shown to be reliable and valid. Bradley et al. (2003) found high levels of inter-rater agreement using observations from 53 pairs of scores (r = .93). In addition, using a nationally representative sample of 377 children, the IT-CC-HOME Total score was found to correlate significantly with measures that assess caregiver-child interactions and physical and organizational features of group care environments (Bradley et al., 2003) such as the ORCE (sensitivity composite r = .58; stimulation composite r = .46) and PROFILE (r = .69). Also, the IT-CC-HOME inventory was found to correlate significantly with a variety of contemporary child behaviors, such as general and language development (Bradley et al., 2003). For example, Clarke-Stewart et al. (2002) found that toddlers who attended better-quality child-care homes (as measure by the IT-CC-HOME) obtained higher Bayley Mental Development Index scores than did toddlers who attended poorer-quality child care homes.

In the larger study of which this is a subset (St. Petersburg-USA Orphanage Research Team, 2008), a member of the St. Petersburg Research Team and one psychologist, widely experience in administering the IT-CC-HOME (hereafter called "experts"), trained two psychology graduate students (hereafter called "assessors"). Experts and assessors practiced by conducting the IT-CC-HOME observation and scoring on caregivers in a preschool until assessors scored 90% of the items identically to an expert on three of four consecutive assessments. Formal reliability for the present study was determined with either an expert and one assessor or an expert and both assessors simultaneously observing and independently scoring a specific caregiver. There were

34 pairs of comparisons across pairs of raters of which 88% were within 1 point of each other on the total score. All six subscales were scored within 1 point of each other, and 87% were identical. On four subscales, perfect agreement was achieved in 91+% of the pair-wise comparisons (the exceptions were 68% for Responsivity and 71% for Acceptance). Correlations between pairs of the expert and assessors were also calculated for total and subscales scores. Correlations were .98 - 1.00 for four subscales and .90 - .91 for Acceptance and Responsiveness; the correlation was .98 for the Total Score. In addition, test-retest reliability of the HOME inventories at three time points showed moderate to high stability (coefficients of .27 to .77 for subscales and .62 to .77 for the Total Score).

2.4.2 Child measures

This study used several measures on children.

2.4.2.1 Functional abilities.

The Functional Abilities Index (FAI) was used to determine if a child was developing typically and to measure the degree of any limitations. The Abilities Index (AI), developed by Simeonsson and Bailey (1988), was modified to be specific to the orphanage context by Muhamedrahimov, Palmov, and Istomina (2000) and called FAI. The FAI has nine domains, including audition, behavior and social skills, intellectual functioning, motor functioning, intentional communication, tonicity, integrity of physical health, eyes, and structural status (shape, body form, and structure). Each domain is rated on a 6-point scale (1= normal/typical functioning to 6= profound/extreme limitation of functioning). If a child had a score of five or higher on one or more of the nine domains or a score of three on four or more domains, the child was considered to have disabilities. The FAI ratings were made during routine physical exams (see above) by BH physicians and professional staff. The FAI was translated into Russian in the same manner as the HOME inventory.

The Ability Index properties have been shown to be reliable and valid. Bailey, Simeonsson, Buysse, & Smith (1993) designed a study to determine the AI reliability. Using a sample of 254 children with disabilities between 1 and 8 years of age, inter-rater agreement was calculated using three raters (the child's parent (P), teacher (T), and specialist (S), such as speech

pathologist) and comparing three sets of paired ratings (P-T, T-S, and P-S). Exact agreement across all three comparison groups averaged 67% agreement (P-T = 68%, P-S = 65%, and T-S = 68%), and agreement within one point across the three comparison groups averaged 86% (P-T = 85%, P-S = 85%, and T-S = 88%). Test-retest reliability (1-month interval) was calculated on a sample of 40 children. Exact agreement ranged from 45% to 90% (mean 68%). Agreement within one point ranged from 80% to 100% (mean 91%). No reliabilities on typically developing children using the original Abilities Index have been published.

In the present study, reliabilities were determined separately for the ratings made by the six special teachers and those made by the neuropathologist on a sample of 30 children from 5 to 52 months. Of all pairs of ratings, 85% were in exact agreement and 98% were within one point. For the FAI Total Score, the correlation between the two sets of raters was .99.

2.4.2.2 General Development.

The Battelle Developmental Inventory (BDI; LINC Associate, 1988) was used to assess children's general development. The Battelle is appropriate for children birth to 95 months and consists of a *Total Score* and six subscales: *Gross Motor*, *Fine Motor*, *Adaptive Behavior*, *Cognitive*, *Communication*, and *Personal-Social*. Two items were not appropriate for BH children; one referred to grammatical properties of English that had no appropriate analog in Russian, and one required equipment that was not routinely available in the institution (e.g., child drinks from a tap). Children were automatically given credit for these items. The Battelle was translated into Russian in the same manner as the HOME inventory.

The Battelle was administered by independent examiners to individual children accompanied by the caregiver who knew the child best. Each session was conducted in a special assessment room and was videotaped in the event scoring required checking. The Battelle was administered at the time of routine physical exams.

As reported in the examiner's manual, test-retest reliability (4-week interval) was calculated on a sample of 183 parent-reared children with approximately equal numbers of children in each age group (LINC, 1988). The reliabilities for the Battelle Total Score were, with two exceptions (72-83 and 84-95 months), .97-.99 across the age span. In addition, the BDI

showed good convergent validity with other measures. BDI Total score correlations with other assessments are moderate to high (e.g., Bayley –Mental Scale .81 and Psychomotor Scale .77; and the Vineland Adaptive Behavior Scale –Composite Score .77).

In the present study, formal reliability was assessed on 19 children during baseline at T+SC by having one assessor administer the BDI in the room with the child and the caregiver, while the expert and other assessor scored the infant independently through a one-way mirror. The children ranged in age from 10 months to 5 years with most 1-3 years old. The differences in scores between pairs of three assessors were determined for the Total Score. For the Total Score, 87% of the pairs of scores were within 2 points. From this perspective, for approximately 90% of the cases, unreliability was <1% of the average total score.

The child's last Battelle assessment was used to provide a Total DQ score. The last Battelle was chosen because it reveals the cumulative effect of the intervention. DQs were computed for Total Score dividing the child's Battelle age equivalent (i.e., "mental age") by his or her age in months at the time of the assessment. These DQs reflect a cumulative rate of growth and have the advantage of being "age invariant;" however, they are not the usual scaled DQs based on a standardization sample because it was out of date (the available norms were from 1988 and based upon approximately 50 children for each 6-month age range).

2.5 ANALYTIC PROCEDURES

The hypothesis that these intervention-produced differences in the caregiving environment mediated the intervention's effects on resident children's developmental outcomes was tested using mediation analyses. Analyses were conducted using two different methodologies for testing mediation: Baron and Kenny's (1986) steps for mediation and the Sobel test (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Baron and Kenny (1986) defined three conditions necessary to demonstrate the existence of mediation. There must be a significant relationship between: a) the independent variable (intervention group – T+SC vs. NoI and TO vs. NoI-) and the dependent variable (children's outcome), known as total effect (path $\hat{C}$); b) the independent variable and the potential mediator

(path *a*); and c) the potential mediator and the dependent variable when the independent variable is controlled (path *b*). In addition, the Sobel test was used to test the significance of the indirect effect (*ab*). The Sobel test requires less power, has been found to have greater statistical power compared to other methods, and can quantify the magnitude of mediation (MacKinnon et al., 2002).

2.5.1 Covariates

Several covariates were considered: (a) The child's age on the date of the child's initial Battelle assessment (which is a proxy for age at intake), (b) the child's Functional Abilities Index (FAI), (c) the child's initial Battelle score, (d) the number of days exposed to the intervention, and (e) the number of caregivers contributing to the weighted IT-CC-HOME score. However, only the FAI and the child's initial Battelle score significantly correlated with the dependent variables and were used as covariates in all analyses.

Finally, because the independent variable is categorical (intervention group), dummy coding's were created using the NoI BH as the reference group.

3.0 RESULTS

First, preliminary and descriptive data for variables considered in this study are presented for baseline, BHs, and gender. Second, results are given for the intervention's effects on children's outcomes. Third, mediation results are presented for (a) general caregiving environment using the weighted IT-CC-HOME Total score (see below) as the mediator between the intervention's effects and resident children's outcomes; (b) specific aspects of the caregiving environment using the weighted IT-CC-HOME subscales scores; and (c) number of caregivers.

3.1 PRELIMINARY AND DESCRIPTIVE DATA

Certain preliminary analyses were conducted on the present subsample (see Table 2 for descriptive data).

3.1.1 Gender

Preliminary analyses showed no significant gender differences on Battelle Total DQ scores at baseline, $t(366) = -.794$, $p > .05$; Battelle Total DQs outcome scores, $t(366) = -.844$, $p > .05$; or IT-CC-HOME scores, $t(366) = -1.49$, $p > .05$.

3.1.2 Baseline differences in children's development and functional ability.

An ANCOVA analysis showed significant differences on children's developmental scores at baseline across BHs, $F(2, 364) = 11.69$, $p < .001$, partial $\eta^2 = .06$ after controlling for children's

FAI. Post hoc analyses using the Tukey HDS test revealed that children in NoI had significantly higher Battelle Total DQ scores (M = 64.53) than children in T+SC (M = 61.45) and TO (M = 59.13). T+SC and TO did not differ significantly. A one-way ANOVA showed significant differences on FAI scores across BHs, $F(2, 365) = 43.64$, $p < .001$. Simple effects test revealed that children in both T+SC $F(1, 367) = 57.50$, $p < .001$ and TO $F(1, 367) = 70.62$, $p < .001$ had significantly lower FAI scores than children in NoI. T+SC and TO did not differ significantly.

3.1.3 Baby Home differences in IT-CC-HOME scores

A one-way ANOVA showed significant differences on IT-CC-HOME Total scores post-intervention across BHs, $F(2, 365) = 170.70$, $p < .001$, partial $\eta^2 = .48$. Simple effects tests revealed that T+SC had significantly higher IT-CC-HOME Total scores than TO, $F(1, 367) = 94.16$, $p < .001$, and both had higher IT-CC-HOME Total scores than NoI, $F(1, 367) = 341.38$, $p < .001$ and $F(1, 367) = 75.38$, $p < .001$; respectively. T+SC differed significantly from TO on most subscales except for Acceptance. T+SC differed significantly from NoI on every subscale. TO differed significantly from NoI on most subscales except for Learning Materials.

3.1.4 Baby Home differences in children's developmental outcome

A one-way ANOVA analysis showed significant differences on children's Battelle scores across BHs, $F(2, 365) = 37.44$, $p < .001$, partial $\eta^2 = .17$. Post hoc analyses using the Tukey HDS test revealed that children in T+SC had significantly higher Battelle Total DQ scores (M = 87.18) than children in TO (M = 74.59) and NoI (M = 69.93). TO and NoI did not differ significantly.

3.1.5 Number of caregivers and time caregiver and child overlapped in the ward

A one-way ANOVA test showed that the mean number of caregivers to whom a child was exposed during the four-month period before the child's last Battelle assessment differed across BHs $F(2, 365) = 65.78$, $p < .001$. Simple effects tests revealed that T+SC had significantly fewer caregivers than TO, $F(1, 365) = 77.07$, $p < .001$, and NoI $F(1, 365) = 118.21$, $p < .001$, while TO

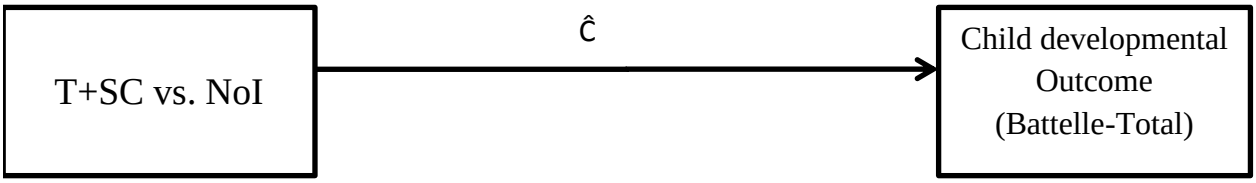
and NoI did not differ, $F(1, 365) = 3.79$, $p > .05$. Overall, after the implementation, caregivers in T+SC spent about 106 days (out of 120 days) working in the same ward as the child, while caregivers in TO and NoI spent an average of 84 and 94 days, respectively. Taken together, these results show that children in the T+SC were exposed to fewer caregivers who spent more days working on the same ward as the children.

Table 2: Descriptive data on the IT-CC-HOME scores, FAI and Battelle scores by BH

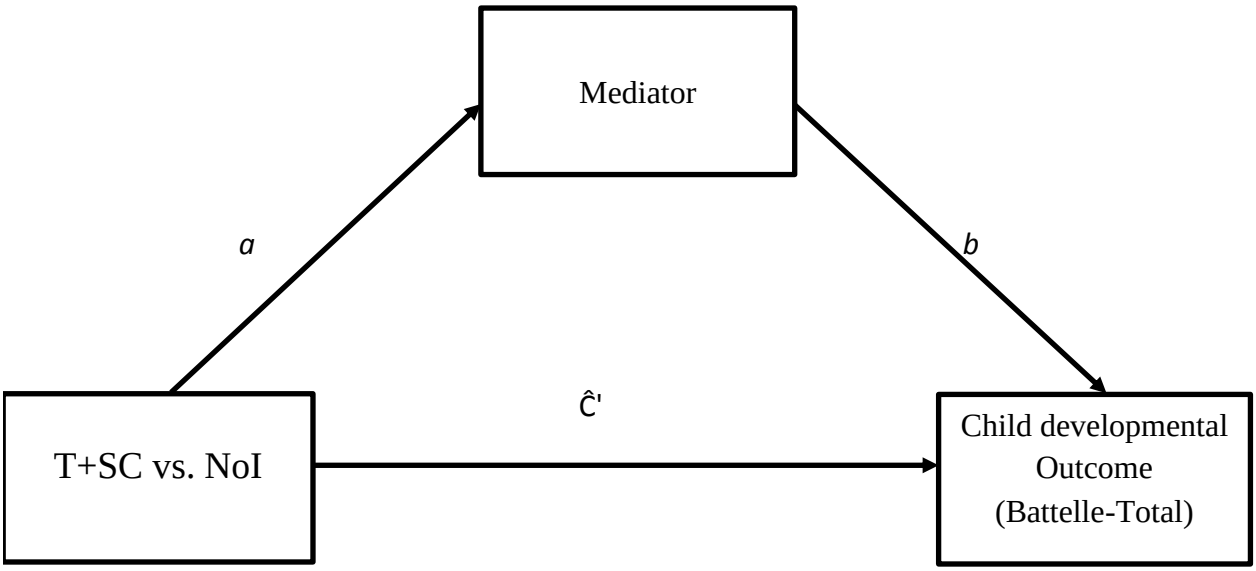
		Training + Structural Changes (T+SC)	Training Only (TO)	No Intervention (NoI)
IT-CC-HOME Total score *M (SD)*		36.83 (1.32)	34.96 (1.36)	33.33 (1.72)
IT-CC-HOME subscales	Responsiveness *M (SD)*	9.64 (.62)	9.46 (.49)	9.26 (.60)
	Acceptance *M (SD)*	6.00 (.53)	5.84 (.49)	5.65 (.80)
	Involvement *M (SD)*	5.01 (.58)	4.67 (.66)	4.18 (.79)
	Organization *M (SD)*	4.07 (.29)	3.84 (.23)	3.32 (.47)
	Learning Materials *M (SD)*	8.83 (.20)	8.50 (.46)	8.51 (.53)
	Variety *M (SD)*	3.29 (.43)	2.66 (.80)	2.39 (.70)
FAI score *M (SD)*		1.66 (.29)	1.63 (.27)	1.94 (.27)
Initial Battelle score *M (SD)*		61.45 (21.01)	59.13 (20.63)	64.53 (20.89)
Final Battelle score *M (SD)*		87.18 (16.33)	74.59 (14.39)	69.93 (17.18)
Number of caregivers who spend at least 3 months with the child *M (SD)*		5.24 (.95)	8.19 (2.61)	8.82 (3.40)

3.2 INTERVENTIONS EFFECT ON CHILDREN'S OUTCOME

First, it was important to determine if the interventions were effective in improving children's development for the subsample of children in this study. The intervention groups significantly predicted children's development, $F(4, 367) = 51.29$, $p < .001$, accounting for 12% of the variance in children's development. However, for the subsample available for mediation analyses, the variance was mainly accounted for by the comparison between T+SC and NoI ($\Delta R^2 = .117$); the comparison between TO and NoI accounted for only $\Delta R^2 = .002$. In other words, only the T+SC intervention had a significant effect on children's development. This result was not very surprising given that the main study found that children in the TO intervention started with low scores and improved somewhat, but TO children's development was not much better than the development of children in NoI. Since the TO vs. NoI comparison did not meet the first condition necessary for mediation (Baron & Kenny, 1986), it was taken out of the model and further mediation analyses only compared T+SC vs. NoI. Because the TO group was removed from the analyses, the two remaining groups were coded: T+SC = 1 and NoI = 0. Figure 1 shows the model analyzed in this paper.



Note. The Ĉ path shows the effect of the intervention on children's development (total effect).



Note. The Ĉ' path shows the effect of the intervention on children's development, when controlling for the mediated variable (direct effect). It is the residual direct effect of the intervention that is not mediated by the target mediator. Path *a* shows the effect of the intervention on the mediator and Path *b* shows the effect of the mediator on children's outcomes, when controlling for the intervention group. The produce of *ab* is the mediated effect.

Figure 1: Illustrations of the total effect and mediation pathway analyses performed

3.3 OVERALL CAREGIVING QUALITY AS MEDIATOR

Based on the importance of the caregiving environment for children's development, a mediation analysis was conducted to examine if intervention-produced differences in caregiving quality mediated the intervention effects on children's outcomes. Because institutionalized children are usually exposed to several caregivers, using previous methodologies of assessing the child with his/her preferred caregiver to evaluate the child's caregiving environment does not reflect the overall quality of the total caregiving environment experienced by the child. For example, Johnson et al., 2010 and Smyke et al, 2007 videotaped children with their favorite caregiver in the ward and then coded for caregiver behaviors using the ORCE; however, this methodology ignores the possible influence that the many other caregivers could have on the development of the child. Thus, computing a single score that combines all the caregivers' scores weighted by the time that caregivers and child spent in the same ward provides a more comprehensive picture than that of a score from a single caregiver.

3.3.1 Data preparation

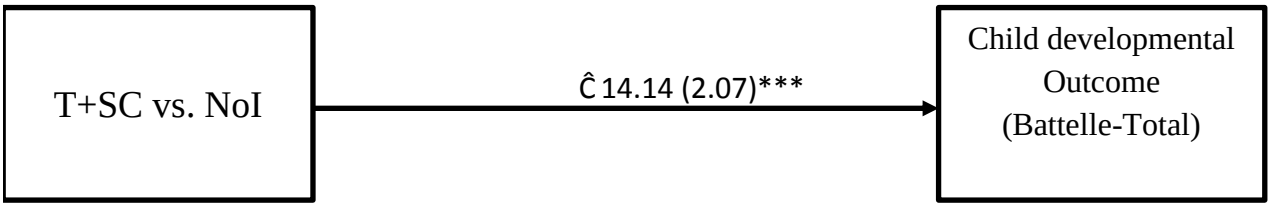
A weighted IT-CC-HOME score for individual children was calculated for Total Score and IT-CC-HOME subscales to reflect the child's general experience with caregivers in the institution. Because several caregivers attended to an individual child, the weighted IT-CC-HOME average scores represent a combination of all caregivers who worked on that child's ward for at least 15 days during the four-month period prior to the child's last Battelle, weighted by the time each caregiver spent on that ward. However, if a caregiver had worked in a child's ward but her last IT-CC-HOME score was more than 6 months apart from the date of the child's last Battelle assessment, that caregiver's score was not used in these analyses. The weighted IT-CC-HOME score was obtained with the equation:

$$\text{Total Weighted Score} = \frac{(\text{TotalHOMECaregiver}_1 \times \text{DaysCaregiver}_1) + (\text{THC}_2 \times \text{DC}_2) + (\text{THC}_3 \times \text{DC}_3)\ldots}{\text{Days}C_1 + \text{Days}C_2 + \text{Days } C_3\ldots.}$$

In the equation, the TotalHOMECaregiver score was replaced by the scores of the subscale (e.g., HOME-Organization: HOME-OrgaCaregiver$_1$ x DaysCaregiver$_1$) to compute the weighted IT-CC-HOME scores for subscales.

3.3.2 Total effect.

T+SC was significantly related to Total Battelle score (Unstandardized B coefficient = 14.14, $p <$ 001). Figure 2 shows the results for Total effect of the intervention on children's development (Ĉ path).



Two covariates were used in the analyses: Child's first Battelle assessment score, and Functional Abilities Index. Numbers represent the Unstandardized Coefficients (standard error).
***p < .001; ** p < .01; * p < .05.

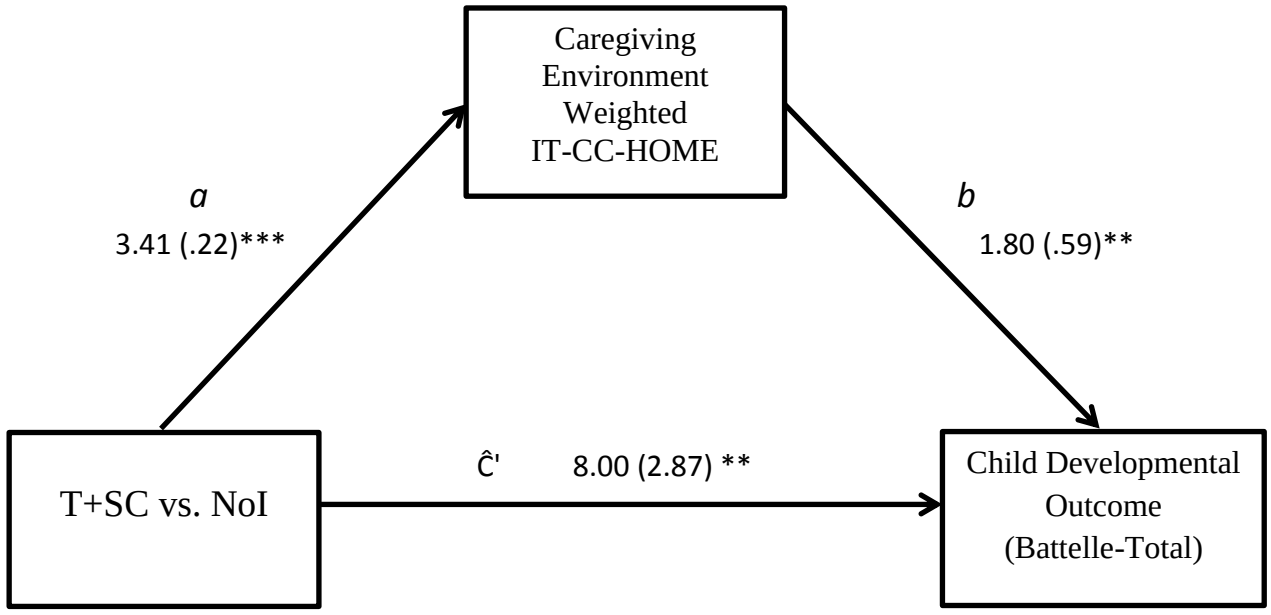
Figure 2: Results for the total effect of the intervention on resident children's outcomes

3.3.3 Direct effect.

In terms of the direct effect (Ĉ'), the relation between T+SC and Battelle Total score (Ĉ) was attenuated by the addition of IT-CC-HOME to the model (B = 8.00, $p <$ .01).

3.3.4 *a* and *b* pathways.

Figure 3 displays the finding that the T+SC intervention (Path *a*) was associated with IT-CC-HOME (B = 3.41, $p < .001$), and IT-CC-HOME was related to Total Battelle score (Path *b*), after controlling for the intervention (B = 1.80, $p < .01$).



Two covariates were used in the analyses: Child's first Battelle assessment score, and Functional Abilities Index. Numbers represent the Unstandardized Coefficients (standard error).
***p < .001; ** p < .01; * p < .05.

Figure 3: Results for the general caregiving environment (IT-CC-HOME Total score) as mediator

Following Baron and Kenny's (1986) steps, this mediation analysis met all the requirements set forth for mediation. In addition, using the Sobel test (ab/SE_{ab}), intervention-produced changes in IT-CC-HOME Total score mediated the relation between the T+SC intervention and resident children's outcome ($z = 3.00$, $p < .01$).

3.3.5 Mediated effect.

The product of the *a* and *b* parameters (i.e., *ab*) was used to quantify the mediated effect. The mediated effect of the T+SC intervention on children's outcomes through intervention-produced differences in caregiving quality (6.14) was significantly different from zero, 95% CI [2.10, 10.18].

The equation $ab/\hat{C}$ was used to measure the effect size for the entire mediated effect of the intervention. Intervention-produced differences in caregiving quality accounted for 43% of the total effect of the intervention on children's Battelle scores.

3.3.6 Standard deviation unit increases.

The T+SC intervention improved IT-CC-HOME scores by 1.46 standard deviation units and Battelle scores by .75 standard deviation units.

In sum, intervention-produced individual differences in quality of caregiving (IT-CC-HOME) were found to partially mediate the association between the intervention and individual children's developmental outcomes. However, the global composite score (IT-CC-HOME Total score) merges characteristics of the physical environment as well as the social experiences of infants and toddlers. Therefore, it is possible that some of these areas may have greater influences on children's development than others. Thus, results for HOME subscales are presented next.

3.4 SPECIFIC ENVIRONMENTAL ASPECTS AS MEDIATORS

To determine which specific aspects of the caregiving environment were more beneficial to children, mediation analyses testing the IT-CC-HOME subscales were performed. The IT-CC-HOME inventory has six subscales, three measure caregiver behavior towards the child (Responsiveness, Acceptance, and Involvement), and three subscales measure the physical and organizational aspects of the environment (Organization, Learning Materials, and Variety of

Experiences). A mediation analysis was run for each subscale separately with the goal of determining how influential each of the aspects measured by the subscales was in mediating children's outcomes when all overlapping variance is included. However, the HOME subscales have been shown to be highly intercorrelated (*r*'s = .44 to .89; Bradley, 1994) and the amount of variance shared among all subscales was .401. Table 3 displays the results for the mediation analyses for the IT-CC-HOME separate subscales.

3.4.1 Relation between the T+SC intervention and IT-CC-HOME subscales (*a* pathways)

As shown in Table 3, the T+SC intervention showed a positive significant association with all the IT-CC-HOME subscales (*a* pathways). In other words, the intervention was successful in improving each aspect of the physical and organizational aspect of the environment as well as caregiver's behaviors, as measured by the IT-CC-HOME inventory.

3.4.2 Relation between IT-CC-HOME subscales and Total Battelle score controlling for intervention effects (*b* pathways).

As shown in Table 3, four of the six subscales had a significant association with children's outcomes after controlling for intervention effects. Thus, HOME-Involvement, HOME-Organization, HOME-Learning Materials, and HOME-Variety of Experiences each mediated the relation between the T+SC intervention and children's outcomes.

The subscales Involvement, Organization, Learning Materials, and Variety met the requirements set forth for mediation by Baron and Kenny (1986). In addition, using the Sobel test (ab/SE_{ab}), intervention-produced improvements in all four subscales were found to mediate the association of the T+SC intervention on resident children's outcomes. Also, as seen in Table 3, the mediated effects of the T+SC intervention on children's outcomes through intervention-produced differences in the four subscales were significantly different from zero.

In terms of effect size ($ab/\hat{C}$), intervention-produced differences in caregiver Involvement accounted for 23%, Organization of the environment accounted for 26%, provision of Learning Materials accounted for 15%, and Variety of Experiences in the caregiving environment accounted for 36% of the total effect of the T+SC intervention on children's outcomes.

Table 3: Results for IT-CC_HOME subscales as mediators between the intervention and children's outcomes

IT-CC-HOME subscales	Relation between T+SC and HOME subscale *(a pathways)*			Relation between HOME subscale and Total Battelle score controlling for intervention group (*b pathways*)			Sobel test	Mediated Effect	Effect Size	SE_{ab}	Confidence Intervals (.95) [LCI, UCI]
	B	Standard Error	*p*	B	Standard Error	*p*	(ab/SE_{ab})	*ab*	$ab/\hat{C}$		
Responsiveness	.456	.085	< .001	-2.822	1.558	.071					
Acceptance	.390	.096	< .001	-.595	1.383	.667					
Involvement	.770	.097	< .001	4.175	1.346	.002	$z = 2.89$ $p < .01$	3.21	22.70%	1.11	[1.03, 5.39]
Organization	.671	.056	< .001	5.420	2.369	.023	$z = 2.25$ $p < .05$	3.64	25.74%	1.62	[.5, 6.82]
Learning Materials	.271	.057	< .001	5.290	2.313	.023	$z = 2.06$ $p < .05$	1.43	14.57%	.69	[.09, 2.78]
Variety	.850	.082	< .001	5.976	1.574	< .001	$z = 3.57$ $p < .001$	5.08	35.93%	1.43	[2.28, 7.16]

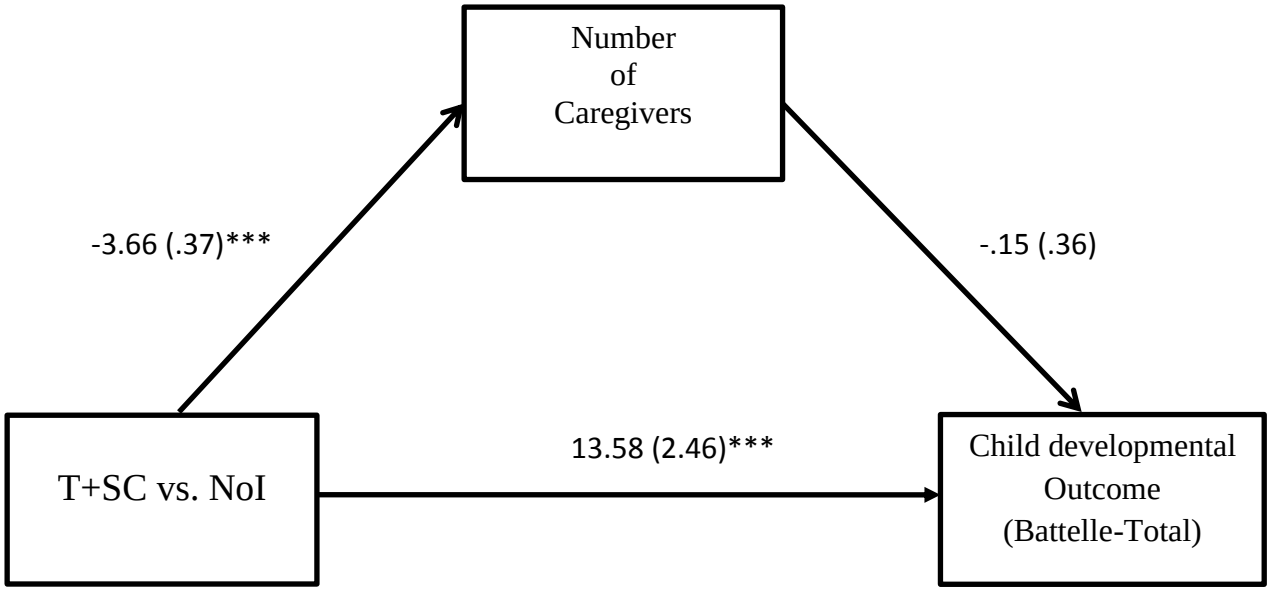
Two covariates were used in the analyses: Child's first Battelle assessment score, and Functional Abilities Index (FAI). [a] B represent the Unstandardized Coefficients (standard error). [b] $\hat{C}$ represent the Total effect of the intervention on children's outcomes.

3.5 NUMBER OF CAREGIVERS AS MEDIATOR

A meditational analysis was conducted to examine if intervention-produced differences in the number of caregivers mediated the association between the intervention's effects and children's outcomes.

3.5.1 Data preparation

The number of caregivers was computed by adding all the caregivers to whom an individual child was exposed for at least 15 days during the four-month period prior to the child's last Battelle. The mediation results are presented in Figure 4.



Note. Two covariates were used in the analyses: Child's first Battelle assessment score, and Functional Abilities Index. Numbers represent the Unstandardized Coefficients (standard error).
***p < .001; ** p < .01; * p < .05.

Figure 4: Results for the number of caregivers as mediator

3.5.2 *a* and *b* pathways.

Results showed that the T+SC intervention (path *a*) had an effect on the number of caregivers to whom a child was exposed (B = -3.66, $p < .001$). However, the number of caregivers was not related to children's Total Battelle score (path *b*) after controlling for intervention group (B = .15, ns). Thus, the number of caregivers lacked the statistical significance needed to mediate the relation of intervention effects on children's outcomes.

4.0 DISCUSSION

This secondary analysis was conducted on data from one of the largest social-emotional-relationship interventions in an institution which measured major aspects of children's development (The St. Petersburg-USA Orphanage Research Team, 2005, 2008). The Training and Structural Changes interventions were designed to promote positive socio-emotional-relationships and warm, responsive, and stimulating caregiver-child interactions. The primary aim of Training (T) was to encourage caregivers to be more socially responsive in their interactions with infants and young children in every aspect of life in the orphanage. Caregivers were given information on child care and development and encouraged to engage in one-on-one interaction with individual children. The Structural Changes (SC) were intended to complement the training by changing a variety of structural factors (i.e., group size, caregiver-child ratios, constant caregivers) to create an environment in which caregiver-child relationships were more likely to develop. One institution implemented both Training and Structural Changes (T+SC), a second implemented Training Only (TO), and a third institution continued business as usual and did not implement any intervention (NoI).

It was found in the current subsample that only the double intervention (T+SC) was successful in improving children's Battelle scores, and that intervention-produced changes in caregiving quality (IT-CC-HOME Total score) significantly mediated the T+SC intervention effects on children's developmental outcomes. Further, the T+SC intervention improved each IT-CC-HOME subscales and caregiver Involvement, Organization of the environment, provision of Learning Materials, and Variety of Experiences in the environment were significant subscale mediators of the intervention on children's development when each subscale was considered in isolation. Although the caregiving environment was a significant mediator, it accounted for 43%

of the direct effect of the T+SC intervention on Battelle scores, indicating that other effects of the intervention mediated the majority of the intervention effect. Contrary to expectations, the number of caregivers was not related to children's development.

4.1 OVERALL CAREGIVING QUALITY A MEDIATOR

The finding that the caregiving environment mediates the association between the intervention and children's development is consistent with the intent of the intervention and findings about the importance of caregiver-child interactions and the role high child-care quality for parent-reared children's development (Ainsworth et al., 1974; Bakeman & Brown, 1980; Bee et al., 1982; Beckwith, 1971; Johnson et al., 2010; NICHD Early Child Care Research Network, 2000; Smyke et al., 2007). In addition, it is in agreement with the literature suggesting that the link between institutionalization and children's development may operate through caregiving quality. For example, Smyke et al., 2007 and Johnson et al., 2010 found associations between observed caregiving quality in institutional environments and children's cognitive development. However, the current study goes further in demonstrating that caregiving behavior explains the effects of a quasi-experimental social-emotional intervention on individual differences in children's development. It also indicates that a weighted combination of all the major caregivers in a child's ward over a four-month period, not just a single score from a favorite caregiver, mediated the intervention effect.

It is notable that the overall caregiving quality accounted for almost half the variance (43%) of the total effect of the intervention on children's Battelle scores. The IT-CC-HOME inventory is a relatively crude measure of those caregiver-child interactions that might be suspected of promoting children's development. The IT-CC-HOME is a yes/no questionnaire in which a caregiver has to show a behavior only once to at least one child over a 60 minute period to get credit for it (not measuring frequency of the behavior), and it omits caregiver-child relationships and other interactions that might be more beneficial to children. In addition, the weighted IT-CC-HOME score represented the overall characteristics of the ward that the child experienced (not child specific). Thus, given the relatively crude nature of the scale and its

measurement in this study, is difficult to judge if 43% should be considered more or less than one could expect. The remaining 57% of the intervention effect could be explained by other aspects and consequences of the intervention, such as, primary caregivers, better relationships with a few caregivers, stability in group assignment (no graduations), and family hour.

Reduction of group size and children-to-caregiver ratios, fewer more consistent caregivers, and other factors providing a more family-like environment appear to support improvements in process quality which in turn had positive effects on children's development. Presumably, caregivers had fewer children to care for, which could lead to caregivers spending less time in caretaking tasks and more time interacting with children. Training promoted more socially responsive interactions which in turn could lead to more cognitive, language, and motor stimulation, and this stimulation from caregivers could have played an important role in children's development.

4.2 SPECIFIC ENVIRONMENTAL ASPECTS

The finding that Involvement mediated the association between the intervention and children's development was consistent with the intervention's goal of promoting caregiver-child one-to-one interactions (e.g., "Caregiver invests maturing toys with value via personal attention;" "When child is an object of caregiver's work (clothes changing, feeding, hygienic procedures) she interacts with the child"). On the other hand, the finding that the Responsivity and Acceptance subscales were not mediators, may be surprising on the surface but understandable when individual items are considered. The Responsivity subscale, for example, mainly measures caregivers' actions that can take place without being engaged or interacting with the child (e.g., "Caregiver's speech is distinct, clear and audible"), and other items on this subscale may not be positive (e.g., "Caregiver spontaneously vocalizes to child at least twice," which could include directives, reprimands). Similarly, the items of the Acceptance subscale largely reflect the absence of harsh behavior towards the child (e.g., "Caregiver does not shout at child;" "Caregiver does not scold or criticize child during visit"). Thus, it is possible for caregivers offering poor caregiving to score high on these two subscales.

The three subscales assessing the physical environment measured the presence and use of toys and other cognitive stimulating objects and activities which were factors consistent with the intervention's goal of promoting an environment conducive to relationships and cognitive stimulation. The Organization (e.g., "Child gets out of Home at least 4 times a week (outside to play)"), Learning Materials (e.g., "Toys for literature and music"), and the Variety of Experiences (e.g., "Child eats meal with caregiver at least once a day") subscales were significant mediators when examined in isolation. In sum, subscales measuring caregiver-child one-to-one interactions, extra stimulation, and the physical and organizational character of the environment seem to be important mediators in children's developmental outcomes.

4.3 NUMBER OF CAREGIVERS

When compared to the other BHs, children in T+SC were exposed to fewer different caregivers, but the number of caregivers did not mediate the association between the T+SC intervention and children's development. This finding seems to contradict previous research on the importance of having a few consistent caregivers (Bowlby, 1951; NICHD Early Child Care Research Network, 2000; Rutter, 1995; Smyke et al,, 2002; Zeanah et al., 2002). However, even though children in T+SC were exposed to fewer caregivers, the range was still high (4 to 8 major caregivers per child- during a three-month period). Thus, the number of caregivers might have contributed to the mediation if the number had been smaller (Sparling et al., 2005). An alternative explanation could be that in institutional settings the caregivers' behaviors towards the child may be more important than the number of different caregivers, and having one or two good caregivers may be sufficient even if the child regularly sees 4-6 other caregivers.

4.4 LIMITATIONS AND IMPLICATIONS

There are some limitations in the present study. IT-CC-HOME scores are not focused on caregiver behavior with individual children but rather on caregivers attending to the entire ward

of children (caregiver specific). Thus, the IT-CC-HOME reflects a particular caregiver's general behavior, not necessarily how she behaves with the target child, and it is possible that not all children in the same ward receive equal quality and amount of interaction from the caregiver. This may be more problematic for the subscales of the IT-CC-HOME that measure caregiver-child interactions than to subscales measuring the physical environment. In addition, it is not possible to establish causality, because of the quasi-experimental design of the study and observational nature of the IT-CC-HOME Inventory.

A second limitation is that children had variable lengths of residency and exposure to the treatment conditions, which occurred at different ages, and the main study showed that longer exposures to the intervention were associated with better BDI scores in children. The inclusion criteria of three months of residency after the complete implementation of the interventions (or three months of residency after NoI baseline was started) was arbitrarily considered the minimum amount of exposure to the interventions.

A third limitation is nonrandom assignment of BHs. The three BHs were not randomly selected among BHs in St. Petersburg nor were they randomly assigned to experimental conditions. The three BHs were selected because their directors were willing to cooperate with the procedures of the project. One of the directors was willing to implement structural changes, another wanted training, and the third believed in the "traditional methods" commonly employed in BHs. Consequently, all three directors believed in the interventions they received. Thus, results should not be generalized to orphanages randomly assigned to an intervention without the director's commitment to that intervention. Finally, assessments of caregivers' behavior on the ward and children's developmental progress were administered by independent examiners, while BH personnel administered the Functional Abilities Index, because they were most familiar with the child's capabilities. Thus, none of these assessments could be conducted blind with respect to intervention group.

This study has scientific and practical implications. The social-emotional neglect (poor process quality) that children experience in institutions is potentially a major contributor to children's delayed development, and improving this aspect of the environment can foster improved general developmental outcomes in children. This study is consistent with previous research reporting associations between quality of caregiving experiences and children's development and goes a step further in showing that changes that emphasize caregiver-child

interactions and relationships are likely to improve children's general development. By training caregivers in child development and making structural changes that remove barriers and promote social-emotional-relationship experiences, children's development can be improved. Thus, this study provides a basis of evidence for changing other institutions in St. Petersburg and throughout the world where institutions remain the primary form of care for true and social orphans.

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