Achievement of Developmental Milestones

Among Salvadorian Orphans

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Abstract

El Salvador has a large population of children living in orphanages where, as predictions from previous research indicate, many will not meet developmental milestones that could be remediated with research and development.

The purpose of this study was to determine milestone achievement and environmental impact among Salvadorian orphans at selected sites, in order to make recommendations for appropriate training materials to allow for the mentoring of caregivers to advance milestone achievement among the orphans.

The five objectives addressed in the research are in context of two investigator selected orphanages in El Salvador: 1. Determine the current level of development of orphans using the Battelle Developmental Inventory Screening Test.

2. Determine characteristics of caregivers who have frequent interactions with the orphans.

3. Determine areas of strength and deficiency among the orphans with respect to Personal-Social, Adaptive, Motor, Communications, and Cognition.

4. Determine the level of association between selected characteristics of orphans with developmental milestone achievement.

5. Develop a model caregiver-training program for implementation at the two selected orphanages based on investigator-derived characteristics and related findings.

Screening Tool strengths and deficiencies were identified among the orphans with respect to Personal-Social, Adaptive, Motor, Communications, and Cognition. The Batelle Developmental Inventory Screening Tool in Spanish was completed on 34 qualifying children at Hogar Immaculado Corazon de Maria orphanage and an additional ten screening tools were completed on qualifying children at Casa de Mi Padre. *Statistical analyses* determined the level of association between selected characteristics of orphans with developmental milestone achievement. *Using findings from this initial phase, a* model caregiver-training program was developed and implemented at the two selected orphanages based on investigator-derived characteristics and related findings. Conclusions from the study and recommendations were developed from the findings.

The level of achievement of developmental milestones among the selected orphans was below the expected level for their chronological age. The caregivers employed by the two orphanages were a diverse group of individuals from a variety of backgrounds. The majority of them described themselves as not having formal education in child development. The strong interest they demonstrated during the training program indicated an eagerness and willingness to learn. The areas of greatest deficiency were communication and cognitive scores. The areas of relative strength were Adaptive and Motor skills.

There were few statistically significant relationships between the selected independent variables and the scores on the screening tool with the exception of association between motor scores and both the child's nutritional status and the number of months they have spent in the orphanage. Months spent in the orphanage also show some evidence of association with communication scores, but not statistically significant. The model intervention program was successfully implemented and should be part of an on-going training program. Future research should replicate this study in similar setting and provide additional probes with a larger sample to substantiate these finding and more in depth understanding for enhancement of both theory and practice.

Dedication

First and foremost to the orphans I had the joy of working with, may your future hold more wonder and possibilities than you can begin to imagine. My hope is that one day you too will be inspired to help as you have inspired me.

To my wonderful parents who, for my whole life, have cheered for me and supported me in whatever I have set out to do. Your love and perseverance have opened the world to me.

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Table of Contents

ACHIEVEMENT OF DEVELOPMENTAL MILESTONES AMONG SALVADORIAN ORPHANS FROM TWO ORPHANAGES

Chapter One

Introduction

Background

It is estimated that today there are over 143 million orphans in the world. By 2010 there will be so many orphans that if they held hands, they could stretch around the equator of the Earth (*Orphan's Hope*). Economic and social pressures cause a large number of children to be abandoned each year (Taneja, Aggarwal, Beri, & Puliyel, 2005). It is presumed and cited by multiple studies that these children fall behind their peers developmentally secondary to many differences between conventional family environments and institutionalized living (Ahmad et al., 2005). Research has shown that institutionalization of children is associated with significant delays in language, cognition, growth, social-emotional and motor skills (O'Connor et al., 2000). A study has shown that the best way to improve the well-being of institutionalized children is by adding family characteristics to their daily life (Ahmad et al., 2005). Although research has shown improvement in orphan development with more stimulating environments, caregivers

may be reluctant to make changes for fear that they will increase their already demanding workload (Taneja et al., 2005).

Scientists now know that all the building blocks of the human brain are formed by four months gestational age. One hundred billion neurons have been produced since conception, and these are the same neurons that will be present throughout this child's life.

Neurons are what scientists call terminally differentiated, meaning that they do not reproduce and die like other cells within the human body, including skin and liver. But, all this information by no means implies that the human brain is in its final form. The most intricate part of development is yet to come. Neural cells grow from the inside out on pathways created by radial glial cells. At this stage, they are mere skeletons of what they will become. Comprised of a single axon with only a few dendrites, neurons make very few synaptic connections. Although this synaptogenesis begins in the spinal cord at 5 weeks of gestation and at 7 weeks within the brain, it moves along very slowly compared to the half million neurons being produced per minute during the first half of gestation. In fact, synaptogenesis is happening so slowly that it will continue in the cerebral cortex through the second year of life.

This “intricate dance” between nature and nurture plays out very slowly. Many of the connections are made in the first days and weeks of life (Eliot, 1999). Studies have repeatedly shown that institutionalized babies suffer because caring for a large number of children is very hard work. While the physical needs of the children are met, play gets neglected (Taneja et al., 2002).

The Battelle Developmental Inventory Screening Tool in Spanish is a valid and reliable assessment tool and the most appropriate instrument for this study to assess orphan milestone achievement. The background of each orphan is determined using an Orphan Survey developed by the primary investigator. Using the information gathered from the screening tool, specific strengths and deficiencies among the children were identified. Recommendations were made for the development of a model training program for the caregivers, in order to instruct them about developmentally-appropriate interactions. The recommended interactions were designed to encourage these children to meet their developmental potential.

The research also employed a survey of the orphans’ background, including their age at the time of assessment, their age at entry into the orphanage, total time spent in the orphanage, amount of contact with birth parents, and nutritional levels. These characteristic were important

because they all have the potential to influence each child's development. The survey was administered at each of two orphanages, with information obtained from caregivers and the children's records.

Two orphanages, Hogar de Corazon Immaculado de Maria and Casa de Mi Padre, served as the research sites. These orphanages were selected over other potential sites because they provided a research setting that fit the unique attributes suitable for the purpose of this study. Additionally, the orphanages were accessible and the administration was highly supportive of the research, thus providing a setting for inquiry uninhibited by artificial barriers.

In each of these orphanages, girls and boys live in separate areas, with another area for those children under three years of age. The separate areas have similar rules and match the standard of living of the surrounding area. Children in both orphanages eat, sleep and do activities on a set schedule. At Hogar Corazon de Maria, traditional family structure is totally lacking. At Casa de Mi Padre, the traditional orphanage setting has been replaced with a parental unit living within the home as "Tias" and "Tios". At both orphanages, relatives may visit the child, or the child may obtain permission to visit their birth family for short periods of time.

During the study, children maintained their usual schedules during observation, with exceptions to allow the principle investigator to complete the Battelle Developmental Inventory II Screening Exam in Spanish, which took no more than thirty minutes for each child to complete.

The BDI-2 Screening Tool was completed for each qualifying child in the first month of the study using established research based procedures from previous studies that used Battelle. At the completion of assessment of all qualifying children in both orphanages, data was analyzed for both individual and group weaknesses in the five general categories of: personal-social skills, adaptive behavior, motor ability, communication and cognition. These categories represent the theoretical constructs taken from well established research in child development. Consistent with the application of the Battelle Developmental Inventory Screening Tool, recommendations were developed from findings on best practice interactions between caregivers and orphans, emphasizing individual and group needs through a model caregiver training program.

Although many researchers have studied orphanages in Asia and Romania, the principle investigator could not find any evidence to suggest studies have been completed among the orphan population of El Salvador.

Problem

El Salvador has a large population of children living in orphanages where, as predictions from previous research indicate, many will not meet developmental milestones that could be remediated with research and development.

Purpose

The purpose of this study was to determine milestone achievement and environmental impact among Salvadorian orphans at selected sites, in order to make recommendations for appropriate training materials to allow for the mentoring of caregivers to advance milestone achievement among the orphans. The principal investigator's goal is that these orphanages and others throughout El Salvador and the developing world will use the information found in this study to aid in determining and addressing the most pressing developmental needs of their orphans, and to implement programs of developmental training for their caregivers. However, the investigator recognizes the findings are specific to the population in this study, and therefore implications for other similar settings must be based on cautious and judicious application. Ideally, any application or adaptations from this research will be based on replication of this study in another setting for which the use of findings is intended. In short, the investigator

encourages consideration of the results that can be applied to other settings, but not extrapolation of the findings without appropriate research and development.

Objectives

The objectives of this research are in context of two investigator selected orphanages in El Salvador:

1. Determine the current level of development of orphans using the Battelle Developmental Inventory Screening Test.

2. Determine characteristics of caregivers who have frequent interactions with the orphans.

3. Determine areas of strength and deficiency among the orphans with respect to Personal-Social, Adaptive, Motor, Communications, and Cognition.

4. Determine the level of association between selected characteristics of orphans with developmental milestone achievement.

5. Develop a model caregiver-training program for implementation at the two selected orphanages based on investigator derived characteristics and related findings.

Significance of the Study

Recommendations for a program of caregiver education at the two investigator selected orphanages has the potential for

significant change to remediate developmental deficiencies of the children in the study. Changes in the developmental strategies within the orphanages could increase the level of developmental milestone achievement among the population studied.

Moreover, this study adds to the sparse literature on developmental milestones in the Latin American region and El Salvador in particular; along with the body of knowledge leading from work in this area across settings.

At the application level, determining the strengths and weaknesses of selected children at the two participating orphanages provides for more developmentally-appropriate interactions between caregivers and orphans. Insights gained from this study may have implications for other similar settings, particularly for children with developmental levels comparable to those of the children in this study. The methodology and findings provide a pilot for further replication using the same or similar methodology among orphanages with comparable children.

The contribution to the scholarly literature on child development where children come from impoverished settings and live in non-traditional households is important. There are at least two elements of the contribution to related literature. First, there are scholarly research findings

with a distinct population along with implications for other settings. Yet another contribution is testing the application of the Battelle Developmental Inventory Screening Tool in Spanish in the Central American setting. This study demonstrates the application of the research instrument in the setting selected and provides evidence of potential use in the Latin American culture and associated ethnocentric complexities.

At the fundamental application level there are derivatives, to create and test implementation of interventions to improve developmental activities for children in the orphanages included in this study. These interventions set the stage for subsequent follow-up studies regarding impact on the orphan's success at subsequent stages of development in the immediate and long term future.

Limitations of the Study

The study findings will be limited to the specific orphanages in the study, but may be relevant to other orphanages with custody of children from similar backgrounds. The findings must not be extrapolated, rather developed from sound methodology and clinical practice.

This study will also only take into account selected measured independent variables. The unique background and genetic makeup which influences developmental potential will

not be accounted for, except through general survey. The two populations studied live in different household environments that may skew the results for one group over the other. Casa de Mi Padre is a group home setting, where 20 - 30 children are cared for within a home environment with "parents" who live in the house along with additional support staff. Hogar Corazon Immaculado de Maria has a more traditional orphanage setting of several nuns and support staff supervising a larger group of children who live in a dormitory-style residence and attend school outside of the orphanage when age appropriate.

Definition of Terms

The following definitions are offered for use in this document.

Age Equivalent - Age in months based on Screening Test. Total Score as given in BDI-2 Manual Appendix A, Table A-2.

Basal - Functional level at which a child shows mastery of a task (Newborg, 2005).

Caregivers - Includes those adults who define the major responsibility of their job as childcare.

Ceiling – The functional level at which the tasks are too difficult for a child to complete (Newborg, 2005).

Child - Term used to generically describe any infant, toddler, or youngster between the ages of 6 months and 6 years participating in this study.

Child Development – The physical and mental progression of a child from birth to adulthood. Progress commonly measured in regular pediatric visits through a developmental screening questionnaire.

Chronological Age – For the purposes of this study, the age in months from month of birth to month of exam. Note: in children for whom exact birth date is unknown, January, of the year they were born, was used as birth month.

Developmental Delay – Any area of deficiency as defined by the Battelle Developmental Inventory Screening Tool.

Domain - A major area of child development as defined and evaluated by the Battelle Developmental Inventory. The five domains evaluated by the BDI-2 are Adaptive, Personal-Social, Communication, Motor, and Cognitive.

Examiner - The person administering the BDI-2 in this study.

Gestational age - The age of an embryo or fetus as dated from the first day of a woman's last menstrual period (LMP).

Global Developmental Delay – Documented delay of two standard deviations or more below the mean, in 2 or more domains of evaluation.

Infancy – The period from the moment of birth to about two years old, when the child begins to use words to make sentences; or the developmental period that extends from birth to 18 or 24 months.

Orphan – For this study, orphan will be defined as a child between the ages of 6 months and 4 years who has been in the custody of the orphanage for at least one month.

Starting Point - The first question, as directed by exam instructions, for each child based on their chronological age.

Synaptogenesis - The formation of synapses involving the formation of a neurotransmitter release site on the pre-synaptic field and a receptor site on the post-synaptic field.

Summary

Orphans will continue be a part of societies around the world, and in some countries their numbers continue to substantially increase due to the effects of HIV/AIDS, poverty, and related factors. In Latin America, orphanages are a necessity to address street children, abandoned children and other factors that leave a significant number of children without adult care.

There is a void in the research on best practices to care for and educate orphans to become productive and healthy members of society. Children in Latin American regions are particularly at risk where the needs are great and the research is not available to inform practice. Addressing developmental needs enhances success in the educational system, and provides hope for future success in society among this at risk population. The investigator developed objectives based on related literature in or to follow a sequence of research that is needed to enhance and inform practice. Furthermore, the research introduces an important tool, the Battelle Developmental Inventory Screening Tool in Spanish for research in orphanages within Latin America. Limitations of the study are controlled within the parameters of this research to ensure findings are valid and reliable.

Chapter Two

Literature Review

Orphans, first and foremost, are children who need and deserve an environment to develop. Step-wise advancement in all areas of development is necessary for any child to progress, be ready for school, and then to become a productive member of society. The orphanages in this study are located in El Salvador.

The purpose of this chapter is to review the current literature concerning orphans and development. First, a review will be presented of the most recent literature pertaining to child development, including brain development, developmental milestones, and development in the specific areas of touch, vision, hearing and language, motor skills and social-emotional growth. There are many articles that assess specific areas of development and the additional stressors which orphans face (Ahmad et al., 2005). Developmental delay will be discussed in terms of causes, outcomes and prevention methods. The assessment instrument, the Battelle Developmental Inventory, 2nd Edition, Spanish Screening Tool, will be presented to develop a basis for use in this study and the relevance. Another section presents the most current related literature on orphans and orphanages and the role caregivers play in

the lives of children and more specifically in the life of an orphan. Finally, the relevance of current statistics, political state and economics of El Salvador will be discussed.

Child Developmental Overview

Brain Development. Science has made great advancements in what is known about the development of the human brain. The brain is "molded from experience" and early in life it is the sights and sounds experienced daily that most influence the laying down of neural connections (Eliot, 1999). These neural connections remain ever changing throughout life, but no growth is as significant as that which takes place during infancy. Research has shown that this development is profoundly influenced by environment and experience (Eliot, 1999). This growth and development is fundamental to future abilities (Isaranurug, Sirikul, Nanthamogkolchai, & Kaewsiri, 2005). Although genes are important in development, it is really the quality of the environment that can be manipulated and changed and thus is the greatest variable in brain development (Eliot, 1999). Prior to birth, the spinal cord and lower brain function is in place, but axons have relatively few synaptic connections. No new neurons are formed after birth, but there are many new dendrites that grow at a feverish pace and serve to thicken the cortex and form the complex circuitry of the brain.

Synaptic connections fuel learning, and these connections are profoundly influenced by environment (Eliot, 1999.

Researchers have discovered some of the variables that make a difference in later intelligence. A study from Mahidal University showed that the variables that have the greatest influence on development are a father's level of education and the home environment (Isaranurug, et al., 2005). Lab rats that grow up in an enriched environment full of objects to explore have larger brains with thicker cortexes. Of these two variables, only one can be changed or influenced after birth. The environment in which a child grows up makes a substantial difference in developmental outcome.

An interesting part of the research into brain development is that apparently the brain has a specific timeline for the development of skills. Once the critical period has finished, it is much more difficult to rewire. The windows for the development of hearing and sight come earlier than the critical periods for language development. This is understandably important, as these early skills are essential for bonding and for gaining information from the environment. Fortunately the critical period for much of development is very long, so if deficits are caught at a young age, there is still often time to enhance the environment to provide better learning opportunities (Eliot, 1999). Adams et al. found that conversational skills of

preschoolers with prior language delays were improved with even short-term intervention (Adams, Lloyd, Aldred, & Baxendale, 2006).

Developmental Milestones. For the ease of use, developmental milestones have been grouped into five major conceptual categories on many major developmental screening tools. These categories include psycho-social (personal-social), fine and gross motor skills, language (communication), adaptation and cognitive skills. At well-baby checks, a pediatrician typically performs an assessment of progression through these milestones. While more and more information is available to parents on the web in order to help them assess their child's development on an ongoing basis (Drachler, Maria de Lourdes, Marshall, & Leite, Jose Carlos de Carvalho, 2007; Newborg, 2005), a clinical assessment with a trained professional is imperative for valid assessment.

Touch. Researchers have discovered much about the way in which the brain gains skills in all five conceptual areas of analysis in this study. Much progress has been made throughout the twentieth century. Even in the first moments of life, newborns are aware of touch. In fact, they have been practicing this skill in utero for months. Touch is actually the first sense to emerge, and researchers have an explanation for why it is so important. Although the

sense of touch was once thought to only be essential for motor development, researchers have shown through several different experiments that touching and being touched play a role in overall health, including physical growth, emotional development and cognitive potential (Eliot, 1999). Harry Harlow experimented with Rhesus monkeys, taking babies away from their mothers and instead giving them two "surrogate" mothers. The first was just wire mesh, but was able to provide milk to the baby. The second had a terry cloth blanket covering the mesh, but it was not able to provide milk. The babies surprised researchers by preferring the soft mother to the mother who actually supplied food. While they visited the wire mother for food, they actually spent most of their day cuddled to the soft tummy of the other mother. The conclusion drawn from this experiment is that it is the tactile contact, not the source of nourishment, which binds a baby to its mother (Harlow & Zimmerman, 1959).

Suomi (1990) found in his research that peer-raised monkeys developed more normally than those raised in isolation, but this benefit disappeared when the monkeys were prevented from touching each other by being kept in separate cages. Sapolsky (1996) found that handled rats were more emotionally stable than those raised in isolation. They were less fearful and more intelligent in life, and on autopsy had less degeneration of the hippocampus, the memory

storing area of the brain. Although these animals showed a normal hormonal response to stress, their corticosteroid level did not rise as high or stay elevated as long. This is important because high stress hormones for an extended period of time can damage many organs in the body (Sapolosky, 1996).

Vision. Vision, although the capability is hard wired into our brains, is heavily experience-driven. Babies are born with primitive visual skills, but by six months of age depth perception, color vision, and fine acuity will have developed (Eliot, 1999.

Hearing and Language. Auditory development and language acquisition go hand in hand. Babies gain language skills through experience. The development of these skills of communication is critical. Communication influences, and is influenced by, other areas such as cognitive, social personal and physical development (Popich, Louw, & Eloff, 2007). A child's first experiences with language come with what they hear in their environment. Researchers have found that the way many people speak to babies, in a loud, higher-pitched, slow sing-songy way is actually perfectly suited to what babies can hear and for their acquisition of language. The volume helps them overcome background noise. The speed allows them to begin distinguishing words. The pitch is in the frequency they are best at hearing (Fernald, 1985).

This probably explains why most babies react so positively to it. The input and stimulation children receive from their parent or primary caregiver is closely linked to communication development.

Children who are deprived of language experience for long enough periods of time will be incapable of learning and using language. Some extreme examples of this are present even in society today. Genie, the daughter of a psychotic man, was strapped to a potty seat during the day and bound in a crib at night. She was merely barked or growled at, in complete isolation from the age of twenty months until fourteen years of age when her equally trapped, blind mother escaped with her. She never developed language skills beyond that of a 2 year old (Curtiss, 1977). Chelsea, by contrast, was not the victim of abuse, but rather of undiagnosed hearing loss. She was not properly diagnosed or fitted for hearing aids until she was 32 years old. Even after much rehabilitation, she continued to have problems with comprehension and understanding even the simplest grammatical rules (Curtiss, 1977). The window of opportunity for truly learning language was forever closed.

Luckily, because language is an innate human skill, we don't need to be exposed to very much for very long to learn to communicate effectively (Eliot, 1999). Researchers at the University of Rochester studied these critical windows for

learning language. The first group they studied had been students at the Pennsylvania School for the Deaf. Researchers tested their level of language competence at thirty years of age. Their findings showed that only students, who had learned American Sign Language from their parents before they entered school, at the age of four, had full understanding and use of the language. Those who entered school young, between four and six years of age, but had not been exposed to ASL beforehand, did well, but were not as fluent as their counterparts. Those children taught to sign after the age of twelve made consistent grammatical mistakes. The same researchers also analyzed how this related to second-language learners, and found that regardless of formal education, training, years in country or general attitude, the same ages seem to apply. In order to perform as well as native speakers, one must enter the country by the age of seven (Newport, 1990). The quality of language experience does affect our later language skills (Eliot, 1999). These examples reinforce how important it is for children to have rich language experience from the very beginning. As Eliot states in her book, “Building this foundation depends on experience, on hearing millions of individual words and phonemes in just the first year alone”(P 367, 1999).

Researchers know that the brain is innately able to learn language. The key is being exposed at the right moments during development. A child does not need to be taught language, only exposed to it. Quality of exposure is important, as is response to their initial babbling. They are trying out language, and want to receive feedback. When caregivers do not pay attention to this babble, it discourages their effort (de Boysson-Bardes & et al, 1989). So, how great is the effect of talking to children? The most extensive study to date on the effects of parenting style on language learning was completed in Kansas City by Betty Hart and Todd Risley. Hart and Risley are psychologists who followed families for the first three years of their children's life. More discussion of this topic will appear under the Caregivers section in Chapter Two.

Many parts of the brain are responsible for the speaking and understanding of language. All these separate parts, learning to work together, explain the typical stages a child goes through in the development of language skills. They start with babbling, then move to single words, almost always nouns; two-word phrases develop from there, and it isn't until around three years of age that children learn to produce a full range of grammatical constructions (Eliot, 1999). Building the connections between these areas, the

largest being Wernicke's and Broca's, requires a full range of language experiences and time. Wernicke's area is known to be responsible for language comprehension and develops much earlier, usually by around 24 months of age. Broca's area is mainly responsible for producing language, and this area is not fully developed until closer to 4 years of age (Werker & Tees, 1992). This also explains why, in the process of language development, children demonstrate clear understanding of what is being said to them long before they can talk about it.

Motor Skills. Motor milestones come gradually in a fairly predictable step-wise pattern, with most children gaining gross and fine motor skills in a consistent pattern. Gross motor skills begin with head control and rolling over and progress to crawling and walking all in usually the first 12 to 18 months of life. Fine motor skills start with rough uncoordinated swatting movements, and gradually develop into fine pincher grasp. The reason that motor milestones come in such a predictable pattern for most babies is that the skills they are displaying directly reflect the processes going on within the brain's circuitry. The earliest motor milestones, those reflexes tested in the newborn nursery, are functions of the lower brain. The gradual maturation of motor circuits from the brain stem to specific motor circuits within the cortex is demonstrated by early control

of the trunk and head muscles with progression to the limbs and digits. The primary motor strip within the cortex develops from the bottom up. The head muscles are controlled by the bottom of the motor strip, and the toes by the top, with a natural progression of body parts in between. This explains the progression of controlled movements from the head to the arms to the legs (Eliot, 1999).

What recent research has found is that although the speed of development of motor circuits and myelination of neurons explains why most children develop along a similar pathway, strength, nutritional status, emotional well being, and even practice all play important roles in the achievement of motor milestones. Neglected babies suffer from motor delays because a nurturing and stimulating environment is essential to normal development in all areas. Research from the 1930's involving twins showed that, although practicing a movement did not help a child master the milestone any sooner than their twin who did not receive any extra practice, it did give them more confidence and interest in motor activities (Gallahue & Ozmun, 1995; McGraw, 1989). It should also be noted that despite what this research found, we now know that a baby logs many hours of "practice" by standing and walking with some type of support before their muscles and brain are ready to walk independently. These experiences

are essential (Thelon & Bradley, 1988). A very controlled study was done utilizing the natural stepping reflex, which babies are born with. For ten minutes each day, babies from the ages of one and nine weeks were held upright with their feet on a table by a parent and allowed to exercise this reflex. Their reflex outlasted other babies in the experiment who either received no exercise, or passive pumping of the arms and legs while in a supine position. The actively-exercised babies also walked independently one month earlier than the other children in the experiment (Zelazo, et al, 1972). Research has found that although practice is important, the quality of the practice matters, and the infant walkers sometimes employed by busy parents and often used with children in orphanages are not only dangerous, but may also delay walking (Siegel, Burton, & reported by Brody, J.E., 1997).

Social-Emotional. Social-Emotional growth is evaluated in the Personal-Social Domain of the BDI-2 Screening Tool. "Emotional Intelligence", the way we relate and react to the world and people around us, plays a large part in determining later success (Goleman, 1995). Our emotional and social lives are controlled by the Limbic system within the brain. There are lower limbic structures that lie outside of the cerebral cortex and produce spontaneous manifestations of emotion, and upper structures, or limbic

cortex, which forms the inner core of the frontal, parietal, and temporal lobes. Feelings produced here are those we have some control over. The reactions produced in the limbic cortex mature with experience and social training throughout our lives. The amygdalae are the two almond-shaped structures that link the upper to the lower limbic system. Doctors have seen that those who suffer damage to the amygdalae are unable to relate to people around them and have major changes in their ability to respond emotionally. One of the leading hypotheses to explain autism is amygdala dysfunction or damage (Bachevalier, 1994). The amygdala also plays an important role in memory as well. The fact that the same structure controls both emotion and memory may help explain why the two are so interrelated in our thought process (Eliot, 1999).

Because the first six months of their lives are dominated by the lower limbic system, babies do not yet make and store long term memories. Due to the immature frontal cortex, the bond felt by the child for their primary caregiver develops more slowly than the affection the caregiver develops for the child. An infant's memories are formed through repetitive habitual practices. Babies learn what to expect by repeatedly getting the same consistent reaction. If the child cannot predict what will happen because their care is inconsistent, they may fail to develop confidence and

emotional security (Eliot, 1999). Babies will develop their primary attachment to the one person who most reliably fills their needs, both physically and emotionally. Many psychologists regard attachment as the single most important event in a person's emotional development (Eliot, 1999). Researchers in the most primitive to the most advanced of societies have observed attachment and stranger anxiety. They both seem to emerge around six months of age and become more intense until children are about eighteen months old (Konner, 1991). Electroencephalography (EEG) has been used by research to look for surges in brain activity. The results of these studies provide the best evidence for frontal lobe development. When the frontal lobes are mature enough to feel genuinely about experiences, around six to eight months, babies have surges of activity in their left frontal lobe in periods of happiness, and surges in their right frontal lobes in periods of anxiety. More specifically, scientists are able to observe surges in a child's left frontal lobe when they see their primary caregiver, and in their right as their primary caregiver walks away (Fox & Bell, 1990).

More evidence has emerged that indicates stress hormones may be hazardous to brain development. They seem to especially affect the limbic portions of the brain and especially the memory-storing cells (Sapolosky, 1996). Scientists studying

the effects of stress hormones have also noted that babies with secure attachments have fewer surges of cortisol, and their surges are smaller when presented with stressful events. Both monkeys and rats have stress response systems that are more difficult to activate when they remain in contact with their mother. Babies' responses are also buffered, even when left with a stranger, if that person is cheerful and willing to play with them (Gunnar & Nelson, 1994; Gunnar, Bruce, & Grotevant, 2000).

Developmental Delay

"A developmental delay is any significant lag in a child's physical, cognitive, behavioral, emotional, or social development, in comparison with norms." (Linwood, 2006) For the Battelle Developmental Inventory, Second Edition, Global Developmental Delay (GDD) may be defined operationally as usually two or more standard deviations below the mean, in two or more domains (M. Shevell, Majnemer, Platt, Webster, & Birnbaum, 2005). At least 8 percent of children from birth to six years have developmental problems and delays in one or more areas of development. Some of these have GDD, meaning they have delays in several or all areas of development (Linwood, 2006).

Causes of Developmental Delay. There are many causes of developmental delay, and at times no firm reason is

determined as a cause. One explanation is that medical problems at birth or in early infancy sometimes cause delay. Babies born prematurely are often closely monitored as they are at risk for developmental delays. Additionally, low IQ and chromosomal abnormalities may contribute to delays (Linwood, 2006). Assessments should be made in order to try to determine the cause and next steps necessary for achieving the highest potential outcomes for the child.

Children from low-income homes are at risk for developing poor adaptive play skills and slow cognitive development as well as other health problems like asthma and anemia (Lequerica, 1997). Institutionalization of a child is a risk factor that sets a child on the path to suboptimal development. The degree of effect seems to be determined by their experiences after the initial trauma of abandonment (Maclean, 2007).

Outcomes. Education is a principal means for advancement, and without it, children will have a number of disadvantages (Oleke, Blystad, Fylkesnes, & Tumwine, 2007). Early developmental difficulties have been correlated to later academic problems (D. M. Shevell, 2005). Children who had significant reading problems at the age of 7 were later found to be delayed in early neuro-developmental milestones in the language and motor domains. Difficultly in math and handwriting is often remembered by parents as being preceded

by delays in the areas of cognitive and motor development. Even with all this evidence, the actual association between early developmental delays and overall school functioning has yet to be described (M. Shevell et al., 2005). A study of education outcomes of 2,046 children who were identified in preschool as having developmental delay revealed that as third graders, 26% of them were in regular education while 74% of them received special education services (Delgado, Vagi, & Scott, 2006).

Prevention Efforts. The goal in primary prevention is to reduce the incidence of disease or injury (Last, Wallace, Maxcy, Rosenau, & Doebbling, 1998). An example of primary prevention would be the widespread use of the measles vaccine to prevent deafness in newborns. Education is an important part of primary prevention, and research has shown that successful prevention programs have education as an important component (Gerber, 1998). More competent caregivers, who have an understanding of child development, are more likely to be able to meet their children's needs (Guralnick, 1997). This education is not limited to parents alone; other primary caregivers also influence development (Rossetti, 2001). Any education initiative should include all primary interaction partners (Klass, 1999).

> The goal of secondary prevention programs is to reduce the prevalence of disease and disability. (Last et al., 1998)

A method of proven effectiveness to minimize or eliminate the risk factors that lead to delay in child development is the promotion of literacy skills (High, Lagrasse, Becker, Ahlgren, & Gardner, 2000). Caregiver education is another proven strategy to promote optimal development (Gerber, 1998).

Orphans and Orphanages

Orphanages have long been used to place children when their current environment was deemed no longer safe for them. These placements have occurred over time for many reasons, including war, poverty and abuse situations. Ahmad et al. suggest in the findings of their research that it is the rapid urbanization and social transitions occurring across much of the developing world that is leaving children more vulnerable. Societies must work hard to obtain the highest possible benefit from these traditional care systems, which are in place to protect children (Ahmad et al., 2005). Many orphanages provide a better environment than the children would have at home, but with so many children often under the care of a limited number of adults; children may not be receiving the nurturing and love they would with a

responsible family (McKenzie). Even in the best-run orphanages, a child may not receive the stimulation they would in a family environment (Taneja et al., 2002). Past research has shown that the participation of home-reared children, whether typical or developmentally delayed, can benefit or be hindered by the level of their caregiver's interactions in activities such as mealtime and play (Kadlec, Coster, & Tickle-Degnen, 2005). Also, many caregiver-child interactions may be disrupted when a child is institutionalized (Gunnar et al., 2000). Children in orphanages have increasing school problems, higher rates of repeating a grade, and more frequently need remedial classes (Ahmad et al., 2005). Orphanages lack traditional family structure, which may lead to increased school problems and the need for special classes (Ahmad et al., 2005). Inadequate feeding has also been reported to negatively affect orphans' ability to succeed at school, because they cannot concentrate or participate fully in activities (Oleke et al., 2007). A longer stay in the orphanage has also been associated with more problems (Maclean, 2007). A Russian study using the Wechsler Adult Intelligence Scale III full scale, found verbal and performance IQ scores positively correlated with the age when children were placed in the orphanage and negatively correlated with the length of stay (Sloutsky, 1997). Many studies show that children who spend an extended period of time in orphanages show more global

developmental delays than children reared at home or adopted (Maclean, 2007).

Ames' 1997 study of Romanian children adopted to Canadian families displayed children with more behavior problems, lower IQ's and more insecure attachment patterns compared to home-reared and children adopted from within Canada (Ames, 1997). In the 1940's, a psychiatrist named Rene Spitz studied disadvantaged babies in a series of studies involving two groups of infants. The first group included children in a foundling home that provided babies with adequate food, clothing and health care in a clean environment. The second group was made up of children whose mothers were in prison. These children lived in a nursery near the prison. The conditions at both locations were very similar in all aspects except that those children kept in the nursery near the prison were fed, nursed and cared for by their own mothers. The mothers spent a limited amount of time with their babies, but during that time they paid a large amount of attention to them. This gave these children an enormous advantage in the amount of nurturing and stimulation they received. The children in the foundling home were cared for by a nurse who also looked after 7 other children, and they were kept in draped cribs except for diaper changes and feedings. The cribs were draped to limit the spread of infection, but also isolated these children

dramatically from their environment. There were devastating consequences for these children. Many didn't survive to age two, and those who did had significant global developmental delay (Emde, 1983). The work that Spitz did in these studies contributed to changes in the adoption process in the United States that now favors early adoption and placement of orphans (Eliot, 1999).

Caregivers

Caregivers in orphanages play a vital role in children's lives. Orphanage environments are typically found to be globally deficient with the greatest deficit usually found in the social-emotional areas (The St. Petersburg–USA Orphanage Research Team, 2005/0). A United Nations study stated that educational attainment of head of household usually has a positive effect on the educational outcomes (UNDP, 2001).

In a study of Russian Baby Homes, even caregivers who received "specialist" training did not receive information about developmental milestones, play, or the special needs of young children. Also most caregivers were unlikely to talk to the children under their supervision except while feeding, changing or washing, and there were very few reciprocal interactions. The children under their care in the Baby Homes had significantly delayed physical and

behavioral development (The St. Petersburg–USA Orphanage Research Team, 2005/0). A similar study found during a 3 hour period an individual child interacted with the caregiver for 12.4 minutes, and almost half of this time was spent feeding (Muhamedrahimov, 1999).

The "Not by Bread Alone" project in India tried to resolve the significant lack of interaction between caregivers and orphans. The project was mindful that even the best run orphanages typically don't supply orphans with the stimulation they would receive from a family (Taneja et al., 2002). In a study published in 2002 out of India, researchers implemented a 90 minute structured play period in a Missionaries of Charity Orphanage in Delhi. The project was started at the request of the Sister Superior by the Department of Pediatrics. Thirty orphans aged 6 months to 2.5 years were assessed using the Indian Adaptation of Bayley's Scale of Infant Development. Separate, developmentally appropriate programs, were implemented for ages 6-12 months and 1-2.5 years. The schedule of play is simple and does not require any formal training. At first the caregivers felt as though the intervention would mean more work for them. As the program was implemented caregivers came to find that the program was fun for them as well as not adding load to their already burdened schedules. The changes were made to the orphanage schedule over a

three-month period of time. The researchers followed the "Theories of Social Learning" in the implementation of the program with the caregivers. This enabled them to maintain enthusiastic support. The first month was introducing the caregivers to various activities under the guidance of a child psychologist. Techniques were modeled by the child psychologist for the 16 workers as most were illiterate. In the last two months of the study the schedule was continued, but with less and less supervision (Taneja et al., 2002).

At the end of three months, the orphans were reassessed using the same developmental screening tool in order to see impact of the intervention. The results showed that the Mean Motor, Mean Mental, and Mean Social Quotients all rose among the children participating. The researchers also noted an overall change in the environment. Some specific observations included the children became more active and attentive, were responsive to music, had improved coordination and become more vocal (Taneja et al., 2002). With the positive results from this program, they suggested that other programs hoping to emulate their results would keep the regime "simple and structured", set the "structured play" sessions into the daily routine, and designate a play area that is close to daily activities to be a constant reminder to staff and children (Taneja et al., 2002).

In a two-year follow-up report, the same researchers reported that over the first year of the program, the caregivers' enthusiasm waned. In response to this the research team brought in a full-time play therapist to bring some life back to the program. This caused the researchers to point out that in order to implement and sustain a program such as this over a long period of time a "highly motivated and dedicated" person must be closely involved (Taneja et al., 2005).

For this follow-up report, the researchers again assessed the children using a developmental inventory. With those children who were in the orphanage long enough to have two assessments, they saw that significant progress had been made. They also made note that the children who remained in the orphanage were those "less well endowed intellectually", but even they had made documentable improvements (Taneja et al., 2005).

The researchers concluded in their 2-year follow-up that although the program improved development among the orphans, it was not as self-sustaining as they had hoped. They found a motivated, trained person needed to be involved for the program to continue (Taneja et al., 2005).

The researchers also firmly believed that this program could be implemented in other orphanages. To substantiate this

statement, they conducted a workshop for 15 Sisters from six other Missionaries of Charity Orphanages around Delhi. Workshop participants were taught the "structured play scheme". Three months after the intervention, orphans' development was reassessed, and again the researchers found statistically significant improvements in mean motor and mean mental quotients from their initial assessments (Taneja, Beri, & Puliyel, 2004).

Baxter and Kahn (1999) found that the majority of families, in an early-intervention program for children diagnosed with a developmental disability, wanted to know more information about development (Baxter & Kahn, 1999). Other studies have also shown that the parents of children who are at risk for communication disorders want information on development (Guralnick, 1997). Mothers who are informed and understand about normal development may actually prevent developmental delays (Werner, 2000).

As discussed in the earlier parts of this chapter, language skills are impacted by caregiver interaction. In 1995, Betty Hart and Todd Risley published results from a longitudinal study of forty-two families in the Kansas City area (Hart & Risley, 1995). They started observing these families before their children could talk, and continued to record data about the children through third grade. Families were observed once per month for one hour by a trained

observer who recorded all the talking and actions related to the child in the study. Their data revealed three major discoveries. The first of these was the large variation in the amount of talking that goes on in ordinary American families. The second discovery tightly linked the amount of language experience a child has before they enter school with their later outcomes. The last major discovery was that the quality of talk, i.e. discussions about feelings and events rather than only daily necessity, made differences in child performance (Hart & Risley, 1995).

Related to this last discovery, the researchers found that if parents increased the amount of talk they were having with their children, the quality increased as well. The research also looked at the effects of socioeconomic class on children's language experience. Families were classified into professional, working class or welfare categories based on information from a survey they filled out. Children from professional families heard on average almost 1,500 more words per hour more than those children from welfare families. This number multiplies out to 250 thousand utterances vs. 4 million utterances in one year. Also children seem to gain vocabulary on similar trajectories regardless of their SES status, but they top off at the level of language spoken in their homes (Hart & Risley, 1995). We are able to derive, from the work of Hart and

Risley, that the quality of language that is used with children can not only improve their language skills, but also possibly even raise their IQ. So, it is important to not only teach parents and caregivers to talk, but also how to increase their talking with their infants and toddlers. The psychologist William Fowler describes his success in teaching parents how to talk to their babies through a program that begins in early infancy (Fowler, 1990). Fowler's strategies involve instructing parents on increasing the amount of language children are exposed to through what he describes as the four stages of language development. Parents are then encouraged to introduce the upcoming stage before their child has actually entered it. Stages include vocalization play, labeling play, phrase and sentence play, and theme play. Starting from babbling, and moving through labeling people, things and actions to more complex parts of speech, to engaging in conversation, parents in his study claimed to have actually brought their children through milestones several months ahead of norm (Fowler, 1990).

Just as caregiver interaction has been shown in the proceeding studies to affect development and language skills, it was shown in a study by Daunhauer et al, to affect the way in which children play. Their 2007 article highlights the study looking at the difference between

independent play and play with their caregivers. Twenty-six orphan children were observed playing, both alone and with caregivers, by twelve pediatric experts. The experts found that the children demonstrated significantly more "developmentally competent" play when they were with their caregiver. This was especially true when the play was structured, when the caregiver offered social-emotional support, and when both participants were truly engaged (Daunhauer, Coster, Tickle-Degnen, & Cermak, 2007).

The same article also highlights important differences between home-reared and institutionalized children. Institutionalized children typically have developmental delays, and they rarely receive care and attention from one individual consistently. They also point out that older children can also facilitate learning and development in younger children (Daunhauer et al., 2007).

Beliefs about child development are the result of complex interactions in ethnicity, social class experience and education. In a study which examined low income Mexican American families, parents' ideas reflected the belief that some milestones happened naturally like talking and walking, while they viewed others as having more parental influence such as developing self confidence and independence (B. Delgado PhD & Ford, 1998). Research has in general shown that parents with more knowledge of child development tend

to provide more developmentally-appropriate stimulation to their children and this leads to better developmental outcomes among their children (Dichtelmiller et al., 1992; Ertem et al., 2007; Goodnow, 1988; Miller, 1988). The World Health Organization sponsored a large, multicultural study on the achievement of developmental milestones. It showed there were many similarities, between and within countries, on age of attainment of milestones. This was especially true in younger children (Lansdown et al., 1996).

Primary Assessment Instrument

The Battelle Developmental Inventory Screening Test is one of many available tests used to formally assess the development of children from birth to 7-11 years old. The screening test takes 10-45 minutes to administer, dependent on age, and assesses the areas of personal-social, adaptive, motor, communication and cognitive ability with 96 items completing all 5 domains. The Personal-Social Skills domain includes adult interaction, expression of feelings, self-concept, peer interaction, coping skills, and social role. The domain of Adaptive Behavior specifically addresses attention, eating, dressing, toileting and personal responsibility. The Cognition domain includes perceptual discrimination, memory, reasoning and academic skills and conceptual development. Sub-domains assessed include fine motor skills, gross motor skill, expressive communication,

and receptive communication. The screening tool was derived from the Battelle Developmental Inventory by taking two items from each domain and sub domain for each age level. Age levels are divided at 6-month intervals up to 23 months and then at 12-month intervals. Item total correlation and item difficulty were used to select the items taken from the full test. A total correlation of .70 or higher and an item difficulty as close to 75% as possible were required for items to be chosen. Item difficulty was defined as the percentage of children for a particular age level receiving full credit for an item (J. Newborg et al., 1984).

Learning Theories

Social Learning Theory. Social Learning Theory states that people can learn by observing, and that learning may or may not be reflected in behavior changes. Modeled behavior is reinforced in an accepting environment where one is complemented for repeating modeled behavior. The learned behaviors may also provide satisfying results that reinforce the behavior. Social learning theorists also state that reinforcement promotes the learning process (Ormrod, 1999).

Several conditions must be met for successful modeling to occur. The observer must first “pay attention” to the model, and then “remember” the behavior. The observer must then be able to “replicate” the behavior. Finally they must

be “motivated” to demonstrate what they have learned (Ormrod, 1999).

Participatory, Collaborative Approach. A participatory, collaborative approach to learning and teaching enables all involved parties to be heard. The process emphasizes inclusion and full participation. It brings individual core values and beliefs to the surface, and then adds the new learning to what is already known. By including all parties, the workload is shared. Through individual and team reflection during the learning process, participants take ownership, and the results have increased credibility. Utilizing this approach can be a very “powerful” tool for individual and organizational learning (Russ-Eft & Preskill, 2001).

El Salvador

The setting for this research is El Salvador. Understanding the setting, people and related variables is important to successful research.

El Salvador has a population of about 6.9 million people by 2007 estimates. The land mass is 21,041 square kilometers, or about the size of the state of Connecticut. El Salvador sits at the conjunction of three geological planes and is thus subject to frequent earthquakes. There are also active volcanoes in the country with the last major eruption in

October of 2005 when Santa Ana in the department of Izalco killed 2 people and forced many to flee for safety (BBC News, 2005). Close to the equator, El Salvador's tropical climate has both rainy and dry seasons.

El Salvador is a republic led by a democratically elected president. The country is divided into fourteen departments, with the majority of control and decisions made at the federal level in the capital city of San Salvador. Forty percent of the population resides in rural areas.

The economy of El Salvador is supported by a largely service-based industry, some manufacturing, and financial support sent from citizens residing outside the country mainly in the United States and Spain. The Pan American Health Organization (2008) stated that in 2000, "A total of 268,780 households were receiving support from families abroad, and the annual flow of remittances to families amounted to approximately US $1,700 million." The Pan American Health Organization (2008) also stated that 47% of the population is living in poverty. The cost of everyday living continues to rise in El Salvador as in most countries (*Pan American Health Organization* 2008). Due to the increasing expenses and low daily wages in the labor sector, many fathers and heads of household have left the rural areas in search of higher-paying jobs in the cities. Partly for this reason, by 1980 about 25 percent of households were

headed by women. This increase in traditional family collapse is evident in the fact that over 60 percent of children were born out of wedlock (U.S. Library of Congress, 1988).

Children in El Salvador are required to attend school beginning after their fifth birthday. Compulsory education through the ninth grade is free and expected. The United States State Department published in 2002 data on human rights in El Salvador which contained the following information:

> Public education is nominally free through high school; however, the inability to pay mandatory fees for books, uniforms, and activities prevents some poor children from attending school. Only a nominal fee is charged to attend the national public university. Rural areas fell short of providing a 9th grade education to all potential students, in part because of a lack of resources and in part because many rural parents withdraw their children from school by the 6th grade to work. UNICEF data from 1998 shows that 14 percent of urban children (ages 7-17) and 29 percent of rural children were not attending classes. The Government estimates that 150,000 children stopped attending school due to family hardship and damage to school buildings caused by major earthquakes in January and

> February." (*Country reports on Human Rights Practices: 2001.*2002)

The literacy rate is about 81% (*Country Studies: El Salvador*). The Salvadoran Rehabilitation Institute for the Disabled offers medical services, counseling, career training and some special education programs through its ten centers throughout the country (*Country Studies: El Salvador*). There is a free public university system available to those who can pay for books and expenses. Private universities are also available to those who can afford them. Teacher education is a four-year program for certification although many teachers in rural communities are not certified due to lack of available resources and strong community need. Medical education is available through both the public and private systems with course work beginning in the first semester at University and extending through clinical rotations in the fifth through eighth years of the program. Required service after graduation keeps medical personnel in the federally-funded community clinics and Social Security Hospitals.

Further information in the U.S. State Department's document on the state of human rights in El Salvador found the following information on the state of child protection in the country:

The Government worked through state institutions and with UNICEF to promote protection and general awareness of children's rights. However, children continued to be victimized by physical and sexual abuse, abandonment, exploitation, and neglect. The Salvadoran Institute for the Protection of Children, an autonomous entity, has responsibility for protecting and promoting children's rights. The ISPM estimated during the year that an average of 1,500 children, some abandoned and others victims of mistreatment, stayed in its shelters. Through November 30, it reported 1,246 cases of physical mistreatment, 310 cases of negligence, and 450 cases of abandonment. In 2000 the ISPM reported approximately 1,600 cases of mistreatment, 267 cases of negligence, and 411 cases of abandonment. Using different criteria, the ISDEMU recorded 1,196 cases of abuse during the year, significantly below the 2000 level of 3,071 cases. The difference reflects a change in reporting criteria. The ISPM believes that the number of cases of abuse actually have fallen due to various educational programs and campaigns they completed during 2000. The Program for the Prevention of Mistreatment was a media campaign through radio, television, and newspapers to educate parents, especially fathers, on appropriate ways to treat their children. A separate informational campaign was aimed

> at communities with high levels of violence. The ISPM held meetings to educate citizens on how to reduce the overall level of violence in their communities. However, some NGO's do not agree that the number of cases of abuse has decreased. (*Country reports on human rights practices: 2001*.2002)

Orphanage records indicate that those children who are abandoned and abused are placed into their protection.

The average life expectancy in El Salvador is 71 years old. The population of El Salvador is young, with the mean age being under 20 years old. The fertility rate in women aged 15-49 years was 3.6 children per woman in 2000. The 1998 Family Health Survey estimated the maternal mortality rate to be 120 per 100,000 live births (*Pan American Health Organization*.2008). Data on the Pan American World Health Website states the following information for childhood health problems:

> Children (0-4 years): The FESAL-98 survey found an infant mortality rate of 35 per 1,000 live births, post neonatal mortality in rural areas was 41 per 1,000 lb and 27 in urban areas. In 1999, children under one year of age presented a total of 1,318 deaths; 46.7% were due to communicable diseases and 44.5% to certain conditions originating in the perinatal period. In

> 1999, among children 1-4 years of age, 232 deaths occurred: communicable diseases (33.6%); external causes (26.7%); and other diseases (30.2%).
>
> School children (5-9 years): Among schoolchildren 5-9 years of age, 228 deaths were reported: external causes (43.9%); communicable diseases (20.7%) and tumors (5.3%). Among the leading causes of morbidity were: acute respiratory infections (ARI) (34.3%) (% of all initial consultations), followed by intestinal parasitism (10.2%). The most frequent causes of hospital mortality were: hemorrhagic dengue (20.7%); pneumonia and bronchopneumonia (12.1%) and head trauma (10.3%) (*Pan American health Organization.*2008)

It was estimated in 2004 that there was approximately one doctor for every 785 Salvadorian citizens. Researchers at the University of Texas at Austin state there are about 40 or 50 clinicians to serve about 150,000 citizens with communication impairments (Griffith, 2003).

Chapter Three

Methods

Introduction

The research was a descriptive correlational study. A quantitative approach using the Battelle Developmental Inventory II Spanish Screening Tool (BDI-II SS) was chosen to assess the question of developmental level among the orphans in the study. A qualitative approach was used to assess the characteristics of the orphans and their caregivers.

Research Design and Procedure

The study design used a one-time case study format. IRB approval was obtained from the United States through the Edward Via Virginia College of Osteopathic Medicine prior to conducting the study, which culminated without alteration of the initial approved plan. Concurrently, all El Salvador legal and medical rules and regulations were obtained a priori and implemented without exception.

In a one-month period of time, qualifying children in each orphanage were observed and screened using the Battelle Developmental Inventory II Spanish Screening Tool. The principle investigator partnered with Dr. Mauro Iglesias, MD, a Salvadorian Doctor, to complete the BDI-II SS with

each of the orphans who qualified to participate in the study. Prior to observation and testing, a *Consent for a Minor to Participate in Research* form was signed by the directors at each orphanage as the child's legal guardian. Each child older than 3 years of age also signed their assent to participate in the study after the expectations were explained to them at a level suited to their understanding. The assessment was administered face-to-face with each orphan in a quiet room, away from the distraction of other children. The principle investigator administered each BDI-II SS with aide in translation provided by the Salvadorian physician.

The BDI-II SS results were then analyzed and scored based on the protocol supplied by the publisher. The results from each screening tool were recorded on an Excel spreadsheet using a coding process to ensure that no instrument could be linked to an individual without access to the code book which was secured and only available to the investigator. Examples of pertinent data included age, nutritional level and number of months spent in the orphanage. This additional data was gathered from the Orphan Environmental Survey (OES). Similar to BDI-II SS data, data on the OES were coded using no identifying information traceable to an individual for publication. Developmental level results have been made available to the orphanage administration and

caregivers with identifiable information remaining in order to provide the most benefit for each child from the results obtained. This diagnosis aspect of the study was separate from the research instrument and approved by IRB.

Qualitative information for the *Orphan Background Survey* was gathered with the aid of orphanage staff from the official records kept on each child within the orphanage. The *Caregiver Survey* was distributed by the principle investigator during a large group meeting gathered to discuss the goals of the research. Due to the fact that some of the caregivers are illiterate, the principle investigator read each question aloud, and both the principle investigator and literate caregivers helped to record oral answers from those who could not write themselves. Each caregiver survey was numbered and recorded to ensure that a survey was completed by each caregiver, and all were returned. This information was then coded for identity protection and recorded on an Excel spreadsheet to analyze for trends in education, hours worked and knowledge of child development. Each caregiver gave their written permission for information gathered on the survey to be used for research purposes. The directors also gave their consent for the employees to participate in the research.

Site Selection, Population and Sample

Site Selection. The sites were selected based on the population of qualifying children, the variety of care-models represented and the willingness of their directors to have the study conducted at their facilities. A relationship with Virginia College of Osteopathic Medicine had been established prior to the start of this research at both orphanages to provide medical care to the orphans and staff of each orphanage. Other potential orphanages were eliminated from consideration because they failed to meet criteria for inclusion in the study at a level of the two orphanages selected.

Population and Sample. The population consisted of orphans, including all children from both orphanages who were at least 6 months old during the screening month and were 6 years old or less at the conclusion of the screening. Children who had been at the orphanage for less than thirty days were excluded. Children who had attended school for more than 1 year were also excluded. There were 34 child participants from Hogar Corazon Immaculado de Maria and 10 children from Casa de Mi Padre.

Caregivers included those adults who defined the major responsibility of their job to be childcare or child wellbeing. Eight caregivers qualified from Hogar Corazon Immaculado de Maria and six caregivers from Casa de Mi Padre.

Instrumentation

Three instruments were used by the primary investigator in the completion of this study. The Battelle Developmental Inventory Spanish Screening Test was used to assess the level of development of each orphan. The Orphan Environmental Survey and the Caregiver Information Survey were used to gather quantitative data about the subjects.

Battelle Developmental Inventory II Spanish Screening Test (BDIS-II SS). The second edition of the Battelle Developmental Inventory was published in 2005 after a five-year process of revision from the first edition. The publishers, to identify the strengths and weaknesses present in the first edition, conducted a literature review. New items were developed and field-tested. Field tests were conducted to assess the ease of administration and scoring along with validity for the milestone being tested. During the Tryout and Standardization phases of development, the statistical measures of DIF and generalized Mantel-Haenszel statistics were calculated for the Tryout items. In order to standardize the new edition, a norming sample of 2,500 children ages birth to 95 months were collected over a 14 month period of time. This is the basis for the normative scores, which are referenced in the results portion of this paper. The test items were standardized to age, sex, race/ethnicity, geographic region and socioeconomic level.

Special care was taken to ensure that the diversity present among the sample group accurately portrayed the diversity present in the United States based on the 2000 US Census. Various special groups, children diagnosed with autism or motor delay as well as children born prematurely, were tested in addition to the original 2,500. There was an effort to keep these special groups diversified with respect to age, race and sex, but they were not representative of the population in the United States. Examiners were trained for two days to ensure a clear level of understanding and knowledge of appropriate testing procedures were in place. The data from the Standardization process generated both classical and Rasch item statistics, and were used to calculate sub-domain reliabilities. The Standardization population also provided support for the established basal and ceiling levels with 90% of the sample scoring full credit for items prior to the basal level and 90% scoring no additional points after establishing the ceiling level (J. Newborg, 2005).

Reliability and Validity. The BDIS-II had established reliability and validity as part of the instrument development. The process for the standardized instrument is explained followed by a description of the methods used to establish validity and reliability for the current study.

Reliability coefficients were calculated using the split-half method and then corrected using the Spearman-Brown Formula based on data from the normative sample. Using this method corrects for the internal error of ability changes in a child by splitting a single testing session into two halves and estimating the correlation between the two halves. For a test to be minimally reliable, the reliability coefficient must be at least .80. The average reliability coefficient for the Total Screening Score is .91. Standard Error of Measurement is the amount of variation one can expect a score to see from one administration to another within a short period of time, accounting for differences in test giver and environment. The Standard Error of Measurement for the Screening Total was calculated to be 3.23. The entire BDI-2 was administered twice to 252 children in two age groupings, 2 year olds and 4 year olds. The median time between testing occasions was 8 days. The group was diversified by sex, race/ethnicity and socioeconomic class. This tested the exam's stability. The mean difference across occasions for the 2 year-old group was +1.3 points and for the 4 year-old group it was 2.4 points. Training programs for examiners along with computer scoring software helped to maintain reliability between two test administrators scoring the same test (J. Newborg, 2005).

Correlations with other developmental scales were tested. As compared to The Bayley Scales of Infant Development, Second Edition (Bayley, 1993), convergent validity was supported by relatively high correlations in the Cognitive and Communication Domain DQ scores and the Mental Index scores as well as the BDI-2 Motor DQ and the Motor Index. Relatively lower correlations between the BDI-2 Cognitive and Communication Domain DQ score and the Motor Index as well as between the BDI-2 Motor Domain DQ score with the Mental Index, demonstrate divergent validity. The BDI-2 was also compared to the Denver Developmental Screening Test II (Frankenburg, Dodds, Archer, Shapiro, & Bresnick, 1992), The Preschool Language Scale (Zimmerman, Steiner, & Pond, 2002), The Vineland Social-Emotional Early Childhood Scales (Sparrow, Balla, & Cicchetti, 1982), The Comprehensive Test of Phonological Processing (Wagner, Torgesen, & Rashotte, 1999), The Wechsler Preschool and Primary Scale of Intelligence, Third Edition (Wechsler, 1991) and the Woodcock-Johnson III Tests of Administration (Woodcock, McGrew, & Mather, 2001). All showed convergent and divergent validity to support the information gained from the administration of the BDI-2 (J. Newborg, 2005).

The BDI-2 Screening Test was further tested within groups of children with known delay. In each study, an examiner blind to their diagnosis tested an equivalent number of children

with delay and those developing normally. The BDI-2 Screening Test was found to be the most sensitive in identifying autistic children through the Personal-Social Screening score (0.93). It was further found to be the least sensitive in identifying children with developmental delay (0.72) or with speech language delay (0.72). The Screening Test was the most specific in identifying children with motor delay (0.88) and least specific in identifying children with Speech and Language Delays (J. Newborg, 2005).

Overall, the reliability and validity of the Battelle Developmental Inventory, second edition, has been well documented through extensive standardization procedures, sampling, and administration of the test to special groups (J. Newborg, 2005).

Orphan Environmental Survey. The Orphan Environmental Survey was developed by the primary investigator to determine characteristics of the orphans participating in the study. The information collected on the survey was gathered from permanent records for each child held by the social workers at each orphanage respectively. Questions on the survey consisted of multiple choice and open-ended questions. Data from the surveys was compiled on the results spreadsheet. The original instrument was modified, based on a panel of expert review, to include selected items pertinent to the research objectives in this study. The composition of the

panel of experts to establish instrument validity was consistent with the content and processes required for this study. The areas of expertise included medical professionals in U.S. and El Salvador; a research expert; and a native Salvadorian Spanish speaker to ensure that verbiage would be easily understood.

Items on the survey pertaining to nutritional level at admission and amount of contact with caregivers were not answered due to inadequate records of this information. The orphanages involved also did not keep information to reflect the amount of time each child spends watching TV or reading. Books were available to all children, but children at one orphanage had more limited access than the other. Due to the difficulty attaining this information, these areas were subsequently dropped from the survey. See Appendix A for a copy of the Orphan Environmental Survey.

Caregiver Information Survey. The Caregiver Information Survey was developed by the primary investigator to gain basic knowledge about those persons at each orphanage whose primary responsibility is the care and wellbeing of the orphans. The survey assessed frequency and duration of work, literacy, level of education attained and personal assessment of knowledge on the subject of child development. This information was used by the primary investigator to develop recommendations for a model-training program best

suited to meet the needs of the caregivers and orphans. Some caregivers required additional assistance in filling out this survey due to limited literacy levels. Validity was established by the same panel of experts previously described. See Appendix A for a copy of the Caregiver Information Survey.

Reliability for the instruments was established for interval level data. Although reliability was already determined for the standardized instrument, the reliability needed to be established with this new population and sample.

Data Analysis

Data analysis for the project occurred after the Screening Test had been administered to each orphan and qualitative data (age, gender, time in orphanage, age at placement and nutritional status) had been gathered. This information was compiled on an excel spreadsheet. Qualitative data were then used to further explain the current level of milestone achievement. Statistical analysis was used to determine the strength of the relationship between variables with the level of development as measured by the Screening Tool. The dependent variable of level of developmental milestone achievement, as well as descriptive statistics summarizing characteristics of the orphans and the caregivers, were

analyzed. An alpha coefficient of .05 was established a priori to establish a criterion for significance tests.

Recommendations have been made in Chapter Five for a training program for caregivers to improve the meaningfulness of their interactions with the children. The level of training for the caregivers was the independent variable that the recommended training plan sought to manipulate in order to affect change on the dependent variable of milestone achievement. All statistical analyses were completed by consultants from The Center for Interdisciplinary Statistical Analysis at Virginia Tech.

The data were interpreted for areas of relative strength and weakness among measured milestones for both individual orphans and for the group as a whole, in order to make recommendations to the caregivers about developmentally-appropriate activities for the children in their care.

Findings from the project were disseminated to the caregivers in a manner that will allow for their optimal understanding. The investigator used a format adapted from similar research projects to disseminate findings to other interested parties. This format includes an abstract, introduction, methods and procedures, results and conclusions with recommendations.

Ethical Considerations

The research protocol was reviewed by expedited procedure through the Institutional Review Board at Virginia College of Osteopathic Medicine. The research protocol was approved September 5, 2007.

Screening and Survey data for the project was managed according to standard research protocol and IRB-approved practices. Coding and labeling of data related to variables was used for computer statistical analysis and data entry to ensure maintenance of validity and consistency. Each orphan received a unique three-part numerical code based on orphanage, order of data analysis and age in months. The study was completed without alteration to the initial plan approved by IRB.

Chapter Four

Results of the Study

The purpose of this study was to determine milestone achievement and environmental impact among Salvadorian orphans at selected sites, in order to make recommendations for appropriate training materials to allow for the mentoring of caregivers to advance milestone achievement among the orphans. The principal investigator's goal is that these orphanages and others throughout El Salvador and the developing world will use the information found in this study to aid in determining and addressing the most pressing developmental needs of their orphans, and to implement programs of developmental training for their caregivers. The principle investigator, with assistance from a Salvadorian physician, assessed the developmental milestone achievements of the 44 qualifying children residing at two orphanages: Hogar Immaculado Corazon de Maria and Casa de Mi Padre.

Each assessment was analyzed and scored based on the guidelines provided by the publisher of the research instrument. See Appendix A. Raw scores in the five domains of development assessed by the BDI-2 SS were recorded and translated into either a pass or the appropriate standard

deviation below norms as determined by the assessment publishers for a child within that age-range. It is important to note that a numerical value was recorded in the Standard Deviation column only if the score fell below the Pass Cut-off Score for the child's particular age level. The same method was applied to an overall score for each child. The overall score for the child also generated an "Age Equivalent" (in months) determined from a table provided by the publisher. All of this information was recorded on an Excel Spreadsheet (Appendix A) using each child's unique six-digit code. Included in the information for analysis was a pass cut-off score generated from a table provided by the assessment publisher, and the difference between the child's raw score and the pass cut-off score for comparative measures. Also recorded on the spreadsheet was qualitative data gathered from the Orphan Environmental Survey. Items recorded included: the orphanage in which the child resided, gender, age in months, current nutritional status, months spent in the orphanage, age at admission to the orphanage and percentage of life spent in the orphanage.

The primary investigator completed analysis of qualitative data. The results were then compiled on an Excel Spreadsheet for ease of use. The results of the data analysis provided rationale and a description for each of the following research objectives:

1. Determine the current level of development of orphans at two investigator selected orphanages using the Battelle Developmental Inventory Screening Test.

2. Determine characteristics of caregivers who have frequent interactions with the orphans.

3. Determine areas of strength and deficiency among the orphans at the two investigator selected orphanages in conceptual areas of: Personal-Social, Adaptive, Motor, Communications, and Cognition.

4. Determine the level of association between principle investigator selected characteristics of orphans with developmental milestone achievement.

5. Develop a model caregiver-training program for implementation at the two selected orphanages based on principle investigator derived characteristics and related findings.

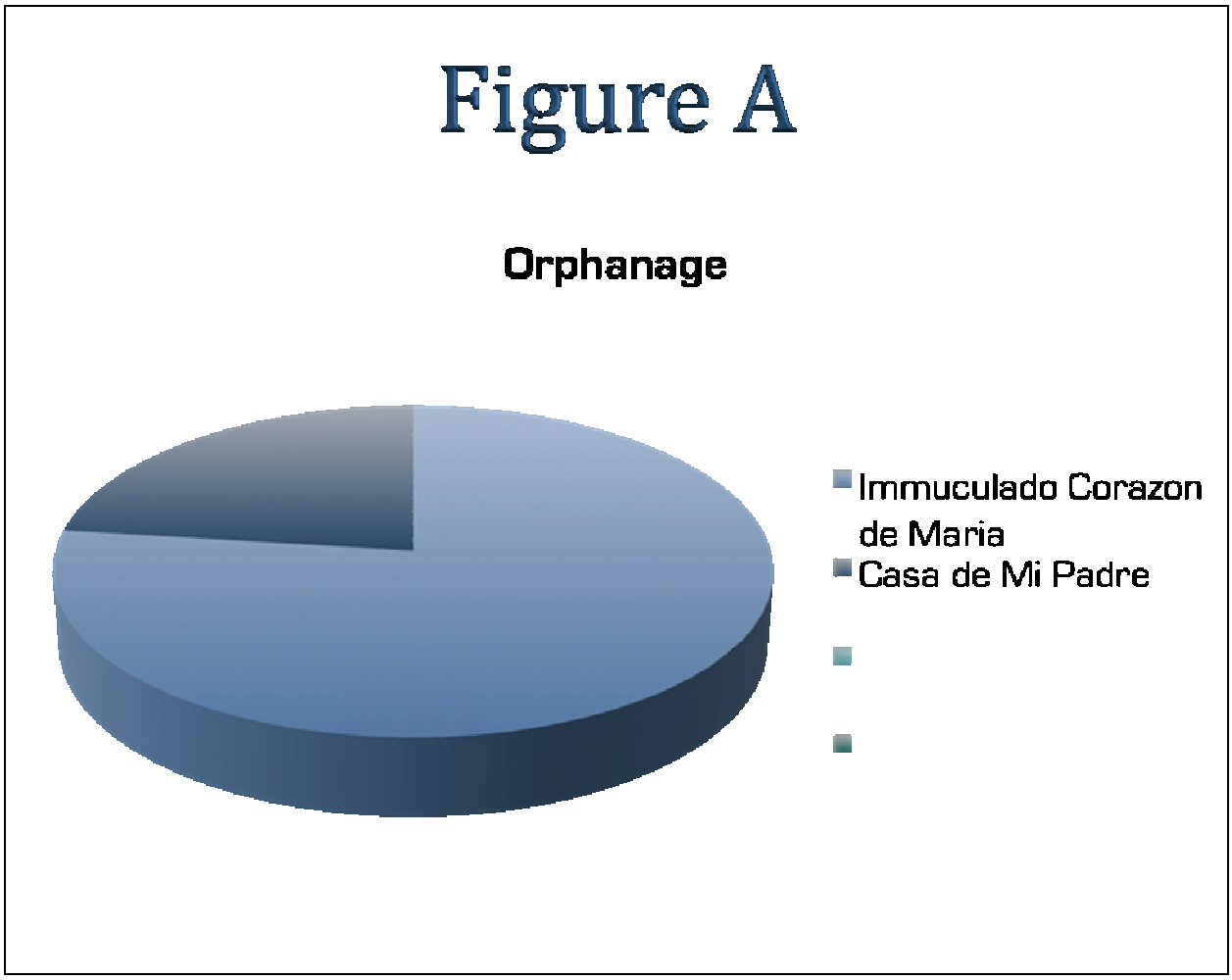
The following represents a synthesis of the data gathered as well as a demographic description of the children and caregivers who participated in the study. The information has been organized by objective.

Current Status of Orphan Development

Objective One was to determine the current level of development of orphans using the Battelle Developmental Inventory Screening Test. All 44 children were screened using the Battelle Developmental Inventory Spanish Screening Test by the principle investigator with translation assistance from the Salvadorian physician working with her.

Of the 44 children screened, 34 (77%) lived at Hogar Corazon Immaculado De Maria and 10 (23%) resided at Casa de Mi Padre. See Figure A. Twenty-eight of the 44 (64%) children were girls.

The publisher scoring protocol age cut-offs are broken down by age in months. Two (5%) of the children assessed were between 6 and 11 months. Two (5%) of the children assessed were between 12 and 17 months old. Only one (2%) child assessed fell between 18 and 23 months old. Five (11%)



children were assessed between the ages of 24 and 35 months old. There were six (14%) children between 36 and 47 months old. Thirteen (30%) children were assessed between the ages 48 and 59 months and 15 (34%) children in the oldest group between 60 and 71 months old. See Figure B

Growth charts used by pediatricians and health promoters throughout El Salvador break down the nutritional levels of children into four groups based on height, weight and age in

months. The four classifications are as follows: Normal (N), Slightly Malnourished (L), Moderately Malnourished (M), and Severely Malnourished (S). Of the children assessed, 18 (43%) children fell into the Normal category, 19 (41%) children fell into the Slightly Malnourished category and 5 (11%) of the children fell into the Moderately Malnourished category. One child was above Normal height and weight for their age, and the principle investigator did not have access to accurate height and weight data for one of the children assessed. See Figure C.

Scoring was completed on each Battelle Developmental Screening Tool at the completion of all testing by the principle investigator per the protocol included with the testing materials. Raw score was determined by adding together the points for each skill completed. Scores were given for each individual section as well as a total screening score. Scores were then compared to norms established by the publisher of the tool and stated to be at or above the expected score for a child of that chronological age, -1 standard deviation below, -1.5 standard deviations below, or -2 or more standard deviations below. This scoring matrix is identical for both Spanish and English versions of the screening tool.

Figure B

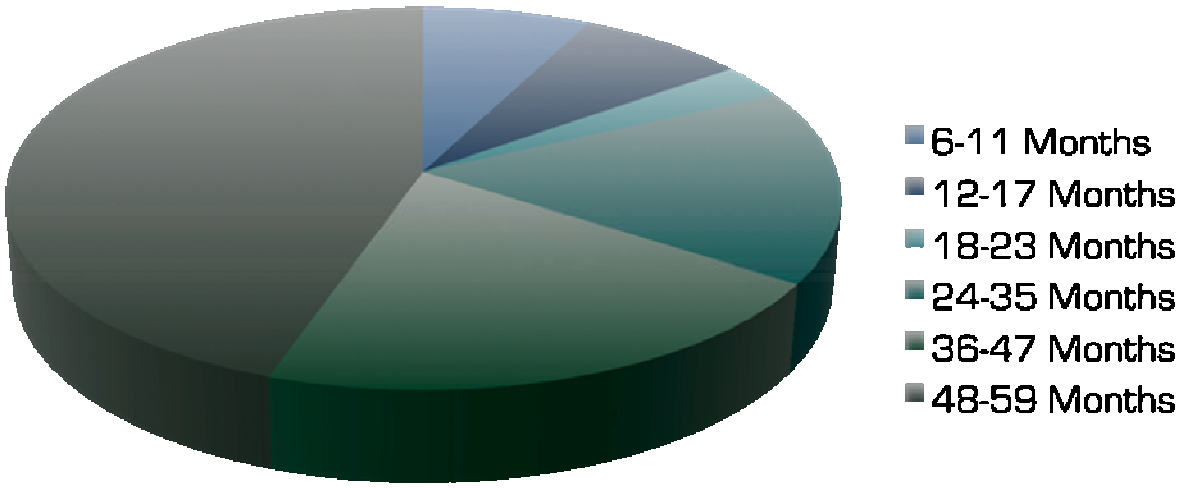
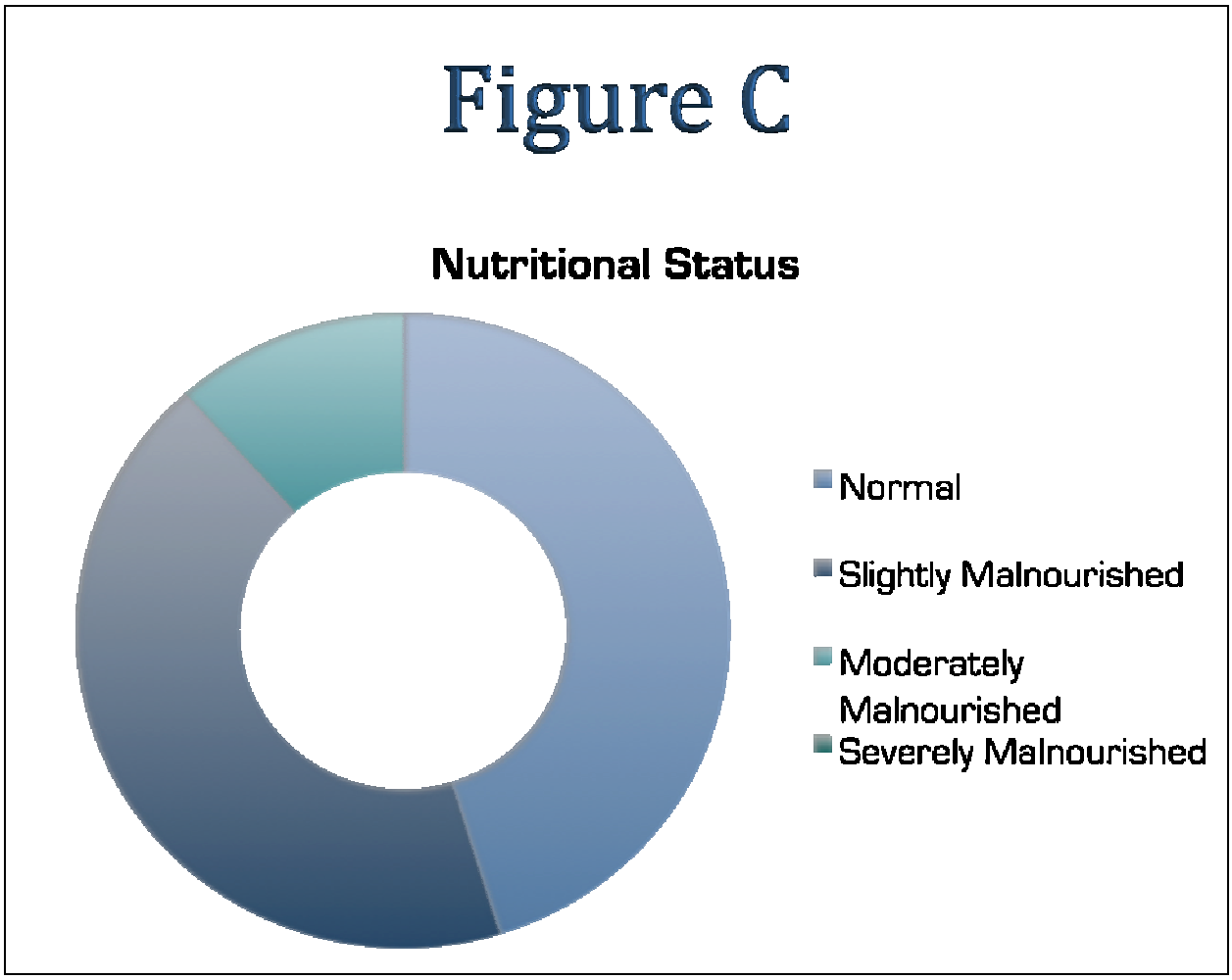

Age of Participants
6-11 Months
12-17 Months
18-23 Months
24-35 Months
36-47 Months
48-59 Months

Figure C



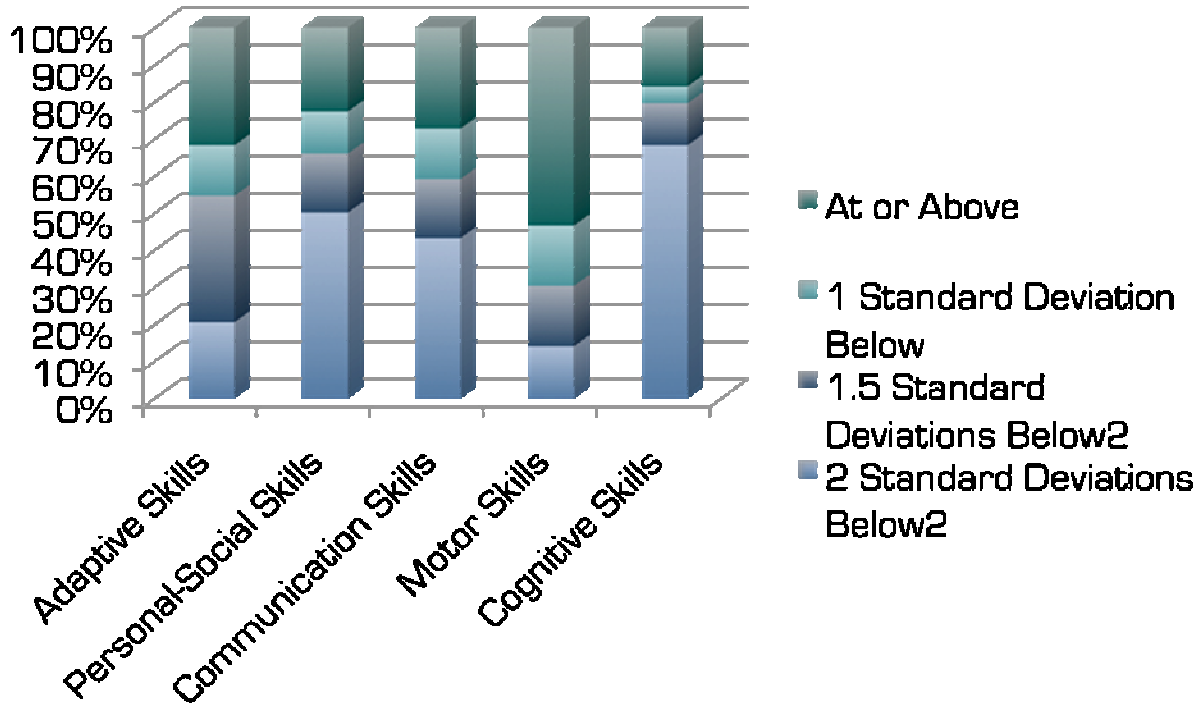
For the Adaptive Skills section of the Battelle Developmental Screening Tool, the scores were as follows: All 44 children completed this portion of the exam. 14 children (31.8%) were at or above the level for their chronological age. Six children (13.6%) were -1 standard deviation away from the expected score. Fifteen (34.1%) of the children were -1.5 standard deviations below the expected score for their age, and 9 children (20.5%) were 2 or more standard deviations below the expected score for

their age. See Figure D.

The Personal-Social section of the exam had the following results: 10 (22.7%) of the 44 total children assessed scored at or above the appropriate level for their chronological age. Five children (11.4%) scored -1 standard deviation below the expected score for their chronological age. Seven (15.9%) of the children were -1.5 standard deviations below the expected score for their age, and 22 children (50%) were 2 or more standard deviations below the expected score for their age. See Figure D.

For the Communication Skills section of the Battelle Developmental Screening Tool, the scores were as follows: All 44 children completed this portion of the exam. Twelve children (27.3%) were at or above the level for their chronological age. Six children (13.6%) were -1 standard deviation away from the expected score. Seven (15.9%) of the children were -1.5 standard deviations below the expected score for their age, and 19 children (43.2%) were 2 or more standard deviations below the expected score for their age. See Figure D.

Figure D



The Motor section of the exam only 43 children completed this portion as one 56 month old child refused to complete this portion of the screening tool. Twenty-three (53.5%) of the 43 total children assessed scored at or above the appropriate level for their chronological age. Seven children (16.2%) scored -1 standard deviation below the expected score for their chronological age. Seven (16.2%) of the children were -1.5 standard deviations below the expected score for their age, and 6 children (13.9%) were 2 or more standard deviations below the expected score for

their age. See Figure D.

For the Cognitive Skills section of the Battelle Developmental Screening Tool included all 44 children. Seven children (15.9%) were at or above the level for their chronological age. Two children (4.5%) were -1 standard deviation away from the expected score. Five (11.4%) of the children were -1.5 standard deviations below the expected score for their age, and 30 children (68.2%) were 2 or more standard deviations below the expected score for their age. See Figure D.

The total score for the screening tool included only 43 children who received a total score. The child who did not complete the motor section of the screening tool could not be given a total score. There were 6 (13.9%) children who scored at or above the expected level for their age. Five (11.6%) of the children scored -1 standard deviation below the expected level. Eleven (25.6%) scores were -1.5 standard deviations below the expected, and 21 (48.8%) scored -2 standard deviations below the expected value.

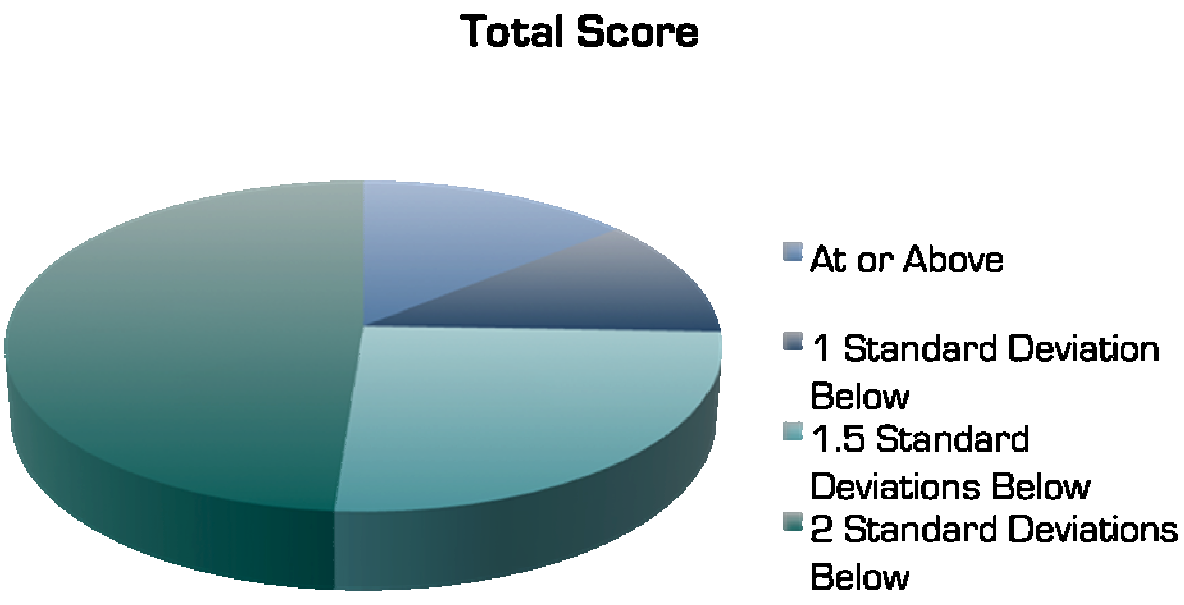
Each score was further correlated, from publisher-supplied tables, with an age equivalent. Forty-three total children received an age equivalent score. See Figure E. Two (4.7%) of those children's age equivalencies were greater than or

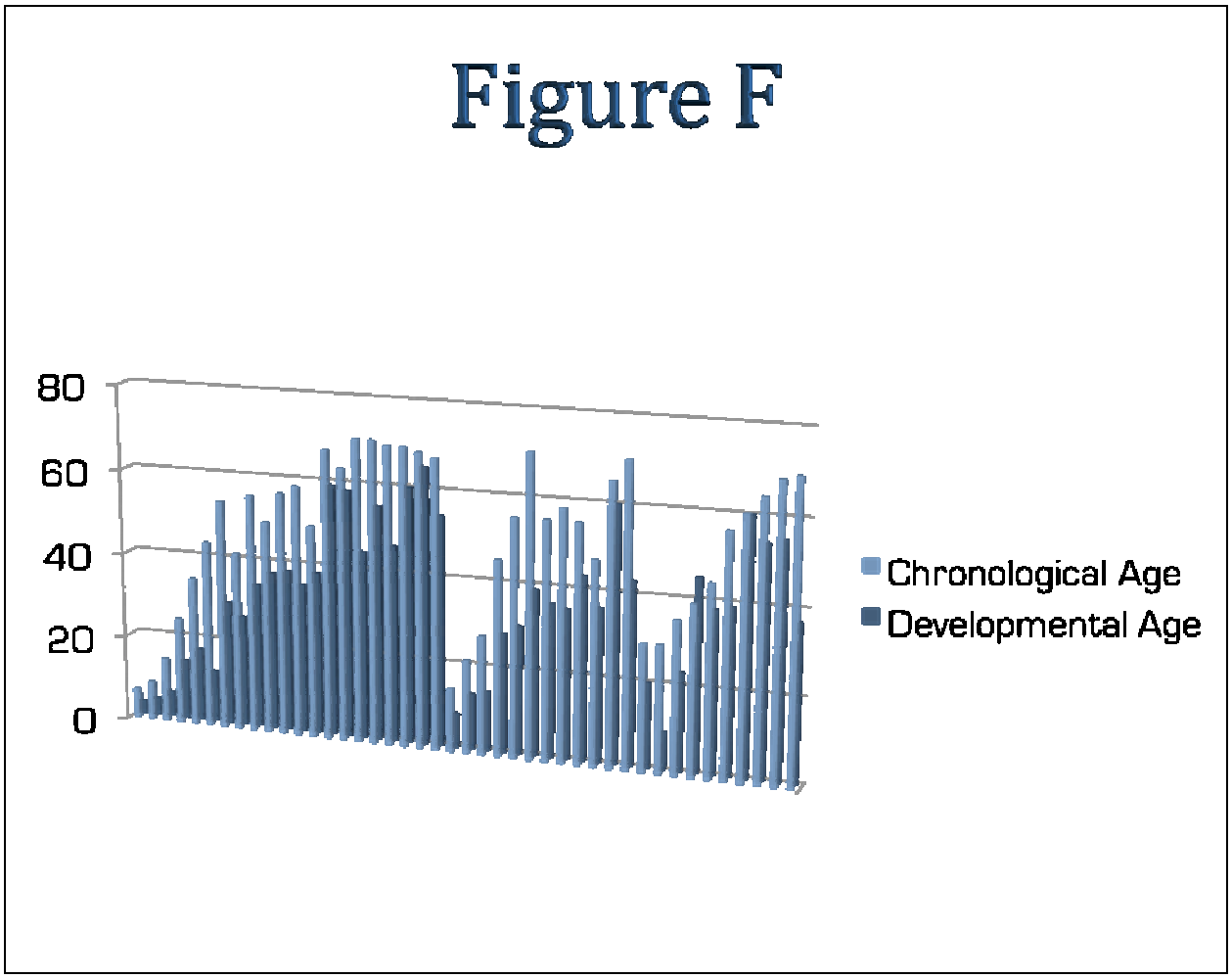
equal to their chronological age in months. Five (11.6%) were 6 months or less behind their chronological age. Twelve (27.9%) were 7-12 months behind their chronological age. Eleven (25.6%) were 13-18 months behind their chronological age. Six (14%) children were 19-24 months behind their chronological age, and the remaining 7 (16.3%) children were 25 or more months behind their chronological age. See Figure F.

Characteristics of Caregivers

Objective two was to determine characteristics of caregivers having frequent interactions with the orphans. Thirteen individuals who described themselves as having a primary role within the orphanage as caregiver of children were surveyed. Eight of the 13 (61.5%) work at Hogar Corazon Immaculado de Maria, and the remaining 5 (38.5%) work at Casa de Mi Padre. All of the caregivers surveyed were women. Although there were men present at both of the orphanages, none of them described their primary role to be Caregiver, but rather as custodian, gardener or security guard. The questionnaire used for these purposes can be found in Appendix C.

Figure E


Total Score
At or Above
1 Standard Deviation Below
1.5 Standard Deviations Below
2 Standard Deviations Below



Hogar Corazon Immaculado de Maria

The caregiver ages in years were as follows: 18, 21, 21, 24, 25, 27, 39, and 44. Caregivers stated that they spent anywhere from 2 to 24 hours per day with the children, with an average of 7.9 hours per day. Those working more hours as a general rule had one day off per week, and those working less, had weekends off. Of the 8 women at Hogar Corazon Immaculado de Maria, 4 had completed a university-level education, 3 had completed education through high

school, and 1 completed less than an eighth grade education. A university-level education in El Salvador consists of a 3-4 year program after high school typically with an emphasis towards specific job training such as nurse, social worker or teacher.

The orphanage had employed six of the eight women for 6 months or less. One woman had worked at the orphanage for 3 years and one other for 6 years. When questioned on amount of knowledge about child development, four of the women responded that they knew less than most people in their community about child development, 2 responded that they felt as though they knew as much as most people about child development, and 2 responded that they knew as much or more than most people about child development. Six of the women claimed to have had some formal education about child development. Two of the respondents had had no formal education in child development.

Casa de Mi Padre

The caregiver's ages in years were as follows: 26, 28, 31, 37, and 40. Caregivers stated that they spent anywhere from 8 to 24 hours per day with the children with an average of 18.4 hours per day. In the schedule at Casa de Mi Padre, caregivers worked 5 days and were off for 24 to 48 hours. Of the 5 women at Casa de Mi Padre, 2 had completed a

university-level education and 3 had completed education through high school. The caregivers had been employed for 8, 9, 10, 16 and 18 months. When questioned on amount of knowledge about child development, three caregivers responded that they felt as though they knew as much as most people about child development, and 2 responded that they knew more than most people about child development. All of the women claimed to have had some formal education about child development.

Strengths and Deficiencies

The third objective was to determine areas of strengths and deficiencies among the orphans in the areas of Personal-Social, Adaptive, Motor, Communications, and Cognition in order to make recommendations about developmentally appropriate caregiver interactions with orphans. The percentage of children scoring -1 standard deviation below the standard or higher were grouped with the percentage of those children scoring -1.5 standard deviation and -2 standard deviations below or less. The two sections that had the largest percentage of children scoring within the high group were Motor (69.8%) and Adaptive (45.4%) skills. The two sections that had the most children scoring in the lower half of the group were Personal-Social (65.9%) and Cognitive (79.6%). These are the two areas in which the principle investigator will make the most recommendations

for developmentally-appropriate interactions between the caregivers and orphans.

Level of Association

Objective 4 was to determine the level of association between characteristics of orphans with developmental milestone achievement.

Statistical analysis was completed on the compiled data for the total score as well as the scores in each of the five domains. All statistical tests were completed at the level of 0.05 statistical significance. A p-value significance was established at less than 0.05. Compiled statistical data can be found in Appendix B.

Statistical analysis assessed the impact of six independent variables on the orphans' developmental score in each of the five areas as well as on the total developmental score. The independent variables studied in this research were 1) length of time in the orphanage in months, 2) nutritional status as determined by a guide used by health care practitioners throughout El Salvador, 3) the age of each child at entrance to the orphanage, 4) the sex of the child, one orphanage environment versus the other, and 5) percentage of their life each child had spent in the orphanage.SAS was used to complete statistical analysis.

In analysis of each variable's impact on the developmental level in each of the five areas as well as the total developmental score, there was no evidence to show that the impact of the independent variable was statistically significant in the majority of cases.

For total developmental scores there is no statistically significant evidence to show that the impact of nutritional status on developmental scores. Nor is there statistically significant evidence to show the impact of which of the two orphanages the orphan resides at is significant to their developmental score. There was no statistically significant evidence to show that a child's age at admission to the orphanage had a significant impact of their developmental score. There is also no statistically significant evidence to show that the length of time a child has spent at the orphanage is significant to their total developmental score.

Adaptive Domain

There was no statistically significant evidence to show that the nutritional status of a child had a significant impact on the score in the adaptive domain. There was no statistically significant evidence to show that the placement into either of the orphanages had an impact on a child's score in the adaptive domain. There was no

statistically significant evidence to show that either a child's age at admission to the orphanage nor the length of time they had lived in the orphanage had a significant impact on their score in adaptation.

Personal Social Domain

There was no statistically significant evidence to show that a child's nutritional level had an impact on their score in the personal-social domain. The choice of orphanage, time spent in the orphanage and age at admission to the orphanage all showed no significant impact on a child's score in the personal-social domain.

Communication Domain

There is no statistically significant evidence to show that nutritional status had an impact on the communication domain score. There was no statistically significant evidence to show that residing in either orphanage was significant to the score in the communication domain, and no statistically significant evidence that a child's age at admission to the orphanage made a difference in communication domain score. Although not significant, there was a low association between the number of months a child spends in the orphanage and their communication score.

Motor Domain

There is statistically significant evidence to show that the impact of nutritional status on motor score is significant at .05 alpha. There was no evidence of a statistically significant difference between motor domain scores at either orphanage. Neither was there statistically significant evidence to show that the age at entrance to the orphanage had a significant impact on the motor domain score. There is a statistically significant association between the number of months in the orphanage and motor development score with p-value <0.05.

Cognitive Domain

There was no statistically significant evidence to show that the impact of nutritional status on cognitive score. The impact of nutritional status on cognitive domain score showed no statistically significant evidence. There was no statistically significant evidence to show that placement in either orphanage had an impact on cognitive domain score. Age at entrance to the orphanage and time spend in the orphanage also had no statistically significant impact on the score in the cognitive domain.

Model Caregiver Training Program

Next, the researcher determined the characteristics of a model caregiver-training program to be recommended for implementation at the orphanages in this study.

Data are provided from the Battelle Developmental Inventory Screening Tool as well as information gathered about the demographics of the caregivers themselves to develop a model program with the goal of improving the achievement of developmental milestones among the selected orphans and remaining sustainable in the future.

A program was developed by the principle investigator and implemented during 4 weeks of in-country emersion work. Those caregivers who were identified by the initial surveys to have the primary job of child care in one form or another were asked to gather at each orphanage for an introductory session with the principle investigator. The caregivers gathered in an area away from their usual responsibilities where distractions could be kept at a minimum. Initial sessions were held in the mornings when many children were at school and therefore the overall workload slightly decreased.

Each introductory session began with a discussion of the brain and basic information about what scientists and educators know about how children learn. Discussion about the huge changes that occur within a child's brain early in life were discussed and demonstrated graphically. Key points discussed at this introductory session included areas of the brain that develop early in life as well as the major physiologic changes that take place early in life.

Knowledge about the importance of language and talking to children, as shown in the research by Hart and Risley, was shared. Examples were shared of children who were deprived of early experiences and the devastating outcomes. Basic information about the five major developmental areas tested accompanied by examples of skills demonstrated in each area were shared.

The intent of this session was to build fundamental knowledge that the surveys demonstrated that most of the caregivers did not have. The principle investigator, coming from a background in elementary education, felt that once this foundation was laid, it would give participants a better base on which to build future knowledge.

At this introductory session, the caregivers were presented with a scaled-down version of the results of the developmental screening tool for the orphans in their care. Due to the limited education of some of the caregivers, as well as the abundance of information that was desired to be communicated in a short amount of time, only a limited sampling of the full set of results for each child was reported back at this time. Each caregiver was given a list reporting each child by name and age in months. Each child's score was reported in age equivalence in months. The principle investigator made the decision to report results in this manner, as age was a meaningful unit understood by

all participants and did not require knowledge of standard deviations or scientific reporting.

The reporting sheets given to each caregiver also included the five areas tested by the Battelle Developmental Inventory Screening Tool. Next to each child's name were highlighted the areas in which they scored below a passing level. The purpose of this procedure was to show which areas should be emphasized with each child. Caregivers were given time to look through the results and ask any questions they had at that time regarding the information they had been given. Special emphasis was placed by the principle investigator on the positive aspects of the survey, including the child who had developmental scores that were at or above their chronological age and the fact that many children were meeting these goals in the motor skills section. The principle investigator also emphasized that, although there was work to be done, the hope was that the program would not add more work to their already busy schedule, but rather help them to work smarter and make the same interactions they already have with the children more meaningful and developmentally-appropriate.

Information sheets were prepared by the principle investigator for each of the developmental areas assessed by the Battelle Developmental Inventory Screening Tool (See Appendix D). The information sheets included

developmentally-appropriate skills for each age range, in the same groupings the screening tool had used. The skills lists were adapted from the Screening Instrument skills tested and from the Denver Developmental Screening Inventory. Included in the column next to skill was a list of activities that could be done in order to promote the acquisition of this particular skill or others. The activities suggested by the principle investigator were intended to be small modifications to current interactions, and able to be completed with materials easily accessible within the orphanage.

The information sheets were printed on colored paper matching the color highlighted on the list of children given to each caregiver. This was completed with the idea that it would facilitate easy use of both sets of information. The information sheets were explained to the caregivers with an emphasis on the fact that these were intended to be a guide to enhancing interactions between children and caregivers.

Information was given and explained to the group as a whole with the idea that this was merely an introduction, and all information would be reviewed and enhanced upon during individual sessions. In this way, all caregivers were exposed to the concepts that they would be working with in their individual sessions. Individual sessions were subsequently scheduled with each of the caregivers during

the next three weeks. Sessions were scheduled during the time when caregivers had primary responsibility for their group of children to facilitate demonstration of techniques. Caregivers also had the option to request a time when they were not actively involved with children if they wanted to plan with the principle investigator. Each caregiver was scheduled for a minimum of three individual sessions.

With so much material to cover, and a limited amount of time to work with the caregivers, the principle investigator opted to focus on the how the caregivers communicated with the children. The research from Hart and Risley showed that the number of words children hear early in life dramatically affects later outcomes in intelligence. It was felt by the principle investigator that working with the caregivers on making their routine communications more effective would provide the best opportunity to effect many developmental areas.

During individual sessions, the principle investigator demonstrated initiating both discussion and question lines with the children. The principle investigator read books with the children in an interactive manner, played word games, directed play among the orphans and provided new games and toys for the children to experience. Throughout this process, the principle investigator encouraged the caregiver to observe and ask questions and then to quickly

become an active participant, following the modeled behavior and adapting it to their personal comfort level. With each additional session, the principle investigator encouraged caregivers to go beyond their comfort level.

It was also the hope of the principle investigator that by introducing these new activities and games to the children, the children would enjoy them enough to continue requesting them, and therefore the caregivers would continue these improved interactions.

At the conclusion of the final session with the principle investigator, each caregiver was given a survey to complete regarding their experience during the training. It is from these surveys, as well as from the experiences of the principle investigator, that the recommendations will be made for the model-caregiver training program.

The program was evaluated by the participants at the conclusion of their sessions with the principle investigator. The purpose of this evaluation was to determine the instructional effectiveness of the “Child Development Training Program” presented during the month of December 2007 to the caregivers at the two orphanages involved in the study. The evaluation was intended to be both developmental and formative in nature, assessing the learning, transfer of knowledge and impact of the “Child

Development Training Program" on the participants. The results were used to make improvements to the workshop with the goal of creating a user-friendly, sustainable program. The overall evaluation of this initial implementation was intended to collect information on the following broad questions in order to improve the program:

- Did the participants enjoy the program and think their time was well spent?
- How much knowledge did the participants gain?
- Did the program change their behavior during their interactions with the children?
- What obstacles do the caregivers anticipate in the implementation of their new skills?

The post-course evaluation included the following statements and questions:

1. The training program was worth my time.

2. I felt the amount of time spent on the training was...

3. What information did you learn in the workshops that you can use in your work?

4. Will information you learned change the way you interact with the children you care for?

5. Where did you get the majority of the information you learned during this training?

6. Would you like more information about child development?

7. What skill or skills did you learn from the workshops that you consider valuable to your professional practice?

8. As a result of the training, what, if anything, will you do differently when working with the children you care for?

9. What problems do you think you might encounter when implementing the new strategies?

The questions asked of the participants in their evaluation of the program helped to determine the following

information: 1) The appropriateness of the time allotment needed for training activities was informed by questions 1, 2 and 6 within the evaluation piece. 2) Type of training desired by the caregivers was informed by question 5. 3) Questions 3, 5 and 7 were to inform the principle investigator of the type of skills actually learned through each of the planned sessions and to evaluate whether the

specified goals of each day of training were met. 4) The principle investigator's goals included making changes in behavior during caregiver-orphan interactions. These specific changes were evaluated through the eyes of the participants in questions 4 and 8. 5) In the implementation of any new program, potential road-blocks to implementation

exist, and these were evaluated in question 9 of the post-course evaluation.

The evaluation was given to all those employees at both orphanages who participated in the Child Development Training Program during the initial implementation stage in December. There were 5 women participating in the training at Casa de Mi Padre and 7 women participating at Hogar Immaclado Corazon de Maria. The participants represented a diverse group of caregivers, including child psychologists, nuns, primary caregivers and social workers.

Limitations to this survey existed in both a language barrier and the literacy level of the participants. To overcome any possible language issues, the principle investigator had the translated version of the survey read by 2 native speakers who also have a firm grasp of the English language. A third American with more Spanish experience than the principle investigator also checked for clarity and meaning. To assure that those with lower literacy levels could complete the survey, they were teamed with a partner to help them.

Information gathered from these surveys revealed an overwhelming feeling of success. Responses on the survey were either open-ended free responses or on a five-point scale strongly agree to strongly disagree.

KEY QUESTIONS AND PERTINENT RESULTS

1. *Did the participants enjoy the program and think their time was well spent?*

Responses from questions 1 and 2

All of the participants felt as though the training was worth their time, with 10 out of 12 strongly agreeing with the statement, "The training program was worth my time". When questioned on the amount of time actually spent in training participants responded "Enough time" and "Too little time" with equal frequency, but when responses were matched with the number of sessions each respondent completed, it was often the case that those who received fewer sessions responded "Too little time" and those with more sessions felt as though they had sufficient time. One exception was a person who completed 9 sessions and felt as though they would have liked more time. It is easy to understand this respondent's feelings - she had many challenges within her group of children, and was continuing to gain many skills as we worked together.

2. *How much knowledge did the participants gain?*

Responses from questions 3, 6 and 7

The participants responded by citing a large amount of knowledge gained during the sessions. The most basic

comments often struck me as most important. When one responder mentioned learning that the caregiver should talk more with the children with whom they work, s/he identified the fundamental understanding of this entire project. Also, the responses were indications that the program did not just deliver esoteric information, but inspired true change in the caregivers' daily interactions with those children under their care.

3. *Did the program change caregivers' behavior during their interactions with the children for whom they care?*

   Responses from questions 4 and 8

   The responses in this area reflect many basic behavioral changes and may represent big changes in the lives of the children with whom they work. Behaviors as simple as talking to the children more and dividing the children into smaller groups for learning signify that the caregivers have gained a much clearer understanding of the way children learn.

Overall, the evaluation results demonstrated feelings of success on the part of the participants. The feedback from the participants was positive and reflected specific growth in knowledge on the subject.

Based on the feedback, recommendations for further development should include continuing sessions for the staff in child development. All participants indicated that they would like more information, and at one of the two orphanages that participated, continuing sessions have already been established and are directed by the psychologist employed by the orphanage.

Chapter 5

Summary, Discussion, Conclusions and Recommendations

Summary/Discussion

The purpose of this study was to determine milestone achievement and environmental impact among Salvadorian orphans at selected sites in order to make recommendations for appropriate training materials to allow for the mentoring of caregivers to advance milestone achievement among the orphans. The following objectives were addressed in context of two investigator selected orphanages in El Salvador:

1. Determine the current level of development of orphans using the Battelle Developmental Inventory Screening Test.

2. Determine characteristics of caregivers who have frequent interactions with the orphans.

3. Determine areas of strength and deficiency among the orphans with respect to Personal-Social, Adaptive, Motor, Communications, and Cognition.

4. Determine the level of association between selected characteristics of orphans with developmental milestone achievement.

5. Develop a model caregiver-training program for implementation at the two selected orphanages based on investigator derived characteristics and related findings.

Chapter Four explained how the information was gathered, and how findings from the completed Battelle Developmental Inventory Screening Tools provided the information to meet these objectives. In addition, there is a discussion of the Caregiver Training Program that was implemented during the principle investigator's last month in El Salvador in response to Objective 5.

Chapter Five includes the summary, conclusions and recommendations for future research.

Conclusions

Current Status of Orphan Development. Batelle Developmental Inventory Screening Tool in Spanish was completed on 34 qualifying children at Hogar Immaculado Corazon de Maria orphanage and an additional ten Screening Tools were completed on qualifying children at Casa de Mi Padre. The level of achievement of developmental milestones among the selected orphans was below the expected level for their chronological age.

Characteristics of Caregivers. The caregivers employed by the two orphanages were a diverse group of individuals from a variety of backgrounds. The majority of them described

themselves as not having formal education in child development. The strong interest they demonstrated during the training program indicated an eagerness and willingness to learn.

Strengths and Deficiencies. The areas of greatest deficiency were communication and cognitive scores. The areas of relative strength were Adaptive and Motor skills.

Level of Association. There were few statistically significant relationships between the selected independent variables and the scores on the screening tool. There was statistically significant evidence to show an association between motor scores and both the child's nutritional status and the number of months they have spent in the orphanage. Months spent in the orphanage also show some evidence of association with communication scores.

Model Caregiver-Training Program. The conclusion for objective 5 is that a model intervention program was successfully implemented and should be part of an on-going training program.

Recommendations for Future Research

1. For a more complete picture, use the Battelle Developmental Inventory rather than the Screening Tool in order to more fully breakdown where the children's individual areas of strength and weakness are in order

to better meet their needs. This would require a longer period of time per child.

2. Assess children living in a more traditional family unit to compare their development with the development of participants of the present study.

3. Include a sample size large enough to encompass a sufficient number of communities in order to enhance the extent findings can be generalized to a broader population.

4. Formulate a more specific, session-by-session program for caregiver training.

5. Assess a group of children using Battelle Developmental Inventory Screening Tool, both before and at regular intervals after the Caregiver Training Program has been implemented to assess effectiveness of training.

6. Determine the factors that influence the caregivers' ability to fully implement learned strategies.

The present study provides insight into not only the need for more child-development-centered training for orphanage caregivers, but also the desire of these hard-working individuals to improve their practice for the betterment of the children they serve.

Making caregiver training programs more readily available is only the first step of the process. Providing materials and facilities that allow for these caregivers to continue implementing best-practice strategies remains a challenge to be overcome.

In the future, a long-range program with plans for development and continued maintenance is a goal for the principle investigator, with the challenge to find continued support for implementation. The program implemented in the Not by Bread Alone project showed that even with demonstrated acceleration of motor and cognitive development among program recipients, programs like this are difficult to sustain over long periods of time (Taneja et al., 2005).

Casa de mi Padre, at the time of research, employed a child psychologist who took on the challenge of continuing to train and motivate staff. Having a person within the internal structure of a group may provide greater likelihood of success.

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Appendix A: Results

ID #	Orphanage	Gender	Age in Months	Nutritional Status		**Adaptation**	Raw Score	Pass Cut-off Score	Difference	Standard Deviation	Cut-off Score		**Personal-Social**	Raw Score	Pass Cut-off Score	Difference	Standard Deviation	Cut-off Score		**Communication**	Raw Score	Pass Cut-off Score	Difference	Standard Deviation	Cut-off Score		**Motor**	Raw Score	Pass Cut-off Score	Difference	Standard Deviation	Cut-off Score		**Cognitive**	Raw Score	Pass Cut-off Score	Difference	Standard Deviation	Cut-off Score		**Total Screening Score**	Raw Score	Pass Cut-off Score	Difference	Standard Deviation	Cut-off Score		Age Equivalent (Months)	el	Difference		Months in Orphanage	Age at Admission to Orphanage (Months)	Percentage of life spent in orphanage
01-01-30	1	F	30	L			21	18	3		17	PASS		17	19	-2.00	-1	18	REFER		16	19	-3	-1.5	16	REFER		20	20	0		19	PASS		15	18	-3	-1.5	16	REFER		89	93		-1	92	REFER		20	30	-10		23	7	77
01-02-61	1	F	61	N			30	32	-2	-1.5	30	REFER		40	35	5.00		34	PASS		31	32	-1	-1	31	REFER		40	33	7		32	PASS		33	33	0		32	PASS		174	166	8		165	PASS		63	61	2		58	3	95
01-03-69	1	F	69	N			29	32	-3	-1.5	30	REFER		35	35	0.00		34	PASS		30	32	-2	-1	31	REFER		37	33	4		32	PASS		26	33	-7	-2	29	REFER		157	166	-9	-1.5	159	REFER		55	69	-14		33	36	48
01-04-36	1	F	36	M			21	24	-3	-1.5	21	REFER		17	25	-8.00	-2	19	REFER		20	25	-5	-2	19	REFER		21	22	-1	-1	21	REFER		18	23	-5	-2	19	REFER		97	119	-22	-2	104	REFER		23	36	-13		28	8	78
01-05-65	1	M	65	L			30	32	-2	-1.5	30	REFER		30	35	-5.00	-2	30	REFER		35	32	3		31	PASS		35	33	2		32	PASS		25	33	-8	-2	29	REFER		155	166	-11	-1.5	159	REFER		54	65	-11		48	17	74
01-06-70	1	M	70	N			30	32	-2	-1.5	30	REFER		26	35	-9.00	-2	30	REFER		22	32	-10	-2	27	REFER		26	33	-7	-2	28	REFER		20	33	-13	-2	29	REFER		124	166	-42	-2	153	REFER		37	70	-33		64	6	91
01-07-40	1	M	40	L			29	24	5		23	PASS		32	25	7.00		18	PASS		34	25	9		24	PASS		25	22	3		19	PASS		20	23	3		17	PASS		140	119	21		92	PASS		45	40	5		33	7	83
01-08-30	1	M	30	N			8	18	-10	-2	14	REFER		6	19	-13	-2	14	REFER		8	19	-11	-2	15	REFER		15	20	-5	-2	16	REFER		8	18	-10	-2		REFER		45	93	-48	-2	79	REFER		9	30	-21		23	7	77
01-09-57	1	F	57	L			25	26	-1	-1	25	REFER		26	30	-4	-1.5	27	REFER		30	27	3		26	PASS		27	26	1		25	PASS		22	27	-5	-2	22	REFER		130	140	-10	-1.5	132	REFER		39	57	-18		33	24	42
01-10-45	1	F	45	N			24	24	0		23	PASS		25	25	0		24	PASS		30	25	5		24	PASS		24	22	2		21	PASS		24	23	1		22	PASS		127	119	8		118	PASS		38	45	-7		42	3	93
02-34-70	2	F	70	L			26	32	-6	-2	28	REFER		30	35	-5	-2	30	REFER		29	32	-3	-1.5	29	REFER		34	33	1		32	PASS		22	33	-11	-2	29	REFER		141	166	-25	-2	153	REFER		46	70	-24		38	32	54
02-33-71	2	F	71	N			30	32	-2	-1.5	30	REFER		28	35	-7	-2	30	REFER		32	32	0		32	PASS		38	33	5		32	PASS		29	33	-4	-2	29	REFER		157	166	-9	-1	165	REFER		55	71	-16		46	25	65
02-32-71	2	F	71	L			29	32	-3	-1.5	30	REFER		25	35	-10	-2	30	REFER		31	32	-1	-1	31	REFER		34	33	1		32	PASS		18	33	-15	-2	29	REFER		137	166	-29	-2	153	REFER		44	71	-27		46	25	65
02-31-57	2	F	57	N			24	26	-2	-1.5	24	REFER		24	30	-6	-2	25	REFER		24	27	-3	-1.5	24	REFER		31	26	5		25	PASS		24	27	-3	-1.5	24	REFER		127	140	-13	-1.5	132	REFER		38	57	-9		38	19	67
02-30-64	2	F	64	N			31	32	-1	-1	31	REFER		34	35	-1	-1	34	REFER		28	32	-4	-2	29	REFER		39	33	6		32	PASS		30	33	-3	-1	31	REFER		162	166	-4	-1	165	REFER		58	64	-6		58	6	91
02-29-54	2	F	54	L			24	26	-2	-1.5	24	REFER		22	30	-8	-2	25	REFER		19	27	-8	-2	22	REFER		22	26	-4	-1.5	23	REFER		19	27	-8	-2	22	REFER		106	140	-34	-2	124	REFER		29	54	-25		12	42	22
02-28-71	2	M	71	M			22	32	-10	-2	28	REFER		24	35	-9	-2	30	REFER		28	32	-4	-1.5	29	REFER		30	33	-3	-1.5	30	REFER		26	33	-7	-2	29	REFER		130	166	-36	-2	153	REFER		39	71	-32		11	60	15
02-27-50	2	F	50	L			25	26	-1	-1	25	REFER		24	30	-6	-2	25	REFER		33	27	6		26	PASS		25	26	-1	-1	25	REFER		20	27	-7	-2	22	REFER		127	140	-13	-1.5	132	REFER		38	50	-12		22	28	44
02-26-68	2	F	68	L			28	32	-4	-2	28	REFER		39	35	4		34	PASS		38	32	6		31	PASS		36	33	3		32	PASS		24	33	-9	-2	29	REFER		165	166	-1	-1	165	REFER		59	68	-9		40	28	59
02-25-56	2	M	56	>N			26	26	0		25	PASS		16	30	-14	-2	25	REFER		34	27	7		26	PASS		36	26	10		25	PASS		23	27	-4	-1.5	24	REFER		135	140	-5	-1	139	REFER		43	56	-13		33	23	59
02-24-56	2	M	56	L			26	26	0		25	PASS		24	30	-6	-2	25	REFER		22	27	-5	-2	22	REFER		26	26	0		25	PASS		22	27	-5	-2	22	REFER		120	140	-20	-2	124	REFER		36	56	-20		24	22	43
02-23-56	2	F	56	N			24	26	-2	-1.5	24	REFER		22	30	-8	-2	25	REFER		20	27	-7	-2	22	REFER		REFUSED	26		RIF USED	REFUSED	REFUSED		22	27	-5	-2	22	REFER			140							56			11	45	20
02-22-59	2	F	59	L			23	26	-3	-1.5	24	REFER		26	30	-4	-1.5	27	REFER		26	27	-1	-1	26	REFER		24	26	-2	-1	25	REFER		17	27	-10	-2	22	REFER		116	140	-24	-2	124	REFER		35	59	-24		1	58	2
02-21-48	2	M	48	N			23	26	-3	-1.5	24	REFER		19	30	-11	-2	24	REFER		32	27	5		26	PASS		26	26	0		25	PASS		22	27	-5	-2	22	REFER		122	140	-18	-2	124	REFER		36	48	-12		26	22	54
02-20-50	2	F	50	L			24	26	-2	-1.5	24	REFER		23	30	-7	-2	25	REFER		23	27	-4	-1.5	24	REFER		29	26	3		25	PASS		27	27	0		26	PASS		126	140	-14	-1.5	132	REFER		37	50	-13		6	44	12
02-19-56	2	F	56	N			24	26	-2	-1.5	24	REFER		23	30	-7	-2	25	REFER		20	27	-7	-2	22	REFER		23	26	-3	-1.5	23	REFER		24	27	-3	-1.5	24	REFER		114	140	-26	-2	124	REFER		34	56	-22		15	41	27
02-18-44	2	F	44	M			18	24	-6	-2	19	REFER		19	25	-6	-2	19	REFER		13	25	-12	-2	20	REFER		19	22	-3	-1.5	20	REFER		14	23	-9	-2	19	REFER		65	119	-54	-2	104	REFER		12	44	-32		10	34	23
02-17-59	2	M	59	L			26	26	0		25	PASS		22	30	-8	-2	25	REFER		26	27	-1	-1	26	REFER		22	26	-4	-1.5	23	REFER		20	27	-7	-2	22	REFER		116	140	-24	-2	124	REFER		35	59	-24		1	58	2
02-16-56	2	M	56	L			22	26	-4	-2	22	REFER		24	30	-6	-2	25	REFER		18	27	-9	-2	22	REFER		24	26	-2	-1	25	REFER		19	27	-8	-2	22	REFER		107	140	-33	-2	124	REFER		30	56	-26		13	43	23
02-15-46	2	M	46	L			20	24	-4	-1.5	21	REFER		22	25	-3	-1	24	REFER		20	25	-5	-2	20	REFER		22	22	0		21	PASS		21	23	-2	-1	22	REFER		105	119	-14	-1.5	111	REFER		28	46	-18		13	33	28
02-14-42	2	F	42	N			23	24	-1	-1	23	REFER		18	25	-8	-2	19	REFER		19	25	-6	-2	20	REFER		23	22	1		21	PASS		19	23	-4	-2	19	REFER		102	119	-17	-2	104	REFER		26	42	-16		6	36	14
02-13-35	2	F	35	M			21	18	3		17	PASS		21	19	2		18	PASS		10	19	-9	-2	15	REFER		18	20	-2	-1.5	18	REFER		11	18	-7	-2	14	REFER		81	93	-12	-1.5	86	REFER		17	35	-18		10	25	29
02-12-28	2	M	28	L			18	18	0		17	PASS		15	19	-4	-1.5	16	REFER		11	19	-8	-2	15	REFER		17	20	-3	-1.5	18	REFER		10	18	-8	-2	14	REFER		71	93	-22	-2	79	REFER		14	28	-14		11	17	39
02-11-25	2	F	25	L			19	18	1		17	PASS		16	19	-3	-1.5	16	REFER		11	19	-8	-2	15	REFER		15	20	-5	-2	16	REFER		11	18	-7	-2	14	REFER		72	93	-21	-2	79	REFER		14	25	-11		13	12	52
02-10-22	2	M	22	M			18	16	2		15	PASS		15	14	1		13	PASS		10	14	-4	-2	10	REFER		14	15	-1	-1	14	REFER		10	15	-5	-2	11	REFER		67	78	-11	-1.5	70	REFER		13	22	-9		18	4	82
02-09-15	2	M	15	L			13	11	2		10	PASS		8	11	-3	-1.5	8	REFER		7	12	-5	-2	9	REFER		7	12	-5	-2	8	REFER		5	12	-7	-2	8	REFER		40	59	-19	-2	45	REFER		8	15	-7		14	1	93
02-08-15	2	F	15	L			11	11	0		10	PASS		6	11	-5	-2	6	REFER		5	12	-7	-2	6	REFER		8	12	-4	-2	8	REFER		6	12	-6	-2	8	REFER		36	59	-23	-2	45	REFER		6	15	-9		13	2	87
02-07-09	2	F	9	KETAMA			5	6	-1	-1	5	REFER		7	7	0		6	PASS		5	6	-1	-1	5	REFER		4	7	-3	-2	4	REFER		4	7	-3	-1.5	5	REFER		25	36	-11	-1.5	30	REFER		4	9	-5		8	1	89
02-06-07	2	F	7	N			3	6	-3	-2	3	REFER		6	7	-1	-1	6	REFER		4	6	-2	-1.5	4	REFER		6	7	-1	-1	6	REFER		3	7	-4	-2	3	REFER		22	36	-14	-2	24	REFER		3	7	-4		6	1	86
02-05-69	2	F	69	N			34	32	2		31	PASS		36	35	1		34	PASS		33	32	1		31	PASS		40	33	7		32	PASS		35	33	2		32	PASS		178	166	12		165	PASS		65	69	-4		25	44	36
02-04-71	2	M	71	N			27	32	-5	-2	28	REFER		32	35	-3	-1.5	32	REFER		21	32	-11	-2	27	REFER		33	33	0		32	PASS		23	33	-10	-2	29	REFER		136	166	-30	-2	153	REFER		43	71	-28		24	47	34
02-03-66	2	M	66	N			31	32	-1	-1	31	REFER		33	35	-2	-1	34	REFER		33	32	1		31	PASS		36	33	3		32	PASS		34	33	1		32	PASS		167	166	1		165	PASS		60	66	-6		18	48	73
02-02-70	2	F	70	N			32	32	0		31	PASS		35	35	0		34	PASS		29	32	-3	-1.5	29	REFER		36	33	3		32	PASS		34	33	1		32	PASS		166	166	0		165	PASS		60	70	-10		45	25	64
02-01-69	2	F	69	N			28	32	-4	-2	28	REFER		32	35	-3	-1.5	32	REFER		34	32	2		31	PASS		32	33	-1	-1	32	REFER		28	33	-5	-2	32	REFER		154	166	-12	-1.5	159	REFER		54	69	-15		6	63	9

Appendix B: SAS Results

Statistical Analysis Result by using SAS

- Please check the excel file, coding sheet for the abbreviation of the variables.
- All statistical tests are at the level of 0.05 statistical significance.
- p-value <0.05 means the effect is significant, otherwise is not significant.

Association of months in orphanage in Cognitive Score

1

Obs	id_	Or	ge	age1	ns	ar	ac	ad	pa	pc	pd	cr	cc	cd
1	01-01-30	1	F	30	L	21	18	3	17	19	-2	16	19	-3
2	01-02-61	1	F	61	N	30	32	-2	40	35	5	31	32	-1
3	01-03-69	1	?F	69	N	29	32	-3	35	35	0	30	32	-2
4	01-04-36	1	F	36	M	21	24	-3	17	25	-8	20	25	-5
5	01-05-65	1	M	65	L	30	32	-2	30	35	-5	35	32	3
6	01-06-70	1	M	70	N	30	32	-2	26	35	-9	22	32	-10
7	01-07-40	1	M	40	L	29	24	5	32	25	7	34	25	9
8	01-08-30	1	M	30	N	8	18	-10	6	19	-13	8	19	-11
9	01-09-57	1	F	57	L	25	26	-1	26	30	-4	30	27	3
10	01-10-45	1	F	45	N	24	24	0	25	25	0	30	25	5
11	02-34-70	2	F	70	L	26	32	-6	30	35	-5	29	32	-3
12	02-33-71	2	F	71	N	30	32	-2	28	35	-7	32	32	0
13	02-32-71	2	F	71	L	29	32	-3	25	35	-10	31	32	-1
14	02-31-57	2	F	57	N	24	26	-2	24	30	-6	24	27	-3
15	02-30-64	2	F	64	N	31	32	-1	34	35	-1	28	32	-4
16	02-29-54	2	F	54	L	24	26	-2	22	30	-8	19	27	-8
17	02-28-71	2	M	71	M	22	32	-10	24	35	-9	28	32	-4
18	02-27-50	2	F	50	L	25	26	-1	24	30	-6	33	27	6

19	02-26-68	2	F	68	L	28	32	-4	39	35	4	38	32	6
20	02-25-56	2	M	56	N	26	26	0	16	30	-14	34	27	7
21	02-24-56	2	M	56	L	26	26	0	24	30	-6	22	27	-5
22	02-23-56	2	F	56	N	24	26	-2	22	30	-8	20	27	-7
23	02-22-59	2	F	59	L	23	26	-3	26	30	-4	26	27	-1

Obs	mr	mc	md	cor	coc	cod	tr	tc	td	agee	agec	agec1	minor	agead
1	20	20	0	15	18	-3	89	93	-4	20	30	-10	23	7
2	40	33	7	33	33	0	174	166	8	63	61	2	58	3
3	37	33	4	26	33	-7	157	166	-9	55	69	-14	33	33
4	21	22	-1	18	23	-5	97	119	-22	23	36	-13	28	8
5	35	33	2	25	33	-8	155	166	-11	54	65	-11	48	17
6	26	33	-7	20	33	-13	124	166	-42	37	70	-33	64	6
7	25	22	3	20	23	3	140	119	21	45	40	5	33	7
8	15	20	-5	8	18	-10	45	93	-48	9	30	-21	23	7
9	27	26	1	22	27	-5	130	140	-10	39	57	-18	33	24
10	24	22	2	24	23	1	127	119	8	38	45	-7	42	3
11	34	33	1	22	33	-11	141	166	-25	46	70	-24	38	32
12	38	33	5	29	33	-4	157	166	-9	55	71	-16	46	25
13	34	33	1	18	33	-15	137	166	-29	44	71	-27	46	25
14	31	26	5	24	27	-3	127	140	-13	38	57	-9	38	19
15	39	33	6	30	33	-3	162	166	-4	58	64	-6	58	6
16	22	26	-4	19	27	-8	106	140	-34	29	54	-25	12	42
17	30	33	-3	26	33	-7	130	166	-36	39	71	-32	11	60
18	25	26	-1	20	27	-7	127	140	-13	38	50	-12	22	28
19	36	33	3	24	33	-9	165	166	-1	59	68	-9	40	28
20	36	26	10	23	27	-4	135	140	-5	43	56	-13	33	23
21	26	26	0	22	27	-5	120	140	-20	36	56	-20	24	22
22	.	26	.	22	27	-5	.	140	.	.	56	.	11	45
23	24	26	-2	17	27	-10	116	140	-24	35	59	-24	1	58

Obs	id_	Or	ge	age1	ns	ar	ac	ad	pa	pc	pd	cr	cc	cd
24	02-21-48	2	M	48	N	23	26	-3	19	30	-11	32	27	5
25	02-20-50	2	F	50	L	24	26	-2	23	30	-7	23	27	-4
26	02-19-56	2	F	56	N	24	26	-2	23	30	-7	20	27	-7
27	02-18-44	2	F	44	M	18	24	-6	19	25	-6	13	25	-12
28	02-17-59	2	M	59	L	26	26	0	22	30	-8	26	27	-1
29	02-16-56	2	M	56	L	22	26	-4	24	30	-6	18	27	-9
30	02-15-46	2	M	46	L	20	24	-4	22	25	-3	20	25	-5
31	02-14-42	2	F	42	N	23	24	-1	18	25	-8	19	25	-6
32	02-13-35	2	F	35	M	21	18	3	21	19	2	10	19	-9
33	02-12-28	2	M	28	L	18	18	0	15	19	-4	11	19	-8
34	02-11-25	2	F	25	L	19	18	1	16	19	-3	11	19	-8
35	02-10-22	2	M	22	M	18	16	2	15	14	1	10	14	-4
36	02-09-15	2	M	15	L	13	11	2	8	11	-3	7	12	-5
37	02-08-15	2	F	15	L	11	11	0	6	11	-5	5	12	-7
38	02-07-09	2	F	9	.	5	6	-1	7	7	0	5	6	-1
39	02-06-07	2	F	7	N	3	6	-3	6	7	-1	4	6	-2
40	02-05-69	2	F	69	N	34	32	2	36	35	1	33	32	1
41	02-04-71	2	M	71	N	27	32	-5	32	35	-3	21	32	-11
42	02-03-66	2	M	66	N	31	32	-1	33	35	-2	33	32	1
43	02-02-70	2	F	70	N	32	32	0	35	35	0	29	32	-3
44	02-01-69	2	F	69	N	28	32	-4	32	35	-3	34	32	2

Obs	mr	mc	md	cor	coc	cod	tr	tc	td	agee	agec	agec1	minor	agead
24	26	26	0	22	27	-5	122	140	-18	36	48	-12	26	22
25	29	26	3	27	27	0	126	140	-14	37	50	-13	6	44
26	23	26	-3	24	27	-3	114	140	-26	34	56	-22	15	41
27	19	22	-3	14	23	-9	65	119	-54	12	44	-32	10	34
28	22	26	-4	20	27	-7	116	140	-24	35	59	-24	1	58
29	24	26	-2	19	27	-8	107	140	-33	30	56	-26	13	43
30	22	22	0	21	23	-2	105	119	-14	28	46	-18	13	33
31	23	22	1	19	23	-4	102	119	-17	26	42	-16	6	36

32	18	20	-2	11	18	-7	81	93	-12	17	35	-18	10	25
33	17	20	-3	10	18	-8	71	93	-22	14	28	-14	11	17
34	15	20	-5	11	18	-7	72	93	-21	14	25	-11	13	12
35	14	15	-1	10	15	-5	67	78	-11	13	22	-9	18	4
36	7	12	-5	5	12	-7	40	59	-19	8	15	-7	14	1
37	8	12	-4	6	12	-6	36	59	-23	6	15	-9	13	2
38	4	7	-3	4	7	-3	25	36	-11	4	9	-5	8	1
39	6	7	-1	3	7	-4	22	36	-14	3	7	-4	6	1
40	40	33	7	35	33	2	178	166	12	65	69	-4	25	44
41	33	33	0	23	33	-10	136	166	-30	43	71	-28	24	47
42	36	33	3	34	33	1	167	166	1	60	66	-6	18	48
43	36	33	3	34	33	1	166	166	0	60	70	-10	45	25
44	32	33	-1	28	33	-5	154	166	-12	54	69	-15	6	63

The FREQ Procedure

ns

ns	Frequency	Percent	Cumulative Frequency	Cumulative Percent
.	1	2.27	1	2.27
L	19	43.18	20	45.45
M	5	11.36	25	56.82
N	19	43.18	44	100.00

The GLM Procedure

Class Level Information

Class	Levels	Values
ns	4	. L M N

Number of observations 44

NOTE: Due to missing values, only 43 observations can be used in this analysis.

Impact of Nutritional Status on Developmental Score
5

The GLM Procedure

Dependent Variable: td td

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	915.323813	305.107938	1.35	0.2738
Error	39	8846.304094	226.828310		
Corrected Total	42	9761.627907			

R-Square	Coeff Var	Root MSE	td Mean
0.093768	-94.68060	15.06082	-15.90698

Source	DF	Type I SS	Mean Square	F Value	Pr > F
ns	3	915.3238134	305.1079378	1.35	0.2738

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ns	3	915.3238134	305.1079378	1.35	0.2738

That means, there is no evidence to show that Impact of Nutritional Status on Developmental Score is significant.

Impact of Orphanage on Developmental Score
6

The GLM Procedure

Class Level Information

Class	Levels	Values
Or	2	1 2

Number of observations 44

NOTE: Due to missing values, only 43 observations can be used in this analysis.

Impact of Orphanage on Developmental Score
7

The GLM Procedure

Dependent Variable: td td

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	326.667301	326.667301	1.42	0.2403
Error	41	9434.960606	230.120990		
Corrected Total	42	9761.627907			

R-Square	Coeff Var	Root MSE	td Mean
0.033464	-95.36532	15.16974	-15.90698

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Or	1	326.6673009	326.6673009	1.42	0.2403

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Or	1	326.6673009	326.6673009	1.42	0.2403

That means there is no evidence to show that Impact of Orphanage on Developmental Score is significant.

Association of admit age and Developmental Score

8

The REG Procedure

Model: MODEL1

Dependent Variable: td td

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	442.18957	442.18957	1.95	0.1706
Error	41	9319.43833	227.30337		
Corrected Total	42	9761.62791			

Root MSE	15.07658	R-Square	0.0453
Dependent Mean	-15.90698	Adj R-Sq	0.0220
Coeff Var	-94.77969		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-11.40272	3.96423	-2.88	0.0064
agead	agead	1	-0.17867	0.12810	-1.39	0.1706

That means, there is no evidence to show that Association of admit age and Developmental Score is significant.

Association of length of stay in orphnage and Developmental Score

The REG Procedure

Model: MODEL1

Dependent Variable: td td

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	859.33513	859.33513	3.96	0.0534
Error	41	8902.29278	217.12909		
Corrected Total	42	9761.62791			

Root MSE	14.73530	R-Square	0.0880
Dependent Mean	-15.90698	Adj R-Sq	0.0658
Coeff Var	-92.63420		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-22.63468	4.06028	-5.57	<.0001
minor	minor	1	0.27421	0.13784	1.99	0.0534

That means, there is evidence to show that Association of length of stay in orphanage and Developmental Score is significant.

Impact of Nutritional Status on Adaptation Score

10

The GLM Procedure

Class Level Information

Class	Levels	Values
ns	4	. L M N

Number of observations 44

Impact of Nutritional Status on Adaptation Score
11

The GLM Procedure

Dependent Variable: ad ad

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	17.1342105	5.7114035	0.63	0.5983
Error	40	361.1157895	9.0278947		
Corrected Total	43	378.2500000			

R-Square	Coeff Var	Root MSE	ad Mean
0.045299	-171.6940	3.004646	-1.750000

Source	DF	Type I SS	Mean Square	F Value	Pr > F

ns	3	17.13421053	5.71140351	0.63	0.5983

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ns	3	17.13421053	5.71140351	0.63	0.5983

That means, there is no evidence to show that Impact of Nutritional Status on Adaptation Score is significant.

Impact of Orphanage on Adaptation Score 12

The GLM Procedure

Class Level Information

Class	Levels	Values
Or	2	1 2

Number of observations 44

Impact of Orphanage on Adaptation Score 13

The GLM Procedure

Dependent Variable: ad ad

Sum of

Source	DF	Squares	Mean Square	F Value	Pr > F
Model	1	0.8088235	0.8088235	0.09	0.7657
Error	42	377.4411765	8.9866947		
Corrected Total	43	378.2500000			

R-Square	Coeff Var	Root MSE	ad Mean
0.002138	-171.3018	2.997782	-1.750000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Or	1	0.80882353	0.80882353	0.09	0.7657

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Or	1	0.80882353	0.80882353	0.09	0.7657

That means, there is no evidence to show that Impact of Orphanage on Adaptation Score is significant.

Association of admit age and Adaptation Score
14

The REG Procedure

Model: MODEL1

Dependent Variable: ad ad

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	47.26819	47.26819	6.00	0.0186
Error	42	330.98181	7.88052		
Corrected Total	43	378.25000			

Root MSE	2.80723	R-Square	0.1250
Dependent Mean	-1.75000	Adj R-Sq	0.1041
Coeff Var	-160.41293		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-0.27135	0.73730	-0.37	0.7147
agead	agead	1	-0.05763	0.02353	-2.45	0.0186

That means, there is evidence to show that Association of admit age and Adaptation Score is significant.

Association of length of stay in orphanage and Adaptation Score

15

The REG Procedure

Model: MODEL1

Dependent Variable: ad ad

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F

Model	1	0.30499	0.30499	0.03	0.8548
Error	42	377.94501	8.99869		
Corrected Total	43	378.25000			

Root MSE	2.99978	R-Square	0.0008
Dependent Mean	-1.75000	Adj R-Sq	-0.0230
Coeff Var	-171.41610		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-1.87419	0.81212	-2.31	0.0260
minor	minor	1	0.00513	0.02784	0.18	0.8548

That means, there is no evidence to show that Association of length of stay in orphanage and Adaptation Score is significant.

Impact of Nutritional Status on Personal Score
16

The GLM Procedure

Class Level Information

Class	Levels	Values
ns	4	. L M N

Number of observations 44

Impact of Nutritional Status on Personal Score
17

The GLM Procedure

Dependent Variable: pd pd

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	20.7380383	6.9126794	0.32	0.8125
Error	40	870.4210526	21.7605263		
Corrected Total	43	891.1590909			

R-Square	Coeff Var	Root MSE	pd Mean
0.023271	-110.9470	4.664818	-4.204545

Source	DF	Type I SS	Mean Square	F Value	Pr > F
ns	3	20.73803828	6.91267943	0.32	0.8125

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ns	3	20.73803828	6.91267943	0.32	0.8125

That means, there is no evidence to show that Impact of Nutritional Status on Personal Score is significant.

Impact of Orphanage on Personal Score
18

The GLM Procedure

Class Level Information

Class	Levels	Values
Or	2	1 2

Number of observations 44

Impact of Orphanage on Personal Score
19

The GLM Procedure

Dependent Variable: pd pd

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	22.0237968	22.0237968	1.06	0.3081
Error	42	869.1352941	20.6936975		
Corrected Total	43	891.1590909			

R-Square	Coeff Var	Root MSE	pd Mean
0.024714	-108.1932	4.549033	-4.204545

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Or	1	22.02379679	22.02379679	1.06	0.3081

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Or	1	22.02379679	22.02379679	1.06	0.3081

That means, there is no evidence to show that Impact of Orphanage on Personal Score is significant.

Association of age of admission on Personal Score
20

The REG Procedure

Model: MODEL1

Dependent Variable: pd pd

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	53.42904	53.42904	2.68	0.1092
Error	42	837.73005	19.94595		
Corrected Total	43	891.15909			

Root MSE	4.46609	R-Square	0.0600

Dependent Mean	-4.20455	Adj R-Sq	0.0376
Coeff Var	-106.22050		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-2.63249	1.17300	-2.24	0.0301
agead	agead	1	-0.06127	0.03743	-1.64	0.1092

That means, there is no evidence to show that Association of age of admission on Personal Score is significant.

Association of months in orphanage on personal Score 21

The REG Procedure

Model: MODEL1

Dependent Variable: pd pd

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	16.53070	16.53070	0.79	0.3780
Error	42	874.62839	20.82449		
Corrected Total	43	891.15909			

Root MSE	4.56339	R-Square	0.0185
Dependent Mean	-4.20455	Adj R-Sq	-0.0048
Coeff Var	-108.53457		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-5.11882	1.23544	-4.14	0.0002
minor	minor	1	0.03774	0.04236	0.89	0.3780

That means, there is no evidence to show that Association of months in orphanage on personal Score is significant.

Impact of Nutritional Status on communication Score 22

The GLM Procedure

Class Level Information

Class	Levels	Values
ns	4	. L M N

Number of observations 44

Impact of Nutritional Status on communication Score 23

The GLM Procedure

Dependent Variable: cd cd

Sum of

Source	DF	Squares	Mean Square	F Value	Pr > F
Model	3	93.769378	31.256459	1.16	0.3378
Error	40	1079.957895	26.998947		
Corrected Total	43	1173.727273			

R-Square	Coeff Var	Root MSE	cd Mean
0.079890	-187.3986	5.196051	-2.772727

Source	DF	Type I SS	Mean Square	F Value	Pr > F
ns	3	93.76937799	31.25645933	1.16	0.3378

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ns	3	93.76937799	31.25645933	1.16	0.3378

That means, there is no evidence to show that Impact of Nutritional Status on communication Score is significant.

Impact of Orphanage on communication Score 24

The GLM Procedure

Class Level Information

Class	Levels	Values
Or	2	1 2

Number of observations 44

Impact of Orphanage on communication Score
25

The GLM Procedure

Dependent Variable: cd cd

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	32.009626	32.009626	1.18	0.2840
Error	42	1141.717647	27.183754		
Corrected Total	43	1173.727273			

R-Square	Coeff Var	Root MSE	cd Mean
0.027272	-188.0388	5.213804	-2.772727

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Or	1	32.00962567	32.00962567	1.18	0.2840

Source	DF	Type III SS	Mean Square	F Value	Pr > F

Or	1	32.00962567	32.00962567	1.18	0.2840

That means, there is no evidence to show that Impact of Orphanage on communication Score is significant.

Association of ge of admission on communication Score 26

The REG Procedure

Model: MODEL1

Dependent Variable: cd cd

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	1.70077	1.70077	0.06	0.8062
Error	42	1172.02651	27.90539		
Corrected Total	43	1173.72727			

Root MSE	5.28256	R-Square	0.0014
Dependent Mean	-2.77273	Adj R-Sq	-0.0223
Coeff Var	-190.51840		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-2.49225	1.38744	-1.80	0.0796
agead	agead	1	-0.01093	0.04428	-0.25	0.8062

That means, there is no evidence to show that Association of ge of admission on communication Score is significant.

Association of months in orphanage in communication Score 27

The REG Procedure

Model: MODEL1

Dependent Variable: cd cd

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	89.93377	89.93377	3.49	0.0689
Error	42	1083.79351	25.80461		
Corrected Total	43	1173.72727			

Root MSE	5.07982	R-Square	0.0766
Dependent Mean	-2.77273	Adj R-Sq	0.0546
Coeff Var	-183.20675		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-4.90524	1.37525	-3.57	0.0009
minor	minor	1	0.08802	0.04715	1.87	0.0689

That means, there is some evidence to show that Association of months in orphanage in communication Score is significant.

Impact of Nutritional Status on Motor Score 28

The GLM Procedure

Class Level Information

Class	Levels	Values
ns	4	. L M N

Number of observations 44

NOTE: Due to missing values, only 43 observations can be used in this analysis.

Impact of Nutritional Status on Motor Score
29

The GLM Procedure

Dependent Variable: md md

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	113.3341493	37.7780498	3.09	0.0380
Error	39	476.5263158	12.2186235		
Corrected Total	42	589.8604651			

R-Square	Coeff Var	Root MSE	md Mean
0.192137	2147.245	3.495515	0.162791

Source	DF	Type I SS	Mean Square	F Value	Pr > F
ns	3	113.3341493	37.7780498	3.09	0.0380

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ns	3	113.3341493	37.7780498	3.09	0.0380

That means, there is evidence to show that Impact of Nutritional Status on Motor Score is significant.

Impact of Orphanage on Motor Score 30

The GLM Procedure

Class Level Information

Class	Levels	Values
Or	2	1 2

Number of observations 44

NOTE: Due to missing values, only 43 observations can be used in this analysis.

Impact of Orphanage on Motor Score
31

The GLM Procedure

Dependent Variable: md md

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	2.4907681	2.4907681	0.17	0.6789
Error	41	587.3696970	14.3260902		
Corrected Total	42	589.8604651			

R-Square	Coeff Var	Root MSE	md Mean
0.004223	2325.060	3.784982	0.162791

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Or	1	2.49076815	2.49076815	0.17	0.6789

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Or	1	2.49076815	2.49076815	0.17	0.6789

That means, there is no evidence to show that Impact of Orphanage on Motor Score is significant.

Association of ge of admission on Motor Score 32

The REG Procedure

Model: MODEL1

Dependent Variable: md md

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.02480	0.02480	0.00	0.9671
Error	41	589.83566	14.38624		
Corrected Total	42	589.86047			

Root MSE	3.79292	R-Square	0.0000
Dependent Mean	0.16279	Adj R-Sq	-0.0243
Coeff Var	2329.93605		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	0.12906	0.99731	0.13	0.8977
agead	agead	1	0.00134	0.03223	0.04	0.9671

That means, there is no evidence to show that Association of age of admission on Motor Score is significant.

The REG Procedure

Model: MODEL1

Dependent Variable: md md

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	141.85172	141.85172	12.98	0.0008
Error	41	448.00875	10.92704		
Corrected Total	42	589.86047			

Root MSE	3.30561	R-Square	0.2405
Dependent Mean	0.16279	Adj R-Sq	0.2220
Coeff Var	2030.58763		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-2.57061	0.91085	-2.82	0.0073
minor	minor	1	0.11141	0.03092	3.60	0.0008

That means, there is strong evidence to show that Association of months in orphanage in Motor Score is significant.

Impact of Nutritional Status on Cognitive Score 34

The GLM Procedure

Class Level Information

Class	Levels	Values
ns	4	. L M N

Number of observations 44

Impact of Nutritional Status on Cognitive Score 35

The GLM Procedure

Dependent Variable: cod cod

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	74.6612440	24.8870813	1.67	0.1893
Error	40	596.8842105	14.9221053		
Corrected Total	43	671.5454545			

R-Square	Coeff Var	Root MSE	cod Mean
0.111178	-72.63599	3.862914	-5.318182

Source	DF	Type I SS	Mean Square	F Value	Pr > F
ns	3	74.66124402	24.88708134	1.67	0.1893

Source	DF	Type III SS	Mean Square	F Value	Pr > F
ns	3	74.66124402	24.88708134	1.67	0.1893

That means, there is no evidence to show that Impact of Nutritional Status on Cognitive Score is significant.

Impact of Orphanage on Cognitive Score 36

The GLM Procedure

Class Level Information

Class	Levels	Values
Or	2	1 2

Number of observations 44

Impact of Orphanage on Cognitive Score 37

The GLM Procedure

Dependent Variable: cod cod

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	4.9454545	4.9454545	0.31	0.5797
Error	42	666.6000000	15.8714286		

Corrected Total	43	671.5454545			

R-Square	Coeff Var	Root MSE	cod Mean
0.007364	-74.91087	3.983896	-5.318182

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Or	1	4.94545455	4.94545455	0.31	0.5797

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Or	1	4.94545455	4.94545455	0.31	0.5797

That means, there is no evidence to show that Impact of Orphanage on Cognitive Score is significant.

Association of ge of admission on Cognitive Score 38

The REG Procedure

Model: MODEL1

Dependent Variable: cod cod

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	8.35107	8.35107	0.53	0.4711
Error	42	663.19438	15.79034		

Corrected Total	43	671.54545	

Root MSE	3.97371	R-Square	0.0124
Dependent Mean	-5.31818	Adj R-Sq	-0.0111
Coeff Var	-74.71927		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-4.69667	1.04367	-4.50	<.0001
agead	agead	1	-0.02422	0.03331	-0.73	0.4711

That means, there is no evidence to show that Association of age of admission on Cognitive Score is significant.

Association of months in orphanage in Cognitive Score 39

The REG Procedure

Model: MODEL1

Dependent Variable: cod cod

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.07336	0.07336	0.00	0.9463
Error	42	671.47209	15.98743		
Corrected Total	43	671.54545			

Root MSE	3.99843	R-Square	0.0001
Dependent Mean	-5.31818	Adj R-Sq	-0.0237
Coeff Var	-75.18413		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	Intercept	1	-5.37909	1.08249	-4.97	<.0001
minor	minor	1	0.00251	0.03711	0.07	0.9463

That means, there is no evidence to show that Association of months in orphanage in Cognitive Score is significant.

Appendix C: Reporting Sheet for Caregivers

Caregiver Questionnaire			
Age	years		
Position at orphanage			
Time in current position	months		
Average contact with children	hours/day		
Level of Education	grade school	high school	university
How well do you understand developmental milestones in children?	I know more than most people about child development	I know about the same amount as most people about child development	I know less than most people about child development
Have you had any formal training in child development?	yes	No	

Appendix D: Skills and Activity Sheet for Caregivers

Age	Adaptive Skills	Activities to Promote Skills
0-11 months	*Drinks from bottle with both hands *Chews with up and down motion *Takes food from a spoon and swallows it	*Give small pieces of food at meals
12-23 months	*Feeds self small pieces of food *Drinks from a cup with help	*Give spoon or fork at meal times *Give cup of milk or water at meal times
24-35 months	*Helps dress themselves (clothes/shoes) *Asks for food with words or gestures *Uses a cup, spoon or fork without help *Understands hot is dangerous	*Give spoon or fork at meal times *Give cup of milk or water at meal times *Help to dress themselves *Washes hands
36-47 months	*Takes off clothes without help *Tells adult when they need to use the toilet *Asks for food when hungry *Understands hot is dangerous *Helps to clean up	*Give spoon or fork at meal times *Give cup of milk or water at meal times *Dress themselves *Washes hands *Help with putting away toys
48-59 months	*Washes and dries hands without assistance *Can get drink without assistance *Chooses correct utensil for food *Sleeps through the night without wetting the bed *Follows directions without being reminded	
60-71 months	*Dresses and undresses without help *Brushes their own teeth and bathes with little help. *Cuts food with the side of a fork *Acts appropriately in public	
72-95 months	*Follows rules in simple games *Asks to use others belongings *Crosses street safely *Responds appropriately in "What to do if…" scenarios	

Age	Personnal-Social Skills	Activities to Promote Skills
0-11 months	*Makes eye contact *Smiles	*Talk with the child. *Repeat sounds the child makes.
12-23 months	*Shows awareness of hands *Plays peekaboo *Discriminates between familiar and unfamiliar *Continues to make sounds if imitated	*Play "peek-a-boo" *Talk with and to the child.
24-35 months	*Shows awareness of own feet * Responds to their name *Responds positively to praise and affection *Shows awareness of and imitates others *Enjoys playing with other children	*Praise the child *Repeat sounds and words the child makes.
36-47 months	*Greets familiar adults *States name and age *Allows others to participate in activities *Imitates others while playing *Participates in make-believe play	* Ask the child, "What is your name? *Ask the child, How old are you?" *Play make-believe with the child. *Play group games.
48-59 months	*States first and last names *Initiates social contact with familiar adults *Separates easily from usual caregiver *Shows affection and sympathy for others	*Ask the child, "What is your name? *Ask the child, How old are you?" *Play make-believe with the child. *Play group games.
60-71 months	*Asks for adult help and helps others *Follows directions with little or no resistance *Follows rules of games *Recognizes adult feelings *Waits their turn in a group *Initiates social contact with others	* Ask the child, "What is your name? *Ask the child, How old are you?" *Play make-believe with the child. *Play group games and have the child teach others the rules.
72-95 months	*Child describes feeling	*Talk about feelings.

Age	Communication Skills	Activities to Promote Skills
0-11 months	*Responds to noises and voices outside field of vision *Soothed by familiar adult *Turns head towards sound *Produces differentiated cries *Babbles	*Make many different sounds *Babble with child *Talk to child *Sing songs *Read books
12-23 months	*Pays attention to someone speaking for 10 seconds *Associates spoken words with familiar objects *Produces one or more consonant sounds *Waves bye-bye *Imitates speech sounds	*Talk to child *Name objects in environment *Wave when you come and go *Sing songs *Read books *Ask child to identify objects *Use words like *inside, outside, on, under*
24-35 months	*Identifies familiar people when named *Responds to commands *Initiates sounds, words or gestures that are associated with objects *Uses two words together	*Name people and objects in environment and in pictures *Give directions *Read books *Ask child to identify objects *Sing songs
36-47 months	*Follows three or more familiar verbal commands *Responds to the prepositions *on* and *out* *Child responds to who and what questions *Uses words to get needs met *Responds "yes" and "no" appropriately	*Read books *Sing songs *Give series of directions *Ask questions about familiar things *Use comparison words
48-59 months	*Follows 2-step commands *Responds to the prepositions behind and towards *Understands words such as softly, loudly, biggest, longest *Asks questions that begin with *who, what, why,* and	*Talk to child about what you are doing *Read books *Sing songs *Ask questions *Play games

	how *Speaks in 5-6 word sentences	*Give directions
60-71 months	*Understands negotiations *Recalls events from a story they are told *Uses plural form of words *Communicates in a way others understand	*Talk to child about what you are doing *Read books *Sing songs *Ask questions *Play games *Give directions
72-95 months	*Converses on topics for more than 5 exchanges *Follows three-step verbal commands *Child identifies beginning and ending sounds in words *Engages in meaningful dialogue *Uses past tense *Identifies objects by their use or definitions	*Talk to child about what you are doing *Read books *Sing songs *Ask questions *Play games *Give directions

Age	Motor Skills	Activities to Promote Skills
0-11 months	*Holds up head *Sits up with support *Sits up without support *Reaches for objects *Crawls *Holds objects	*"Tummy time" *Put objects just out of reach *Floor time
12-23 months	*Crawls *Pulls up to stand *Stands with help *Moves from sitting to standing without help *Stands without help *Walking *Crawling up steps *Raking grasp *Pincer grasp	*Floor time *Group exercises
24-35 months	*Walking *Crawling up steps *Walks down stairs with help *Intentionally throws object	*Floor time *Ball play *Draw with crayons *Painting
36-47 months	*Runs without falling *Kicks ball forward *Throws ball *Walks backwards *Jumps forward with both feet *Points *Scribbles	*Outside play *Ball play *Jumping rope *Obstacle courses *Drawing with crayons and pencils
48-59 months	*Can walk on a line one the floor *Walks downstairs without help	*Outside games *Jumping rope

	*Buttons, snaps, zips without assistance *Stacks cubes *Draws circles	*Drawing with crayons and pencils *Copying shapes and letters
60-71 months	*Hops on one foot *Skips *Balances on one foot *Folds paper in half *Cuts with scissors on a line	*Continue previous activities *Drawing letters
72-95 months		

Age	Cognitive Skills	Activities
0-11 months	*Pay attention to an object *Pay attention to auditory stimulus	*Sing songs *Play "peek-a-boo" *Read books paying special attention to the pictures.
12-23 months	*Pay attention to a sound or activity for 15 seconds *Discover a hidden toy	*Hide a toy and ask "Where did it go?" *Play "peek-a-boo" *Read books paying special attention to the pictures.
24-35 months	*Look at and touch the pictures an a book	*Read books paying special attention to the pictures. *Play the game "I Spy".
36-47 months	*Pay attention to one activity for more than 3 minutes *Identify colors in their environment. *Place one object inside of another	*Look for hidden objects and pictures. * Play the game "I Spy". *Play the game, "Guess which hand." *Play memory games
48-59 months	*Recite from memory songs, stories and poems. *Know the names of colors.	* Play the game "I Spy". *Play the game, "Guess which hand." *Play memory games *Sign the alphabet song
60-71 months	*Recite the alphabet from memory *Identify which number is bigger *Identify opposites *Count objects	*Play memory games. *Play opposite games. *Play counting games.
72-95 months	*Relate the number of objects with the written number. *Count from memory from 1 to 40	*Count how many objects. *Complete word problems involving numbers.

Age	Personnal-Social Skills	Activities to Promote Skills
0-11 months	*Makes eye contact *Smiles	*Talk with the child. *Repeat sounds the child makes.
12-23 months	*Shows awareness of hands *Plays peekaboo *Discriminates between familiar and unfamiliar *Continues to make sounds if imitated	*Play "peek-a-boo" *Talk with and to the child.
24-35 months	*Shows awareness of own feet * Responds to their name *Shows appropriate affection *Responds positively to praise *Shows awareness of and imitates others *Enjoys playing with other children	*Praise the child *Repeat sounds and words the child makes.
36-47 months	*Greets familiar adults *States name and age *Allows others to participate in activities *Imitates others while playing *Participates in make-believe play	* Ask the child, "What is your name? *Ask the child, How old are you?" *Play make-believe with the child. *Play group games.
48-59 months	*States first and last names *Initiates social contact with familiar adults *Separates easily from usual caregiver *Shows affection for peers *Shows sympathy for others	*Ask the child, "What is your name? *Ask the child, How old are you?" *Play make-believe with the child. *Play group games.
60-71 months	*Asks for adult help and helps others *Follows directions with little or no resistance *Follows rules of games *Recognizes adult feelings *Waits their turn in a group *Initiates social contact with others	* Ask the child, "What is your name? *Ask the child, How old are you?" *Play make-believe with the child. *Play group games and have the child teach others the rules.

72-95 months	*Child describes feeling	*Talk about feelings.

Age	Communication Skills	Activities to Promote Skills
0-11 months	*Responds to noises and voices outside field of vision *Soothed by familiar adult *Turns head towards sound *Produces differentiated cries *Babbles	*Make many different sounds *Babble with child *Talk to child *Sing songs *Read books
12-23 months	*Pays attention to someone speaking for 10 seconds *Associates spoken words with familiar objects *Produces one or more consonant sounds *Waves bye-bye *Imitates speech sounds	*Talk to child *Name objects in environment *Wave when you come and go *Sing songs *Read books *Ask child to identify objects *Use words like *inside*, *outside*, *on*, *under*
24-35 months	*Identifies familiar people when named *Responds to commands *Initiates sounds, words or gestures that are associated with objects *Uses two words together	*Name people and objects in environment and in pictures *Give directions *Read books *Ask child to identify objects *Sing songs
36-47 months	*Follows three or more familiar verbal commands *Responds to the prepositions *on* and *out* *Child responds to who and what questions *Uses words to get needs met *Responds "yes" and "no" appropriately	*Read books *Sing songs *Give series of directions *Ask questions about familiar things *Use comparison words

48-59 months	*Follows 2-step commands *Responds to the prepositions behind and towards *Understands words such as softly, loudly, biggest, longest *Asks questions that begin with *who*, *what, why,* and *how* *Speaks in 5-6 word sentences	*Talk to child about what you are doing *Read books *Sing songs *Ask questions *Play games *Give directions
60-71 months	*Understands negotiations *Recalls events from a story they are told *Uses plural form of words *Communicates in a way others understand	*Talk to child about what you are doing *Read books *Sing songs *Ask questions *Play games *Give directions
72-95 months	*Converses on topics for more than 5 exchanges *Follows three-step verbal commands *Child identifies beginning and ending sounds in words *Engages in meaningful dialogue *Uses past tense *Identifies objects by their use or definitions	*Talk to child about what you are doing *Read books *Sing songs *Ask questions *Play games *Give directions

Age	Motor Skills	Activities to Promote Skills
0-11 months	*Holds up head *Sits up with support *Sits up without support *Reaches for objects *Crawls *Holds objects	*"Tummy time" *Put objects just out of reach *Floor time
12-23 months	*Crawls *Pulls up to stand	*Floor time *Group exercises

	*Stands with help *Moves from sitting to standing without help *Stands without help *Walking *Crawling up steps *Raking grasp *Pincer grasp	
24-35 months	*Walking *Crawling up steps *Walks down stairs with help *Intentionally throws object	*Floor time *Ball play *Draw with crayons *Painting
36-47 months	*Runs without falling *Kicks ball forward *Throws ball *Walks backwards *Jumps forward with both feet *Points *Scribbles	*Outside play *Ball play *Jumping rope *Obstacle courses *Drawing with crayons and pencils
48-59 months	*Can walk on a line one the floor *Walks downstairs without help *Buttons, snaps, zips without assistance *Stacks cubes *Draws circles	*Outside games *Jumping rope *Drawing with crayons and pencils *Copying shapes and letters
60-71 months	*Hops on one foot *Skips *Balances on one foot *Folds paper in half *Cuts with scissors on a line	*Continue previous activities *Drawing letters
72-95 months		

Age	Cognitive Skills	Activities
0-11 months	*Pay attention to an object *Pay attention to auditory stimulus	*Sing songs *Play "peek-a-boo" *Read books paying special attention to the pictures.
12-23 months	*Pay attention to a sound or activity for 15 seconds *Discover a hidden toy	*Hide a toy and ask "Where did it go?" *Play "peek-a-boo" *Read books paying special attention to the pictures.
24-35 months	*Look at and touch the pictures an a book	*Read books paying special attention to the pictures. *Play the game "I Spy".
36-47 months	*Pay attention to one activity for more than 3 minutes *Identify colors in their environment. *Place one object inside of another	*Look for hidden objects and pictures. * Play the game "I Spy". *Play the game, "Guess which hand." *Play memory games
48-59 months	*Recite from memory songs, stories and poems. *Know the names of colors.	* Play the game "I Spy". *Play the game, "Guess which hand." *Play memory games *Sign the alphabet song
60-71 months	*Recite the alphabet from memory *Identify which number is bigger *Identify opposites *Count objects	*Play memory games. *Play opposite games. *Play counting games.
72-95 months	*Relate the number of objects with the written number. *Count from memory from 1 to 40	*Count how many objects. *Complete word problems involving numbers.