DESCRIBING THE ADAPTIVE BEHAVIOR OF CHILDREN WITH DOWN SYNDROME WHO RECEIVED EARLY INTERVENTION MEASURED BY THE VINELAND ADAPTIVE BEHAVIOR SCALES: A TREND ANALYSIS

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DEDICATION

I dedicate this dissertation to all of the families I have worked with who have children with Down syndrome. You will never know the impact you have had on my life. Your children have made me laugh, cry and taught me more than I could have ever learned in a classroom.

My deepest gratitude,

Molly Sullivan Taylor

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ABSTRACT

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The purpose of this study was to investigate the trends across developmental domains for a specific group of children with Down syndrome who received early intervention from an integrated intervention program. The study explored the measurement between four different developmental domains: communication, socialization, daily living skills, and motor skills, and with 11 sub-domains: receptive language, expressive language, written language, personal, domestic and community skills, interpersonal relationships, play and leisure time, coping skills, gross motor skills and fine motor skills. The independent variables were gender, age, school and time and the dependent variables were the developmental test results. In this study, standardized results from a developmental assessment contributed to understanding how young children with Down syndrome compare developmentally to each other based on age and gender across time and how they compared developmentally to the sample population in a national study.

The study employed quantitative methods to identify specific trends as they related to the developmental domains and sub-domains. The Vineland Adaptive Behavior Scale was used to gather the required developmental scores. The participants for this study consisted of 81 children with Down syndrome ages 18 months to 6 years. The data came from existing test scores from three different non-profit early intervention pre-schools located in Tuscaloosa, Alabama; Dallas, Texas; and Houston, Texas. Each participant had at least three years of developmental test scores for use in this study allowing the test results to be measured over a three year period of time.

According to the results for this study, across all participants from all three schools and all three times, the results of the motor skills domain were significantly lower than the communication, daily living skills and socialization domains. The children in the current study scored lower than the children used in the national study performed by the authors of the Vineland in all areas of development. For the participants who received intense therapy from the early intervention program, after two years of speech therapy, occupational therapy, physical therapy and music therapy their standard scores, percentile ranks and stanine scores remained unchanged.

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CHAPTER I

INTRODUCTION

Research has addressed the development of both typically developing children and children with special needs. While a wealth of research exists that examines the developmental trends of the general population with regards to child development, little research is available that examines developmental trends across the Down syndrome population. There is mounting evidence that children with Down syndrome do not learn in the same manner that typical children do these children have a different style of assimilating information, and therefore, the usual methods of instruction are less effective (Winders, 2001). There are many other challenges including language, education, development of social skills, and gross motor skills (Winders, 2001). As medical technology continues to change and early intervention programs continue to improve in meeting early developmental needs of children with special needs, the need for research is also increasing.

Down Syndrome

It is important to know how the development of children with Down syndrome is being measured, and how these findings correlate to the general population. The concept of adaptive behavior is a well-known method for measuring an individual's daily functioning (Nash, Rounds, & Bowen, 1992). Adaptive behavior can be defined as the performance of daily activities that are required for personal and social sufficiency

(Sparrow, Cicchetti, & Balla, 2005). Since 1959, legislation and the official manuals of the American Association on Mental Retardation (Grossman, 1973, 1977, 1983; Heber, 1959, 1961) have stated that deficits in adaptive behavior, as well as cognitive functioning, must be substantiated before an individual is given a diagnosis or classification of mental retardation. Down syndrome is a common genetic variation that usually causes delay in physical, intellectual and language development. The exact causes of the chromosomal rearrangement and primary prevention of Down syndrome are currently unknown (Mish, 1997).

Down syndrome is one of the leading clinical causes of cognitive delay in the world and is not related to race, nationality, religion, or socio-economic status. According to Mish (1997) the incidence of Down syndrome in the United States is estimated to be 1 in every 800 - 1,000 live births. Of all children born in this country annually, approximately 5,000 will have Down syndrome. Therefore, approximately a quarter of a million families in the United States are affected by Down syndrome. While the likelihood of giving birth to a child with Down syndrome increases with maternal age, 80% of babies with Down syndrome are born to women under 35 years of age (Mish, 1997).

There is wide variation in mental abilities, behavior and physical development in individuals with Down syndrome. Each individual has his/her own unique personality, capabilities, and talents. Individuals with Down syndrome can benefit from loving homes, early intervention, inclusive education, appropriate medical care, and positive

public attitudes. In adulthood, many persons with Down syndrome hold jobs, live independently, and enjoy recreational opportunities in their communities (National Down Syndrome Congress, 2007).

In 1986, special education reauthorization (Public Law 99-457) mandated special education preschool services for children aged 3 through 5 years. This reauthorization codified the importance of measuring adaptive functioning in young children, making it one of five domains of development by which young children could be eligible for intervention services. This legislation made the assessment of adaptive abilities an essential part of evaluations for children birth through age 5 (American Association on Mental Retardation 1992, 2002). It also mandated the involvement of caregivers in the evaluations, highlighting the importance of the caregiver's perspectives in understanding a young child's developmental strengths and needs (Sparrow, et al., 2005). Two underlying premises of PL 99-457 are that, a) young children develop within the context of their family where children are dependent upon family members, and b) the extent to, and the manner in which parents are involved in decision making and goal setting influences their participation in helping their children achieve those goals (Nash, Rounds, & Bowen, 1992).

Definitions of Developmental Domains

The following developmental domains and content categories are defined for the study. These definitions were taken from the Vineland Adaptive Behavior Scales (Sparrow et al., 2005) and are the developmental areas that are of interest to this research:

1. Communication Domain
    a. Expressive language: pre-speech expression, beginning to talk, interactive speech, speech skills, and expressing complex ideas.
    b. Receptive language: understanding, listening and attending, and following instructions.
    c. Written language: beginning to read, reading skills, and writing skills.
2. Daily Living Skills Domain
    a. Personal: eating and drinking, toileting, dressing, bathing, grooming and health care.
    b. Domestic: safety at home, kitchen chores and housekeeping.
    c. Community: telephone skills, rules, rights, and safety, time and dates, job skills, computer skills, money skills, restaurant skills, television and radio and going places independently.
3. Socialization Domain
    a. Interpersonal Relationships: responding to others, expressing and recognizing emotions, imitating, social communication, thoughtfulness, friendship and dating.
    b. Play and Leisure Time: play skills, sharing and cooperating, going places with friends, playing games, and recognizing social cues.
    c. Coping Skills: manners, apologizing, responsibility, appropriate social caution, transitions, controlling impulses, and keeping secrets.

4. Motor Skills Domain

   a. Gross Motor: sitting, walking and running, play activity, standing, creeping and crawling.

   b. Fine Motor: manipulating objects, drawing and using scissors, using keyboard.

Definition of Terms

This study employed a variety of operational terms to identify the construct under study and related variables:

Adaptive behavior: the degree to which the individual is able to function and maintain him or herself independently and the degree to which he or she meets satisfactorily the culturally imposed demands or personal and social responsibility (Heber, 1961).

Developmental delay: a delay in one or more areas of development, often caused by a genetic disorder such as Down syndrome.

Developmental trends: the inclination of development to follow a consistent pattern over time.

Down syndrome: a congenital condition characterized by moderate to severe mental retardation, slanting eyes, a broad short skull, broad hands with short fingers, and trisomy of the human chromosome numbered 21 (Mish, 1997).

Early intervention: services provided by professional to families of children with special needs. These services can include therapies as well as family centered counseling.

Gender: male or female participants

Integrated early intervention program: a program where children receive physical therapy, occupational therapy, speech therapy and music therapy in the classroom with no pull out therapy services.

Limitations in adaptive functioning: a person with mental retardation is assumed to have sub-average intellectual functioning and significant generalized deficits in multiple areas of adaptive behavior (Sparrow et al., 2005).

Mental retardation: a particular state of functioning that begins in childhood and is characterized by limitation in both intelligence and adaptive skills. Mental retardation reflects the "fit" between the capabilities of individuals and the structure and expectations of their environment (American Association on Mental Retardation, 1992).

Typical development: predictable development for children who do not have a cognitive or physical delay.

Vineland Adaptive Behavior Scales: an individually administered measure of adaptive behavior for ages birth through 90 (Sparrow et al., 2005).

Adaptive Development

Adaptive behavior can be defined as the performance of daily activities that are required for personal and social sufficiency (Sparrow et al., 2005). Several principles are inherent in the authors of the Vineland Adaptive Behavior Scales definition of adaptive behavior (Sparrow et al., 2005). Age is the first principle, and in most individuals, adaptive behavior increases and becomes more complex as an individual grows older. Adaptive behavior is also defined by the expectations or standards of other people in the

environment. Last, adaptive behavior is modifiable depending on the intervention these individuals receive over the course of time. The construct of adaptive behavior has its roots in the history of defining mental retardation. In 1961, the American Association on Mental Deficiency published its first official manual and formally defined adaptive behavior as having two major facets: the degree to which the individual is able to function and maintain him or herself independently, and the degree to which he or she meets satisfactorily the culturally imposed demands of personal and social responsibility (Herber 1961). The most recent (2002) edition of the manual identifies three domains of adaptive behavior: conceptual (involving language, money concepts, and reading and writing), practical (activities of daily living, occupational skills), and social (interpersonal, responsibility, obeying laws).

Cognitive Development

Children with Down syndrome are the most extensively studied subgroup of those people with cognitive disabilities (Hauser-Cram et al., 1999). Several longitudinal investigations have been conducted to document their development. These studies, which have focused most often on the emergence of cognitive skills, have yielded consistent findings. In an extensive longitudinal study, Carr (1995) investigated 44 children from England with Down syndrome from 6 months of age to adulthood over their lifetime. The researcher documented a general decline in standard cognitive scores followed by a slight increase during the late adolescent period. In a study of children with Down syndrome in the United States, Reed, Pueschel, Schnell, and Cronk (1984) reported a lag in cognitive

development over the first 3 years of life. Other researchers have noted a similar pattern (Connolly, Morgan, Russell, & Richardson, 1980; Gibson, 1978; Morgan, 1979; Nadel, 1988; Sharav, Collins, & Shlomo, 1985), which indicates that by early childhood most children with Down syndrome have standard cognitive scores at least two standard deviations below the normative mean (Hauser-Cram et al., 1999).

Communication Development

Language is the means by which humans communicate their ideas and emotions, foster special relationships, and learn about their world. It is a fundamental skill that is dependent on social, motor, and cognitive development (Hess, Dohman, & Huneck, 1997). Young children's language development is often categorized as expressive language, language that is produced and receptive language, language that is understood. Children with Down syndrome show greater impairment in expressive language than in nonverbal cognition and syntax comprehension when expressive language is measured (Chapman, Schwartz, & Kay-Raining Bird, 1991; Chapman, Seung, Schwartz, & Kay-Raining Bird, 1998). Children already understand approximately 50 words by the time they say their first word (Mills, Coffey-Corina, & Neville, 1997), which typically occurs between 8 and 14 months of age for a typically developing child (Wilcox, Hadley, & Ashland, 1996). At this stage of language development, communication functions as a means of social engagement, regulating the environment, and initiating joint attention (Prizant, Wetherby, & Roberts, 1993). For most children with Down syndrome, language does not progress according to the normal developmental course.

Motor Development

Motor skills are another important area of development for typically developing children as well as children with special needs, and Down syndrome has an effect on the motor development of children. Neuromuscular abnormalities in children with Down syndrome which have been observed to be coincident with developmental delays, include generalized muscular hypotonia, the persistence of primitive reflexes beyond their normal disappearance with age, and slowed reaction times during voluntary movement. When motor development of a child with Down syndrome is compared with that of a typically developing child, a consistent delay is observed in the acquisition of both postural and voluntary components of motor control. Physical, cognitive, and sensory integration problems decrease the functional ability of children in activities of daily living therefore neurodevelopmental approaches, sensory integrative therapy, and vestibular stimulation have been used to improve function in children with Down syndrome (Uyanik, Bumin, & Kayihan, 2003). Motor skills will impact these individuals from birth into the adult years. Shields and Dodd (2004) showed in their research that because the work-place activities typically emphasize physical rather than cognitive skills, decreased strength can negatively impact the vocational and social development of adults with Down syndrome.

Social Development

Behaviorally, persons with Down syndrome are often described as charming, social, friendly, and engaging (Dykens, Hodapp, & Finucane, 2000). While inattention, stubbornness, and non-compliance are common behavior issues, children with Down syndrome show lower rates of emotional and behavior problems when compared to others with intellectual disabilities (Rosner, Hodapp, Fidler, Sagun, & Dykens, 2004). Given this profile of sociability combined with low rates of negative behaviors, Rosner et al. (2004) state that they expect children with Down syndrome to score relatively well on measures of social competence as they relate to daily living capabilities. Assessment of cognitive ability is important for children with Down syndrome, but assessment of adaptive functioning allows one to ascertain more directly how well individuals function in their environment.

Developmental Measurement

The Vineland Adaptive Behavior Scales is a valuable measurement for adaptive behavior assessment. The researchers used a large, representative sample population to create their norms (Sparrow et al., 2005). The scales on the Vineland were normed on a national sample of 3,695 individuals aged birth to 90 years. The sample is equally balanced by sex and is representative of the U.S. population in regard to race, ethnicity, community size, geographic region, and socioeconomic status (Sparrow et al., 2005). The results from this assessment tool are highly interpretable and the standardization sample gives a measure of the individual's overall level of adaptive functioning in distinct areas.

The distinct adaptive domains and sub-domains measured by the Vineland are consistent with current research on adaptive behavior and correspond to the specifications identified by the American Association on Mental Retardation. Another important asset of the Vineland is that the assessment has undergone extensive bias reviews and statistical analyses to ensure that individuals of either sex and from a variety of ethnic and socioeconomic backgrounds can be assessed with confidence (Sparrow et. al., 2005). The Vineland has dense developmental levels at the early stages of the assessment and therefore the test results give a more complete picture of the part of the population undergoing the most rapid and dramatic developmental changes (Sparrow et al., 2005).

Statement of the Problem

In this study, standardized results from a developmental assessment contributed to understanding how young children with Down syndrome compare developmentally to each other based on age and gender across time and how they compared developmentally to the sample population in a national study. Pueschel and Hopmann (1993) have commented on the great need to acquire "good normative studies on the development of children with Down syndrome, as helpful guidelines for both parents and professionals" (p. 135). The current study addressed how a specific group of children with Down syndrome function in different areas of development and provided clarification of the methods used by children with Down syndrome to assimilate and use information. There is increased evidence that children with Down syndrome have a unique learning style. Understanding how these children learn is crucial for parents, practitioners, therapists.

and educators who wish to facilitate the development of gross motor skills as well as success in other areas of life including language, education and the development of social skills (Winders, 2001). Wishart (1991), a psychologist at the University of Edinburgh in Scotland, has studied how children with Down syndrome learn. The researcher writes, "Despite the absence of an adequate developmental database, theory and practice in this area have nonetheless continued to assume that the process of learning in children with Down syndrome is essentially a slowed-down version of normal cognitive development." (pg. 30). An increasing number of recent studies are suggesting that this 'slow development' approach may be ill founded and that learning for children with Down syndrome may differ significantly in structure and organization from that found in ordinary children. It is important for parents to have an understanding of how their child assimilates information so that they can be successful partners in their child's learning. The acquisition of adaptive skills over the course of childhood can reduce the need for behavioral support in adult life (Chadwick, Cuddy, Kusel & Taylor, 2005).

Purpose of the Study

The purpose of this study was to investigate the trends across developmental domains for a specific group of children with Down syndrome who received early intervention from an integrated intervention program. The trends were examined based on age, gender, school and time. The study explored the measurement between four different developmental domains: communication, socialization, daily living skills, and motor skills, and with 11 sub-domains: receptive language, expressive language, written

language, personal, domestic and community skills, interpersonal relationships, play and leisure time, coping skills, gross motor skills and fine motor skills. The independent variables were gender, age, school and time and the dependent variables were the developmental test results. The study employed quantitative methods to identify specific trends as they related to the developmental domains.

Null Hypotheses

The following null hypotheses guided the proposed study:

1. There will be no statistically significant differences in the 4 developmental domains and 11 sub-domains, as measured by the Vineland Adaptive Behavior Scales as a function of the time the child has been exposed to programmatic services.
2. There will be no statistically significant difference when comparing the developmental scores of children with Down syndrome from early intervention programs located in Alabama, Dallas and Houston to the developmental scores of children used in the national study conducted by the authors of the Vineland.
3. There will be no statistically significant difference in the developmental domains of children with Down syndrome based on gender, age and school when comparing the developmental scores over time.

These null hypotheses were used to investigate the developmental trends of children with Down syndrome as they compare to the children in the national study conducted by the authors of the Vineland Adaptive Behavior Scales (Sparrow et al., 2005). These null hypotheses were also used to investigate how the participants from all

three schools compared to each other in 4 different developmental domains: communication, socialization, daily living skills and motor skills, and with 11 sub-domains: receptive language, expressive language, written language, personal, domestic and community skills, interpersonal relationships, play and leisure time, coping skills, gross motor skills and fine motor skills. The unit of analysis for this study was the individual participants when looking at developmental scores over time. When comparing group means, the unit of analysis was the group of scores gathered from the Vineland.

Assumptions

The following assumptions were made for this study:

1. Children with Down syndrome have a developmental delay.
2. Most children with Down syndrome typically receive some kind of early intervention before six years of age.
3. Professionals giving developmental assessments are trained on the techniques of the assessments.
4. Scores given on the developmental assessment will show some difference between developmental and chronological age for children with Down syndrome.

Delimitations

The following delimitations established the parameters of the proposed study:

1. Interaction effects of selection biases may have been a factor when trying to generalize the participants to population because the participants came from private schools where the parents are very involved in the education of their children.
2. Interaction effects of testing may have affected the results because the participants may have received the assessment more than once. This may have affected the generalizability to an untested population.

Limitations

1. The developmental scores found by the Vineland Adaptive Behavior Scales Assessment may not have been an exact reflection of the participants' true developmental functioning, but viewed more as a general indication of functioning.
2. Since the children receive a battery of assessments at one time, the testing effect may have been a factor due to the effect of the other tests given at that time.
3. Inter-rater reliability may have influenced the results because in an ex post facto study there is no way to control for the training the assessors received before giving the test.
4. Children with limited cognitive and physical abilities present a number of challenges for the researcher because it is rare for a disability to occur in isolation (Brown, Cozby, Kee, & Worden, 1999).

Summary

This chapter introduced the quantitative trend analysis study of the adaptive behavior of children with Down syndrome. The type of research was described as well as the purpose of the study. In addition, three null hypotheses were presented and described. The limitations of the research were discussed as well as the delimitations and assumptions were presented that established the parameters for the study. The developmental domains that relate specifically to this study were defined as well as other terms. In addition, an introduction of the Vineland Adaptive Behavior Scale was introduced and was the basis from which the data for this research emerged.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The literature review for this study outlines the present body of research concerning the adaptive behavior skills of children with Down syndrome and demonstrates a need for further, more specific research that investigates the quantitative trends of early development and developmental trends over time in this specific population. For this study the quantitative trends were defined as changes of developmental growth from year to year. This was studied by looking for a pattern of consistency among the participants. Children with Down syndrome can be categorized as developmentally delayed, and children who are developmentally delayed share many similar characteristics. When researching family issues and early intervention, there can be some cohesiveness across developmental issues. Individuals with mental retardation are generally deficient across a broad spectrum of social and adaptive behaviors (Siperstein, 1992). A review of literature shows the impact of early intervention on development and family cohesiveness. It also outlines communication skills, daily living skills, socialization skills and motor skills of young children with special needs. Finally, the literature review regarding children with Down syndrome targets the relationship of adaptive behavior levels to levels of clinical, cognitive and educational functioning.

Theoretical Framework

Theoretical frameworks of Chomsky, Bruner and Vygotsky have shaped research on development and intervention in persons with mental retardation. Studies on the emerging competencies of children with biologically based impairment have only rarely and inconsistently been informed by theoretical advances in the field of child development. By applying these evolving conceptual frameworks to children with atypical developmental patterns, our understanding of the full range of human adaptation may be broadened (Hauser-Cram et al., 1999). Several theoretical lenses from which these issues were viewed are the nativist theory by Noam Chomsky, the social development theory by Lev Vygotsky, and the constructivist theory by Jerome Bruner.

Nativisit Theory

The nativist approach advocated by Chomsky was first introduced in the 1960s. There are four key claims to this theory:

1. The human brain is especially well designed to learn language and, thus, every child is born with the capacity to learn language (Chomsky, 1965).
2. This capacity consists of a tacit or implicit knowledge of the properties common to all languages and of the constraints on the ways in which language can differ. This "advance" knowledge leads the child to generate only a limited number of sensibly constrained hypotheses about the input of language.
3. The child needs to encounter only a limited number of key examples in the input language to arrive at the necessary language-specific categories and rules. These key

examples represent very basic facts about language and are likely to be available in virtually all environments and are unlikely to have much of an impact on language development.

4. The capacity to learn language operates in modular fashion, meaning it is tuned especially to processing linguistic representations and rules and requires little if any input from more general cognitive processes or other mental functions (Chomsky, 1965).

The nativist theory has its origins in linguistics and originally was debated most intensely among researchers studying typical development, but research on mental retardation also has been shaped by these debates (Abbeduto & Boudreau, 2004). There are two caveats regarding the nativist definition of language, which is rather narrowly compared with the skills and knowledge typically targeted in language development and intervention research (Crain & Pietroski, 2002). The nativist claims are intended to apply largely to learning the forms of language like syntax and phonology. Although there are thought to be innate constraints on learning the meanings of words and on learning how to use language for social interaction, they are assumed to be fewer and more general (Pinker, 1996). Also, nativist claims are restricted largely to the acquisition of language competence rather than language performance. Language is the way we communicate with others and language development plays a vital role in early intervention therapies with children who have special needs (Chomsky, 1975).

Constructivist Theory

The constructivist theory was originally associated with Jerome Bruner and is based on three claims (Bruner, 1960).

1. Interactions are motivated by the child's desire for attempts to acquire a means of participation in social interaction with the important people in his or her life (Bruner, 1975). From the constructivist perspective, development is embedded within the broader context of the acquisition of cultural practices. Bruner (1960) stated that learning is an active process in which learners construct new ideas or concepts based upon their current knowledge. This theory is relevant to the early intervention program with which the participants in the study were associated because the constructivist theory implies that any curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned. This type of curriculum is integrated into the learning activities and therapies of each of the participants because each developmental learning task builds on the objectives and goals set by the educators for each child in the program.
2. Interactions and relationships that the child has with others are critical for determining the rate and course of development (Abbeduto & Boudreau, 2004). This is also relevant to the early intervention program in which the participants are participating because there are both typically developing children and children with Down syndrome in the same classrooms receiving the same integrated therapies.

3. There is considerable variation among children regarding their environments, including the extent and nature of their interactions and relationships with care providers. Although the social-interactionist approach is not inconsistent with the possibility that children are predisposed by virtue of heredity to be especially prepared to learn, the approach also emphasizes that the social uses and contexts of language are important for development. These inconsistencies are a source of differences among children as regards to their trajectories and outcomes (Bruner, 1975).

Social Development Theory

Social interaction plays a fundamental role in the development of cognition. Vygotsky showed that at each level of development, the child's manner of interacting with the world is determined by the particular structures of the personality at that time (Thomas, 2000). A second aspect of this theory is that as a child is developing, the range of skills that the level of achievement that can be reached with the help of adult guidance or peer collaboration exceeds what could be attained by the child alone (Thomas, 2000). In 1978 Lev Vygotsky stated

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first between people being interpsychological and then inside the child, intrapsychological. This applies equally to voluntary attention, to logical memory, and to the formation of

concepts. All higher functions originate as actual relationships between individuals. (p.57)

A child first seems to use language for superficial social interaction, but at some point this language goes underground to become the structure of the child's thinking (Vygotsky, 1978). According to Vygotsky, all fundamental cognitive activities take shape in a matrix of social history and form the products of sociohistorical development (Luria, 1976). Cognitive skills and patterns of thinking are not primarily determined by innate factors, but are the products of the activities practiced in the social institutions of the culture in which the individual grows up. The history of the society in which a child is reared, and the child's personal history are crucial determinants of the way in which that individual will think. In this process of cognitive development, language is a crucial tool for determining how the child will learn how to think because advanced modes of thought are transmitted to the child by means of words (Thomas, 2000). One essential tenet in Vygotsky's theory is the notion of the existence of the zone of proximal development (Thomas, 2000). The zone of proximal development is the difference between the child's capacity to solve problems independently, and with assistance. The actual developmental level refers to all the functions and activities that a child can perform in solo and without the help of anyone else. The zone of proximal development includes all the functions and activities that a child or a learner can perform only with the assistance of someone else. The assisting person in this scaffolding process, providing non-intrusive intervention, could be an adult (e.g. parent, teacher, caretaker, language instructor) or another peer who

has already mastered that particular function. Social and cognitive learning are interrelated rather than separate processes and an individual's competencies and interests have the potential to influence relationships just as relationships are able to impact all levels of functioning (Nuthall, 2001). An essential feature of learning for children with Down syndrome is that it awakens a variety of internal developmental processes that are able to operate when the child is interacting with people in his environment and in cooperation with his peers.

Early Intervention

One of the most frequent claims of researchers, administrators, and practitioners involved in early intervention is that programs which involve parents are more effective than those which do not (White, Taylor, & Moss, 1992). Families of children with a developmental delay, such as Down syndrome, are subject not only to the excessive demands faced by families with typically developing children, but also the unique responsibilities and challenges associated with raising a child with a developmental delay (Van Riper, 2000). According to Sloper and Turner (1996), children who have a developmental delay and are in need of early intervention will require more attention and support than typically developing children

There is overwhelming evidence that families of children with Down syndrome experience higher levels of stress than families with typically developing children. These stresses include increased time demands, strains and transition in addition to devoting

more of their time to child care and educational activities and less of their time to social activities than do parents of non-disabled children (Van Riper, 2000).

While the demands on the family unit are high, meeting the needs of a child with a developmental delay may take precedence over meeting the needs of other family members. The economic impact of having a child with special needs may include frequent medical needs as well as educational services. The need to understand how children respond to the experience of living in a family that includes a child with a developmental delay is even greater today than it was in prior decades. Early intervention has been defined as early detection of a disability or delay, a child-family centered intervention, psychological support for the parents and siblings, and the interdisciplinary teamwork or trained professionals (Croft et al., 1997).

Siblings of children with special needs are greatly affected throughout their lives by the pressures associated with being raised with a child with Down syndrome. The Fisman (2000) study showed the effect of stress of family members is both direct and indirect. Stress is generated directly by the child with the disability as well as indirectly through the disabled child's impact on parental and marital functioning (2000). In the last 10 years, early intervention programs have become more family centered. Professionals who work with children with special needs like Down syndrome realize that when family needs are satisfied, children thrive (Pretis, 2000).

The claim that parent involvement is essential for educational success is not new. Frederick Froebel, one of the primary contributors to the establishment of American kindergarten programs, said that,

> All are looking for reform in education....If building is to be solid, we must look to the foundations of the home. The home education of rich and poor alike must be supplemented....It therefore behooves the state to establish institutions for the education of children, of parents and of those who are to be parents. (Hauschmann, 1987, p.183)

Beyond the intra-child focus of most organismic models, contemporary frameworks for studying child development increasingly emphasize the importance of transacting biological, social, and psychological factors. The various systems in which children develop, including the family, and community and bi-directional transactions within and across contexts over time are important to development (Guralnick, 1998). The investigational study by Hauser-Cram et al. (1999) was conducted to test the hypothesis that the family relational environment predicts the development of adaptive functioning over the first 5 years of life in children with special needs. These findings support the hypothesis that organismic principles of development apply to children with special needs as they do to all children.

Family Variables

It has only been in recent years that when looking at the family patterns that are associated with children's development, an emphasis has been placed on the relational

aspects of the family environment. Hauser-Cram et al. (1999) stated that, "Central to all of these current perspectives is the recognition of the family as the critical context of development for the young child" (p. 980). They also described a model that identified key predictors of children's cognitive development based primarily on family factors. Specifically, the researchers delineated two separate dimensions of families that have effects on children's developmental trajectories: (a) family characteristics, including sociodemographic features; and (b) patterns of interactions within families. The Hauser-Cram et al. study also reported a high correlation between the importance of family variables to typical development in children. Since children with mental retardation develop in similar patterns as children with Down syndrome, family variables appear to be crucial to the development of these children, as well. Carr (2000) indicated that measures of family processes appear to have important predictive power for the development of children with mental retardation above and beyond that of maternal education. A study by Cummings, Goeke-Morey, & Dukewich, (2001) on family processes found that when examining parent-child relationships, sibling relationships and marital relationships warm and supportive associations within the family are linked with positive child development outcomes.

Higher levels of family cohesiveness predicted greater motivation on mastery tasks during the preschool years for children with mental retardation and more positive peer interactions in the preschool classroom (Hauser-Cram, Sirin, Stipek, 2003). Older siblings of children with disabilities engage in twice as many managing, helping, and

teaching interactions as older siblings of children without disabilities and therefore tend to assume playmate roles which become beneficial to the sibling with special needs (Stoneman, Brody, Davis, & Crapps, 1998). Siblings of children with special needs have not been a major focus on intervention research. However, there are a few studies in which typically developing children have been taught strategies to support the language and communication of their brothers and sisters with disabilities (Girolametto, 1988).

Language Development

Language is critical to social interaction, learning, and performance across a variety of contexts (Murphy & Abbeduto, 2005). Children with Down syndrome have a characteristic delay in their language development, but it is important to recognize the unexplained variation in language development so that the chromosome abnormality is insufficient in itself to account for language impairment (Laws & Bishop, 2004). A large body of research into the language development of children with Down syndrome provides support for the hypothesis that their language and communication skills follow the same course and sequence as that of typical children, but progress at a slower rate (Chan, 2001). In a study on the communication skills of children with Down syndrome, Smith and von Tetzchner (1996) found that delays in language and communication skills increased as their general cognitive skills increased with advancing age, thereby indicating a widening gap between cognition and language. In particular, they observed delays in nonverbal requesting and infrequent pre-speech vocalizations in relation to a comparison group of children without disabilities who were of similar mental ages. On

the basis of their findings, Smith and von Tetzchner concluded that children with Down syndrome have a specific deficit in emergent language and that their nonverbal requesting skills are related to delays in expressive language (1996).

Only a few studies have produced general results regarding the communicative development of children with Down syndrome (Berglund, 2001). Some current researchers have chosen to compare children with Down syndrome with their typically developing peers when studying language and social interactions. Mundy, Kasari, Sigman, and Ruskin (1995) explored the predictive relationship between nonverbal communication and early language acquisition in a well-known longitudinal study in which they compared children with Down syndrome to those children exhibiting a typical developmental pattern. These researchers found that social interaction and requesting and responding to joint attention were significant predictors of both receptive and expressive language and that the typical children were much more likely to master these skills at a faster rate than the children with Down syndrome. In 1998, the first large-scale study of a national sample of children with Down syndrome was conducted by Eva Berglund in which normative data were provided using 330 subjects. This researcher also studied sex-related differences in language among children with Down syndrome and children in the normative group. The findings of this study showed significant differences for both vocabulary and pragmatic skills for girls and boys. The results showed that girls averaged a better performance better than boys on expressive language skills (Berglund, 2001). Fenson et al. (1993) reported small but consistent differences between boys and girls with

Down syndrome in their study. In contrast, Berglund and Eriksson (2000) and Ericksson and Berglund (1999) found no differences in the language acquisition between boys and girls with Down syndrome.

Language development of children with Down syndrome differs in important ways from that of children with typical language development (Thordardottir, Chapman, & Wagner, 2002). Receptive language may be a relative strength in the Down syndrome population (Barrett & Diniz, 1989). Fowler (1990) said "Even with a relatively strong lexical domain, there may be islands of specific difficulty such as the understanding and use of spatial terms. These will depend on the acquisition of conceptual knowledge and its integration with linguistic knowledge" (p. 213).

Motor Development

Gross motor development in children with Down syndrome is influenced by a number of factors, including hypotonia, ligamentous laxity, decreased strength, and short arms and legs. Patricia Winders (2001) stated in her research that the development of gross motor skills is the first learning task that the child with Down syndrome and his or her parents will face together. In the development of individuals with Down syndrome, drawing and other activities involving perceptual and motor skills may be relatively weak compared to their typically developing peers (Barrett & Eames, 1996; Clements & Barrett, 1994; and Laws & Lawrence, 2001). Individuals with Down syndrome generally show deficits in motor skills throughout development (Palisano et al., 2001). Children with Down syndrome may be facing other factors that are related to specific

developmental deficits associated with the syndrome. These problems include issues with planning and motor weakness. Children with Down syndrome have a decreased ability to generalize their learned motor skills (Winders, 2001). In addition to motor delays, children with Down syndrome have delays in the emergence and termination of reflexes and according to Dunst (1988) these features seem to become more evident towards the end of the first year of life.

Laws and Lawrence (2001) compared the drawings of typically developing students to the drawings of students with Down syndrome. The study showed that many of the children with Down syndrome showed poor understanding of spatial concepts, which were strongly related to grammar comprehension. Those with very poor understanding adopted inconsistent strategies to represent the different spatial arrays. The most obvious finding was that the typically developing children showed more mature motor and grasp patterns. This research supported the possibility of a different pattern to drawing development in children with Down syndrome rather than a delayed version of typical development (Laws & Lawrence, 2001). In contrast to this study, other researchers discovered that the development of children with Down syndrome follows a delayed version of typical development (Wishart, 1993). For example, Fayasse showed that children with Down syndrome may acquire spatial prepositions in the same order as other children but are significantly delayed compared to normal children and to children with other learning disabilities (1997). In a more current study, Evensen et al., (2004) found that when they evaluated the prevalence of psychiatric symptoms and disorders

associated with low birth weight children, the children with Down syndrome had an increased risk of motor problems compared with the control group of children who were labeled as small for gestational age.

Research on motor development in the Down syndrome population suggests a deficit in relation to mental age (Fayasse, 1997). In adults, this has been identified with problems in sequential movement planning, possibly related to difficulties in accessing stored motor programs (Laws & Lawrence, 2001). Motor and daily living skills are defined as observable and measurable behaviors that promote independence, social acceptability, and quality of life (Matson, Mayville, Lott, Bielecki, & Logan, 2003).

Daily Living Skills

Daily living skills are often referred to in the literature as adaptive behavior (Harrison, 1987). These terms are used interchangeably and can be defined as the performance of daily living activities required for personal and social sufficiency (Sparrow et al., 2005). These skills can be changed or modified depending upon the interventions that the individuals receive over time. In a study by Tingey, Mortensen, Matheson, and Doret (1991), skills in specific domains of development yielded some consistent patterns. For example, children with Down syndrome appeared to demonstrate particular weakness in communication, especially with respect to expressive language. The impairments were relatively less pronounced in social development and in the mastery of adaptive skills associated with the tasks of daily living. Growth in these domains progress at a slower rate in comparison to that of typically developing children

(1991). In a longitudinal study, Carr (2000), examined a birth cohort of children with Down syndrome on several occasions during the first 4 years of life and then at 11 and 12 years. She concluded that children with Down syndrome acquire adaptive skills in the same order as non disabled children, but more slowly, and in some cases incompletely.

Adaptive behavior is important because of the value in predicting later functioning for individuals with disabilities (Harrison, 1987). The American Association on Mental Retardation (1992) defined mental retardation with the inclusion of an assessment of adaptive behavior as well as cognitive performance. Sloper and Turner (1996) followed a sample of children with Down syndrome over a 5-year period and found that developmental age at initial assessment was the strongest predictor of improvements in self-help skills. Although often correlated with cognitive performance, adaptive behavior focuses on typical functioning rather than on maximum performance, thereby making it a more practical and meaningful outcome to parents and service providers (Keogh, Bernheimer, & Gutherie, 1997). The study by Hauser-Cram et al. (1999) tested the hypothesis that the family relational environment predicts the development of adaptive functioning over the first 5 years of life in children with Down syndrome. These researchers hypothesized that family relations would predict positive growth in children's adaptive functioning. The findings from this study highlighted the power of family factors in predicting growth in communication, social, and daily living skills for children with Down syndrome. Programs that focus on the importance of daily living skills and social skills can dramatically impact the lives of persons with mental

retardation such as Down syndrome and lead to more successful community integration (Matson et al., 2003).

Socialization

The ability to relate and communicate with others is crucial to developing social relationships and it is a skill that develops early in life (Chan, 2001). Children with Down syndrome have shown a deficit in labeling emotions such as happiness, sadness, and anger in several current studies (Williams, Wishart, Pitcairn, & Willis, 2005). Children with Down syndrome are compelled by the behavior of others and by the human face in general (Keogh, Bernheimer & Gutherie, 1997). Sigman and Ruskin (1999) showed that children with Down syndrome spent more time looking at an experimenter's face than the assessment toys during a testing situation. General impression, as well as clinical description, portrays children with Down syndrome as being particularly socially responsive but empirical research has yielded mixed findings regarding their level of sociability (Chan, 2001). In a study by Sigman and Ruskin (1999) where children with Down syndrome were compared to children with other developmental delays, the children with Down syndrome did not distinguish themselves with a high proportion of social play. The children with Down syndrome also seemed more able to form friendships than the other children. In the same study the researchers showed that the children with Down syndrome did not show a level of peer interaction that might have been expected from their absorbed interest in their emotional reactions of adults in the laboratory. The researchers showed in their findings that the fact that these children have

special friends is a significant social achievement. These researchers concluded that adult interventions that improve peer interactions are valuable for these children (Sigman and Ruskin, 1999). Wishart and Pitcairn (2000) explored understanding of emotions in children with Down syndrome ages 8 through 14 who had been matched using a facial-recognition task to typically developing children of a similar developmental level. The researchers found no statistically significant difference between the scores of the children with Down syndrome and the scores of typically developing children.

History of the Vineland

As early as the time mid-1800s, doctors recognized that deficits in adaptive functioning were important criteria for the diagnosis of mental retardation. The concept of social incompetence as the most important criterion of mental deficiency was formulated in 1935 by Edgar A. Doll, the original author of the family of Vineland assessment instruments, the Vineland Social Maturity Scale (Doll, 1935, 1965), and the president of the American Association on Mental Retardation. Doll argued social sufficiency was dependent on the age of the individual and encompassed a wide range of domains (Sparrow et al., 2005). The Vineland Adaptive Behavior Scales assesses personal and social sufficiency of individuals from birth to adulthood. This type of assessment is applicable whenever an evaluation of an individual's daily functioning is necessary.

Applicability

Since 1984, the Vineland Adaptive Behavior Scales have been used in more than 1,000 studies to investigate the effects on everyday functioning of a broad range of disorders or disabilities including Down syndrome (Sparrow et al., 2005). Standardization of the Vineland Survey Interview Form took place from March 2003 to October 2004. Each of these forms consisted of 444 items in the four primary domains: communication, daily living skills, socialization, and motor skills. Nationally representative samples of 3,695 individuals aged birth through 90 years were assessed at 242 sites and the District of Columbia.

Demographics

The demographic targets for the Vineland norm sample, based on the Current Population Survey, March 2001, were applied to 20 age groups covering the age range birth through 90 years. Eleven clinical groups were defined, and data were collected as evidence for the validity of the Vineland in identifying adaptive behavior deficits in those populations. These samples included individuals identified as having one or more of the following conditions: (a) attention-deficit/hyperactivity disorder, (b) autism-nonverbal, (c) autism-verbal, (d) emotional or behavioral disturbance, (e) deafness/hard of hearing, (f) learning disability, (g) mental retardation-mild, (h) mental retardation-moderate, (i) mental retardation-severe or (j) profound, and (k) visual impairment (Sparrow et al., 2005). Data were collected to provide three types of evidence for the reliability of the Survey Interview Form. The first was internal-consistency reliability, using the split-half

method, for each domain and sub-domain. Also, test-retest reliabilities and inter-rater reliabilities for four different age ranges were collected from the evidence.

Sample

The developmental norms set by the researchers and authors of the Vineland used a sample that closely resembles the current U.S. population of children, adolescents, and adults. For standardization, such a sample was achieved through the collection of demographic information on a large group of individuals for potential assessment and the application of random sampling methods to match the testing plan. Demographic variables were controlled as a way of ensuring that the final sample would resemble the U.S. population in the distribution of adaptive behaviors measured by the Vineland. Selection of a norm sample of 3,695 cases was made electronically from a pool of over 25,000 individuals in a way that matched the demographic variable targets within each age group. Individuals with various disabilities or other special conditions were eligible for inclusion in the norm sample, and are represented proportionally to their incidence in the population (Sparrow et al., 2005). For adaptive functioning, significant limitations are established by a score that is at least two standard deviations below the mean of the norm population in at least one domain or on the overall composite. The Vineland Adaptive Behavior Scale is applicable whenever an assessment of an individual's daily functioning is required.

Summary

This study combined portions from different theoretical frameworks that have produced research on development and intervention in persons with mental retardation. This chapter connected information from current research studies as well as studies that have been built upon over time. The review of literature described the child with Down syndrome as well as variables that will affect their development. Also, the history of the Vineland Adaptive Behavior Scales was presented. Research was presented that supports the current study including adaptive skills and how those abilities will affect the lives of children with Down syndrome and their families. The theoretical framework that was used for this study was presented by looking at this subject through three different but related lenses: the nativist theory, the constructivist theory, and the social learning theory.

CHAPTER III

METHODOLOGY

This chapter describes the specific objectives of the present quantitative study in detail. The methods that were employed to meet the objectives, a description of the participants involved, and the statistical analysis to be completed was also described. Research hypothesis and instrumentation were discussed. The purpose of this study was to investigate the trends across developmental domains for a specific group of children with Down syndrome who received early intervention from an integrated intervention program. The results of the developmental scores on the Vineland Adaptive Behavior Scales for children with Down syndrome were used to analyze developmental trends based on age and gender of the subjects, the school attended and based on time. The scores from this specific population were reviewed against the norm sample provided by the Vineland Adaptive Behavior Scales study performed on 3,695 participants. A quantitative research approach was used to describe specific trends across the population and a correlation between the developmental scores was reviewed across time.

Population and Sample

The participants for this study consisted of 81 children with Down syndrome ages 18 months to 6 years. The data came from existing test scores from three different non-profit early intervention pre-schools. Each participant had at least three years of developmental test scores to use for the study. The schools are located in Tuscaloosa,

Alabama; Dallas, Texas; and Houston, Texas. The participants must have a Down syndrome diagnosis and must have been considered by professionals to be developmentally delayed in at least one area of development. The participants must have received early intervention from a specified non-profit early intervention program.

The current study utilized non probability sampling methods to gather the developmental scores of participants through convenience sampling. Non-probability sampling is often used in social science research (Brown, Cozby, Kee, & Worden, 1999). The results from this quantitative study were not intended to reflect the general population in any way. The sample consisted of 81 individuals with Down syndrome who received early intervention from a specific early intervention program that included integrated therapy into the daily routines of each student.

Sampling Procedures

The researcher discussed the current quantitative study with the directors at each of the early intervention programs, informing them of the purpose of the study. After written consent from the directors was provided, the original developmental records of the Vineland Adaptive Behavior Scales assessment were copied for each child. The participants' names were masked from the document and a code for male or female was placed on each test record. An individual who was not associated with the study made the copies at each early intervention program and the copies were then sent to the researcher via mail in a sealed envelope. The data were recorded and entered into a computer program, Statistical Package for the Social Sciences (SPSS) version 15.0, for analysis.

Specific demographic information was unnecessary for the purpose of this research and was not gathered from the parents of the participants. A pilot study consisted of 5 participants who had 4 records of developmental scores from The Vineland Adaptive Behavior Scales. The pilot study participants represented children from an early intervention program in Dallas, Texas.

Protection of Human Participants

Prior to the study, a required application was submitted to the Institutional Review Board (IRB) of Texas Woman's University. Deliberations of ethical issues were addressed in this submission. The researcher limited the potential harm to any of the participants because the data collection methods insured privacy and no personal information were used in any part of the research. The names of the subjects were masked from their developmental test scores from The Vineland Adaptive Behavior Scales before the researcher looked at the data; children were identified by a code number to assure privacy. In addition data collection methods assured privacy by not using the names of any of the participants on any of the documents. The potential of any psychological harm to the participants during the study was limited because the data that was used came from existing information drawn from assessments that were given prior to the research study. The developmental test results used for this study ranged from 1997 to 2007.

Pilot Study

A pilot study was conducted to examine the reliability and validity of the proposed research project. The reliability of a research instrument concerns the extent to which the instrument yields the same results on repeated trials. Although unreliability is always present to a certain extent, there will generally be a good deal of consistency in the results of a quality instrument gathered at different times (Babbie, 2004). The tendency toward consistency found in repeated measurements in this study is referred to as reliability. For this study validity was defined as the degree to which the Vineland measures what it is supposed to measure. This study consisted of 5 participants of similar age and experience to the prospective participants, and examined the developmental trends across time for these participants. The 5 participants were chosen based on the number of test results they had; each student in the pilot study had at least 4 records of test results. The Vineland Adaptive Behavior Scales scores of the pilot study participants were analyzed for quantitative trends and the results were reviewed by the researcher. Four main developmental domains with 11 sub-domains were used for the pilot study. The developmental domains were communication, daily living skills, socialization and motor skills and the sub-domains were receptive language, expressive language, written, personal, domestic, community, interpersonal relationships, play and leisure, coping skills, gross motor skills and fine motor skills. The data were gathered and analyzed using the same approaches as those used in the main study. Participants in the pilot study satisfied the criteria for participation in the main study. After the pilot study, the

researcher made modifications to the methodology as needed and proceeded with the quantitative study.

Procedure

The researcher explained the research project to the directors of each early intervention program. A written consent letter was requested of each director. The participants were then selected based on recommendations from the directors. Each early intervention program had a person unrelated to the study gather the data by making photocopies of the test results after the names of the children were masked. The test records were coded by number and each test record was marked male or female. The directors received a copy of the research project with the findings attached for their use in each early intervention program.

Data Treatment

A database management system was used to store and code data, and then the data were analyzed using a statistical software program, Statistical Package for the Social Sciences (SPSS) version 15.0. These systems insured systematic and careful collection, storage, and retrieval of the data. After the data were used for the study, it will be destroyed by the researcher to protect the participants from any further distribution of test scores.

Quantitative Data Analysis

The quantitative data were collected and the information was coded for inclusion in the study. Each participant was coded based on the program they attended as well as

gender and age. The data were analyzed for a systematic pattern or trend. Kachigan (1986) states that to test a hypothesis about the relationship between the predictor and criterion variables, a special set of orthogonal contrasts to assess the trends is needed. The independent variables were age, gender, school and time. The dependent variables were the participant's test results on the Vineland Adaptive Behavior Scales as they were categorized by domain and sub-domain. A sample mean from the participants was compared to the norm sample mean gathered from 3,695 individuals conducted from the national study by the Vineland researchers.

Several types of analyses were used for the current study. Pearson's product moment correlations were used in the preliminary analyses to determine the relationship of age and the other variables. A Multiple Analysis of Variance (MANOVA) was also used to determine differences between the four developmental domains and 11 sub-domains when referring to the standard scores, the percentile scores, the stanine scores, age equivalent scores, raw scores, and adaptive levels. A nonparametric chi square cross tab measure was used when comparing the three schools on the adaptive levels of development for the domain and sub-domain scores. When controlling for age and comparing the standard scores, percentile ranks, stanine scores, adaptive levels and age equivalent scores for the four domains, as well as to asses potential differences in gender and school, repeated measures of Multivariate Analysis of Covariance (MANCOVA) were conducted. Associations were considered significant at the .05 level.

Effects

The data were analyzed at three different points of time, therefore producing a time effect. Each participant had three sets of developmental test results from the Vineland Adaptive Behavior Scales. These assessments did not occur at the exact same time for each participant, but rather at their entry into the early intervention program and then again the following two years. Age was therefore controlled for using Pearson's product moment correlations in the preliminary analysis. The time effect occurred because across every point of the analysis there was a change in the developmental test scores over time. The domain effect and sub-domain effect took place when across all three points of time there was a difference in at least one domain or sub-domain. The school effect can be defined as the difference between the developmental test scores of the participants from three different schools across all domains. The gender effect was the differences that were found between male and female participants.

Scoring Methods

The Vineland Adaptive Behavior Scales uses different kinds of scores to interpret the findings of each domain and sub-domain. Standard scores are used to describe an individual's overall functioning. This score tells the distance of the individuals' raw score from the mean raw score (Sparrow et al., 2005). Standard scores have a mean of 100 and a standard deviation of 15. Percentile ranks express the percentage of people that an individual outperformed in his or her age group. Adaptive levels are used to summarize a participant's overall level of functioning and age equivalents are the norm referenced

scores that show the age level at which a participant is functioning. Stanine scores are whole-number scores that range from 1 to 9 with a mean of 5 and a standard deviation of 2. Each stanine score represents a specific range of percentile ranks (Sparrow et al., 2005).

Summary

Research methodology for the proposed quantitative study was outlined in this chapter. The sampling procedure was delineated and the procedures that were used to acquire the data were discussed. The way in which participants were protected through the different procedures was identified. A rationale and a plan for a pilot study were presented. This chapter also addressed how the research was addressed ethically, including the protection of human subjects, informed consent, confidentiality, and security of the data. The different effects were defined for the methodology, scoring terms were defined and the methods for collecting, storing, and analyzing data were also outlined in this chapter.

CHAPTER IV

RESULTS

The purpose of the present study was to investigate the trends across developmental domains for a specific group of children with Down syndrome who received early intervention from an integrated intervention program. The trends were examined based on age, gender, school and time. The study explored the measurement between four different developmental domains: communication, socialization, daily living skills, and motor skills, and with 11 sub-domains: receptive language, expressive language, written language, personal, domestic and community skills, interpersonal relationships, play and leisure time, coping skills, gross motor skills and fine motor skills. The independent variables were gender, age, school and time and the dependent variables were the developmental test results of the participants. The study employed quantitative methods to analyze the interactions between the variables.

Demographics

A total of 81 participants were included in the current sample for this study. As shown in Table 1, there were approximately the same proportion of male (48.1%) and female (51.9%) participants. The participants were students in Tuscaloosa, Alabama (30.9%); Dallas, Texas (40.7%) and Houston, Texas (28.4%).

Table 1

Frequencies and Percentages for School and Gender

	Frequency	Percent
School		
Alabama	25	30.9
Dallas	33	40.7
Houston	23	28.4
Gender		
Male	39	48.1
Female	42	51.9

Preliminary Analyses

Schools

The current sample included students from different schools in two different states, and therefore, the potential exists for differences between these three sample subgroups (e.g., Dallas, Houston, Alabama). In order to determine whether or not to collapse the sample across the three schools or to include school as one of the levels in the analysis, a series of analyses were conducted to test for school differences on the various developmental measures collected at baseline in the current study.

Standard scores. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the standard scores for communication, daily living skills, socialization, and motor skills. The overall multivariate effect was significant, $F(8, 150) = 3.29$, $p < .01$. The univariate analysis revealed significant differences for school on all four standard scores (see Table 2), including communication, $F(2, 78) = 7.72$, $p < .01$; daily living skills, $F(2, 78) = 9.18$, $p < .001$; socialization, $F(2, 78) = 6.86$, $p < .01$; and motor skills, $F(2, 78) = 8.22$, $p < .01$.

Post hoc tests using the Scheffe' test indicated that the scores from Alabama were significantly different than both Dallas and Houston on all four standard scores. More specifically, students from Alabama had significantly higher scores on communication ($M = 80.92$, $SD = 15.50$) than both Dallas ($M = 67.48$, $SD = 9.00$) and Houston ($M = 69.09$, $SD = 16.60$).

Similarly, Alabama had significantly higher scores on daily living skills ($M = 83.72$, $SD = 17.61$) than both Dallas ($M = 68.45$, $SD = 7.21$) and Houston ($M = 71.91$, $SD = 16.05$). The same pattern was observed on the socialization scores; Alabama had significantly higher scores ($M = 82.64$, $SD = 12.75$) than Dallas ($M = 72.91$, $SD = 9.23$) and Houston ($M = 71.87$, $SD = 12.79$). Finally, Alabama also had significantly higher scores on motor skills ($M = 73.28$, $SD = 11.14$) than Dallas ($M = 64.64$, $SD = 7.17$) and Houston ($M = 63.43$, $SD = 10.25$).

Table 2

Means and Standard Deviations of Standard Score by School

	N	Mean	SD	*F*	*p*
Communication				7.72	.001
Alabama	25	80.92	15.50		
Dallas	33	67.48	9.00		
Houston	23	69.09	16.60		
Daily living skills				9.18	.000
Alabama	25	83.72	17.61		
Dallas	33	68.45	7.21		
Houston	23	71.91	16.05		
Socialization				6.86	.002
Alabama	25	82.64	12.75		
Dallas	33	72.91	9.23		
Houston	23	71.87	12.79		
Motor skills				8.22	.001
Alabama	25	73.28	11.14		
Dallas	33	64.64	7.17		
Houston	23	63.43	10.25		

Percentile rank. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the percentile rank for communication, daily living skills, socialization, and motor skills. The overall multivariate effect was significant, F (8, 150) = 4.15, $p <$ .001. The univariate analysis revealed significant differences for school on all four percentile ranks (see Table 3), including communication, F (2, 78) = 6.87, $p < .01$; daily

living skills, F (2, 78) = 11.85, p < .001; socialization, F (2, 78) = 8.63, p < .001; and motor skills, F (2, 78) = 10.64, p < .001.

Post hoc tests using the Scheffe' test indicated that the percentile rank for communication from Alabama (M = 19.04, SD = 21.21) was significantly different than the communication rank from Dallas (M = 3.16, SD = 3.98). Alabama also had significantly higher ranking scores on daily living skills (M = 25.54, SD = 25.07) than both Dallas (M = 3.04, SD = 3.16) and Houston (M = 11.47, SD = 19.52).

Similarly, Alabama had significantly higher ranking scores on socialization (M = 19.09, SD = 15.83) than both Dallas (M = 6.39, SD = 10.37) and Houston (M = 6.85, SD = 11.25). Finally, the percentile ranks for motor skills were significantly higher in Alabama (M = 6.99, SD = 6.26) than both Dallas (M = 1.73, SD = 1.89) and Houston (M = 2.66, SD = 4.75).

Stanine. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the stanine scores for communication, daily living skills, socialization, and motor skills. The overall multivariate effect was significant, F (8, 150) = 4.11, p < .001. The univariate analysis revealed significant differences for school on all four stanine scores (see Table 4), including communication, F (2, 78) = 12.02, p < .001; daily living skills, F (2, 78) = 12.40, p < .001; socialization, F (2, 78) = 7.19, p < .01; and motor skills, F (2, 78) = 12.70, p < .001.

Table 3

Means and Standard Deviations of Percentile Rank by School

	N	Mean	SD	*F*	*p*
Communication				6.87	.002
Alabama	25	19.04	21.21		
Dallas	33	3.16	3.98		
Houston	23	11.17	20.43		
Daily living skills				11.85	.000
Alabama	25	25.54	25.07		
Dallas	33	3.04	3.16		
Houston	23	11.47	19.52		
Socialization				8.63	.000
Alabama	25	19.09	15.83		
Dallas	33	6.39	10.37		
Houston	23	6.85	11.25		
Motor skills				10.64	.000
Alabama	25	6.99	6.26		
Dallas	33	1.73	1.89		
Houston	23	2.66	4.75		

Post hoc tests using the Scheffe' test indicated that the stanine scores for Alabama were significantly greater than those from both Dallas and Houston. The stanine communication scores for Alabama ($M = 2.96$, $SD = 1.70$) were significantly greater than those from Dallas ($M = 1.33$, $SD = .65$) and Houston ($M = 1.74$, $SD = 1.42$). A similar pattern emerged for the stanine scores for daily living skills. Alabama had significantly greater scores for daily living skills ($M = 3.12$, $SD = 1.79$) compared to Dallas ($M = 1.30$.

SD = .59) and Houston (M = 1.96, SD = 1.66). Alabama also had significantly higher stanine scores for socialization (M = 3.00, SD = 1.50) than Dallas (M = 1.82, SD = .92) and Houston (M = 1.83, SD = 1.50). Finally, Alabama had significantly higher stanine scores for motor skills (M = 1.96, SD = .79) than both Dallas (M = 1.18, SD = .39) and Houston (M = 1.30, SD = .63).

Table 4

Means and Standard Deviations of Stanine by School

	N	Mean	SD	F	p
Communication				12.02	.000
Alabama	25	2.96	1.70		
Dallas	33	1.33	.65		
Houston	23	1.74	1.42		
Daily living skills				12.40	.000
Alabama	25	3.12	1.79		
Dallas	33	1.30	.59		
Houston	23	1.96	1.66		
Socialization				7.19	.001
Alabama	25	3.00	1.50		
Dallas	33	1.82	.92		
Houston	23	1.83	1.50		
Motor skills				12.70	.000
Alabama	25	1.96	.79		
Dallas	33	1.18	.39		
Houston	23	1.30	.63		

Adaptive levels. There were three adaptive levels for each developmental measure, including communication, daily living skills, socialization, and motor skills. Crosstabular analyses were conducted to compare the distribution across these three levels and the three different schools (see Table 5). Pearson's chi-square analysis indicated that the distribution of communication scores across adequate, low, mod-low by school was significant, χ^2 (4) = 21.33, $p < .001$. Students in Alabama tended to score in the adequate and mod-low communication categories, whereas the students in Dallas and Houston tended to score in the low and mod-low categories.

The distribution of daily living skills scores across adequate, low, mod-low by school was also significant, χ^2 (4) = 20.05, $p < .001$. Students in Alabama tended to score in the adequate and mod-low daily living skills categories, whereas the students in Dallas and Houston tended to score in the low and mod-low categories. Similarly, Pearson's chi-square also indicated that the distribution of socialization scores across adequate, low, mod-low by school was significant, χ^2 (4) = 17.45, $p < .01$. Students in Alabama tended to score in the adequate category, whereas students from Dallas and Houston tended to score in the mod-low category. Finally, Pearson's chi-square test revealed that the distribution of motor skills scores across adequate, low, mod-low by school was also significant, χ^2 (4) = 14.74, $p < .01$. Alabama students tended to score in the mod-low category, whereas students in Dallas and Houston tended to score in the low category.

Table 5

Frequencies and Percentages of Adaptive Levels by School

Variable	Alabama		Dallas		Houston	
	n	%	n	%	n	%
Communication						
Adequate	10	40.0	1	3.0	3	13.0
Low	3	12.0	20	60.6	8	34.8
Mod-Low	12	48.0	12	36.4	12	52.2
Daily Living Skills						
Adequate	10	40.0	0	.0	3	13.0
Low	5	20.0	18	54.6	7	30.4
Mod-Low	10	40.0	15	45.5	13	56.5
Socialization						
Adequate	13	52.0	2	6.1	5	21.7
Low	4	16.0	13	39.4	5	21.7
Mod-Low	8	32.0	18	54.6	13	56.5
Motor skills						
Adequate	6	24.0	0	.00	4	17.4
Low	7	28.0	23	69.7	14	60.9
Mod-Low	12	48.0	10	30.3	5	21.7

Age equivalent scores. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the age equivalent scores for communication, daily living skills, socialization, and motor skills. The overall multivariate effect was not significant.

F (8, 150) = 1.32, p = .238. The univariate analysis revealed significant differences for school on one of the four age equivalent scores (see Table 6). There were significant differences between schools for the age equivalent scores on motor skills, F (2, 78) = 3.71, p < .05. Despite the univariate significance, post hoc tests using the Scheffe' test failed to reveal significant differences between schools for motor skills.

Table 6

Means and Standard Deviations of Age Equivalent (in Months) by School

	N	Mean	SD	*F*	*p*
Communication				1.51	.227
Alabama	25	8.92	6.82		
Dallas	33	11.27	3.88		
Houston	23	9.61	5.27		
Daily Living Skills				1.57	.215
Alabama	25	10.16	5.42		
Dallas	33	12.09	4.68		
Houston	23	10.26	3.83		
Socialization				2.38	.099
Alabama	25	9.52	6.21		
Dallas	33	13.39	12.31		
Houston	23	8.61	3.88		
Motor Skills				3.71	.029
Alabama	25	8.48	7.41		
Dallas	33	11.76	4.40		
Houston	23	8.22	4.55		

Adaptive behavior composite variables. A series of one-way (school: Alabama vs. Dallas vs. Houston) ANOVAs were conducted to examine differences between schools on adaptive behavior composite variables, including the standard score, percentile rank, stanine, adaptive level, and age equivalent (see Table 7). The analysis on the standard scores revealed a significant effect for school, F (2, 78) = 9.74, $p < .001$. Post hoc comparisons using the Scheffe' test revealed that Alabama standard scores (M = 76.04, SD = 14.05) were significantly greater than Dallas standard scores (M = 63.73, SD = 6.98) and Houston standard scores (M = 64.74, SD = 12.71).

The results from the analysis on percentile rank also revealed a significant effect for school, F (2, 78) = 4.99, $p < .01$. Post hoc comparisons using the Scheffe' test revealed that the Alabama percentile rank (M = 15.05, SD = 21.20) was significantly greater than the Dallas percentile rank (M = 1.73, SD = 20.63).

Similar results were obtained from the analysis on the stanine scores. The results revealed a significant effect for school, F (2, 78) = 9.06, p < .001. Post hoc comparisons using the Scheffe' test revealed that Alabama stanine scores (M = 2.64, SD = 1.75) were significantly greater than Dallas stanine scores (M = 1.12, SD = .33).

The analysis on adaptive level failed to reveal a significant effect for school, F (2, 78) = 1.32, p = .272. Finally, the analysis on age equivalent scores revealed a significant difference for school, F (2, 78) = 3.49, $p < .05$. Post 3 hoc comparisons, however, failed to reveal significant differences between the three schools.

Table 7

Means and Standard Deviations of Adaptive Behavior Composite Variables by School

	N	Mean	SD	*F*	*p*
Standard Score				9.74	.000
Alabama	25	76.04	14.05		
Dallas	33	63.73	6.98		
Houston	23	64.74	12.71		
Percentile Rank				4.99	.009
Alabama	25	15.05	21.20		
Dallas	33	1.56	1.73		
Houston	23	7.82	20.63		
Stanine				9.06	.000
Alabama	25	2.64	1.75		
Dallas	33	1.12	.33		
Houston	23	1.78	1.70		
Adaptive Level				1.32	.272
Alabama	25	2.24	.88		
Dallas	33	2.15	.36		
Houston	23	2.43	.66		
Age Equivalent				3.49	.035
Alabama	25	9.28	6.64		
Dallas	33	11.97	3.96		
Houston	23	8.83	3.79		

Communication sub-domains adaptive levels. There were three to four adaptive levels for the communication sub-domains, which included receptive, expressive, and written. Crosstabular analyses were conducted to compare the distribution across the adaptive levels and the three different schools (see Table 8). Pearson's chi-square analysis indicated that the distribution of receptive scores across adequate, low, mod-low by school was not significant, χ^2 (4) = 6.18, p = .19. The distribution of expressive scores across adequate, low, mod-low, and high by school was significant, χ^2 (6) = 12.69, p < .05. Expressive scores in Alabama tended to be mod-low, whereas scores in Dallas tended to be low and scores in Houston tended to be low or mod-low. Pearson's chi-square analysis indicated that the distribution of written scores across adequate, low, mod-low by school was not significant, χ^2 (4) = 2.35, p = .67.

Daily life skills sub-domains adaptive levels. There were three adaptive levels for the daily life skills sub-domains, which included personal, domestic, and community. Crosstabular analyses were conducted to compare the distribution across the adaptive levels and the three different schools (see Table 9). Pearson's chi-square analysis indicated that the distribution of personal scores across adequate, low, mod-low by school was marginally significant, χ^2 (4) = 9.45, p = .051. Alabama scores tended to be either adequate or mod-low, whereas Dallas scores tended to be low, and Houston scores tended to be low or mod-low. The distribution of domestic scores across adequate, low, mod-low by school was significant, χ^2 (4) = 18.82, p < .01. Domestic scores in Alabama tended to be either adequate or mod-low, whereas scores in Dallas tended to be mod-low and

scores in Houston tended to be adequate. Pearson's chi-square analysis indicated that the distribution of community scores across adequate, low, mod-low by school was also significant, χ^2 (4) = 16.10, $p < .01$. Community scores in Alabama tended to be mod-low, whereas scores in Dallas tended to be either low or mod-low, and scores in Houston were mod-low.

Table 8

Frequencies and Percentages of Communication Sub-Domains Adaptive Levels by School

	Alabama		Dallas		Houston	
Variable	n	%	n	%	n	%
Receptive						
Adequate	7	28.0	3	9.1	2	8.7
Low	13	52.0	17	51.5	12	52.2
Mod-Low	5	20.0	13	39.4	9	39.1
Expressive						
Adequate	5	20.0	1	3.0	2	8.7
Low	7	28.0	21	63.6	10	43.5
Mod-Low	10	40.0	11	33.3	10	43.5
High	3	12.0	0	.0	1	4.3
Written						
Adequate	24	96.0	31	93.9	23	100.0
Low	0	.0	1	3.0	0	.0
Mod-Low	1	4.0	1	3.0	0	.0

Note: The category for "high" is not represented for all measures.

Table 9

Frequencies and Percentages of Daily Living Skills Sub-Domains Adaptive Levels by School

Variable	Alabama		Dallas		Houston	
	n	%	n	%	n	%
Personal						
Adequate	10	40.0	4	12.1	6	26.1
Low	6	24.0	20	60.6	9	39.1
Mod-Low	9	36.0	9	27.3	8	34.8
Domestic						
Adequate	14	56.0	5	15.2	14	60.9
Low	1	4.0	4	12.1	4	17.4
Mod-Low	10	40.0	24	72.7	5	21.7
Community						
Adequate	7	28.0	0	.0	3	13.0
Low	6	24.0	17	51.5	4	17.4
Mod-Low	12	48.0	16	48.5	16	69.6

Socialization sub-domains adaptive levels. There were three to four adaptive levels for the socialization sub-domains, which included interpersonal relationships, play and leisure time, and coping skills. Crosstabular analyses were conducted to compare the distribution across the adaptive levels and the three different schools (see Table 10). Pearson's chi-square analysis indicated that the distribution of personal scores across adequate, low, mod-low by school was marginally significant, χ^2 (4) = 13.12, $p < .05$.

Alabama scores tended to be adequate, whereas Dallas scores tended to be low, and Houston scores tended to be low or mod-low. The distribution of play and leisure time scores across adequate, low, mod-low by school was not significant, χ^2 (4) = 8.32, p = .08. Pearson's chi-square analysis indicated that the distribution of coping skills scores across adequate, low, mod-low, and high by school was significant, χ^2 (6) = 19.80, $p <$ .01. Coping skills scores in Alabama tended to be adequate, whereas scores in Dallas tended to be mod-low, and scores in Houston tended to be adequate or mod-low.

Table 10

Frequencies and Percentages of Socialization Sub-Domains Adaptive Levels by School

	Alabama		Dallas		Houston	
Variable	n	%	n	%	n	%
Interpersonal Relationships						
Adequate	12	48.0	3	9.1	6	26.1
Low	7	28.0	22	66.7	10	43.5
Mod-Low	6	24.0	8	24.2	7	30.4
Play and Leisure Time						
Adequate	11	44.0	4	12.1	7	30.4
Low	8	32.0	16	48.5	11	47.8
Mod-Low	6	24.0	13	39.4	5	21.7
Coping Skills						
Adequate	15	60.0	4	12.1	12	52.2
Low	1	4.0	4	12.1	4	17.4
Mod-Low	9	36.0	24	72.7	7	30.4
High	0	.0	1	3.0	0	.0

Note: The category for "high" is not represented for all measures.

Motor skills sub-domains adaptive levels. There were three adaptive levels for the motor skills sub-domains, which included gross motor and fine motor. Crosstabular analyses were conducted to compare the distribution across the adaptive levels and the three different schools (see Table 11). Pearson's chi-square analysis indicated that the distribution of gross motor scores across adequate, low, mod-low by school was significant, χ^2 (4) = 11.19, $p < .05$. Alabama scores tended to be low with a small portion of scores falling into the adequate or mod-low category. Dallas scores tended to be low and Houston scores tended to be low or adequate. The distribution of fine motor scores across adequate, low, mod-low by school was not significant, χ^2 (4) = 17.53, $p < .01$. Fine motor skill scores in Alabama tended to be adequate, whereas scores in Dallas tended to be either low or mod-low, and scores in Houston tended to be low.

Table 11

Frequencies and Percentages of Motor Skills Sub-Domains Adaptive Levels by School

	Alabama		Dallas		Houston	
Variable	n	%	n	%	n	%
Gross Motor						
Adequate	5	20.0	0	.0	5	21.7
Low	14	56.0	26	78.8	17	73.9
Mod-Low	6	24.0	7	21.2	1	4.3
Fine Motor						
Adequate	11	44.0	1	3.0	5	21.7
Low	6	24.0	16	48.5	13	56.5
Mod-Low	8	32.0	16	48.5	5	21.7

Communication sub-domain age equivalent scores. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the age equivalent scores for the communication sub-domains, which included receptive, expressive, and written. The overall multivariate effect was not significant, F (6, 152) = 1.62, p = .146. The univariate analysis revealed significant differences for school on one of the three communication sub-domains (see Table 12). There were significant differences between schools for the receptive scores, F (2, 78) = 3.22, $p < .05$. Despite the univariate significance, post hoc tests using the Scheffe' test failed to reveal significant differences between schools for the receptive scores.

Table 12

Means of Communication Sub-Domain Age Equivalent Scores by School

	N	Mean	SD	*F*	*p*
Receptive				3.22	.045
Alabama	25	8.12	7.16		
Dallas	33	12.03	4.99		
Houston	23	9.52	5.81		
Expressive				1.83	.168
Alabama	25	8.24	5.71		
Dallas	33	10.09	3.91		
Houston	23	8.09	3.57		
Written				1.05	.354
Alabama	25	17.04	3.34		
Dallas	33	17.91	1.18		
Houston	23	17.22	2.59		

Daily living skills sub-domain age equivalent scores. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the age equivalent scores for the daily living skills sub-domains, which included personal, domestic, and community. The overall multivariate effect was significant, $F(6, 152) = 2.63, p < .05$. The univariate analysis revealed significant differences for school on one of the three communication sub-domains (see Table 13). There were significant differences between schools for the personal scores, $F(2, 78) = 3.89, p < .05$. Despite the univariate significance, post hoc tests using the Scheffe' test failed to reveal significant differences between schools for the personal scores.

Table 13

Means of Daily Living Skills Sub-Domain Age Equivalent Scores by School

	N	Mean	SD	*F*	*p*
Personal				3.89	.025
Alabama	25	10.16	6.90		
Dallas	33	13.79	5.49		
Houston	23	10.26	4.31		
Domestic				.91	.405
Alabama	25	13.84	5.34		
Dallas	33	14.64	5.92		
Houston	23	12.65	4.64		
Community				.69	.506
Alabama	25	6.20	3.92		
Dallas	33	5.67	4.14		
Houston	23	7.17	6.16		

Socialization sub-domain age equivalent scores. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the age equivalent scores for the socialization sub-domains, which included interpersonal relationships, play and leisure time, and coping skills. The overall multivariate effect was not significant, $F(6, 152) = 1.39$, $p = .222$. The univariate analysis revealed significant differences for school on one of the three socialization sub-domains (see Table 14). There were significant differences between schools for the play and leisure time scores, $F(2, 78) = 3.60$, $p < .05$. Despite the univariate significance, post hoc tests using the Scheffe' test failed to reveal significant differences between schools for the play and leisure time scores.

Table 14

Means of Socialization Sub-Domain Age Equivalent Scores by School

	N	Mean	SD	*F*	*p*
Interpersonal Relationships				1.81	.170
Alabama	25	8.60	6.45		
Dallas	33	10.70	6.02		
Houston	23	8.04	3.50		
Play And Leisure Time				3.60	.032
Alabama	25	9.00	6.37		
Dallas	33	12.39	6.02		
Houston	23	8.65	5.09		
Coping Skills				1.06	.352
Alabama	25	10.76	3.62		
Dallas	33	11.30	9.78		
Houston	23	8.65	3.84		

Motor skills sub-domain age equivalent scores. A one-way (school: Alabama vs. Dallas vs. Houston) MANOVA was conducted on the age equivalent scores for the motor skills sub-domains, which included gross motor and fine motor skills. The overall multivariate effect was not significant, $F(4, 154) = 3.19, p < .05$. The univariate analysis revealed significant differences for school on both of the motor skills sub-domains (see Table 15), including gross motor skills, $F(2, 78) = 3.89, p < .05$, and fine motor skills, $F(2, 78) = 5.53, p < .01$. Despite the univariate significance, post hoc tests using the Scheffe' test revealed that Dallas gross motor skills were significantly greater ($M = 11.55$, $SD = 4.69$) than Alabama gross motor skills ($M = 7.72$, $SD = 7.37$). Similarly, Dallas fine motor skills ($M = 12.24$, $SD = 4.33$) were significantly greater than both Alabama ($M = 8.72$, $SD = 6.64$) and Houston ($M = 8.00$, $SD = 4.51$).

Table 15

Means of Motor Skills Sub-Domain Age Equivalent Scores by School

	N	Mean	SD	*F*	*p*
Gross Motor				3.89	.025
Alabama	25	7.72	7.37		
Dallas	33	11.55	4.69		
Houston	23	8.30	4.76		
Fine Motor				5.53	.006
Alabama	25	8.72	6.64		
Dallas	33	12.24	4.33		
Houston	23	8.00	4.51		

Age

In order to determine the relationship between age and the dependent variables, a series of correlation analyses were conducted between age and the various sets of dependent variables at baseline.

Standard scores. Pearson's product moment correlations were conducted to examine the relationships between age and the standard scores, including communication, daily living skills, socialization, and motor skills. The results revealed significant negative correlations between age and all four standard scores (see Table 16). Older ages were associated with lower scores on communication, $r\ (79) = -.596$, $p < .001$, daily living skills, $r\ (79) = -.694$, $p < .001$, socialization, $r\ (79) = -.475$, $p < .001$, and motor skills, $r\ (79) = -.625$, $p < .001$.

Table 16

Pearson's Product Moment Correlations Between Age and the Standard Score (N = 81)

	Age (In Months)
Communication	-.596 **
Daily Living Skills	-.694 **
Socialization	-.475 **
Motor Skills	-.625 **

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

Percentile rank scores. Pearson's product moment correlations were conducted to examine the relationships between age and the percentile rank scores, including communication, daily living skills, socialization, and motor skills. The results revealed significant negative correlations between age and all four percentile rank scores (see Table 17). Older ages were associated with lower scores on communication, $r\ (79) = -.527$, $p < .001$, daily living skills, $r\ (79) = -.685$, $p < .001$, socialization, $r\ (79) = -.476$, $p < .001$, and motor skills, $r\ (79) = -.629$, $p < .001$.

Table 17

Pearson's Product Moment Correlations Between Age and the Percentile Rank (N = 81)

	Age (In Months)
Communication	-.527 **
Daily Living Skills	-.685 **
Socialization	-.476 **
Motor Skills	-.629 **

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

Stanine scores. Pearson's product moment correlations were conducted to examine the relationships between age and the stanine scores, including communication, daily living skills, socialization, and motor skills. The results revealed significant negative correlations between age and all four stanine scores (see Table 18). Older ages were associated with lower scores on communication, $r\ (79) = -.584$, $p < .001$, daily living skills, $r\ (79) = -.665$, $p < .001$, socialization, $r\ (79) = -.519$, $p < .001$, and motor skills, $r\ (79) = -.563$, $p < .001$.

Table 18

Pearson's Product Moment Correlations Between Age and the Stanine (N = 81)

	Age (In Months)
Communication	-.584 **
Daily Living Skills	-.665 **
Socialization	-.519 **
Motor Skills	-.563 **

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

Adaptive level scores. Pearson's product moment correlations were conducted to examine the relationships between age and the adaptive level scores, including communication, daily living skills, socialization, and motor skills. The results revealed significant positive correlations between age and two of the adaptive level scores (see Table 19). Older ages were associated with higher adaptive level scores on daily living skills, $r\ (79) = .243$, $p < .05$ and socialization, $r\ (79) = .356$, $p < .001$.

Table 19

Pearson's Product Moment Correlations Between Age and the Adaptive Level (N = 81)

	Age (In Months)
Communication	.214
Daily Living Skills	.243 *
Socialization	.356 **
Motor Skills	.199

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

Age equivalent scores. Pearson's product moment correlations were conducted to examine the relationships between age and the age equivalent scores, including communication, daily living skills, socialization, and motor skills. The results revealed significant positive correlations between age and all four of the age equivalent scores (see

Table 20). Older ages were associated with higher age equivalent scores on communication, r (79) = .673, $p < .01$; daily living skills, r (79) = .744, $p < .01$; socialization, r (79) = .404, $p < .01$; and motor skills, r (79) = .823, $p < .01$.

Table 20

Pearson's Product Moment Correlations Between Age and the Age Equivalent (N = 81)

	Age (In Months)
Communication	.673 **
Daily Living Skills	.744 **
Socialization	.404 **
Motor Skills	.823 **

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

Adaptive behavior composite. Pearson's product moment correlations were conducted to examine the relationships between age and the adaptive behavior composite scores, including the standard score, percentile rank, stanine, adaptive level, and age equivalent. The results revealed significant correlations between age and four of the adaptive behavior composite scores (see Table 21). Older ages were associated with lower standard scores, r (79) = -.634, $p < .01$; percentile rank, r (79) = -.542, $p < .01$; and

stanine, r (79) = -.608, $p < .01$. Older ages were also associated with higher age equivalent scores, r (79) = .819, $p < .01$.

Table 21

Pearson's Product Moment Correlations Between Age and the Adaptive Behavior Composite (N = 81)

	Age (In Months)
Standard Score	-.634 **
Percentile Rank	-.542 **
Stanine	-.608 **
Adaptive Level	.186
Age Equivalent	.819 **

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

Communication sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the communication sub-domain adaptive level scores, including receptive, expressive, and written. The results revealed significant correlations between age and two of the communication sub-domain adaptive level scores (see Table 22). Older ages were

associated with lower expressive scores, r (79) = -.234, $p < .05$ and higher written scores, r (79) = .565, $p < .01$.

Table 22

Pearson's Product Moment Correlations Between Age and the Communication Sub-Domain Adaptive Level (N = 81)

	Age (In Months)
Receptive	.122
Expressive	-.254 *
Written	.565 **

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

Daily living skills sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the daily living skills sub-domain adaptive level scores, including personal, domestic, and community. The results revealed significant correlations between age and all three of the daily living skills sub-domain adaptive level scores (see Table 23). Older ages were associated with higher personal scores, r (79) = .233, $p < .05$, domestic scores, r (79) = .407, $p < .01$, and community scores, r (79) = .241, $p < .05$.

Table 23

Pearson's Product Moment Correlations Between Age and the Daily Living Skills Sub-Domain Adaptive Level (N = 81)

	Age (In Months)
Personal	.233 *
Domestic	.407 **
Community	.241 *

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

Socialization sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the socialization sub-domain adaptive level scores, including interpersonal relationships, play and leisure time, and coping skills. The results revealed significant correlations between age and all three of the socialization sub-domain adaptive level scores (see Table 24). Older ages were associated with higher interpersonal relationship scores, $r\ (79) = .441, p < .01$, play and leisure time scores, $r\ (79) = .241, p < .05$, and coping skills, $r\ (79) = .480, p < .01$.

Table 24

Pearson's Product Moment Correlations Between Age and the Socialization Sub-Domain Adaptive Level (N = 81)

	Age (In Months)
Interpersonal Relationships	.441 **
Play and Leisure Time	.241 *
Coping Skills	.480 **

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

Motor skills sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the motor skills sub-domain adaptive level scores, including gross motor and fine motor skills. The results revealed significant correlations between age and both of the motor skills sub-domain adaptive level scores (see Table 25). Older ages were associated with higher gross motor scores, $r\ (79) = .276$, $p < .05$ and higher fine motor scores, $r\ (79) = .329$, $p < .01$.

Table 25

Pearson's Product Moment Correlations Between Age and the Motor Skills Sub-Domain Adaptive Level (N = 81)

	Age (In Months)
Gross Motor	.276 *
Fine Motor	.329 **

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

Communication sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the communication sub-domain adaptive level scores, including receptive, expressive, and written. The results revealed significant correlations between age and all three of the communication sub-domain adaptive level scores (see Table 26). Older ages were associated with higher receptive scores, r (79) = .738, $p < .01$, expressive scores, r (79) = .696, $p < .01$, and written scores, r (79) = .305, $p < .01$.

Table 26

Pearson's Product Moment Correlations Between Age and the Communication Sub-Domain Age Equivalent (N = 81)

	Age (In Months)
Receptive	.738**
Expressive	.696**
Written	.305**

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

Daily living skills sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the daily living skills sub-domain adaptive level scores, including personal, domestic, and community. The results revealed significant correlations between age and all three of the daily living skills sub-domain adaptive level scores (see Table 27). Older ages were associated with higher personal scores, $r\ (79) = .778, p < .01$, domestic scores, $r\ (79) = .416, p < .01$, and community scores, $r\ (79) = .372, p < .01$.

Table 27

Pearson's Product Moment Correlations Between Age and the Daily Living Skills Sub-Domain Age Equivalent (N = 81)

	Age (In Months)
Personal	.778 **
Domestic	.416 **
Community	.372 **

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

Socialization sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the socialization sub-domain adaptive level scores, including interpersonal relationships, play and leisure time, and coping skills. The results revealed significant correlations between age and all three of the socialization sub-domain adaptive level scores (see Table 28). Older ages were associated with higher interpersonal relationships scores, r (79) = .730, $p < .01$, play and leisure time scores, r (79) = .695, $p < .01$, and coping skills scores, r (79) = .315, $p < .01$.

Table 28

Pearson's Product Moment Correlations Between Age and the Socialization Sub-Domain Age Equivalent (N = 81)

	Age (In Months)
Interpersonal Relationships	.730 **
Play and Leisure Time	.695 **
Coping Skills	.315 **

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

Motor skills sub-domain adaptive level. Pearson's product moment correlations were conducted to examine the relationships between age and the motor skills sub-domain adaptive level scores, including gross motor and fine motor skills. The results revealed significant correlations between age and both of the socialization sub-domain adaptive level scores (see Table 29). Older ages were associated with higher interpersonal gross motor scores, $r\ (79) = .825, p < .01$ and fine motor skill scores, $r\ (79) = .786, p < .01$.

Table 29

Pearson's Product Moment Correlations Between Age and the Motor Skills Sub-Domain Age Equivalent (N = 81)

	Age (In Months)
Gross Motor	.825 **
Fine Motor	.786 **

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

Primary Analysis

Due to the significant differences between schools on the majority of the measures utilized in the current study, school will be entered as a factor in the primary analyses for the current study. In addition, because age was significantly related to a number of the dependent variables, age will be used as a covariate in subsequent analyses. More specifically, a series of ANCOVAs and MANCOVAs were conducted on the dependent measures in the current study using age as a covariate. The results of these analyses are presented below.

Domain Standard Scores

A time (time 1 vs. time 2 vs. time 3) x domain (communication vs. daily living vs. socialization vs. motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male

vs. female) repeated measures MANCOVA was conducted on the standard scores using age as a covariate (see Table 30). The results revealed a within subjects main effect for time, F (1.84, 138.22) = 23.319, $p < .001$ and an interaction effect for time x school, F (3.87, 138. 22) = 8.82, $p < .001$. The time 1 scores were significantly greater ($M = 72.35$) than both the time 2 ($M = 65.51$) and time 3 scores ($M = 66.05$; $p < .001$). In addition, the time 1 scores in Alabama were the greatest (M = 77.10), with the time 2 (M = 67.41) and time 3 scores (M = 64.68) both showing a decrease over time. In Dallas and Houston, however, the scores dropped between the ($M_{Dallas} = 71.40$, $M_{Houston} = 68.57$) and time 2 measures ($M_{Dallas} = 67.00$, $M_{Houston} = 62.11$), and showed a slight increase in the time 3 scores ($M_{Dallas} = 70.10$, $M_{Houston} = 63.37$). There was also a significant within subjects effect for domain, F (2.66, 199.56) = 85.80, $p < .001$. The socialization scores (M = 72.10) were significantly greater than the other three domains, including communication ($M = 67.89$), daily living ($M = 67.99$), and motor skills ($M = 63.90$).

In addition, the results indicated significant interaction effects for time x domain, F (4.59, 344.25) = 5.85, $p < .001$, time x domain x school, F (9.18, 344.35) = 2.74, $p <$ .01, and time x domain x school x gender, F (9.18, 344.25) = 2.73, $p < .01$. The time 1 scores in each of the four domains were the highest, including communication (M = 71.85), daily living ($M = 74.61$), socialization ($M = 75.78$), and motor skills ($M = 67.17$). The scores decreased from time 1 to time 2 ($M_{communication} = 65.82$, $M_{dailyliving} = 64.57$, $M_{socialization} = 69.87$, $M_{motorskills} = 61.77$), and then increased slightly from time 2 to time 3 ($M_{communication} = 66.00$, $M_{dailyliving} = 64.80$, $M_{socialization} = 70.64$, $M_{motorskills} = 62.76$). The

domain scores in Alabama started out as the highest time 1 ($M_{communication}$ = 77.60, $M_{dailyliving}$ = 79.76, $M_{socialization}$ = 80.37, $M_{motorskills}$ = 70.65), and dropped significantly from time 1 to time 2 ($M_{communication}$ = 67.23, $M_{dailyliving}$ = 66.42, $M_{socialization}$ = 72.71, $M_{motorskills}$ = 63.26), and from time 2 to time 3 ($M_{communication}$ = 64.65, $M_{dailyliving}$ = 62.32, $M_{socialization}$ = 69.06, $M_{motorskills}$ = 62.72). Males and females started out with roughly similar time 1 scores in Alabama. However, females in Alabama showed a greater drop from time 1 (M = 77.35) to time 2 (M = 64.40) compared to male time 1 (M = 76.84) to time 2 scores (M = 70.41) in Alabama. The domain scores in Dallas, however, dropped only slightly from time 1 (M = 71.40) to time 2 (M = 67.00), and increased from time 2 to time 3 (M = 70.10). Females in Dallas started out with slightly higher time 1 (M = 73.25) than males (M = 69.54) in Dallas, however, both male and female scores dropped slightly from time 1 to time 2 (M_{male} = 64.25, M_{female} = 69.75) and increased from time 2 to time 3 (M_{male} = 68.82, M_{female} = 71.39). The Houston domain scores dropped from time 1 (M = 68.57) to time 2 (M = 62.11) and stayed relatively similar from time 2 to time 3 (M = 63.37). Compared to males in Houston, females in Houston started out with higher scores in three of the domains (daily living, socialization, motor skills). Scores for both males and females decreased to similar levels from time 1 to time 2. Time 3 scores for females in Houston were greater than Houston males for communication, daily living, and socialization. Males had slightly higher time 3 scores for motor skills.

Finally, the results revealed a significant between subjects effect for school. Students in Alabama scored significantly higher than students in Houston.

Table 30

Means and Standard Deviations of Domain Standard Scores by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Communication									
	80.99	69.33	65.48	66.78	67.07	70.41	69.13	61.89	62.45
	(13.8)	(9.6)	(9.1)	(14.0)	(9.7)	(9.2)	(14.4)	(10.0)	(9.4)
Daily Living									
	83.77	68.07	63.35	67.69	64.13	67.91	73.98	62.15	63.56
	(13.5)	(9.1)	(9.4)	(13.7)	(9.3)	(9.6)	(14.0)	(9.5)	(9.8)
Socialization									
	82.61	74.20	69.66	72.44	67.95	73.58	73.18	68.06	68.93
	(11.4)	(8.2)	(8.3)	(10.1)	(7.3)	(7.3)	(11.9)	(8.5)	(8.6)
Motor Skills									
	73.26	65.03	63.70	64.27	60.60	64.44	65.03	60.38	60.53
	(9.2)	(8.8)	(10.5)	(9.4)	(8.9)	(10.6)	(9.6)	(9.1)	(10.9)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Domain (communication vs. daily living vs. socialization vs. motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Domain Percentile Rank Scores

A time (time1 vs. time 2 vs. time 3) x domain (communication vs. daily living vs. socialization vs. motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the percentile rank scores using age as a covariate. The results revealed a significant within subjects effect for time, F (1.73, 122.94) = 48.90, $p < .001$. Time 1 scores ($M = 9.89$) were significantly greater than both the time 2 scores ($M = 3.24$) and the time 3 scores ($M = 3.48$). There was also significant within subjects interaction effects for time x school F (3.46, 122.94) = 6.20, $p < .001$. Time 1 scores in Alabama ($M = 15.64$) were higher than time 1 scores in both Dallas ($M = 6.55$) and Houston ($M = 7.48$), however, the time 3 scores in Dallas ($M = 5.18$) were greater than time 3 scores in both Alabama ($M = 2.77$) and Houston ($M = 2.48$).

There was a significant within subjects effect for domain, F (2.28, 161.61) = 17.38, $p < .001$. Motor skills scores ($M = 2.50$) were significantly less than the scores for the other three domains, including communication ($M = 6.57$), daily living ($M = 6.51$), and socialization ($M = 6.56$). Finally, the within subjects interaction effect for time x domain was significant, F (3.59, 254.81) = 12.46, $p < .001$. The time 1 scores for all four domains were greater than the time 2 scores and time 3 scores. The scores decreased from time 1 to time 2 for all four domains. Communication scores, however, increased slightly from time 2 ($M = 3.48$) to time 3 ($M = 4.79$), whereas scores for the other three domains remained the same or changed only slightly from time 2 to time 3.

The between subjects effect for school was also significant, $F(2, 71) = 5.24$, $p < .01$. Scores for Alabama ($M = 7.87$) were significantly greater than both Dallas ($M = 5.00$) and Houston ($M = 3.74$).

Table 31

Means and Standard Deviations of Domain Percentile Rank by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Communication									
	16.80	5.16	3.86	6.82	4.49	7.25	10.68	.80	3.25
	(16.1)	(6.3)	(13.9)	(16.9)	(6.6)	(14.5)	(15.8)	(6.2)	(13.6)
Daily Living									
	22.04	4.59	1.28	8.89	3.00	5.32	10.70	1.30	1.50
	(14.7)	(5.0)	(4.8)	(15.3)	(5.2)	(5.0)	(14.4)	(4.9)	(4.7)
Socialization									
	17.57	8.36	3.65	7.25	3.94	5.92	6.17	2.09	4.04
	(10.8)	(7.4)	(6.2)	(11.3)	(7.8)	(6.5)	(10.6)	(7.3)	(6.1)
Motor Skills									
	6.15	2.67	2.29	3.22	1.68	2.21	2.37	.78	1.14
	(4.0)	(2.5)	(3.8)	(4.1)	(2.6)	(3.9)	(3.9)	(2.4)	(3.7)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Domain (communication vs. daily living vs. socialization vs. motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Domain Stanine Scores

A time (time 1 vs. time 2 vs. time 3) x domain (communication vs. daily living vs. socialization vs. motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the stanine scores using age as a covariate (see Table 32). The results revealed a significant within subjects effect for time, F (1.81, 133.75) = 35.03, $p < .001$. Time 1 scores ($M = 1.94$) were significantly greater than both time 2 ($M = 1.31$) and time 3 scores ($M = 1.33$). There was also significant within subjects interaction effects for time x school F (3.62, 133.75) = 6.28, $p < .001$. Time 1 scores in Alabama (M = 2.50) were significantly greater than the time 1 scores for Dallas (M = 1.70) and Houston (M = 1.60). Alabama scores decreased from time 1 ($M = 2.50$) to time 2 ($M = 1.51$) to time 3 ($M = 1.22$), however, scores in Dallas decreased from time 1 ($M = 1.70$) to time 2 ($M = 1.38$), and increased from time 2 to time 3 ($M = 1.62$). Scores in Houston decreased from time 1 ($M = 1.60$) to time 2 ($M = 1.01$), then showed a slight increase from time 2 to time 3 ($M = 1.14$).

There was a significant within subjects effect for domain, F (2.53, 187.27) = 18.13, $p < .001$. Socialization scores ($M = 1.72$) were significantly greater than scores for communication ($M = 1.54$), daily living skills ($M = 1.57$), and motor skills ($M = 1.26$). Finally, the within subjects interaction effect for time x domain was significant, F (4.80, 354.90) = 6.96, $p < .001$. Time 1 scores for daily living skills ($M = 2.12$) and socialization ($M = 2.17$) were greater than scores for motor skills ($M = 1.48$), however, scores for daily living dropped from time 1 to time 2 ($M = 1.31$) so that they were less than time 2 scores

for both communication ($M = 1.36$) and motor skills ($M = 1.14$). The between subjects effect for school was also significant, $F(2, 74) = 6.43$, $p < .01$. The scores for Houston ($M = 1.26$) were significantly less than the scores for both Alabama ($M = 1.74$) and Dallas ($M = 1.57$).

Table 32

Means and Standard Deviations of Domain Stanine by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Communication									
	2.68	1.48	1.22	1.65	1.58	1.61	1.60	1.02	1.02
	(1.2)	(.8)	(.6)	(1.2)	(.8)	(.7)	(1.2)	(.8)	(.6)
Daily Living									
	2.77	1.52	1.13	1.70	1.33	1.62	1.87	1.07	1.14
	(1.1)	(.7)	(.7)	(1.2)	(.7)	(.7)	(1.2)	(.7)	(.7)
Socialization									
	2.72	1.72	1.31	2.11	1.46	2.02	1.68	1.09	1.33
	(1.2)	(.8)	(1.1)	(1.3)	(.9)	(1.1)	(1.2)	(.8)	(1.1)
Motor Skills									
	1.85	1.30	1.21	1.32	1.14	1.23	1.27	.99	1.05
	(.5)	(.4)	(.6)	(.6)	(.4)	(.6)	(.6)	(.4)	(.6)

Note: Means are from a Time (time vs. time 2 vs. time 3) x Domain (communication vs. daily living vs. socialization vs. motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Domain Adaptive Level Scores

A time (time 1 vs. time 2 vs. time 3) x domain (communication vs. daily living vs. socialization vs. motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the domain adaptive level scores using age as a covariate (see Table 33). The results revealed a significant within subjects effect for time, $F(2, 148) = 8.59$, $p < .001$. Time 2 scores ($M = 2.39$) were significantly greater than time 1 ($M = 2.25$). The within subjects interaction effect for domain x gender was significant, $F(2.55, 188.58) = 4.54$, $p < .01$. Males scored highest on communication ($M = 2.26$), whereas females scored the highest on socialization ($M = 2.64$). The between subjects effect for gender was also significant, $F(1, 74) = 21.88$, $p < .001$. Females ($M = 2.47$) had higher overall adaptive level scores than males ($M = 2.18$).

Domain Age Equivalent Scores

A time (time 1 vs. time 2 vs. time 3) x domain (communication vs. daily living vs. socialization vs. motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the domain age equivalent scores using age as a covariate (see Table 34). The results revealed a significant within subjects effect for time, $F(1.5, 111.17) = 45.75$, $p < .001$. Time 3 scores ($M = 26.86$) were significantly greater than both time 1 ($M = 10.31$) and time 2 scores ($M = 16.73$). In addition, time 2 scores ($M = 16.73$) were significantly greater than time 1 scores ($M = 10.31$).

Table 33

Means and Standard Deviations of Domain Adaptive Level by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Communication									
	2.12	2.36	2.41	2.25	2.27	2.29	2.42	2.60	2.52
	(.8)	(.6)	(.6)	(.8)	(.6)	(.6)	(.8)	(.6)	(.6)
Daily Living									
	2.03	2.35	2.22	2.34	2.30	2.29	2.49	2.47	2.22
	(.7)	(.5)	(.6)	(.8)	(.5)	(.6)	(.7)	(.5)	(.6)
Socialization									
	1.87	2.53	2.49	2.32	2.40	2.42	2.47	2.59	2.64
	(.8)	(.5)	(.6)	(.8)	(.5)	(.6)	(.8)	(.5)	(.6)
Motor Skills									
	2.28	2.30	2.19	2.24	2.21	2.21	2.15	2.28	2.23
	(.7)	(.5)	(.4)	(.7)	(.5)	(.5)	(.7)	(.5)	(.5)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Domain (communication vs. daily living vs. socialization vs. motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Table 34

Means and Standard Deviations of Domain Age Equivalent (in Months) by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Communication									
	10.51	15.12	22.88	9.10	17.40	27.55	10.34	15.68	26.37
	(4.1)	(5.3)	(9.8)	(4.3)	(5.5)	(10.2)	(4.2)	(5.4)	(10.0)
Daily Living									
	11.74	16.82	24.27	10.12	15.37	26.57	11.29	18.52	32.44
	(3.3)	(6.0)	(10.3)	(3.4)	(6.2)	(10.7)	(3.4)	(6.1)	(10.5)
Socialization									
	11.05	16.33	23.74	11.21	14.16	25.72	9.25	17.59	27.37
	(8.6)	(6.1)	(9.4)	(9.0)	(6.4)	(9.8)	(8.8)	(6.2)	(9.6)
Motor Skills									
	10.55	17.06	26.83	9.22	16.78	26.49	9.34	19.95	32.05
	(3.4)	(6.5)	(10.3)	(3.5)	(6.8)	(10.7)	(3.4)	(6.6)	(10.5)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Domain (communication vs. daily living vs. socialization vs. motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

The within subjects interaction effect for domain x school was significant, F (6, 222) = 2.73, $p < .05$. The highest scores for Alabama students were for motor skills (M = 18.15), whereas Dallas students had their highest scores for communication (M = 18.02). Houston students, on the other hand, had their highest scores on daily living skills (M = 20.75) and motor skills (M = 20.45). There was also a significant within subjects interaction for time x domain x school, F (12, 444) = 1.97, $p < .05$. The time 3 scores were the highest scores for all domains, including communication (see Table 34). Time 3 scores for Houston on motor skills and daily living skills was greater than the scores for the other domains in the other schools.

Domain Adaptive Behavior Composite Scores

Five separate repeated measure ANCOVAs were conducted on the domain adaptive behavior composite scores to examine effects over time. The means and standard deviations are presented in Table 35.

A time (time 1 vs. time 2 vs. time 3) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures ANCOVA was conducted on the standard scores using age as a covariate. The results revealed a significant within subjects effect for time, F (2, 148) = 19.25, $p < .001$. Time 1 scores (M = 68.01) were significantly greater than both time 2 (M = 61.16) and time 3 scores (M = 62.75). The within subjects interaction effect for time x school was significant, F (4, 148) = 5.73, $p < .001$. Time 1 scores in Alabama (M = 73.10) were the highest overall, however, the scores in Alabama decreased from time 2 (M = 63.39) to time 3 (M = 60.21). Scores in Dallas decreased

from time 1 ($M = 66.70$) to time 2 ($M = 62.49$), but increased from time 2 to time 3 ($M = 66.83$). The time 3 scores in Dallas were similar to the time 1. Scores in Houston decreased from time 1 ($M = 64.24$) to time 2 ($M = 57.60$), and increased slightly from time 2 to time 3 ($M = 61.20$). Finally, there was a significant between subjects effect for school, $F(2, 74) = 4.36$, $p < .05$. Houston students scored significantly less ($M = 61.01$) than both Alabama ($M = 65.57$) and Dallas students ($M = 65.34$).

A time (time 1 vs. time 2 vs. time 3) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures ANCOVA was conducted on the percentile rank scores using age as a covariate. The results revealed a significant within subjects effect for time, $F(2, 146) = 31.19$, $p < .001$. Time 1 scores were significantly greater ($M = 8.38$) than both time 2 ($M = 1.75$) and time 3 scores ($M = 1.54$). Finally, there was a significant between subjects interaction effect for school x gender, $F(2, 73) = 3.77$, $p < .05$. Alabama males had higher scores ($M = 7.96$) than females in Alabama ($M = 3.00$). In Houston, females had higher scores ($M = 4.24$) than males ($M = 1.61$). The scores for females ($M = 3.34$) and males ($M = 3.19$) were similar in Dallas.

A time (time 1 vs. time 2 vs. time 3) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures ANCOVA was conducted on the stanine scores using age as a covariate. The results revealed a significant within subjects effect for time, $F(1.30, 96.28) = 39.90$, $p < .001$. Time 1 scores were significantly greater ($M = 1.86$) than both the time 2 ($M = 1.14$) and time 3 scores ($M = 1.11$). The results also revealed a significant within subjects interaction effect for time x school, $F(2.60, 96.28)$

= 3.46, $p < .05$. Time 1 scores in Alabama were greater ($M = 2.37$) than the other scores, however, the scores in Alabama decreased from time 1 to time 2 ($M = 1.29$) and from time 2 to time 3 ($M = 1.03$). Scores in Dallas, on the other hand, decreased from time 1 ($M = 1.49$) to time 2 ($M = 1.12$), and increased from time 2 to time 3 ($M = 1.24$). Finally, scores in Houston decreased from time 1 ($M = 1.71$) to time 2 ($M = 1.00$), and stayed relatively the same from time 2 to time 3 ($M = 1.06$). There was also a significant between subjects effect for school, $F(2, 74) = 4.08$, $p < .05$. Alabama scores ($M = 1.56$) were significantly greater than both Dallas ($M = 1.29$) and Houston ($M = 1.25$). Finally, there was a significant between subjects interaction effect for school x gender, $F(2, 74) = 3.40$, $p < .05$. Males in Alabama scored higher ($M = 1.76$) than females in Alabama ($M = 1.36$).

A time (time 1 vs. time 2 vs. time 3) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures ANCOVA was conducted on the adaptive level scores using age as a covariate. The results revealed a significant within subjects effect for time, $F(1.77, 130.84) = 4.73$, $p < .05$. The pairwise comparisons analysis, however, failed to reveal any significant differences between time 1 ($M = 2.29$), time 2 ($M = 2.28$), and time 3 scores ($M = 2.31$). There was also a significant between subjects effect for school, $F(2, 74) = 4.10$, $p < .05$. Houston ($M = 2.45$) had significantly higher scores than both Alabama ($M = 2.23$) and Dallas ($M = 2.20$). Finally, there was a significant between subjects effect for gender, $F(1, 74) = 8.36$, $p < .01$. Females scored significantly higher ($M = 2.40$) than males ($M = 2.18$).

Table 35

Means and Standard Deviations of Domain Adaptive Behavior Composite by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Standard Score									
	73.10	63.39	60.21	66.70	62.49	66.83	64.24	57.60	61.19
	(9.2)	(7.7)	(8.3)	(9.6)	(8.0)	(8.6)	(9.4)	(7.9)	(8.5)
Percentile Rank									
	12.32	3.10	1.01	5.60	1.71	2.48	7.21	.44	1.12
	(14.7)	(3.8)	(1.8)	(15.4)	(4.0)	(1.9)	(14.9)	(3.9)	(1.9)
Stanine									
	2.37	1.29	1.03	1.49	1.12	1.24	1.71	1.00	1.06
	(1.2)	(.4)	(.3)	(1.2)	(.4)	(.3)	(1.2)	(.4)	(.3)
Adaptive Level									
	2.31	2.20	2.19	2.05	2.13	2.42	2.52	2.50	2.33
	(.7)	(.5)	(.5)	(.7)	(.5)	(.5)	(.7)	(.5)	(.5)
Age Equivalent									
	11.09	16.18	24.71	9.68	17.17	26.32	9.79	17.70	30.06
	(3.0)	(6.1)	(8.4)	(3.1)	(6.4)	(8.7)	(3.0)	(6.3)	(8.6)

Note: Means are from separate time (time 1 vs. time 2 vs. time 3) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures ANCOVAs using age as a covariate. Standard deviations are in parentheses.

A time (time 1 vs. time 2 vs. time 3) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures ANCOVA was conducted on the age equivalent scores using age as a covariate. The results revealed a significant within subjects effect for time, F (1.77, 131.30) = 54.67, $p < .001$. The time 3 scores ($M = 27.03$) were significantly greater than both the time 1 ($M = 10.19$) and time 2 scores ($M = 17.02$). There was a significant within subjects interaction effect for time x school, F (3.55, 131.30) = 74.51, $p < .05$. Scores within each school increased over time, however, the scores in Houston had the greatest increase from time 1 ($M = 9.79$) to time 3 ($M = 30.06$). There was a significant within subjects interaction effect for time x gender, F (1.77, 131.30) = 3.67, $p < .05$. Females had slightly higher scores than males at both time 1 ($M_{male} = 9.85$, $M_{female} = 10.53$) and time 2 ($M_{male} = 16.89$, $M_{female} = 17.14$), however, the female time 3 scores ($M = 29.18$) were much greater than male time 3 scores ($M = 24.88$).

Communication Sub-Domain Adaptive Level Scores

A time (time 1 vs. time 2 vs. time 3) x communication sub-domain (receptive vs. expressive vs. written) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the communication sub-domain adaptive level scores using age as a covariate (see Table 36). There was a significant within subjects effect for sub-domain, F (2, 148) = 96.21, $p < .001$. The written scores ($M = 1.49$) were significantly less than both the receptive ($M = 2.12$) and expressive scores ($M = 2.27$). The within subjects interaction effect for time x sub-

domain was also significant, F (3.48, 257.76) = 2.56, $p < .05$. Slight decreases over time were observed for both the receptive scores (M_{pre} = 2.17, $M_{time\ 2}$ = 2.12, $M_{time\ 3}$ = 2.06) and the expressive scores (M_{pre} = 2.38, $M_{time\ 2}$ = 2.24, $M_{time\ 3}$ = 2.18). The written scores, however, showed a slight increase over time (M_{pre} = 1.08, $M_{time\ 2}$ = 1.38, $M_{time\ 3}$ = 2.00).

Table 36

Means and Standard Deviations of Communication Sub-Domain Adaptive Level by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Receptive									
	1.96	2.23	2.21	2.25	2.29	1.91	2.30	1.83	2.07
	(.7)	(.6)	(.8)	(.7)	(.7)	(.8)	(.7)	(.7)	(.8)
Expressive									
	2.34	2.25	2.09	2.37	2.32	2.27	2.43	2.16	2.17
	(.8)	(.6)	(.4)	(.8)	(.6)	(.4)	(.8)	(.6)	(.4)
Written									
	1.18	1.37	1.86	1.01	1.41	2.14	1.05	1.34	1.99
	(.3)	(.7)	(.8)	(.3)	(.7)	(.9)	(.3)	(.7)	(.9)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Communication Sub-domain (receptive vs. expressive vs. written) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Daily Living Skills Sub-Domain Adaptive Level Scores

A time (time 1 vs. time 2 vs. time 3) x daily living skills sub-domain (personal vs. domestic vs. community) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the daily living skills sub-domain adaptive level scores using age as a covariate (see Table 37). The results revealed a significant within subjects effect for time, $F(1.80, 133.36) = 7.46, p < .01$, and for sub-domain, $F(2, 148) = 3.10, p < .05$. The pairwise comparisons analysis, however, failed to reveal any significant differences between time 1, time 2, and time 3 scores. In terms of sub-domain, the community scores ($M = 2.27$) were significantly greater than both the personal ($M = 2.13$) and domestic scores ($M = 2.13$).

The within subjects interaction effect for time x sub-domain x school was significant, $F(6.61, 244.67) = 3.21, p < .01$. The Houston scores for personal decreased over time, whereas the Alabama and Dallas scores for personal increased slightly from time 1 to time 2 and decreased slightly from time 2 to time 3 (see Table 37). The Houston scores for community also decreased over time, whereas the Alabama scores for community increased slightly from time 1 to time 2, and decreased slightly from time 2 to time 3. Dallas community scores, on the other hand, decreased from time 1 to time 2 and increased from time 2 to time 3.

Table 37

Means and Standard Deviations of Daily Living Skills Sub-Domain Adaptive Level by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Personal									
	2.03	2.33	2.08	2.08	2.32	2.16	2.11	2.08	1.96
	(.8)	(.6)	(.6)	(.8)	(.6)	(.6)	(.8)	(.6)	(.6)
Domestic									
	1.93	2.19	2.46	2.44	2.04	2.03	1.68	2.28	2.08
	(.9)	(.8)	(.8)	(.9)	(.8)	(.9)	(.9)	(.8)	(.8)
Community									
	2.26	2.31	2.13	2.37	2.34	2.46	2.62	2.12	1.80
	(.7)	(.6)	(.5)	(.7)	(.6)	(.6)	(.7)	(.6)	(.6)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Daily Living Skills Sub-domain (personal vs. domestic vs. community) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Socialization Sub-Domain Adaptive Level Scores

A time (time 1 vs. time 2 vs. time 3) x socialization sub-domain (interpersonal relationships vs. play and leisure time vs. coping skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the socialization sub-domain adaptive level scores using age as a covariate (see Table

38). The results revealed a significant within subjects effect for time, F (2, 148) = 13.21, $p < .001$. Time 3 scores ($M = 2.36$) were significantly greater than both time 1 ($M = 2.04$) and time 2 scores ($M = 2.19$). In addition, time 2 scores ($M = 2.19$) were significantly greater than time 1scores ($M = 2.04$). The within subjects interaction effect for time x gender was significant, F (2, 148) = 4.17, $p < .05$. Males had lower time 1 ($M = 1.85$) than females ($M = 2.23$). Males and females, however, had very similar time 3 scores ($M_{males} = 2.36$, $M_{females} = 2.35$).

There was also a significant within subjects interaction effect for time x sub-domain, F (3.37, 249.35) = 3.60, $p < .05$. Time 1 scores for play and leisure time ($M = 2.01$) were about the same as the time 1 scores for interpersonal relationships ($M = 2.00$) and lower than the time 1 scores for coping skills ($M = 2.11$). The time 2 scores for play and leisure time ($M = 2.22$) were greater than both the time 2 scores for interpersonal relationships ($M = 2.19$) and coping skills ($M = 2.16$). Similarly, the time 3 scores for play and leisure time ($M = 2.47$) were greater than both of the time 3 scores for interpersonal relationships ($M = 2.24$) and coping skills ($M = 2.35$).

The within subjects interaction effect for time x sub-domain x school was also significant, F (6.74, 249.35) = 2.61, $p < .05$. Alabama scores for interpersonal relationships increased over time, whereas Dallas scores increased from time 1 to time 2 and decreased from time 2 to time 3. Houston scores for interpersonal relationships, on the other hand, decreased from time 1 to time 2 and increased from time 2 to time 3 (see Table 38). Similarly, Alabama scores for coping skills increased over time, whereas

Dallas scores decreased from time 1 to time 2 and increased from time 2 to time 3. Houston scores for coping skills, however, increased from time 1 to time 2 and decreased from time 2 to time 3. Finally, the between subjects effects for school, $F(2, 74) = 4.81, p < .05$, and gender, $F(1, 74) = 6.37, p < .05$ were also significant. Dallas scores ($M = 2.33$) were significantly greater than Alabama ($M = 2.11$) and Houston scores ($M = 2.15$).

Table 38

Means and Standard Deviations of Socialization Sub-Domain Adaptive Level by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Interpersonal Relationships									
	1.86	2.19	2.24	1.98	2.37	2.20	2.17	1.99	2.28
	(.7)	(.7)	(.6)	(.7)	(.7)	(.6)	(.7)	(.7)	(.6)
Play and Leisure Time									
	1.83	2.08	2.49	2.16	2.33	2.61	2.05	2.26	2.31
	(.7)	(.7)	(.6)	(.8)	(.7)	(.6)	(.7)	(.7)	(.6)
Coping Skills									
	1.87	2.05	2.34	2.53	2.07	2.70	1.91	2.37	2.02
	(.8)	(.7)	(.7)	(.9)	(.8)	(.7)	(.8)	(.8)	(.7)

Note: Means are from a Time (time vs. time 2 vs. time 3) x Socialization Sub-domain (interpersonal relationships vs. play and leisure time vs. coping skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Motor Skills Sub-Domain Adaptive Level Scores

A time (time 1 vs. time 2 vs. time 3) x motor skills sub-domain (gross motor skills vs. fine motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the motor skills sub-domain adaptive level scores using age as a covariate (see Table 39). The results revealed a significant within subjects effect for time, $F(2, 148) = 12.04$, $p < .001$. Time 1 scores were significantly lower ($M = 2.08$) than both the time 2 scores ($M = 2.29$) and time 3 scores ($M = 2.26$).

Table 39

Means and Standard Deviations of Motor Skills Sub-Domain Adaptive Level by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Gross Motor									
	2.11	2.44	2.35	2.12	2.28	2.40	1.84	2.30	2.03
	(.5)	(.5)	(.6)	(.6)	(.5)	(.6)	(.5)	(.5)	(.6)
Fine Motor									
	1.92	2.22	2.23	2.34	2.24	2.31	2.16	2.24	2.23
	(.7)	(.6)	(.6)	(.7)	(.6)	(.6)	(.7)	(.6)	(.6)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Motor Skills Sub-domain (gross motor skills vs. fine motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

The within subjects interaction effect for sub-domain x school was significant, $F(2, 74) = 4.03$, $p < .05$. Alabama had the highest scores for gross motor skills ($M = 2.30$), compared to Dallas ($M = 2.27$) and Houston ($M = 2.06$). Dallas, on the other hand, had the highest scores for fine motor skills ($M = 2.30$), compared to Alabama ($M = 2.12$) and Houston ($M = 2.21$). The within subjects interaction effect for sub-domain x gender was also significant, $F(1, 74) = 7.14$, $p < .01$. Males and females scored relatively similarly on gross motor skills ($M_{male} = 2.22$, $M_{female} = 2.20$). Females, on the other hand, scored higher ($M = 2.32$) than males ($M = 2.10$) on fine motor skills.

Communication Sub-Domain Age Equivalent Scores

A time (time vs. time 2 vs. time 3) x communication sub-domain (receptive vs. expressive vs. written) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the communication sub-domain age equivalent scores using age as a covariate (see Table 40). The results revealed a significant within subjects effect for time, $F(1.40, 103.58) = 19.40$, $p < .001$. Time 1 scores ($M = 12.06$) were significantly less than both time 2-scores ($M = 17.17$) and time 3 scores ($M = 26.18$). In addition, time 2 scores ($M = 17.17$) were significantly less than time 3 scores ($M = 26.18$).

The within subjects effect for sub-domain was significant, $F(1.92, 142.25) = 28.10$, $p < .001$. Written scores ($M = 21.89$) were significantly greater than both receptive ($M = 18.57$) and expressive scores ($M = 14.95$). In addition, receptive scores ($M = 18.57$) were significantly greater than expressive scores ($M = 14.95$).

Table 40

Means and Standard Deviations of Communication Sub-Domain Age Equivalent by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Receptive									
	10.07	15.98	25.15	9.41	19.23	32.35	10.38	18.34	26.18
	(4.2)	(7.8)	(12.1)	(4.4)	(8.1)	(12.5)	(4.3)	(7.9)	(12.3)
Expressive									
	9.62	13.95	20.54	8.08	16.30	22.95	8.79	12.78	21.56
	(3.2)	(5.6)	(8.7)	(3.3)	(5.9)	(9.0)	(3.2)	(5.8)	(8.8)
Written									
	17.32	18.60	26.92	17.65	19.03	29.99	17.21	20.31	30.00
	(2.5)	(5.2)	(13.1)	(2.6)	(5.4)	(13.6)	(2.5)	(5.3)	(13.4)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Communication Sub-domain (receptive vs. expressive vs. written) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

There was also a significant within subjects interaction effect for sub-domain x school x gender, F (3.85, 142.25) = 2.81, $p < .05$. Males in Dallas scored higher on receptive (M = 18.08) than males in Alabama (M = 17.74) and males in Houston (M = 16.97). Females in Dallas also scored higher on receptive (M = 22.59) than females in

Alabama ($M = 16.39$) and females in Houston ($M = 19.64$). Females in Dallas scored higher on expressive ($M = 17.88$) than females in Alabama ($M = 14.97$) and Houston ($M = 14.49$) and males in Alabama ($M = 14.44$), Dallas ($M = 13.67$), and Houston ($M = 14.27$). Females had higher written scores in Alabama ($M = 22.11$), Dallas ($M = 22.89$), and Houston ($M = 23.72$) than males in Alabama ($M = 19.79$), Dallas ($M = 21.56$), and Houston ($M = 21.30$).

The within subjects interaction effect for time x sub-domain was also significant, $F(3.33, 246.71) = 9.27$, $p < .001$. All of the sub-domain scores increased over time, however, the receptive scores showed increases from time 1 ($M = 9.96$) to time 2 ($M = 17.85$) and time 3 ($M = 27.89$). The written scores were similar at time 1 ($M = 17.39$), time 2 ($M = 19.31$), but increased at time 3 ($M = 28.97$). The expressive scores started out the lowest at time 1 ($M = 8.83$), but increased at time 2 ($M = 14.34$), and increased again at time 3 ($M = 21.68$).

Daily Living Skills Sub-Domain Age Equivalent Scores

A time (time 1 vs. time 2 vs. time 3) x daily living skills sub-domain (personal vs. domestic vs. community) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the daily living skills sub-domain age equivalent scores using age as a covariate (see Table 41). The results revealed a significant within subjects effect for time, $F(1.63, 120.60) = 30.34$, $p < .001$. The time 3 scores ($M = 26.50$) were significantly greater than both the time 1 ($M = 10.65$) and the time 2 scores ($M = 15.50$). In addition, the time 2 scores ($M = 15.50$) were

significantly greater than the time 1 scores ($M = 10.65$). There was a significant within subjects interaction effect for time x school, $F(3.26, 120.60) = 3.33$, $p < .05$. The scores increased over time for all three schools. Scores in Houston increased the most from time 1 ($M = 10.89$) to time 3 ($M = 30.44$) and scores in Alabama showed the smallest increase from time 1 ($M = 11.32$) to time 3 ($M = 22.66$). Dallas scores increased a medium amount from time 1 ($M = 9.72$) to time 3 ($M = 26.40$).

Table 41

Means and Standard Deviations of Daily Living Skills Sub-Domain Age Equivalent by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Personal									
	12.10	17.87	24.49	11.02	17.19	28.19	11.72	18.97	30.31
	(3.5)	(6.1)	(9.6)	(3.6)	(6.3)	(9.9)	(3.6)	(6.2)	(9.7)
Domestic									
	14.70	17.77	25.28	13.58	15.77	29.78	13.15	19.27	32.78
	(5.2)	(6.9)	(12.5)	(5.4)	(7.2)	(13.0)	(5.3)	(7.1)	(12.8)
Community									
	7.18	10.05	18.22	4.55	10.31	21.23	7.80	12.31	28.24
	(4.5)	(8.6)	(13.2)	(4.7)	(8.9)	(13.7)	(4.6)	(8.8)	(13.5)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Daily Living Skills Sub-domain (personal vs. domestic vs. community) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

There was a significant effect for sub-domain, F (2, 148) = 8.43, $p < .001$. Community scores (M = 13.32) were significantly lower than both personal scores (M = 19.10) and domestic scores (M = 20.23). In addition, personal scores (M = 19.10) were significantly less than domestic scores (M = 20.23). There was also a significant within subjects interaction effect for time x sub-domain, F (3.27, 241.65) = 3.18, $p < .05$. All scores were at their lowest at time 1. The community scores were the lowest (M = 6.51), the personal scores were in the middle (M = 11.61), and the domestic scores were the highest (M = 13.81). The scores for all three domains increased from time 1 to time 2; community remained the lowest of the three scores (M = 10.89), domestic scores were a little less (M = 17.60) than personal scores (M = 18.01). Finally, the scores for all three domains were at their highest at time 3. The domestic scores were the highest at time 3 (M = 29.28), the personal scores were the second highest (M = 27.66), and the community scores were the lowest of the three (M = 22.57). Finally, the between subjects effect for gender was significant, F (1, 74) = 4.35, $p < .05$. Females had higher scores (M = 18.75) than males (M = 16.35).

Socialization Sub-Domain Age Equivalent Scores

A time (time vs. time 2 vs. time 3) x socialization sub-domain (interpersonal relationships vs. play and leisure time vs. coping sills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the socialization sub-domain age equivalent scores using age as a covariate (see Table 42). The results revealed a significant within subjects effect for time, F (1.62, 120.10) =

27.57, $p < .001$. Time 3 scores ($M = 24.11$) were significantly greater than both time 1 ($M = 9.96$) and time 2 scores ($M = 14.80$). In addition, time 2 scores ($M = 14.80$) were significantly greater than ($M = 9.96$).

Table 42

Means and Standard Deviations of Socialization Sub-Domain Age Equivalent by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Interpersonal Relationships									
	10.51	13.99	20.58	8.17	14.81	23.77	9.11	13.81	19.72
	(3.8)	(7.3)	(11.8)	(4.0)	(7.6)	(12.3)	(3.9)	(7.4)	(12.1)
Play and Leisure Time									
	10.84	15.96	23.17	10.07	14.78	28.22	9.80	17.48	25.32
	(4.6)	(6.6)	(9.7)	(4.7)	(6.8)	(10.1)	(4.6)	(6.7)	(9.9)
Coping Skills									
	11.62	14.97	22.03	10.57	11.19	24.89	8.94	16.22	29.27
	(6.9)	(7.6)	(10.6)	(7.2)	(7.8)	(11.0)	(7.0)	(7.7)	(10.8)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Socialization Sub-domain (interpersonal relationships vs. play and leisure time vs. coping skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

There was a significant effect for sub-domain, F (1.60, 118.21) = 4.63, $p < .05$. Interpersonal relationship scores (M = 14.94) were significantly less than both play and leisure time scores (M = 17.29) and coping skills scores (M = 16.64). There was also a significant within subjects interaction effect for sub-domain x school x gender, F (3.20, 118.21) = 4.86, $p < .01$. Males in Dallas scored lower on interpersonal relationships (M = 13.54) than males in Alabama (M = 14.97) and males in Houston (M = 14.20). Females in Dallas, however, scored higher on interpersonal relationships (M = 17.62) than females in Alabama (M = 15.08) and females in Houston (M = 14.23). Females in Dallas scored higher on play and leisure time (M = 18.96) than females in Alabama (M = 15.83) and Houston (M = 17.99) and males in Alabama (M = 17.48), Dallas (M = 16.43), and Houston (M = 17.08). Females had higher coping skills scores in Houston (M = 19.48) and Alabama (M = 18.56), than females in Dallas (M = 15.58) and males in Alabama (M = 13.86), Dallas (M = 15.53), and Houston (M = 23.72).

The within subjects interaction effect for time x sub-domain x school was significant, F (5.90, 218.20) = 3.12, $p < .01$. The scores on all three of the sub-domains increased from time 1 to time 3 within each school. The amount of increase from time 1 to time 3 varied by school and by sub-domain. Scores in Houston for coping skills showed the greatest increase from time 1 (M = 8.94) to time 3 (M = 29.27). Scores in Alabama for interpersonal relationships showed the least amount of increase from time 1 (M = 10.51) to time 3 (M = 20.58).

The within subjects interaction effect for time x sub-domain x gender was also significant, F (2.95, 218.20) = 3.86, $p < .05$. Scores for both males and females increased from time 1 to time 3 for each of the three domains. Females had lower coping skills at time 1 ($M = 9.80$) than males ($M = 10.96$), however, females had slightly higher coping skills time 2 scores ($M = 14.88$) than males ($M = 13.38$). By the time 3 assessment, females had much greater scores on coping skills ($M = 28.95$) than males ($M = 21.85$).

Motor Skills Sub-Domain Age Equivalent Scores

A time (time 1 vs. time 2 vs. time 3) x motor skills sub-domain (gross motor skills vs. fine motor skills) x school (Alabama vs. Dallas vs. Houston) x gender (male vs. female) repeated measures MANCOVA was conducted on the socialization sub-domain age equivalent scores using age as a covariate (see Table 43). The results revealed a significant within subjects effect for time, F (1.52, 111.19) = 49.90, $p < .001$. The time 3 scores ($M = 27.68$) were significantly greater than both the time 1 ($M = 9.68$) and time 2 scores ($M = 17.23$).

Comparison to National Norms

One sample t tests were conducted to compare the present sample to the national norms. As shown in Table 44, the present sample had statistically greater standardized scores for all four domains than the national sample at all three points in time (all ts, $p < .01$). The present sample also had statistically greater standardized adaptive behavior composite scores than the national sample at all three points in time (all ts, $p < .01$).

Table 43

Means and Standard Deviations of Motor Skills Sub-Domain Age Equivalent by School Across Time

	Alabama (n = 25)			Dallas (n = 33)			Houston (n = 23)		
	T 1	T 2	T 3	T 1	T 2	T 3	T 1	T 2	T 3
Gross Motor									
	9.89	15.65	25.83	8.98	16.74	24.98	9.41	19.96	29.77
	(3.5)	(6.0)	(11.0)	(3.6)	(6.1)	(11.2)	(3.6)	(6.0)	(11.0)
Fine Motor									
	10.56	16.04	26.09	9.97	16.04	27.01	9.28	18.96	32.41
	(3.5)	(6.2)	(10.2)	(3.6)	(6.4)	(10.4)	(3.5)	(6.3)	(10.2)

Note: Means are from a Time (time 1 vs. time 2 vs. time 3) x Motor Skills Sub-domain (gross motor skills vs. fine motor skills) x School (Alabama vs. Dallas vs. Houston) x Gender (male vs. female) repeated measures MANCOVA using age as a covariate. Standard deviations are in parentheses.

Hypotheses Summary

Null Hypothesis 1.

There will be no statistically significant differences in the four developmental domains and 11 sub-domains, as measured by the Vineland Adaptive Behavior Scales as a function of the time the child has been exposed to programmatic services.

Results from the time x domain x school x gender Repeated Measures MANOVAs revealed a domain effect which showed that across all participants and times, motor skills were significantly lower than the other three domains, thus this hypothesis is not supported.

Null Hypothesis 2.

There will be no statistically significant difference when comparing the developmental scores of children with Down syndrome from early intervention programs located in Alabama, Dallas and Houston to the developmental scores of children used in the national study conducted by the authors of the Vineland.

Results from the One Samples *t* tests showed that the developmental scores of children with Down syndrome were statistically different from children used in the national study, thus this hypothesis was not supported.

Null Hypothesis 3.

There will be no statistically significant difference in the developmental domains of children with Down syndrome based on gender, age and school when comparing the developmental scores over time.

Results from the time x domain x school x gender Repeated Measures MANOVAs showed that domain scores increased over time, thus this hypothesis is not supported.

Table 44

Means and Standard Deviations of Domain and Adaptive Behavior Composite Standard Scores for Present Sample and National Norms across Time

	Present Sample Mean	Nation Sample Mean	*t*	*p*
Communication				
Time 1	72.09	66.00	3.73	< .001
Time 2	66.42	63.00	3.03	.003
Time 3	66.51	59.00	7.00	< .001
Daily Living Skills				
Time 1	74.15	70.00	2.47	.016
Time 2	64.91	58.00	6.56	< .001
Time 3	65.02	53.00	11.41	< .001
Socialization				
Time 1	75.62	65.00	7.79	< .001
Time 2	70.15	65.00	5.24	< .001
Time 3	70.86	63.00	8.29	< .001
Motor Skills				
Time 1	66.96	62.00	4.36	< .001
Time 2	62.05	50.00	12.28	< .001
Time 3	63.46	39.00	21.02	< .001
Adaptive Behavior Composite				
Time 1	67.81	60.00	5.67	< .001
Time 2	61.53	54.00	7.78	< .001
Time 3	63.09	49.00	14.92	< .001

Note: Means are from a one sample *t* tests.

Summary

Chapter IV presented the results of the quantitative trend analysis of the developmental progression of children with Down syndrome. Pearson's Correlations, MANOVAs, ANOVAs, MANCOVAs, and ANCOVAs were calculated for the developmental domains and sub-domains. The independent variables were gender, age, school and time and the dependent variables were the developmental test results from the Vineland Adaptive Behavior Scales.

The domain effect showed that across all participants from all three schools and all three times, the results of the motor skills domain were significantly lower than the communication, daily living skills and socialization domains. The children in the current study scored lower than the children use in the national study performed by the authors of the Vineland in all areas of development. The developmental scores for all of the participants did increase over three measurements of time, thus showing that early intervention does make an impact on developmental progress.

CHAPTER V

SUMMARY, DISCUSSION, AND CONCLUSIONS

This quantitative study sought to investigate the trends across developmental domains for a specific group of children with Down syndrome who received early intervention from an integrated intervention program. The developmental domains were measured using the Vineland Adaptive Behavior Scales. The sample for this study consisted of 81 children ages18 months to 6 years. The data came from existing test scores from three non-profit early intervention pre-schools located in Tuscaloosa Alabama, and Dallas and Houston Texas. Each participant had at least three years of developmental test scores provided for use in the study. Thirty-nine males and forty-two females participated in the study.

Discussion

School Differences

The participants from the Alabama program had greater scores at the start of the study than the Dallas and Houston schools; therefore school was included as a factor in all the analyses of the present study. In hindsight, these school differences are not surprising. The Alabama program is the original early intervention program which was funded in 1974 by the U.S. Office of Health, Education and Welfare as a demonstration program designed to serve young children with physical disabilities from birth to five years of age. The program was one of the first 150 early intervention programs that were

federally funded in the United States in order to provide services to children with special needs. The program in Dallas was started in 1998 and the program in Houston began in 2000, both of these schools were started by parents of children with Down syndrome. The schools in Dallas and Houston emulate the program at the University of Alabama. All three programs are accredited by the National Association for the Education of Young Children. Another difference in the schools is that the Alabama program starts children with Down syndrome as early as 3 months old, while the Houston school starts children with Down syndrome at 6 months old and the Dallas school starts children with Down syndrome at 18 months. Therefore, the Alabama students start receiving therapy services younger than the Dallas and Houston school participants.

Age Covariates

Preliminary results also revealed that age was related to the domain and subdomain scores, in that older children had greater scores, and age of the participants was used as a covariate in the analyses. By including age as a covariate, potential differences across time, domain, school, and gender were determined regardless of the age differences of the participants.

Standard Scores

Overall. When comparing the overall standard scores on all four developmental domains for all schools and all participants, scores dropped from time 1 to time 2, but did not change from time 2 to time 3. Motor skills were significantly lower than the other three domains and communication and daily living scores were significantly lower than

motor skills. There were no gender differences on the standard scores and socialization was highest for each of the three times the standard scores were measured; motor skills was the lowest. Alabama had highest scores overall, but all three schools tended to have their highest scores on socialization and their lowest scores on motor skills.

Adaptive behavior composite. On the adaptive behavior composite, standard scores for all participants decreased from time 1 to time 2 and held steady at time 3. Males and females did not differ on the standard scores of the adaptive behavior composite.

Percentile Rank

For the Vineland Adaptive Behavior Scales the percentile ranks are available for the adaptive behavior composite and the developmental domains, but not for the sub-domains. For all of the participants and all of the domains, scores dropped from time 1 to time 2, but did not change from time 2 to time 3. Motor skills were significantly lower than the other three domains. There were no gender differences. Socialization domain had the highest percentile rank scores for each of the three times, and the motor skills percentile ranks were the lowest.

Adaptive behavior composite. The adaptive behavior composite percentile rank. scores decreased from time 1 to time 2 and held steady at time 3. Males and females did not differ on the percentile rank scores of the adaptive behavior composite.

Stanine Scores

When analyzing the 4 developmental domains using stanine scores, scores dropped from time 1 to time 2, but did not change from time 2 to time 3. Motor skills were significantly lower than the other three domains. Socialization scores were greater than communication and daily living. Across all domains, time, and schools, males and females did not differ. Socialization was highest for each of the three times, and motor skills were the lowest. All four developmental domains tended to drop from time 1 to time 2, but held steady from time 2 to time 3. This finding may be a reflection of the amount of time that the participants have had early intervention by their third assessment year at the school.

Adaptive behavior composite. The adaptive behavior composite stanine scores decreased from time 1 to time 2 and held steady at time 3. There was no gender effect when comparing males and females over time. For Alabama, the male participant's stanine scores were greater than female's stanine scores at time 1 and time 2, and not at time 3. The adaptive behavior composite scores for the Dallas males were greater at time 1 and time 3; the female's scores were greater at time 2. The Houston female participant's stanine scores were greater than males at time 1 and time 3, but not time 2.

Adaptive Level

Descriptive categories such as adaptive levels are often used to communicate test results to parents and teachers. The descriptions on the Vineland express the approximate

distance of the score range from the age group mean (Sparrow et al., 2005). These adaptive levels are best used to summarize an individual's overall level of functioning.

Domain adaptive level. The adaptive levels of the four domains for all participants increased from time 1 to time 2, but held steady from time 2 to time 3. Females did better than males for their adaptive level scores on the four main domains. Females did better on all four domains than males, but best on socialization, and worst on motor skills. The male participants did slightly better on communication than the other three domains.

Sub-Domain Adaptive Levels

Communication: receptive, expressive, written adaptive level. Across all participants, schools and times, communication written scores were lower than receptive and expressive scores. Receptive adaptive levels held steady across the three points in time, while expressive adaptive levels decreased and written adaptive levels increased. This finding may be a reflection of the Vineland Adaptive Behavior Scales because the test items get harder over time and the children with Down syndrome may not be advancing with the rate of normal expressive language development because of low muscle tone and low oral motor tone (Laws & Bishop, 2004).

Daily living skills: personal, domestic, community. For the personal sub-domain, all three schools had similar scores at time 1, but at time 2, Dallas and Alabama participants had greater scores than Houston participants, but all three were similar again by time 3. For the domestic sub-domain, the Dallas participant's scores started higher

than the Alabama participants or the Houston participants, but by time 3, the Dallas participants and the Houston participants were lower than the Alabama participants. For the community sub-domain, the Houston participants started higher than the Dallas participants or the Alabama participants, but their scores were lower than the other two schools at time 3.

Socialization: interpersonal relationships, play and leisure time, coping skills. Across all sub-domains, participants, and schools, adaptive level scores for the socialization sub-domains increased from time 1 to time 2 and again rose at time 3. Females had greater scores than males. While all sub-domains increased from time 1 to time 2 and again at time 3, play and leisure had greater increases than the other sub-domains. Coping skills had greater increases than interpersonal relationships. The male's coping skills scores started lower than the females coping skills scores and the males scores were lower than female's scores at time 2, however, by time 3, the boys and girls had similar coping skills scores.

Motor skills: gross motor, fine motor. Across all sub-domains, participants, and schools, scores increased from time 1 to time 2, but held steady from time 2 to time 3. Males had greater gross motor skills than fine motor skills, while females had greater fine motor skills than gross motor skills.

Age Equivalents

There were no significant differences between the schools for the three communication sub-domains, the daily living domestic age equivalents, the daily living

community sub-domain, or the three socialization sub-domains. Scores increased from time 1 to time 2 and again rose at time 3. While all domains increased from time 1 to 2 and again at time 3, motor skills had the greatest increases. Males and females did not differ at time 1 or time 2, but females had greater increases in their age equivalent scores than males at time 3.

Age Equivalents–Sub-Domains

For the communication domain the receptive, expressive, written sub-domain age equivalents, scores increased from time 1 to time 2 and again rose at time 3. Written scores were greater than both receptive and expressive scores. Receptive scores were also greater than expressive scores. Males and females did not differ on their age equivalent scores for the 3 communication sub-domains. While all domains increased from time 1 to 2 and again at time 3, receptive scores had the greatest increases. Houston males and females were similar on expressive age equivalent scores and written age equivalents; however Houston female's scores were greater than Houston males on receptive language skills. Dallas male's and female's were similar on written skills, but females were greater than males on receptive scores and expressive language skills. Alabama male's and female's were similar on expressive age equivalent scores, but the female's scores were marginally greater on written scores than the male's, and the male's receptive scores were marginally greater than the female's scores.

The daily living skills domain personal, domestic, community sub-domain age equivalents scores increased from time 1 to time 2 and again increased at time 3. Personal

and domestic scores were greater than community scores. The female's had greater age equivalent scores than males for the daily living skills sub-domains.

The socialization domain interpersonal relationships, play and leisure time, and coping skills sub-domain age equivalents scores increased from time 1 to time 2 and again rose at time 3. Interpersonal relationship age equivalent scores were lower than both play and leisure time, and coping skills age equivalent scores. For the interpersonal relationships sub-domain, all three schools had similar scores at time 1, but by time 3, the Dallas participants had marginally greater scores. Similar trends occurred for the play and leisure time sub-domain. For coping skills, all three schools had similar age equivalent scores at the start, but the Houston participant's scores were marginally greater than the Alabama participant's age equivalent scores and the Dallas participant's scores by time 3. While both genders' scores increased over time for all three socialization sub-domains, and that both genders had similar scores on all three domains for time 1 and time 2, females had greater age equivalent scores than males at time 3 for coping skills. Houston males and females were similar on interpersonal relationships and play and leisure age equivalent scores; however the Houston female's scores were greater than Houston male's age equivalent scores on coping skills. Dallas males and females were similar on coping skills, but the female's scores were greater than male's scores on interpersonal and play and leisure skills. Alabama males and females were similar on interpersonal relationships age equivalents scores, but the female's scores were greater on coping skills

than the male's scores. The male participant's age equivalent scores were greater on the play and leisure skills sub-domain than the female participants.

The age equivalents for the motor skills sub-domains gross motor and fine motor skills increased from time 1 to time 2 and again rose at time 3. There were no other interactions between any of the variables, time, sub-domain, school, domain, or gender for gross or fine motor skills.

Adaptive behavior composite. The overall adaptive behavior increased from time 1 to time 2 and again at time 3. The time by gender interaction showed that at time 1 and time 2, males and females had the same age equivalent scores, but at time 3, the female participants had greater age equivalent scores than the male participants.

Conclusions

In general, results of the present study showed that all domain and sub-domain scores increased across time 1 to time 2, and tended to increase or hold steady from time 2 to time 3. Domain effects showed that in general, motor skills were significantly lower than the other three domains. Communication and daily living skills scores were significantly lower than motor skills. Socialization was highest for each of the three times the standard scores were measured and motor skills was the lowest.

The following hypotheses guided the study:

Hypothesis 1: There will be no statistically significant differences in the four developmental domains and 11 sub-domains, as measured by the Vineland Adaptive

Behavior Scales as a function of the time the child has been exposed to programmatic services.

In answer to Hypothesis 1, results of this study show that there were significant differences when comparing the four developmental domains. Motor skills were lower than the other three domains. This may be a reflection of the hypotonia that affects children with Down syndrome as well as the ligamentous laxity, decreased strength, and short arms and legs (Winders, 2001). For parents and therapists this shows the importance of early physical and occupational therapy for children with Down syndrome. Large muscle development for these children is crucial for laying a good foundation for fine motor development as well as speech production. Stability in the core muscles of the body develop before mobility and these skills are vital to later motor skill development.

The socialization skills for these children were the highest scoring domain and this may encourage parents and practitioners to strive for a social learning environment for children with Down syndrome. This coincides with Vygotsky's social learning theory. Thomas (2000) says that as a child is developing the range of skills that can be reached with the help of adult guidance or peer collaboration exceeds what could be attained by the child alone.

Hypothesis 2: There will be no statistically significant difference when comparing the developmental scores of children with Down syndrome from early intervention programs located in Alabama, Dallas and Houston to the developmental scores of children used in the national study conducted by the authors of the Vineland.

Hypothesis 2 compared the developmental scores of the participants for this study with the sample of the population used for the authors of the Vineland. The researchers used a sample of over 3,695 individuals who were chosen to represent a national average of the population. Of those 3,695, 199 of their participants were labeled mentally retarded. The current study used the same identifying factors of adaptive functioning as the authors of the Vineland. Although the current participants did score significantly lower than the whole sample, they did not score lower than the children who were labeled as mentally retarded. Both the 199 participants from the national group and the 81 participants from current study established developmental scores at least two standard deviations below the mean of the non clinical reference group in at least one domain or on the overall composite. The group on the Vineland labeled as mentally retarded showed a flat pattern of deficits reflecting the generalized distribution of deficits in adaptive functioning (Sparrow et al., 2005). The same showed true for the current children with Down syndrome.

Hypothesis 3: There will be no statistically significant difference in the developmental domains of children with Down syndrome based on gender, age and school when comparing the developmental scores over time.

In answering Hypothesis 3 there were significant differences found between the developmental domains over time. When comparing the overall standard scores of all four developmental domains, the percentile ranks and the stanine scores the participant's scores dropped from time 1 to time 2 but they stayed the same from time 2 to time 3. The

same results were found when looking at the adaptive behavior composite standard scores, percentile ranks, and stanine scores. This is a reflection of the early intervention that the participants received over a 3 year time frame. It could be expected that the standard scores, percentile ranks and stanine scores of young children with special needs would slowly decrease because of the developmental delay and the natural increases in abstract learning skills associated with getting older. For the participants who received intense therapy from the early intervention program, after two years of speech therapy, occupational therapy, physical therapy and music therapy their standard scores, percentile ranks and stanine scores remained unchanged. Overall adaptive levels increased from time 1 to time 2 and held steady at time 3. When the domains are divided into sub-domains, it is apparent that the receptive communication adaptive scores held firm across all 3 points of time. Expressive language skills decreased over time and written scores increased. Receptive language scores remaining steady across time is a reflection of the social learning environment as well as the speech therapy the participants were involved in. For children with Down syndrome, expressive language skills appear to be one of their biggest challenges, and true to this study the findings are not surprising because expressive language skills become incrementally harder as children get older. An increase in written scores is an attribute of the occupational therapy and fine motor challenges the subjects participate in during their daily routine. The socialization adaptive level scores and the daily living skills adaptive level scores increased from time 1 to time 2 and time 2

to time 3. This suggests the power of a social learning environment and the everyday participation in a classroom setting with typically developing peers.

Limitations

This study was a trend analysis and therefore the results must be generalized with caution. Limitations of this research include the following:

1. Limited sample size. A total of 81 participants from two Texas schools and one Alabama school were used for this study.
2. Maturation. Time may have affected the test results; as the participants got older, their scores tended to increase.
3. Selection of participants. The participants have all received early intervention and therefore the results may not be generalized to other Down syndrome populations.

Suggestions for Future Research

Recommendations for future research are as follows:

1. Through other studies, an analysis of the developmental test scores of children who receive early intervention could be compared to children who do not receive early intervention.
2. Future research could add a component of randomization to allow better generalizability. Since all of the participants were chosen by the directors of the three early intervention programs, the findings can not be generalized to the general public due to the non-randomization.

3. In order to include more information to the current study additional entries of test results could be added for the current participants for each additional year they are in the early intervention program and would add validity and reliability to the study.
4. Comparing the developmental test results from the Vineland to other developmental inventories for a comparative study among the domains of development would add a level of interest to the study.
5. Expanding the sample size to include more participants would create better generalizability. This could be done by adding participants from the four new early intervention programs that have started all over the United States.
6. Adding an element of qualitative study wherein the parents of the participants could be interviewed about private therapies and their perceptions of the impact early intervention has made on the development of their child.

Implications

Comparable studies in this area could help emphasize significance of development of children with special needs. The current study was an attempt in this direction. Follow up research in this area can provide important information to parents, educators, practitioners, doctors and therapists who work with these special children.

1. Parents should find good early intervention programs for their children starting from birth.
2. Educators and practitioners should focus on the social learning environment for therapy services instead of one on one therapy.

3. Doctors should refer parents to good early intervention resources at the child's initial medical evaluation.
4. Therapist should focus on motor development including gross and fine motor skills.
5. Government should allot funds for good early intervention programs so that these special children will receive the early support they need in order to function in society as productive adults.

Summary

This chapter gave a review of the findings including school differences and age covariates, as well as a review of the standard scores, percentile ranks, stanine scores, adaptive levels and age equivalents. How the findings related to the three null hypotheses was discussed and the limitations of the study were addressed. Suggestions for future research were examined and ideas for how the research could be expanded upon were given. In order for children with Down syndrome to reach their full potential, parents, practitioners, therapists, doctors and teachers must provide learning opportunities and experiences for these special children to promote growth and development.

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The Rise School

OF DALLAS

AT ST. LUKES EPISCOPAL CHURCH

April 2, 2007

Molly Taylor
10124 Rockmoor Dr.
Dallas, TX 75229

Dear Molly:

Our school is pleased to grant you approval to conduct a quantitative research project using test results from our program to complete your doctoral degree in Child Development at Texas Woman's University.

We are aware that your study will involve the Vineland Adaptive Behavior Scale scores of students who currently attend our early intervention program and also some students who have attended our program in the past. We are aware that the developmental assessments were given to the children by employees of our school who have been educated on giving the Vineland Adaptive Behavior Scale to young children.

We believe that you have appropriate procedures in place to conduct the research in an accurate way. The parents of each child who attend our program have signed a consent form for an authorization to test their child and a release and information consent form of those developmental records. We look forward to sharing the results of your research study with the staff and parents of the families that we serve.

Sincerely,

Peggy Dyer

Director

5923 ROYAL LANE DALLAS, TEXAS 75230 TEL: 214.373.RISE (7473) FAX: 214.373.6545 EMAIL: RISEDAL@SWBELL.NET
A non-profit 501 (c)(3) organization

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Sincerely,

Martha J Cook

Director

The Rise School

OF HOUSTON

"Where Special Kids Shine"

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