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Pencil grasp comparisons among Hispanic and Anglo-American preschoolers, ages three to five

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PENCIL GRASP COMPARISONS AMONG HISPANIC AND ANGLO-AMERICAN PRESCHOOLERS, AGES THREE TO FIVE.

by

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ABSTRACT

Handwriting and its components, including pencil grasp, are major foci of occupational therapy today. Writing is an important skill that most people use daily. Students use this skill to take notes; other individuals use it to make a living; and still others enjoy it as a leisure activity. The development of grasp is a major skill that develops as each child matures. Many factors affect this development, including culture and parental influence. The purpose of this study was to examine and determine patterns of pencil grasps in Hispanic, African-American, and Anglo-American preschoolers ages three to five, and to examine if parental influence is associated with these patterns.

Thirty-eight children mainly from Hispanic and Anglo-American backgrounds participated in the writing portion of the study. The data was obtained by asking the children to complete four writing exercises: a written maze completed three times, and drawing a person. The children, who all attended childcare centers in Manhattan and Ithaca, NY, were observed during the assessment. Pencil grasp was determined by observation of the pencil grasps used during writing exercises and comparison of the observation to an adaptation of Schneck's five-grip scale. Fifteen parents, (four Hispanics and nine Anglo-Americans), participated in a nine-question demographic survey.

Cross tabs and chi-square analysis were used to analyze recorded data. The study found that children of Hispanic descent commonly used an interdigital grasp and obtain an adult grasp at a younger age than Anglo-Americans. This study also found that children of Anglo-American descent used a tripod grasp and developed more transitional grasps than children of Hispanic descent. Children of African-American descent could not be studied due to attrition of participants and lack of childcare centers from this cultural group.

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A Thesis Presented to the Faculty

Of the School of Health Science and Human Performance

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CERTIFICATE OF APPROVAL

This is to certify that the Thesis of

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DEDICATION

I dedicate this thesis to my supreme role model, the strongest and loveliest woman I know, my mother, Carmen Almarante. You are my guiding star and source of everlasting energy. I love you very much.

Tammy

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CHAPTER ONE: INTRODUCTION

INTRODUCTION

Handwriting and the use of hands in daily activities are major foci of occupational therapy practice. The ample research that has been presented in publications such as *The Journal of American Medical Association, The American Journal of Occupational Therapy,* and *The Occupational Therapy Journal of Research* has demonstrated that hand function is an important topic, and area of treatment, in the field of occupational therapy.

Writing is a means of life for many people. Numerous individuals use writing to make a living, while others use it as a leisure activity. Handwriting is a meaningful activity that can change an individual's contentment, composition, experience, and efficiency (Bonney, 1992). No matter its purpose, if writing is impaired, an individual can lose a major source of communication and memory (Bonney, 1992).

The first written marks children make are scribbles. With time and practice these markings develop into specific shapes and figures. Eventually, these markings evolve into writing that meets the standards of a culture. Writing can define the development of a society and is a measure of education (Andre-Salvini, 1995).

The physical skill of handwriting is developed over time. This skill usually begins with the child first holding the writing utensil in a fisted, pronated grasp with hand movement originating from the shoulder (Amundson and Weil, 1996). With neuromotor development and practice, these movements develop into a precise grasp involving the first three digits with movement originating from the intrinsic muscles of the hand, instead of the shoulder. The rate at which this development occurs varies among individuals and ethnic groups (Lawrence and Hopkins, 1976). Although many handwriting studies exist, there are currently no studies showing differences in pencil

grasps among Hispanics and African-Americans (Halverson, 1931; Rosenbloom and Horton, 1971; Saida and Myashita, 1979).

A number of studies have discussed the relationship between parental influence in Hispanic and African-American cultures and the success and maturity of their children. These studies have found that parental differences in teaching style correlate with the academic success of a child. Findings reveal that respectively, Asians, Anglo-Americans, African-Americans, and Hispanics parental teaching style improved the child's academics. (Talamantes, Cornell, Liechtenstein, Hazuda and P. H, 1996). Beyond cognitive maturity, other areas differ among cultural groups, such as the rate of physical growth and psychological development. Research has shown that Hispanics' and African-Americans' physical growth and maturity surpasses Anglo-Americans (Wilkson, 1987; Lawrence and Hopkins, 1976). This growth is manifested at the rate at which children of these cultures develop neuromuscloskeletally in comparison to children of Anglo-American descent (Wilkson, 1987; Lawrence and Hopkins, 1976). Since children of ethnic groups differ in patterns and rate of development, one can assume that these differences may also cause differences in fine motor areas, such as handwriting. These and other studies, which will be discussed in detail, have inspired this researcher to pursue this topic.

Problem Statement

Handwriting has various components including: grasp, in-hand manipulation, strength and reach. Several landmark studies (Halverson, 1931; Gesell, 1940; Rosenbloom and Horton, 1971; Saida and Myashita, 1979; Goodgold 1983) have been conducted to illustrate hand skill development. These studies have been used as a basis

for comparison of hand development of children from different cultures in more recent studies. The results of the later studies have shown that ethnic background does affect the maturity and type of pencil grasp (Tseng, 1998).

Although researchers have compared the handwritings of children of different backgrounds, research comparing pencil grasps in children with Hispanic and African-American backgrounds is not available. As occupational therapists increase contact with children from Hispanic and African-American ethnicities, we need to gain knowledge of patterns of development that are common to these cultures. This is crucial because of the population growth of these ethnicities in the United States (US Census, 2002).

Purpose

The purpose of this study was to examine and compare the patterns of pencil grasp used by Hispanic, African-American, and Anglo-American preschoolers aged three to five, and to discover if parental influence is associated with these patterns.

Questions

The questions posed by this study are:

1. Is there a relationship between pencil grasp of preschoolers and their ethnicity?
2. Are there differences in pencil grasp among children of different age groups or genders?
3. Is parental influence in a child's handwriting development related to the maturity or development of pencil grasp in children?

Definitions

Ethnic Groups

African-American - an American of African race and especially black African, or descending or originating from black Caribbean islands, such as Jamaica, Antigua, St.Croix, Bahamas, etc.

Anglo-American – a North American Caucasian whose native language is English and is of English or European origin.

Hispanic – A person of Spanish descent living in the United States; especially one of Central or South American or of Spanish speaking Caribbean origin.

Culture – Behaviors peculiar to a specific group of humans. Culture includes language, ideas, beliefs, customs, expectations, tools and techniques. (Castello, 1991).

Handwriting and Pencil Grasp

Extension – A movement that brings the parts of a limb into or towards a straight position. Opposite of flexion (Trombly, 1995).

Flexion – The act of bending or condition of bringing the limbs together in contrast to extension (Trombly, 1995).

Handwriting – The movements a child makes with the digits of the hands while grasping a writing utensil to form culture-specific symbols on paper (Trombly, 1995).

Pencil Grasp – The particular manner in which a child postures his hand or fingers to hold a writing implement (Trombly, 1995).

Pencil Grasp Maturity – The stage of pencil grasp development a child currently exhibits (Trombly, 1995).

Pronation – Turning the forearm so the palm of the hand faces downwards (Trombly, 1995).

Supination – Turning the forearm so the palm of the hand faces upwards (Trombly, 1995).

Limitations and Delimitations

Delimitations

The delimitations of this study included the following:

- The participants were limited to those aged three to five.
- Participants were recruited through preschools or childcare centers where they were enrolled.
- The participants were of Hispanic, African-American or Anglo-American backgrounds only.
- All the participants lived in Ithaca, New York or Manhattan, New York.
- The Hispanic participants were only those who spoke Spanish at home.
- The participants did not have any physical or mental disabilities as observed by the childcare coordinator, their teachers, or the researcher.

Limitations

The following limitations were constraints to the study:

- The sample came only from New York City and Ithaca, New York. This is a convenience sample, due to the financial constraints of the researcher.

- Due to the financial and geographical constraints in data gathering, the population sample was limited in size.
- How much Spanish is spoken at home varied among participants and was not measured.
- Since the participants were not being studied in their country of origin, the amount of Americanization was not measured and therefore could affect the study.
- The cultural backgrounds of the children studied were not uniform because participants and their parents were foreign born or US born, Americanized or non-Americanized.
- The amount of exposure and resources the participants had with writing was not measured and could have been quite varied.

Assumptions

The following were assumed before the study began:

- The measurement instruments would gather the intended data and simulate the natural usage of the participants' handwriting.
- The children would cooperate with the data-gathering process.
- The parents would fill out all forms accurately and honestly.
- The sample taken would be representative of the participants' usual preferred grasp pattern.

CHAPTER TWO: LITERATURE REVIEW

LITERATURE REVIEW

Many occupational therapists work in a school setting, helping children learn functional skills needed to succeed in school (Feder, Annette, and Synnes, 2000). One major area occupational therapists address is handwriting and its related grasp skills (Feder, Annette, and Synnes, 2000). To understand and appreciate the dynamics of handwriting fully, research is needed to discover handwriting patterns in children of different ethnicities. Handwriting has multiple components that are mastered in stages. Each of these skills is an element that a child needs to learn in order to write properly and legibly. The component of handwriting that this researcher focused on was pencil grasp and its development.

History of Pencil Grasp Development

Researchers have studied and classified pencil grasp and its development in various ways. In 1931 Halverson studied motor development and prehension in children from eight weeks to six years of age. He described five stages of prehension and grasp development that were based on progressive movements beginning with the shoulders, arms, and then the wrists of the child. He discussed development ranging from the undirected movements of an eight-week-old to the pencil grasp of an adult, a motor skill typically acquired by age six. Halverson identified this mature adult pencil grasp in 1931, which was later titled the dynamic tripod grasp by Wynn-Parry in 1966.

In Halverson's (1931) study, the rate of hand development reported was slower than in present studies. For example, he stated that a child reaches a dynamic tripod grasp by the age of six, while recent studies of pencil grasp development (Rosenbloom and Horton, 1971; Schneck and Henderson, 1990) have demonstrated that most American

children achieve this grasp by age five. This difference in the rate of grasp development could be due to a boom in technology, an increase in parental involvement in early childhood education, and a change in educational standards, or more exposure to writing-related skills.

Later researchers placed the development of pencil grasp formation into more concrete stages. Gesell (1940), whose work is a landmark in generating developmental data, and whose assessment tools are still used today, described grasp formation and motor development in children from ages one to five. He assessed these skills by observing his participants while dressing, buttoning, and picking up cubes. In his book, *The First Five Years of Life*, he described how pencil grasp matures each year from a 2½-year-old's palmar grasp to a six-year-old's tripod grasp. Gesell was the first to categorize hand development into stages. He described three stages: immature, transitional, and mature, which are the bases upon which later developmental specialists built their models. Even now, physicians and educators still refer to and base their practice on Gesell's work.

In 1971 Rosenbloom and Horton performed a study with 128 British children ranging from ages eighteen months to seven years. They found that children developed grasp patterns beginning from a supinated fisted grasp on the proximal part of the pencil, not touching their elbow or forearm on the table, and progressing to a tripod grasp using the fingers on the distal portion of the pencil. Like Gesell, they categorized pencil grasp formation into three groups or stages. In the first stage, the first and second digits supporting the shaft of the crayon depicts the most immature grasp-- the palmer grasp. In the second stage, the static tripod grasp, the tips of the first, second, and third digits hold

the implement. In stage two, movement originates in the shoulder, elbow, and then wrist; all three larger joints move instead of the fingers and intrinsic muscles of the hand. Finally, in the third stage, the dynamic tripod grasp, the implement is held with the first digit pad to pad with the second digit, holding the writing utensil securely onto the distal phalange of the third digit (See Figure 1). In this grasp the fingers and the intrinsic muscles of the hand are used to form the letters, with limited wrist and arm motions.

Figure 1. Dynamic Tripod Grasp (Alley, 2002)

Saida and Myashita (1979) replicated Rosenbloom and Horton's (1971) study in Japan. They studied 154 children (78 boys and 76 girls) with an age range of two years and three months to six years and five months. In this study, they grouped pencil grasp formation into four stages instead of three.

Stage one - the palmer grasp, is the most immature grasp, in which the hand is static with movement originating from the shoulder and elbow. Stage two - the incomplete tripod posture, is an umbrella term in which all the unusual or bizarre (Ziviani, 1983) pencil grasps are placed. Next are stages three - the static tripod grasp, and four - the dynamic tripod grasp.

In this study there were no cultural differences regarding when attainment of a static tripod posture was mastered, but there was a marked difference observed for when

the dynamic tripod grasp was mastered- with a mean of forty-eight months in children of British descent and thirty-five months in children of Japanese descent. This study suggests that children of Japanese descent obtain a dynamic tripod grasp thirteen months earlier than their British counterparts. Tseng suggested that this dissimilarity might be due to different cultural expectations of children in Asian and Western cultures (1998).

In 1983 Goodgold had findings similar to those of Saida and Myashita. He also discussed four stages of pencil grasp formation in his study of twenty pre-kindergarten and fifty-seven pre-kindergarten aged children. In this study, grasps were labeled (1) a fisted grasp, (2) a palmer grasp, (3) a transitional grasp (which consisted of a variety of pencil grasp patterns), and (4) a dynamic tripod grasp. Later studies found that grouping grasp development into four sections instead of three is less accurate.

One important study was by Schneck and Henderson (1990), who conducted a study with 320 children with typical abilities. These researchers identified developmental stages for children aged three to six. This research discovered that ninety percent of the older group of children used a mature grasp in comparison to forty-eight percent of the youngest group. Schneck and Henderson also found two pencil grasps that were commonly used by their older subjects; these were the dynamic and lateral tripod grasps. They also found differences in the pencil grasp development between genders. Females generally obtained mature pencil grasps at a younger age than the male participants. These researchers defined ten different pencil grasps, which later became the ten-grip scale. Schneck adapted and used this scale in later studies to evaluate her participants (See Appendix I, p. 80). This scale, revised to a five-level scale, has become a major tool used in many current studies (Case Smith, 1994; Burton and Danciask, 2000).

Tseng (1998) replicated Schneck and Henderson's study comparing the pencil grasps of children of Taiwanese descent with children of American descent. Studying 326 children ranging in age from two years five months to six years four months, Tseng identified fourteen different pencil grasp patterns, four more than Schneck and Henderson's 1990 study. Tseng proposed that children of Taiwanese descent could have more deviations in grasp due to learning the use of chopsticks and different writing utensils, such as brushes for calligraphy at an early age.

Although children are generally thought to demonstrate a mature pencil grasp by the age of five, different studies have reported varying results. In her 1983 study of 287 children of Australian descent, whose ages ranged from seven to fourteen years, Ziviani found that pencil grasp was fully mastered and matured only at about ten years and five months of age. Studies by Lawrence and Hopkins (1976), Paré and Dugas (1999) suggest that maturity in pencil grasp is acquired through the maturation of neuronal formations and the development of grip form -- the ability to grasp an item with appropriate strength. Can this mean that the participants in Ziviani's group took longer to attain maturity in their pencil grasp because of a different rate of neuronal formation, or did their culture influence the different grasp patterns? Because the various studies use different classification criteria in defining pencil grasp and different instrumentation to test the participants, a clear comparison among these studies is very difficult. But what was consistent among the studies were the comparisons of pencil grasps between separate cultures and a noted difference in the grasp patterns for each culture studied. This similarity then leads us to the next question: How does origin of birth influence pencil grasp maturity?

Handwriting Measurement Instruments

The goal of any handwriting researcher is to obtain a writing sample that mimics what the participants would use in their natural environment. In order to do this, researchers have created assessment instruments to measure writing skill and grasp development.

A topic of serious debate in handwriting assessment is whether the tasks to be completed by the participants should or do simulate typical grasp use. Rosenbloom and Horton (1971) stated that the tasks the children completed were irrelevant to whether the tripod grasp was used. However, in a similar study, Schneck and Henderson (1990) found that drawing different sized circles made a difference in how the children in their study grasped their pencils. They found that grasp would also vary depending on the task assigned. If the child was asked to color in a circle he or she would use a static grasp, but if asked to draw a small circle the child would use a dynamic grasp. This variation in pencil grasp was more typically observed in the younger children. This suggests that it is important to choose a task that appropriately represents the common grasp use of the participant tested throughout the length of the test.

If one agrees with Schneck and Henderson (1990), one can then conclude that a limitation of Saida and Myashita's study (1979) was the 13cm x 18cm square that the children were asked to trace. Burton and Danciask (2000) suggest that tracing these squares promoted the use of a static tripod grasp and not the typical grasp the child would normally use. This was due to the size of the square that the children were asked to trace. In order to complete the task, the child had to move the whole hand and wrist to completely trace the square. The hand movement used to complete this task is typically

seen with a static grasp, handwriting movement originating from the shoulder, elbow, or wrist. This tool, therefore, distorted the data gathered, since children used compensatory movements to complete the task by moving the wrist and forearm instead of the digits and intrinsic muscles of the hand.

Other investigators have examined whether the implement used in an assessment can also change which pencil grasp is used. It is a popular belief among occupational therapists that one should promote the use of wide writing implements by novice writers. Oehler and her partners (2000) found that the work of beginning writers did not improve with a wider writing implement, and that some children actually preferred to use the standard No.2 pencil. Burton and Danciask (2000) recommend using a writing implement with a specific diameter when assessing handwriting. They also found that a pencil or crayon is better than a pen, because the children will not compensate with their hand to make the angle less steep, which was typically found when using a pen. An assessment that can accurately elicit the grasp the child typically uses, without causing compensatory movements, is needed to acquire accurate data.

Once a proper tool and writing implement are obtained, how would one measure pencil grasp? Many researchers have addressed this question. Schneck (1991) developed a five-level scale from the ten-grip scale (See Appendix I, p. 80) to test children with writing disabilities. When these two scales were discussed, Burton and Danciask (1999) stated that the use of Schneck and Henderson's "ten-grip scale is recommended only for recording the grips of individual persons and changes in their grip. If comparisons between persons are desired, then Schneck's (1991) five-level scale should be used" (p.6). This is because participants can easily and accurately be assigned into the set

categories increasing reliability. The ten-grip scale is more specific and better for recording individual progress (Burton and Danciask, 2000). The five-level scale has an acceptable interrater reliability of .80. Burton and Danciask (2000) discovered that although Schneck and Henderson's ten-grip scale is a good tool to assess pencil grasp, its interrater reliability was rather low n= -0 .67.

Handwriting

Pencil Grasp Development

Several factors may affect grasp development, these include; gender, ethnicity, and age. Gender is one element that could influence pencil grasp maturity. There are some disagreements about whether developmental differences exsist between the pencil grasps of males and females. Goodgold (1983), Rosenbloom, and Horton (1971) did not find significant gender differences in their studies. However, Ziviani (1983) found that females were more likely to hyperextend their distal interphalageal joints and use more flexion in their proximal interphalageal joints than males of the same age (six to nine years of age). Saida and Myashita (1979) also found a difference in the development of pencil grasp between genders at the age of three. At this age, females appear more mature, reaching a transitional or dynamic tripod grasp sooner.

Other researchers have found that different patterns of development exist among cultures (Werner, 1972; Saida and Myashita, 1979; Mardel-Czudnowski, Chien-How and Tien-Miau, 1986). It was found that each culture progresses in a specific area of physical development. Children of different cultures develop at different muscular, neuronal, and skeletal rates. This may be due to a variety of reasons: environmental stimulation, amount

of stressed placed on the body, and nutrition (Mardell-Czudnowski, Chien-How and Tien-Miau, 1986; Tseng, 1998; Jones and Luo, 1999). It could also be due to parental influence, exposure to culture-specific activities, and the effect of these variables on the human body (Huntsinger, Schoeneman and Wei-Di, 1994). Since these ethnic groups differ in areas and rate of development, overall, one can assume that these differences in development can also cause development of handwriting to differ.

Schneck and Henderson (1990) found that American three-year-olds were highly variable in their maturity of pencil grasp. However, by the age of four and a half, the child was typically in a transitional stage of grasp, and by six and a half the typical American child has mastered an adult grasp. Developmentally this data is true, however, this information varies for children of different cultural backgrounds.

Schneck and Henderson (1990) found that the youngest American child to develop a dynamic tripod grasp was a three-year-old. Rosenbloom and Horton (1971) found that the youngest child of British descent to achieve a dynamic tripod grasp was a four-year-old. Saida and Myashita (1979), found that the youngest child of Japanese descent in their study to demonstrate a dynamic tripod grasp was two years and eleven months old. The youngest child of Taiwanese descent to acquire a dynamic tripod grasp was at the age of two years five months (Tseng, 1998).

There were many reasons postulated for this difference. Tseng (1998), Saida, and Myashita (1979) suggested that children of Asian descent demonstrate a faster rate of development due to the early use of calligraphy brushes, which requir the use of intrinsic muscles of the hand and in-hand manipulation. Huntsinger and associates (1994) suggested this difference could also be due to parental influence and parent involvement

in the child's education. They found that Chinese-Americans set aside more time with their children to work on fine motor tasks than did Caucasian-American parents. This may be due to the importance of writing and academic excellence in Chinese culture. In summation, the above statements address why Asian children develop handwriting tasks at a faster rate. It might also be proposed that these children develop pencil grasp at a faster rate than other cultures because of the great cultural importance placed on handwriting and academic excellence.

Ideal Pencil Grasp

Another question of great debate is whether there is one ideal grasp. Benbow (1995), a landmark researcher on handwriting treatments and assessments, has stated that the ideal pencil grasp is the dynamic tripod grasp with an open web space. The positioning of this grasp is an "open web space forming a circle, the thumb the index fingers make the longest flexion, extension and rotary excursions with a pencil during handwriting (Benbow, 1995, p. 7)." She has proposed several assessments and treatment protocols popular in occupational therapy to develop this pattern.

The studies discussed (Halverson, 1931; Gesell, 1940; Rosenbloom and Horton, 1971; Saida and Myashita, 1979; Goodgold 1983) omitted the lateral tripod grasp from their discussion. The lateral tripod grasp is when a writing implement is held with the tip of the thumb and index finger and rests against the side of the third finger, but the index finger rests flexed on top of the shaft of the implement (see Figure x).

Figure 2. Lateral Tripod Grasp (Barbmanning, 2002)

There has been some controversy about whether the lateral tripod grasp is a functional grasp. Levine, Brooks, and Shonkoff (1980) stated that children with mental disabilities were more often seen using a lateral tripod grasp, and therefore considered it a maladaptive grasp. Additionally, they stated that the use of this grasp could lead to problems in legibility and speed in later years.

Despite these previous findings, Bergmann (1990) found that 9.3% of his adult sample used a lateral tripod grasp and 12% used an alternate grasp other than a dynamic tripod, additional to the lateral tripod grasp. Tseng (1998) found that children of Taiwanese descent use a lateral tripod grasp more frequently than American children. Bergmann (1990), Schneck, and Henderson (1990) all agreed that the lateral tripod grasp should be accepted as an alternative mature grasp until further research on pencil grasp and its effect on handwriting legibility is made.

In the aforementioned studies it was posited that the lateral tripod grasp is a mature and acceptable adult grasp. The current belief among researchers is that because a variety of pencil grasps do exist among different cultural populations, an atypical pencil

grasp in not necessarily a dysfunctional one (Ziviani, 1983; Schneck and Henderson, 1990; Tseng, 1998).

As the above researchers discovered, culture can have an influence in handwriting development because of both physical growth, which varies among cultural groups, and cultural beliefs about handwriting related tasks. The individuals who usually place an emphasis on handwriting are typically parents and teachers. Since parents teach and enforce cultural beliefs, rules, and standards to their children, it is wise to consider these factors as a major influence on their child's physical and mental development, including their handwriting development and performance.

Parental Styles

One of many areas which were discovered to differ between culture is parental style. Darling (1999) proposed a model of parental styles that will be used by this researcher to explain parental differences among cultural groups. He classifies parenting into two primary stages: authoritarian and authoritative.

Children who have parents with an authoritative style of parenting – parents who are both demanding and responsive, but use low psychological control when teaching, view themselves as socially acceptable and competent. This is in comparison to children of authoritarian parents – a style of parenting that uses highly demanding and psychologically controlling methods of teaching. These children may find themselves to be less socially acceptable and competent. These differences in parenting styles tend to be popular in different cultures. American culture finds an authoritative style of parenting an optimal style to use while other cultures believe the opposite. This study will not examine which style is better, but uses these terms to understand some of the cultural differences

in parenting style, how a child learns from their parents, and how this learning process influences a child's physical and mental development and, finally, handwriting development (Darling, 1999).

Hispanic Parenting and its Influence on Child Development

The term "Hispanic" is used variably by different people and for different purposes. This variability in usage is due to the differences in language and culture among Spaniards and those individuals from countries that were conquered by Spain. All countries that speak Spanish do not share identical traditions and cultures with other Spanish speaking countries. Countries conquered by Spain speak Spanish and have adopted many cultural elements from Spain, but each has also incorporated the local native dialects and cultures. For example, Caribbean Hispanics including Cubans, Puerto Ricans, and Dominicans share many traditions and terminology of the Taino Indians, who inhabited these islands at the time of conquest. The similarities in cultures may extend to a similarity in mental and physical development since these countries all share similar ethnic and cultural roots.

For the purpose of this study, Hispanics include the following groups: individuals from South and Central America and Caribbean Hispanics (Cubans, Puerto Ricans and Dominicans). Hispanics vary with regard to living arrangements, such as nuclear or extended families (Blank and Torrecilha, 1998), income, socioeconomic status (Talamantes, et.al, 1996), educational level, country of origin, and time of migration to the U.S. Although agreement exists on familial roles, there is a lack of agreement about typical Hispanic parenting style.

Some researchers have found that Hispanics are more authoritarian in teaching, while others state that they are more nurturing and loving (McKenry and McKelvey, 1994). A 1997 study by Moreno found that Mexican-American mothers used less controlling and non-verbal teaching behaviors than did Caucasian-American mothers. This study is an important contrast to some previous research, which stated that Mexican-American mothers are more controlling than Caucasian-Americans (Steward and Steward, 1973). Moreno (1997) studied his participants in their home environment and asked the parents to teach their children how to tie their shoelaces (a task the children could not do). The mothers were asked to take forty-eight hours to teach their child and were asked to record two hours of the training. Pre- and post-tests revealed that the Mexican-Americans mothers were more successful in teaching their children to tie their shoelaces than the Caucasian-American mothers. The Mexican-American mothers also used more commands and verbal demonstrations than Caucasian-American mothers, while Caucasian-American mothers used more non-verbal demonstrations and follow-up questions.

Although Moreno's test is rather artificial, -- giving the parents limited time to teach their child and not having a deeper understanding why the mother used the specific style of teaching verses another: many researchers agree with his findings. Case-Smith and associates (1998) agreed with Moreno's findings when they stated that verbal commands are more beneficial in promoting learning than non-verbal commands because the preschooler knows what is expected of him or her. Since the child understands what is expected of him or her, and if parents teach their children a specific task, it is safe to say that the child will learn it correctly according to the parent's instruction. Therefore, if

a parent teaches his/her child how to grasp a pencil, the child will learn and use the grasp taught by his or her parents. Therefore, the grasp taught is not abnormal but a learned task that is culturally appropriate.

African-American Parenting and its Influence on Child Development

One might think that because African-Americans have adopted many western habits and cultures, their parenting styles should be similar to those of the Anglo-American culture. However, this is not always the case (Perry, 1998; Jones and Luo, 1999). As a result of the racial injustice and the hostile environments to which the majority of these people have been exposed, they live for survival. Consequently, a positive self-image and good coping skills are attributes on which African-Americans depend (McKenry, McKelvey, 1994; Jones and Luo, 1999). These skills, which will be further discussed, are needed to cope with their environment and to function in their communities.

In a study by Bartz and Levine (1978), "it was found that African-American parents believe in the value of strictness, in accepting early assumption of responsibility by the child for his or her own bodily function and personal feelings and that the child's time should be used wisely and not wasted [sic]" (As cited in McKenry and McKelvey, 1994, p. 33). African-American parents traditionally use an authoritative parenting style, leaving lines of communications open to give support to their children when needed (McKenry and McKelvey, 1994). This strictness is used to teach the child rules and regulations at an early age. With this approach, it is hypothesized that the child will have a decreased chance of getting into trouble, and will appropriately perform the skills taught as a child when he or she becomes an adult.

Some researchers have suggested that African-American mothers are interested in their children's learning and education, but have difficulty following through with school-related skills due to a lack of personal educational success (Harris and Terrel, 1999). Consequently, African-American mothers rely on the school system to educate their children instead of educating them at home (Harris and Terrel, 1999). Harris and Terrel (1999) further suggest that differences in parental education affect their teaching strategies. In their study, fifty-one African-American mothers of different socioeconomic and educational backgrounds were asked to teach their four-year-old children to memorize three tasks. The first task was a rote memory task with cartoon characters. The second task was memorizing the sequential order of wrapping a gift. Six photographs of the wrapping sequence were given. The final task consisted of memorizing a variety of zoo animals. The mothers' teaching strategies changed with each task. For task number one (the rote memory task), the mothers used more verbal cues and mnemonics than with the other two tasks. The children's performance for task one and two were fair, but their performance for the zoo animal task was poor. Parental education was related to how much the parents could teach their child the assigned tasks; because some of the parents could not teach well, their child's performance was affected. This research found that mothers with more education used more verbal cues and relevant questions than mothers with less education.

Case-Smith and colleagues (1998) found that verbal cues helped preschoolers learn tasks more quickly than non-verbal cues. Researchers have concluded that verbal cues increase children's ability to learn when they enter the school system (Case Smith, Heaphy, Marr, Galvin, Koch, Ellis and Perez, 1998). Therefore, children whose parents

have more educational exposure performed much better than their counterparts with less educated parents, and educated parents are more efficient in preparing their child for school. Because many African-American mothers cannot and do not teach their children important tasks needed to succeed in school, this unintentional neglect hinders many developmental milestones needed to succeed in school. One of these milestones may be handwriting grasp and maturity.

Limitations of the Harris and Terrel's (1999) study include the tasks the mothers were asked to teach, the method of scoring, and the sample size. Throughout this study there was a lack of consistency in the economic and educational background of the participants, which limited the study. This is a limitation because the sample was not random and sampling was not balanced for socioeconomic status. In their study they had more disadvantaged African-American parents.

A higher rate of poverty typical with African-Americans may also result in their children having access to fewer or less diverse educational supplies (crayons, scissors, books, and toys), essential for completion of many school tasks (Jones and Luo, 1999). This situation, in turn, hinders their performance in school since the child is not exposed to these materials at an early age. A lack of opportunity and practice using handwriting materials may inhibit development in prewriting skills, including grip, and coordinated grasp patterns.

Anglo-American Parenting and its Influence on Child Development

The research on Anglo-Americans has been done primarily with middle class and college - educated families. Many of these studies have been comparison studies with other cultures or subgroups, with the Anglo-Americans used as the standard of

comparison (Moreno, 1997; McKenry and McKelvey, 1994). Anglo-Americans often performed better than other cultures. However, this may be attributed to differences in socioeconomic status and educational attainment or to the use of tasks biased in favor of Anglo-American culture.

Darling (1999) found that Anglo-American parenting is both authoritative and indulgent in nature. Children with parents who have an indulgent parenting style (high responsiveness but not demanding) are more likely to have behavioral problems such as aggressive and abusive behaviors. However, these children often have high self-image and social skills. Children in Anglo-American homes are instructed to love and respect their neighbors, to accept life and be open-minded, to be proactive in life, and to always look to the future rather than the past (McKenry and McKelvey, 1994). Children are taught these traits in order to help them lead successful and productive lives.

Studies have shown that many ethnic cultures do not emphasize independence as much as Anglo-Americans, and that Anglo-American teaching style may not be appropriate for every ethnic group (Huntsinger, et.al, 1994; McKenry and McKelvey, 1994). Moreno (1997) found that when teaching their children to tie their shoes, Anglo-American mothers use more controlling and non-verbal commands than Mexican-American mothers. Although the Anglo-American parenting style is not the same as the Mexican mothers it is very effective. Anglo-American culture places great emphasis on academics and having a high self-image. As a result, Anglo-American parents teach their children tools that they need to excel in school. Middle class Anglo-Americans also have the finances to supply their children with writing supplies. These supplies are needed in order to develop proper fine motor coordination and grasp patterns.

Conclusion

Researchers have found that there are different rates of development among cultures (Werner, 1972; Saida and Myashita, 1979; Mardel-Czudnowski, Chien-How and Tien-Miau, 1986). Tseng found that her Taiwanese participants developed mature pencil grasps at a much younger age than their American counterparts (1998). These differences in ages may be due to parental influence, and exposure to culture-specific activities, or the availability of writing utensils, which may affect the child and his or her pencil grasp development (Huntsinger, et. al, 1994).

In summary, this synthesis found that differences in cultural backgrounds and parenting styles among Hispanic, African-American, and Anglo-Americans may differ because of historical, socioeconomic, and educational factors. These differences can affect the way, and how soon their children acquire pencil grasp maturity. (Huntsinger, et.al, 1994; Moreno, 1997).

Anglo-Americans were consistently used as the standard while other cultures were used for comparison. Who is to say that Anglo-American culture is the standard or that Anglo-Americans pencil grasp development is normal? Also, Anglo-Americans participants were typically from a middle class background while many of the comparison groups were not. This means that the parents were better educated and the children had more exposure to pre-writing tools and tasks. The only culture tested that has surpassed the Anglo-Americans in pencil grasp development is the Taiwanese. This difference in development is due to higher parental educational and cultural expectations.

Although all the parents differ in parenting style there are patterns by culture that have been discovered. Each group in one way or another still teaches traits and beliefs

that are specific to their respective culture. These traits extend to the rate at which the child develops and excels in physical and mental tasks. The physical task of handwriting has been tested and discovered to differ among cultures.

CHAPTER THREE: METHODOLOGY

METHODOLOGY

The purpose of this study was to examine and compare the patterns of pencil grasp used by Hispanic, African-American, and Anglo-American preschoolers aged three to five years, and discover if parental influence was associated with these patterns. The data was obtained through the completion of four writing exercises: the participants completed a written maze three times and drawing a person once. Parents were given short survey.

Subjects

Sampling Criteria

Approximately sixty children, both males and females aged three to five years were to be included in this study. These children were recruited from seven childcare centers in Manhattan and two in Ithaca, NY. The children were of Hispanic, African-American or Anglo-American descent. To be included, children from a Hispanic descent were required to speak Spanish at home. Approximately twenty children were to be selected from each cultural group. Participants could not have any physical or mental disabilities as observed by the childcare coordinator or their teachers.

Sampling Procedure

The childcare centers were gathered from www.childcareguide.com. Once registered onto the Internet site, a demographic questionnaire was provided by the website and a parent or guardian would fill out this form to find childcare providers for children of specific ages. The researcher filled out this form to identify children that met

the sampling criteria. The website provided a list of more than thirty childcare providers in Ithaca and Manhattan, serving children in the target age groups. The list included the name of the childcare center, the name of the director, the fax, telephone number, and the e-mail of the childcare centers.

From September 2001 through March of 2002, the researcher called the facilities and asked to speak with the director. Once reached, the researcher introduced herself and told the director about the study, and asked if he or she wished to participate. If the director agreed, the researcher confirmed the address and the spelling of the director's name to assure the delivery of a recruitment package (see Appendix II, p. 82). The recruitment package included a formal letter discussing the phone conversation, general information about the study, multiple copies of parental consent forms, a facility consent form, demographic forms, and a copy of the assessment tool.

Three weeks after the initial phone call the researcher again called the facility to inquire if the recruitment package had been received, and if the director had any further questions. If further time to review the package was requested, the researcher called back in another week and a half. Once all questions were answered, and interest in participating in the study remained, the director was asked to fill out the facility consent form and distribute the recruitment letter, the parental consent forms, and the demographic surveys to the parents. Appointments were then arranged to perform the assessment. Three days before going to the facility a confirmation phone call was made to the director.

Before the researcher carried out the study on the participants she obtained the facility and parental informed consent forms and the returned demographic surveys. Once

the forms were received the researcher reviewed the forms for completion. When the researcher completed this step she began the study.

Sampling Selection

Originally twenty-five childcare centers verbally agreed to participate in the study. From these, only six remained committed: three childcare centers in Manhattan and three in Ithaca, NY. The researcher had a very difficult time obtaining African-American childcare centers and participants due to the large attrition among childcare centers serving children of African-American descent. Because of the amount of attrition among the African-American childcare centers (only three five-year-olds of African-American descent were recruited), parts of the study were redesigned and limited to subjects of Hispanic and Anglo-American descent. The redesign of this study required recruiting more children of Anglo-American descent in order to obtain an even distribution of Hispanic and Anglo-American participants in all age ranges.

The researcher was able to recruit thirty-eight children, sixteen males, and twenty-two females. In this group there were seven three-year-olds, eighteen four-year-olds, and thirteen five-year-olds, from Hispanic and Anglo-American backgrounds. There were eighteen Hispanic and seventeen children of Anglo-American descent in the study. All the children of Hispanic descent spoke Spanish at home. None of the participants had any physical or mental disabilities as observed by the childcare providers, teachers, and researcher.

The main ethnic population in the specific childcare center reflected the areas where the childcare centers are located. For example, three childcare centers were located

in Washington Heights, NY, an area populated mainly by Hispanics. This situation facilitated the recruitment of Hispanic and Anglo-American participants since the researcher was able to assess a large number of children from the same culture at one time.

Operationalization of Concepts into Variables

Variables

- Variable of Interest: Pencil Grasp Maturity, categorizing the participants pencil grasp according to Schneck's five-grip scale after observation of grasp use during the completion of four writing exercises (see Appendix I, p. 80).
- Constant Variable: Participant's membership in a childcare center.
- Independent variable: Culture (Hispanic, African-American, Anglo-American), gender, and parental influence as measured through responses obtain from the demographic survey.
- Intervening or Confounding variables: Mixed parental background, the quality of the daycare centers.

Research Design

An experimental correlation design was used for this study. The purpose of this design is to discover relationships among variables through the use of correlational statistics. Data was analyzed using descriptive statistics and Chi-Square analysis.

Correlational Methods

Correlational methods permit the researcher to analyze the relationships among a number of variables in a single study (Bradley, 2000). This researcher was interested in determining whether a relationship existed in pencil grasps among Hispanic, African-American, and Anglo-American preschoolers aged three to five. Analysis was done examining relationships between grasp, culture, and other variables to determine if associations existed between these variables. Descriptive and comparative statistics including cross tabulations and chi-square analysis were used to find relationships among the variables.

Experimental Procedure

Initially, the study consisted of a five to ten minute assessment in which the participant's hands were observed and video recorded. However, due to the reliability of the observational ability of the researcher, video recording of the assessment was omitted and direct observation of the participant's hands was used for the majority of the data-gathering sessions. To confirm observational ability, comparisons of data of prerecorded and on-site observations were analyzed and found to be the same and consistent.

The assessments consisted of a simple maze drawing, which the child was asked to complete three times to ensure accuracy and assure consistency of grip. The children were also asked to draw a person (e.g. their parents or siblings). Pencil grasp was determined by observing the child's hands during the assessment and comparing findings to Schneck's five-level scale (see Appendix I, p. 80). After the children completed the assessment the participants were rewarded with a sticker which was shown to them at the start of the session and the pencil used during the assessment.

Test Instruments

Research by Burton and Danciask (2000), and Goodenough and Harris (1963) was used to design the assessment tools given to the participants. These instruments were developed from components of the aforementioned researchers' instruments. The following elaborates on how the researchers developed the test instruments and all the components of the assessment tools.

The Maze. The maze was adapted from the assessment Burton and Danciask (2000) comprised for their study. These researchers created a maze based on the finger lengths of their three to five year old participants. This maze is finger-length-specific tool, having in total a 6.3 mm difference from the small square (used for smaller finger sizes) to the large square (used for larger finger sizes). Because these researchers were testing drawing accuracy, a stringent tool was created to accommodate their research.

However, adaptation to finger lengths was not done in this study. The width of the maze was kept consistent due to the similarity in finger size among the participants. Because this researcher was only testing the grasp pattern and not skill, a finger-length-specific tool was not needed. Instead the researcher created a similar tool, with a 9/10 inch writing path and a 1 9/10 inch rectangle at the start and termination of the maze (see Figure 2).

The test number, participant's age, participant number, gender, and handgrip category were written on the upper right portion of the 8.5 x 11 inch test paper in bullet style. The administrator used this list to enter the data observed. The maze looked like this:

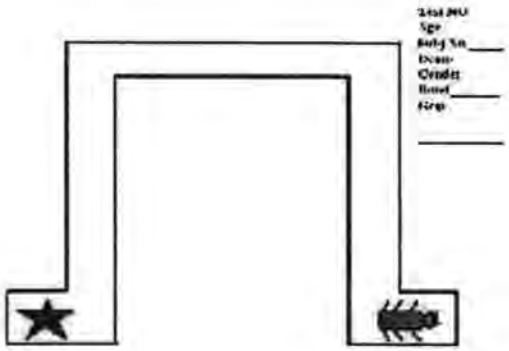


Figure 3. Maze

Burton and Danciask's (2000) test has reliability and validity. The adapted maze used in this researcher's study was not retested for reliability and validity. However, it was observed that during the administration of the test, all the participants were able to finish the test with ease no matter their age or the pencil grasp used.

Draw-A-Person. The participants in this study were also asked to "draw your mommy, daddy, brother or sister" on a blank 8.5 x 11 inch piece of paper and were observed to assess pencil grasp used. This portion of the test was used to determine if grasp patterns were consistent when drawing lines and curves. The Draw-A-Person section of the assessment tool was adapted from the Draw-A-Person test which was developed by Goodenough (1926) and later revised by Goodenough and Harris (1963).

The Draw-A-Person test focuses on 71 details of the human person. Unlike the original test, the participants were not evaluated on the number of details included in their drawing of a person, but only on the grasp used while drawing the picture. The reason for using this tool was based upon the research performed by Schneck and Henderson (1990). These researchers found that drawing circles as opposed to lines made a difference in the manner in which the children in their study grasped their pencils. They

found that maturity of grasp would vary depending on the task given. This tool was used to ensure consistency of grasp whether the participants made straight or curved lines. In addition, the Draw-A-Person test is commonly used in many research studies because of the unstructured and non-threatening nature of the assessment (Goodenough, 1926; Goodenough and Harris, 1963). This was another major reason for the inclusion of this test. Below is an example of what a child would draw on this test.

Figure 4. Child Drawing

Pencil Grasp Assessment. Schneck's (1991) five-level scale was developed from Schneck and Henderson's (1990) ten-grip scale. This test was created to assess children with writing disabilities and was found to have an acceptable interrater reliability of 0.80 and a Kappa coefficient of 0.64. Burton and Danciask (2000) stated that the use of Schneck and Henderson's "ten-grip scale is recommended only for recording the grips of individual persons and changes in their grip. If comparisons between persons are desired, then Schneck's (1991) five-level scale should be used" (1990, p.13). Schneck's five-level scale was used instead of the ten-grip scale because it is easier to generalize the results (see Appendix I, p. 80). Because of the structure of the five-grip scale, the researcher used both scales, in order to gather the data properly (see Figure 6).

While the participants were completing each assessment the researcher observed the grasp pattern used. Notation was made of the digits stabilizing the pencil, and whether

the writing movement was originating from the hand, wrist or shoulders. To determine the participant's score, the researcher looked first at the ten-grip and found the matching grasp and corresponding number, and then looked across to the five-level scale (see Appendix I, p. 80) to acquire the final numeric score. This number was recorded on a separate sheet of paper and used in the data analysis.

Parents' Questionnaire. The parents of the participants were asked to complete a nine-question survey, which asked questions about their cultural background, and how much they helped their children with handwriting tasks (see Appendix III, p. 96). This survey was used to assess the degree of parental influence on the maturity of a child's pencil grasp.

Test Procedure

Testing Environment. The researcher set up the testing materials in a designated area assigned by the director of the childcare center. The designated area was typically separate from the other children, and included two student desks and three chairs, which were supplied by the facility. The researcher supplied the participants with a sharpened, standard No.2 lead pencil that contained a cartoon print on the shaft. The pencil and a cartoon sticker were used as a reward for participating. The researcher arranged the assessment tools, stickers, and pencils on the table before calling the participants into the testing area. Initially, when using the video recorder, the researcher held the camera while the child participant completed the assessment. Once this form of data gathering was discontinued, the researcher sat to the left or right of the child depending on the child's hand dominance, and observed the child's hands during the completion of the assessments.

Child Participant. During the assessment the child participant was called by first and last name. Once the child acknowledged his or her name, the researcher introduced herself. The researcher then escorted the participant to the testing area. If the participant was uncomfortable he or she was advised to bring a friend in order to feel more comfortable. If the friend did not have a consent form he or she was not assessed, but was also rewarded with a pencil and sticker as a thank you from the researcher for helping with the study.

The participant was asked to sit in a standard chair by a student desk and to pick a cartoon sticker. The children were told that once the activity was completed that they would be able to take the sticker back to their classroom. This was used as an icebreaker and to relax the participant. The participant was also asked to pick a cartoon-imprinted, standard No.2 pencil to complete the assessment.

The participant was then instructed how to complete the four writing tasks. The participant was told, "Draw a line so the star can get to the ant." The participant was asked to complete this task three times, each task on a different test paper (see Appendix III, p. 94). On the fourth blank, 8½ x 11 inch piece of paper, the participant was told, "Draw your mommy, daddy, brother, or sister" in order to complete the fourth task (See Appendix III, p. 95). During the assessment the researcher observed the participants' hands. Pencil grasp was later determined by comparing the data acquired during the assessment with Schneck's five and ten-level scales. When the participants were finished they were rewarded by being presented with the cartoon-designed pencil and the cartoon sticker that they picked in the beginning of the study. Afterwards they were escorted back to their classroom, if applicable.

Parent Participation. After the facility agreed to participate in the study, an informed consent form and a demographic survey were distributed to the parent participants. The researcher received the survey in two ways; either from the director of the childcare center or directly from the parent. When received, the researcher numbered the survey for data analysis and tracking purposes.

Data Analysis

Once all forms were returned and pencil grasps were recorded, data entry was completed using SPSS 12.0, a statistical analysis program. Descriptive statistics including cross tabs and chi-square analysis of relevant factors were computed to determine if relationships existed among the variables. Relationships between age, culture and pencil grasps were analyzed. Further information about the data gathered and results found will be discussed in the next chapter.

Summary

This chapter discussed the methodology, measurement instruments, data gathering process, and organization of the current study. The main interest of this study was to examine and compare the patterns of pencil grasp used by preschoolers of Hispanic, African-American, and Anglo-American descent, aged three to five, and to discover if parental influence is associated with these patterns. The original time frame to finish this study was August 2001. However, due to the attrition of subjects the study was finished in December 2002.

CHAPTER FOUR: RESULTS

RESULTS

Introduction

The researcher investigated general patterns in the child participants' handwriting in the areas of age, gender, grasp, and culture. After completion, the demographic survey received from the parents was examined. Descriptive statistics, such as cross tabs, and non-parametric independent tests, primarily chi-square analysis of relevant factors, were performed to determine relationships among the variables. This chapter discusses the results by answering the original research questions.

1. Are there differences in pencil grasp among children of different age groups and genders?
2. Is there a relationship between pencil grasp of preschoolers and their ethnicity?
3. Is parental influence in a child's handwriting development related to the maturity or development of pencil grasp in children?

Subjects

Sampling Selection

There was notable difficulty in obtaining participants for this study. Many of the childcare centers who initially agreed to participate later withdrew. Of the three cultural groups, African-American childcare centers consistently withdrew or did not want to participate in the study. The researcher contacted fifteen different African-American centers in Manhattan, NY, and the surrounding areas. Only three children of African-

American descent and no African-American parents participated in the survey. All three African-American participants were males attending a Hispanic childcare center. Data from children of African-American descent were included in age and gender comparisons; however, they were excluded in the culture-to-culture comparisons. Because of the small number of participants recruited from the African-American group, a portion of the study were restricted to Hispanic and Anglo-American children.

Originally, twenty-five childcare centers agreed to participate; however, only six childcare centers participated in the actual study. Several facilities withdrew and others were later recruited. Three of these centers were located in Washington Heights, Manhattan, NY; the other three were located in Ithaca, NY. The childcare centers in Washington Heights typically served children of Hispanic backgrounds while those in Ithaca most often served children of Anglo-American descent.

Participants

In total, thirty-eight participants from six different childcare centers, sixteen males and twenty-two females from ages three to five participated in this study. Eighteen were Hispanic, three were African-American, and seventeen were children of Anglo-American descent. All participants were free from physical and mental disabilities, as observed by the researcher and childcare coordinator (see Table 1).

Three age groups were examined. Age was obtained by the complete cardinal years of the child. In the three-year-old group, there were four Hispanic, one African-American, and two Anglo-American children. There were eight Hispanic, no African-American, and ten Anglo-American four-year-old participants. In the five-year-

Table 1

Age and Gender in Years by Ethnicity

	Subject Ethnicity				
Group	Hispanic	African-American	Anglo-American	Total	Percentage
Age in Years					
Three	4	1	2	7	18.40%
Four	8	0	10	18	47.40%
Five	6	2	5	13	34.20%
Total	18	3	17	38	100%
Gender					
Male	5	3	8	16	42%
Female	13	0	9	22	58%
Total	18	3	17	38	100%

old group, there were six Hispanic, two African-American, and five Anglo- American participants. Of the male participants, five were Hispanic, three were African-American, and eight were Anglo-American. Thirteen Hispanic, no African-American, and nine Anglo-American females were recruited (see Table 1). Although the participant sample was small, the male to female and Hispanic to Anglo-American ratios were generally even.

Four Hispanic and eleven Anglo-American parents completed the demographic survey. The parents were from different lineal generations - the parents were 1st, 2nd or 3rd generation descendants. The parents had varied educational and socioeconomic backgrounds and all were members of childcare centers in Washington Heights, Manhattan, NY, or Ithaca, NY.

Data Analysis

Handedness

Of the thirty-eight participants, thirty-three used their right hands and five used their left hands during the test (see Table 2). Among the right-handed group, all three-year-olds, sixteen four-year-olds, and ten five-year-olds used their right hands for the assessments. No three-year-olds, two four-year-olds, and three five-year-olds used their left hands during the assessment. Cross tabulation comparisons found that fifteen males and eighteen females used their right hands, and one male and four females used their left hands (see Table 3).

Table 2

Handedness by Age in Years Cross Tabulation

	Age in Years			
Handedness	Three	Four	Five	Total
Right	7	16	10	33
Left	0	2	3	5
Total	7	18	13	38

Table 3

Handedness by Gender Cross Tabulation

	Subject Gender		
Handedness	Male	Female	Total
Right	15	18	33
Left	1	4	5
Total	16	22	38

Age

In total, seven three-year-olds, eighteen four-year-olds and thirteen five-year-olds participated in the study. Tables four through nine represent data addressing research question one: Are there differences in pencil grasp among children of different age groups and genders? Table four shows the nine different grasps patterns that were used in the three age groups. While the difference is not statically significant, it does approach significance, suggesting a trend among grasp use and age, chi-square (16) =24.125, p=.086) (see Table 5).

Grasp patterns were identified and then rated one through five, with one and two representing immature grasps, three and four representing transitional grasps, and five representing mature grasps. Table six shows the grasps used among the three age groups, based on the five-grip scale. These tables demonstrate the developmental stages of pencil grasp by depicting that the age three group used varied grasps, with none of the three-year-olds using an immature grasp; two children in the age four group used an immature grasp, while the remainder of the participants used transitional and mature grasps. All of the children in the age five group used mature dynamic grasps. Chi-square analysis of data in Table 7 found a significant difference when comparing age to the five-grip scale, chi-square (6) =14.441, p=.025). When comparing age to a broader generalization of pencil grasp maturity (see Table 8), it was found that while the comparison did not prove to be statistically significant chi-square (4) =8.786, p=.066), it was close to $p = >.05$ suggesting a trend (see Table 9).

Table 4

Adapted Grip Scale by Age Cross Tabulation

	Age in Years			
Adapted Grip Scale	Three	Four	Five	Total
Palmar Supinated Grasp	0	1	0	1
Brush Grasp	2	0	0	2
Cross Thumb Grasp	1	0	0	1
Digital Pronated Grasp	0	1	0	1
Static Tripod Grasp	0	2	0	2
Interdigital Grasp	0	2	0	2
Lateral Tripod Grasp	0	1	2	3
Dynamic Interdigital Grasp	2	8	5	15
Dynamic Tripod Grasp	2	3	6	11
Total	7	18	13	38

Table 5

Adapted Grip Scale by Age Chi-Square Analysis

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.14807415	16	0.08631991*
N of Valid Cases	38		

Note. 24 cells (88.9%) have an expected count less than 5.

The minimum expected count is .18. *p <.05

Table 6

Five Grip Scale by Age Cross Tabulation

	Age in Years			
Five Grip Scale	Three	Four	Five	Total
One	0	0	0	0
Two	0	2	0	2
Three	2	0	0	2
Four	1	3	0	4
Five	4	13	13	30
Total	7	18	13	38

Note. One and two are Immature Grasps, three and four are Transitional Grasps, and five is an adult grasp. The Radial Cross Palmar Grasp (one) was not observed.

Table 7

Five Grip Scale by Age Chi-Square Analysis

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.441	6	0.025079675*
N of Valid Cases	38		

Note. 9 cells (75.0%) have an expected count less than 5.

The minimum expected count is .37. *p <.05

Table 8

Age by Grasp Maturity Cross Tabulation

	Grasp Maturity			
Age	Immature	Transition	Mature	Total
Three	0	3	4	7
Four	2	3	13	18
Five	0	0	13	13
Total	2	6	30	38

Table 9

Age by Grasp Maturity Chi-Square Analysis

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.78624	4	0.066670193*
N of Valid Cases	38		

Note. 6 cells (66.7%) have an expected count less than 5.

The minimum expected count is .37. *p <.05

Gender

Sixteen males and twenty-two female preschoolers participated in the study. Some unique trends among the gender groups were found. Table ten shows all nine grasps that were used among the gender groups. Two times more females (n=10) used an interdigital grasp (see Figure 4) when compared to the males (n=5). Only females used a lateral tripod grasp.

Figure 5. Interdigital Grasp (ESS Office, 2004)

Tables eleven and twelve demonstrate that none of the female participants used an immature grasp while two male four-year-old participants did so. The tables also show that female participants attain mature grasps at a younger age than do the males. The first mature grasp was attained by a female by the age of three. Although the findings are interesting, none of the chi-square analysis values reached $p < .05$.

Ethnicity

Eighteen Hispanic and seventeen children of Anglo-American descent participated in the study (see Table 13). In the Hispanic group, there were four three-

Table 10

Adapted Grip Scale by Gender Cross Tabulation

	Subject Gender		
Adapted Grip Scale	Male	Female	Total
Palmar Supinated Grasp	1	0	1
Brush Grasp	1	1	2
Cross Thumb Grasp	1	0	1
Digital Pronated Grasp	1	0	1
Static Interdigital Grasp	1	1	2
Static Tripod Grasp	1	1	2
Lateral Tripod Grasp	0	3	3
Dynamic Interdigital Grasp	5	10	15
Dynamic Tripod Grasp	5	6	11
Total	16	22	38

Table 11

Grasp Maturity by Gender Cross Tabulation

	Subject Gender		
Grasp Maturity	Male	Female	Total
Immature	2	0	2
Transition	3	3	6
Mature	11	19	30
Total	16	22	38

Table 12

Grasp Maturity by Gender by Age Cross Tabulation

Age in Years	Grasp Maturity	Gender		
		Male	Female	Total
Three	Transitional	2	1	3
	Mature	3	1	4
	Total	5	2	7
Four	Immature	2	0	2
	Transitional	1	2	3
	Mature	4	9	13
	Total	7	11	18
Five	Mature	4	9	13
	Total	4	9	13

Table 13

Ethnicity by Age Cross Tabulation

	Subject Ethnicity		
Age in Years	Hispanic	Anglo-American	Total
Three	4	2	6
Four	8	10	18
Five	6	5	11
Total	18	17	35

Note. Since there was a small number of African American participants, this data was omitted.

year-olds, eight four-year-olds, and six five-year-olds. Among the Anglo-American group, there were two three-year olds, ten four-year-olds, and five five-year-olds (see Tables 14 and 15). When children were compared by ethnic origin, interesting findings were discovered.

Table sixteen presents the grasps that the two cultural groups used by gender and age and table seventeen addresses the maturity level between these groups. Two participants of Hispanic descent developed a dynamic tripod or an interdigital grasp by age three, while six children of Anglo-American descent developed these grasps by age four. While two Anglo-American participants used immature grasps, no Hispanic participant did (see Table 16). Equal numbers of Hispanics and Anglo-Americans had transitional grasps (n=3). At age five, all Hispanic and Anglo-Americans used a mature grasp (see Table 16).

Each of the ethnic, age, and gender groups used multiple grasps, but the two most commonly used were the dynamic tripod and the dynamic interdigital grasps (see Table 17). Table eighteen addresses the second research question: Is there a relationship between pencil grasp of preschoolers and their ethnicity?, by showing that three Hispanic and seven children of Anglo-American descent used a dynamic tripod grasp during their assessment. Sixty-one percent of the children of Hispanic descent used a dynamic interdigital grasp, 2.44 times more frequently than did children of Anglo-American descent. This study also found that children of Anglo-American descent used twice as many transitional grasps as their Hispanic peers. Although the data is intriguing, a statistical relationship was not found to exist between preschoolers' grasp patterns and their ethnicity (see Table 15).

Table 14

Ethnicity by Gender Cross Tabulations

	Subject Ethnicity		
Gender	Hispanic	Anglo-American	Total
Male	5	8	13
Female	13	9	22
Total	18	17	35

Note. Since there was a small number of African American participants; this data was omitted.

Table 15

Ethnicity by Pencil Grasp Chi-Square Analysis

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.98433196	8	0.538324078*
N of Valid Cases	38		

Note. 15 cells (83.3%) have an expected count less than 5.

The minimum expected count is .42. *p <.05

Table 16

Grasp Maturity by Ethnicity by Age by Gender Cross Tabulation

Gender	Age in Years	Grasp Maturity	Subject Ethnicity		Total
			Hispanic	Anglo-American	
Male	Three	Transition	1	1	2
		Mature	2	0	2
		Total	3	1	4
	Four	Immature	0	2	2
		Transition	0	1	1
		Mature	2	2	4
		Total	2	5	7
	Five	Mature	0	2	2
		Total		2	2
Female	Three	Transition	0	1	1
		Mature	1	0	1
		Total	1	1	2
	Four	Transition	2	0	2
		Mature	4	5	9
		Total	6	5	11
	Five	Mature	6	3	9
		Total	6	3	9

Note. Since there was a small number of African American participants, this data was omitted.

Table 17

Pencil Grasp by Ethnicity Cross Tabulation

	Subject Ethnicity			
Pencil Grasps	Hispanic	Anglo-American	Total	Percent
Palmar Supinated Grasp	0	1	1	2.60%
Digital Pronated Grasp	0	1	1	2.60%
Brush Grasp	1	1	2	5.30%
Cross Thumb Grasp	0	1	1	2.60%
Static Tripod Grasp	1	1	2	5.30%
Static Interdigital Grasp	1	1	2	5.30%
Dynamic Tripod Grasp	3	7	10	26.30%
Dynamic Interdigital Grasp	11	3	14	36.80%
Dynamic Lateral Tripod Grasp	1	1	2	5.30%
Total	18	17	35	100%

Note. Percentages are derived from the total participants per culture with the total scale for that culture. Since there were a small number of African - American participants, this data was omitted.

Demographic Survey

The third research question: Is parental influence related to the maturity or development of pencil grasp in children?, was addressed through the examination of the demographic survey completed by the parents. Only fourteen parents completed and returned the demographic survey. Four Hispanic and eleven Anglo-American parents were compared.

All parents, with the exception of one Hispanic parent, reported helping their children with writing tasks (see Table 18). All Hispanic and ten Anglo-American parents stated that they helped their child with homework. All of the children were exposed to writing utensils.

Findings of time spent on activities were consistent between the cultures studied. All the Anglo-American and Hispanic parents stated that they helped their child with a variety of handwriting tasks. All ethnicities practiced their cultures at home and all Spanish-speaking participants spoke Spanish at home (see Table 19).

The majority (73.3%) of the children used their writing implement daily. The remainder was exposed to writing utensils at least on a weekly basis. The uniformity of these results may have been because all the children attended childcare centers whose curricula required the use of writing utensils on a daily to weekly basis. Tables eighteen and nineteen answer question three, is parental influence in a child's handwriting development related to the maturity or development of pencil grasp in children?, by showing that no significant differences were found when comparing parental influence to a child's handwriting development, maturity or grasp.

Table 18

Demographic Survey Results

	Response		
Group	Yes	No	Total
	Helps Child with Writing		
Hispanic	3	1	4
Anglo-American	11	0	11
Percentage	93.30%	6.70%	100%
	Helps Child with Homework		
Hispanic	4	0	4
Anglo-American	10	1	11
Percentage	93.30%	6.70%	100%
	Child's Exposure to Writing		
Hispanic	4	0	4
Anglo-American	11	0	11
Percentage	100%	0%	100%
	Speaks Spanish at Home		
Hispanic	4	0	4
Anglo-American	0	11	11
Percentage	26.70%	86.70%	100%
	Observes Culture at Home		
Hispanic	4	0	4
Anglo-American	7	4	11
Percentage	86.70%	26.70%	100%

Table 19

Demographic Survey Results II

	Usage of Writing Utensils			
Subject Ethnicity	Daily	2-3x a Week	Weekly	Total
Hispanic	3	1	0	4
Anglo-American	8	2	1	11
Percentage	73.30%	20%	6.70%	100%

	Generation			
Subject Ethnicity	First	Second	Third	Total
Hispanic	2	1	1	4
Anglo-American	2	1	8	11
Total	4	2	9	15
Percentage	27%	13%	60%	100%

Note. No African American parent answered the demographic survey.

CHAPTER FIVE: DISCUSSION

DISCUSSION

Introduction

The importance of handwriting to children's success in school is one reason this thesis topic was chosen. As discussed, writing is a meaningful act that plays various roles for many people. Pencil grasp is only one aspect of handwriting; it relates to fine motor control and therefore is an area addressed in therapy. In order to educate occupational therapists on creating appropriate treatment plans for their clients, it is necessary to perform research on how handwriting may be specific to certain cultures. The creation of such treatment plans is important, as one of the main findings in this study is that pencil grasp may differ from one culture to another. To be effective, treatment programs must be customized not only to the client's type of dysfunction, but also to the client's ethnic background.

This study has a small sample size, and data analysis demonstrates few significant results. There are, however, many fascinating and promising findings. This chapter will discuss and synthesize the findings and their implications. The researcher also will discuss the strengths and weaknesses of this study, and address recommendations for future studies.

Questions

This study examined whether there is a difference in pencil grasp among children of different age groups and or genders; if a relationship exists between preschoolers' pencil grasp and their ethnicity; and whether parental influence relates to the maturity of pencil grasp in children.

Age

As expected, grasp patterns change and mature within the different age groups. The participants in this study demonstrated several stages of handwriting development, with the three main stages classified as immature, transitional, and mature. Significant results support the presence of a relationship between age and grasp maturity. In general, three-year-olds used either transitional or mature grasps, four-year-olds ranged from immature to mature grasps, and five-year-olds all used mature grasps. It is to be noted that none of the three-year-olds in this study used an immature grasp. This finding does not support the research found in previous studies (Halverson, 1931; Gesell, 1940; Rosenbloom and Horton, 1971; Saida and Myashita, 1979; Goodgold, 1983). These researchers state that three-year-old participants use less mature grasps. The result found in this study is most likely an artifact of the small sample size.

Gender

Male and female participants in this study had different patterns in their development of pencil-grasp maturity. While children of both genders demonstrated various grasps, none of the female participants used an immature grasp. The female participants appear to have matured more quickly than the males in this aspect of handwriting. A trend in the results suggests that a relationship between gender and grasp maturity may exist. This finding is similar to Saida and Myashita's (1979) research of differences in handwriting patterns between sexes. Their study found that female participants used more mature and fewer transitional grasps than did males.

Grasp and Ethnicity

Varieties of grasp patterns were discovered in this study group. Most of the grasp patterns used were within the classifications of Schneck and Henderson's, and Tseng's research. Nine different pencil grasps that fit under both Tseng's (1998) and Schneck and Henderson's (1990) pencil grasp research were discovered in this study. Two additional grasps not included in Schneck and Henderson's research but noted in Tseng's research—the static and the dynamic interdigital grasps—were demonstrated. As Schneck and Henderson's scales do not have these grasps in their charts, a new chart to accommodate these two grasps was created (see Appendix I, p. 81). This suggests a limitation of their classification system.

While not statistically significant, children of Anglo-American descent demonstrated a wider range in grasps than did children of Hispanic descent, evidencing a difference in grasps between these cultures. Of the mature grasps, children of Hispanic descent were more likely to use an interdigital grasp than were their Anglo-Americans peers, who frequently used the tripod grasps. This finding confirms Tseng's (1998) statement that what is common in one culture may not be common in another. She found that her Taiwanese participants used a lateral tripod grasp, while the Anglo-American participants used a tripod grasp.

Additionally, Anglo-American children used immature grasps; none of the Hispanic participants did so. The data could indicate that Hispanic participants mature, in terms of grasp patterns, at a younger age than Anglo-Americans, or that they progress through the transitional grasps at a faster rate than their Anglo-American counterparts. A larger sample is needed, however, to confirm this hypothesis. A relationship between

ethnicity and pencil grasp was not demonstrated conclusively, although some evidence of this existed. With a larger sample, this data may prove with greater significance.

Parents Survey

Nearly all responding parents reported they helped their children with writing. All the parents, with the exception of one Anglo-American, stated they helped their children with homework, and all children were exposed to writing utensils. Since the raw data is so similar, the impact of parental influence is not clear. These results did not indicate any differences between parental influence and culture. This may have occurred because of the very small size of the respondent group; because all the children attended childcare centers in which they were engaged in writing activities, or because the questions in the survey were not sensitive enough to detect differences.

Critique

This was a small, non-funded master's study, and the difficulties with subject recruitment may have led to the lack of significant results. If the sample size had been larger there could have been an increase in significant results and relationships. Despite the subject size limitation, however, this study has several strengths.

Strengths of the Study

This study is a promising prototype for studying these populations. It suggests potential differences in pencil grasp between Hispanic and Anglo-American children. It also confirms landmark studies (Halverson, 1931; Gesell, 1940; Rosenbloom and Horton, 1971; Saida and Myashita, 1979) that show children go through phases of handwriting development, and these phases may vary by gender, age, and ethnicity. Other researches

have been performed that compare American children with Asian (Saida and Myashita, 1979; Tseng, 1998), Australian (Ziviani, 1983), and British cultures (Rosenbloom and Horton, 1971). This research is one of the first studies comparing Hispanic and Anglo-American children.

Assumptions

Many assumptions were made before the commencement of the study. A student researcher could use the test instrument and scoring system reliably. When observing the participants grasp their pencils, the researcher noticed it was not difficult for the participants to complete the assessment. Once the instructions were given, the participants were able to complete the assessment quickly and easily. Because of the nature of the assessment, it was easy to visually evaluate the grasps used by the participants. In addition, there was good visual reliability of the assessment. All the children cooperated and were easily motivated to participate in the study through use of stickers or having a friend companion.

Limitations

The main limitation of this study was the small sample size. The sample was selected only from New York City and Ithaca, N.Y., due to time restraints, financial constraints, and geographic location of the researcher. Fifteen of the childcare centers withdrew after agreeing to participate in the study. African-American childcare centers consistently withdrew or did not want to participate in the study. As a result, ten more childcare centers were recruited. From these ten, only three remained committed. Additional recruitment calls were made to gather more participants, which significantly

lengthened the study process. In the end, only six childcare centers participated: three in Washington Heights, Manhattan, and three in Ithaca, N.Y.

The small final sample size made it difficult to tell whether raw data differences reflected a trend that would hold up and achieve significance for a larger group, or if the differences were the result of random error. Clearly, gathering additional data in subsequent or larger studies would be valuable. Due to the attrition of the African-American childcare centers, the study analysis was limited to Hispanics and Anglo-American subjects. It is peculiar that this specific cultural group uniformly did not wish to participate in this study.

Another limitation of this study was that all the participants were enrolled in childcare centers. Their involvement in childcare centers possibly affected their writing maturity and grasp, due to the amount of writing exposure they receive in these settings. It was difficult to separate educational influence from parental influence in the participants' handwriting. If all the participants had not attended a childcare center, the results might have been different.

One limitation of the survey tool was the lack of reliability and validity testing. All the parents were literate in English, a skill needed to complete the survey. Therefore, they clearly had some form of formal schooling or had been acculturated to the U.S. If a larger, more heterogeneous sample were chosen, or if the survey were available in Spanish as well as English, more variations in the answers might have been found. The survey tool also should include additional detailed questions that target how parents may influence the handwriting development of their children.

Schneck's five- and ten-level scales are limited in that they do not contain the dynamic and static interdigital grasp frequently used by Hispanic participants. To accommodate this limitation, two extra categories were created and added to the scale. Although observation of the assessment tools demonstrated similarity in use and good visual reliability, the assessment tool was not formally tested for reliability and validity.

Application to OT

Research indicates that the ideal grasp for all children is the dynamic tripod grasp (Benbow, 1995). This grasp is, however, primarily used by Anglo-American children (Schneck and Henderson, 1990), so this finding may not be valid for children of Hispanic descent, who, in this study, commonly used the interdigital grasp patterns. Discovering that some Hispanics routinely use a dynamic or mature grasp that is not the ideal is important, as a large number of occupational therapists work in school settings (Feder, Annette and Synnes, 2000) and focus on handwriting ability, including pencil grasps (Case Smith, 1996). The information gained from this research is germane in light of the fact that Hispanics are the fastest growing minority group in the United States (U.S. Census, 2002), and occupational therapists now spend more time working with this ethnic group than in previous years (U.S. Census, 2002). Therefore, it is important for occupational therapists to be educated on Hispanic cultural norms and on the normal variations of developmental progression among different cultures. Failure to be aware of these norms and variations may reduce an occupational therapist's effectiveness in practice. If, for example, an occupational therapist assists an Hispanic child in using a dynamic tripod grasp instead of an interdigital grasp—because the interdigital grasp is considered bizarre (Ziviani, 1983, p.13)—this unnecessary therapy could have a negative

physical effect on the child. Unnecessarily changing a child's pencil grasp can place the child in a stressful situation, as he or she has kinesthetically memorized this grasp and made it habitual (Benbow, 1995). Failure to recognize cultural differences also can result in unnecessary therapeutic intervention and waste therapeutic resources, as the child has a grasp that is normal for his or her cultural group.

Therapeutic professionals also should be aware that parents from certain ethnic backgrounds may have different cultural and educational expectations for their children that could affect their children's pencil-grasp development. For example, certain cultures may require the use of unique cultural objects, such as chopsticks or calligraphy brushes, which may alter the type of pencil grasp a child uses (Tseng, 1998). Parents may teach their children skills that are appropriate to their own culture, but which may differ from those of the larger Western culture (Huntsinger, Schoeneman, and Wei-Di, 1994). This information is beneficial to the rehabilitation and educational communities because it describes the developmental patterns of handwriting in children from various ethnic backgrounds.

Recommendations

If given the opportunity to perform a similar study with additional resources, many adjustments and recommendations would be implemented. A larger sample size would be recruited—a sample at least ten times larger than the current one would increase the accuracy of the results and might show greater differences in age, gender, and ethnicity. Because cultural subgroups can vary greatly from one to another, and because this is believed to be particularly true for Hispanic Americans, studying specific subgroups instead of a larger, culturally mixed Hispanic group could demonstrate more

culture-specific grasps. Another recommendation would be to recruit African-American participants and to perform a study comparing pencil grasps of children of African-American descent to children of Hispanic and Anglo-American descent.

Children in a childcare center may have more exposure to writing and writing-related training than those developing through the preschool period at home. As a result, this researcher might try to enlist children who were not enrolled in a childcare program.

Changes to the assessment chosen also would be made. A grip scale containing all the known grasp patterns, similar to that used in Tseng's (1998) research, would be used, and reliability and validity testing would be performed on the improved assessment. A more extensive survey targeting questions that can accurately assess parental influence would be given to the parents, rather than the nine-question demographic survey that was used in this study. A quantitative survey asking parents about their methods of teaching, frequency of instruction, and value of writing in their culture would be valuable and appropriate. Finally, this survey would be given to a larger parental sample size.

Conclusion

This study can be viewed as a field trial or prototype for further research; it raises several interesting questions for further inquiry. It suggests that children of Hispanic descent frequently use an interdigital grasp and that children from a certain culture may have a particular grasp or developmental progression that is unlike that of Anglo-American children.

It is hoped that with this and future similar studies, occupational therapists can learn whether different grasps are necessarily dysfunctional, as well as how such grasps relate to a child's culture. Applying this information when initially assessing a child for a

handwriting dysfunction would help minimize unnecessary treatment and waste of resources, and increase effectiveness in treatment plans.

APPENDIX I

Non-Adapted and Adapted Ten-Grip and Five-Level Scales

Ten-grip scale*	Five-grip scale**	Descriptions
1	1	Radial cross palmer grasp: implement position across palm radially (thumb down); implement held with fisted hand; forearm fully pronated; full arm movement
2	2	Palmer supinated grasp; implement positioned across palm projecting ulnarly (thumb up); implement held with fisted hand; wrist slightly flexed and supinated away from mid-position; full arm movement
3	2	Digital pronated grasp, only index finger extended; implement held in palmer grasp; index finger extended along pencil toward tip; arm not supported on table, full arm movement
4	3	Brush grasp; implement held with fingers; eraser end pointed against palm; hand pronated with wrist movement present; whole arm movement; forearm positioned in air
5	3	Grasp with extended fingers; implement held with fingers; wrist straight and pronated with slight ulnar deviation; forearm moves as a unit
6	4	Cross thumb grasp; fingers fisted loosely into palm; implement held against index finger; thumb crossed over pencil toward index finger; finger and wrist movement; forearm positioned on table
7	4	Static tripod grasp; implement stabilized against radial side of third digit by thumb pulp; index pulp on top shaft; thumb stabilized in full opposition; wrist slightly extended; hand moves as a unit; implement rests in open web space; forearm resting on
8	4	Four fingers grasp; Implement held with four fingers in opposition; wrist and finger movement; forearm positioned on table
9	5	Lateral tripod grasp; implement stabilized against radial side of third digit by thumb pulp; index pulp on top of shaft of implement; thumb adducted an braced over or under anywhere along lateral border of index finger; fourth and fifth digits flexed to stabilize the metacarpophalangeal arch and third digit; localized movements of digits of tripod and wrist movements on tall and horizontal strokes; forearm resting on table
10	5	Dynamic tripod grasp; implement stabilized against radial side of third digit by thumb pulp; index pulp on top of shaft of implement; thumb stabilized in full opposition; wrist slightly extended; fourth and fifth digits flexed to stabilize the metacarpophalangeal arch and third digit; localized movements of digits of tripod and wrist movements on tall horizontal strokes; forearm resting on table

Note. *From Schneck and Henderson (1990) ** From Schneck (1991).

Figure 6. Pencil Grasps Table

Ten-grip*	Five-grip**	Pencil Grasps
1	1	Radial Cross Palmer Grasp
2	2	Palmer Supinated Grasp
3	2	Digital Pronated Grasp
4	3	Brush Grasp
5	3	Grasp With Extended Fingers
6	4	Cross Thumb Grasp
7	4	Static Tripod Grasp
8	4	Static Interdigital Grasp
9	4	Four Fingers Grasp
10	5	Lateral Tripod Grasp
11	5	Dynamic Interdigital Grasp
12	5	Dynamic Tripod Grasp

Note. Adapted * From Schneck and Henderson (1990).

** From Schneck (1991).

Figure 7. Adapted Pencil Grasps Table

APPENDIX II

Recruitment Materials

Thursday, March 25, 2004

Dear Mrs. Jane Doe,

My name is Tomasina Harper and I am an Ithaca College occupational therapy graduate student, I spoke to you earlier about a master thesis project, you stated you wished to participate in. Again, my study is finding how children of different cultural backgrounds hold their pencil.

As per our conversation, I have sent you various forms. First is a description of what my study is about, consent forms for you and the parents, and what will be administered to the child. As an incentive and a thank you gift, I will give your child a cartoon or landscape printed pencil and a sticker.

Please fell free to review the forms. If you wish to contact me, my phone number is (607) ###-###. I am best reached at work and my phone number there is (607) ####-####. Thank you again. I really appreciate your help.

Respectfully Yours,

Tomasina Harper

Figure 8. Letter to Director of Childcare Center

Thursday, March 25, 2004

Dear Parent,

My name is Tomasina Harper and I am an Ithaca College occupational therapy graduate student. I am trying to complete my master thesis and I need your help! I have discussed with the director of your childcare center about this study and she has agreed to participate. My study is finding how children of different cultural backgrounds hold their pencil. As an incentive and a thank you gift, I will give your child a cartoon or landscape printed pencil and sticker.

I will be coming to ABC Childcare on Monday and Tuesday (date) at 9:00am. Attached are various forms. First is a description of what my study is about, consent forms for you, and a sample of what will be administered to your child. Attached is also a demographic survey, which I would appreciate if you would fill out. This 9-question survey will give me more background information about you and your child.

Please fell free to review the forms. If you wish to contact me, my phone number is (607) ###-####. I am best reached at work, my phone number there is (607) ####-####. Thank you again. I really appreciate your help.

Respectfully Yours,

Tomasina Harper

Figure 9. Letter to the Parents

General Information about the Study

The purpose of this study is to examine and determine the pencil grips used by Hispanic, African-American and Anglo-American preschoolers ages 3-5, and to discover if parental influence is associated with these patterns. The pencil grasps will be observed while the child completes various writing exercises: completing a written maze three times and a drawing a person task. There will be approximately 40 children studied from various childcare centers in Manhattan and Ithaca, NY. This study is essentially un-funded and involves minimal costs. My research will occur during the months of February, 2001 through December 2002.

Related Experience of the Researcher

The researcher's experience is limited to Ithaca College's occupational therapy curriculum. The researcher is an Ithaca College graduate student who has taken various classes on child and adult assessments. The researcher has interned in the Franziska Racker Center in Cortland, NY and The Brooklyn Hospital Center in Brooklyn, NY.

Benefits of the Study

This study can help occupational therapists treat children with handwriting dysfunctions more effectively. Learning the developmental patterns of pencil grips in children can help the occupational therapists better understand where the child lies in his or her developmental spectrum. Professionals must gain awareness that parents from different ethnic backgrounds have different cultural expectations for their child. This information can help occupational therapist create a treatment plan that will help both the child and parents needs. In addition, since there is a lack of research in this area, this information will be of great benefit for the rehabilitation community.

Figure 10. General Information About the Study

PARENT INFORMED CONSENT FORM

A CROSS-CULTURAL STUDY ON PENCIL GRIP COMPARISONS

1. PURPOSE OF THE STUDY

The purpose of this study is to examine and determine the patterns of pencil grips used by Hispanic, African-American and Anglo-American preschoolers ages 3-5, and to discover if parental influence is associated with these patterns. The data will be obtained through the completion of various writing exercises: having participants complete a written maze three times and drawing a person. The children who attend various childcare centers in Manhattan and Ithaca, NY will have their hands observed during the assessments in the months of January 2001 and December of 2002. Pencil grip will be observed and compared with Schneck's five-grip scale to determine pencil grasp. Data will be recorded and patterns analyzed to determine if any significant relationships exists among the groups.

2. Benefits of the Study
   a) To add to the lack of research in the area of ethnic groups and pencil grasps.
   b) To help future and current occupational therapists learn the differences in pencil grasps among children of different ethnic backgrounds.
   c) This will help future children obtain better care, since the occupational therapist will be aware of the differences in pencil grasp development among children of different cultures.

3. What Will Your Child Be Asked to Do

The study will consist of a 5-10 minute assessment, in which your child's hands will be observed.

- Your child will be asked to sit in a standard desk and chair in the back of the classroom
- Your child will be given a standard number two pencil to complete the assessment
- Your child will be asked to complete four writing tasks:
  - The tasks consist of a written maze, which your child will be asked, "draw a line so the ant can get to the star". Your child will be asked to complete this three times each on a different test paper.
  - Your child will also be asked to draw a person e.g. their parents, friend, teacher, sibling.
- Pencil grip will be observed and compared with Schneck's five-grip scale to determine pencil grasp.
- When your child is finished he or she will be rewarded by keeping the cartoon designed pencil he or she was tested with.

Initial

4. Risks

   Your child may feel uncomfortable and frightened of being observed while completing the assessment, since they are not familiar with the researcher. These psychological risks are minimal and can be minimized by presenting the researcher to the whole class and creating a rapport with your child before the commencement of the assessment. This will make your child feel comfortable with the researcher's presence. If your child is still uncomfortable, the presence of a known individual during the assessment can make your child feel at ease. Your child will be told that they can stop at anytime and still will be rewarded with a pencil at the end of the session.

5. Withdrawal from The Study

   At any point in the study, you and your child are able to withdraw from the study with out penalty.

6. How the Data will be Maintained in Confidence

   During the study, your child will be observed and confidentiality and anonymity will be assured. Your child's hands will be observed. Your child's name will never appear on any testing material. Instead, each child will be given a number in order for the researcher to match the test materials with the data gathered. The only individuals who will view the data are the researcher and the faculty advisor. During the study the data will be in the possession of the researcher, the data will be held in one box and the consent forms will be held in another in the researcher's home. This will insure that confidentiality and anonymity will be maintained. After the data gathered is assessed and the researcher's thesis is complete; testing materials will be securely held at Ithaca College's occupational therapy department. Information pertaining to the location of your childcare center will be destroyed so future viewers cannot trace the location of the participants. With your permission this data will be shown to future occupational therapy students but at no point will your child's name or school will be shared with viewers.

_____

Initial

7. If You Would Like More Information about the Study

If you would like more information before or after the study, please contact my advisor or I at:

Tomasina Harper, BS, OTS
Ithaca, NY 14850
Telephone: (607) ###-###
Email: fabelmo@excite.com

Catherine Gordon, Ed.D, OTR, FAOTA
Department of Occupational Therapy
Ithaca College, 200 Smiddy Hall
953 Danby Rd
Ithaca, NY 14850-7079
(607) 274-1975

I have read the above and I understand its contents. I agree to participate in the study.

_____

Print or Type Name

_____ _____

Signature Date

Check Below:

☐ After the completion of the study, I give the department of occupational therapy at Ithaca College permission to show my child's data to future students for educational purposes only. At no point will my child's name or school will be shared with viewers.

☐ After the completion of the study, I do not give the department of occupational therapy at Ithaca College permission to show my child's data to future students for educational purposes only. Even though, at no point will my child's name or school will be shared with viewers.

Figure 11. Parental Consent Form

FACILITY INFORMED CONSENT FORM

A CROSS-CULTURAL STUDY ON PENCIL GRIP COMPARISONS

1. PURPOSE OF THE STUDY

The purpose of this study is to examine and determine the patterns of pencil grips used by Hispanic, African-American and Anglo-American preschoolers ages 3-5, and to discover if parental influence is associated with these patterns. The data will be obtained through the completion of various writing exercises: having participants complete a written maze three times and drawing a person. The children who attend various childcare centers in Manhattan and Ithaca, NY will have their hands observed during the assessments in the months of January 2001 and December of 2002. Pencil grip will be observed and compared with Schneck's five-grip scale to determine pencil grasp. Data will be recorded and patterns analyzed to determine if any significant relationships exists among the groups.

2 Benefits of the Study

a) To add to the lack of research in the area of ethnic groups and pencil grasps.
b) To help future and current occupational therapists learn the differences in pencil grasps among children of different ethnic backgrounds.
c) This will help future children obtain better care, since the occupational therapist will be aware of the differences in pencil grasp development among children of different cultures.

3. What Will the Child Be Asked to Do

The study will consist of a 5-10 minute assessment, in which the child's hands will be observed.

- The child will be asked to sit in a standard desk and chair in the back of the classroom
- The child will be given a standard number two pencil to complete the assessment
- The child will be asked to complete four writing tasks:
    - The tasks consist of a written maze, which the child will be asked, "draw a line so the ant can get to the star". The child will be asked to complete this three times each on a different test paper.
    - The child will also be asked to draw a person e.g. their parents, friend, teacher, sibling.
- Pencil grip will be observed and compared with Schneck's five-grip scale to determine pencil grasp.
- When the child is finished he or she will be rewarded by keeping the cartoon designed pencil he or she was tested with.

_____

Initial

4. Risks

The child may feel uncomfortable and frightened of being observed while completing the assessment, since they are not familiar with the researcher. These psychological risks are minimal and can be minimized by presenting the researcher to the whole class and creating a rapport with the child before the commencement of the assessment. This will make the child feel comfortable with the researcher's presence. If the child is still uncomfortable, the presence of a known individual during the assessment can make the child feel at ease. The child will be told that they can stop at anytime and still will be rewarded with a pencil at the end of the session.

5. Withdrawal from The Study

At any point in the study, you and the participants are able to withdraw from the study with out penalty.

6. How the Data will be Maintained in Confidence

During the study, the child will be observed and confidentiality and anonymity will be assured. The child's hands will be observed. The child's name will never appear on any testing material. Instead, each child will be given a number in order for the researcher to match the test materials with the data gathered. The only individuals who will view the data are the researcher and the faculty advisor. During the study the data will be in the possession of the researcher, the data will be held in one box and the consent forms will be held in another in the researcher's home. This will insure that confidentiality and anonymity will be maintained. After the data gathered is assessed and the researcher's thesis is complete; testing materials will be securely held at Ithaca College's occupational therapy department. Information pertaining to the location of the childcare center will be destroyed so future viewers cannot trace the location of the participants. With your permission this data will be shown to future occupational therapy students but at no point will the child's name or school will be shared with viewers.

_____

Initial

5. If You Would Like More Information about the Study

   If you would like more information before or after the study, please contact my advisor or I at:

Tomasina Harper, BS, OTS
Ithaca, NY 14850
Telephone: (607) ###-###
Email: fabelmo@excite.com

Catherine Gordon, Ed.D, OTR, FAOTA
Department of Occupational Therapy
Ithaca College, 200 Smiddy Hall
953 Danby Rd
Ithaca, NY 14850-7079
(607) 274-1975

I have read the above and I understand its contents. I agree to participate in the study.

_____

Print or Type Name

_____ _____

Signature Date

_____

Name of Facility

Figure 12. Facility Consent Form

APPENDIX III

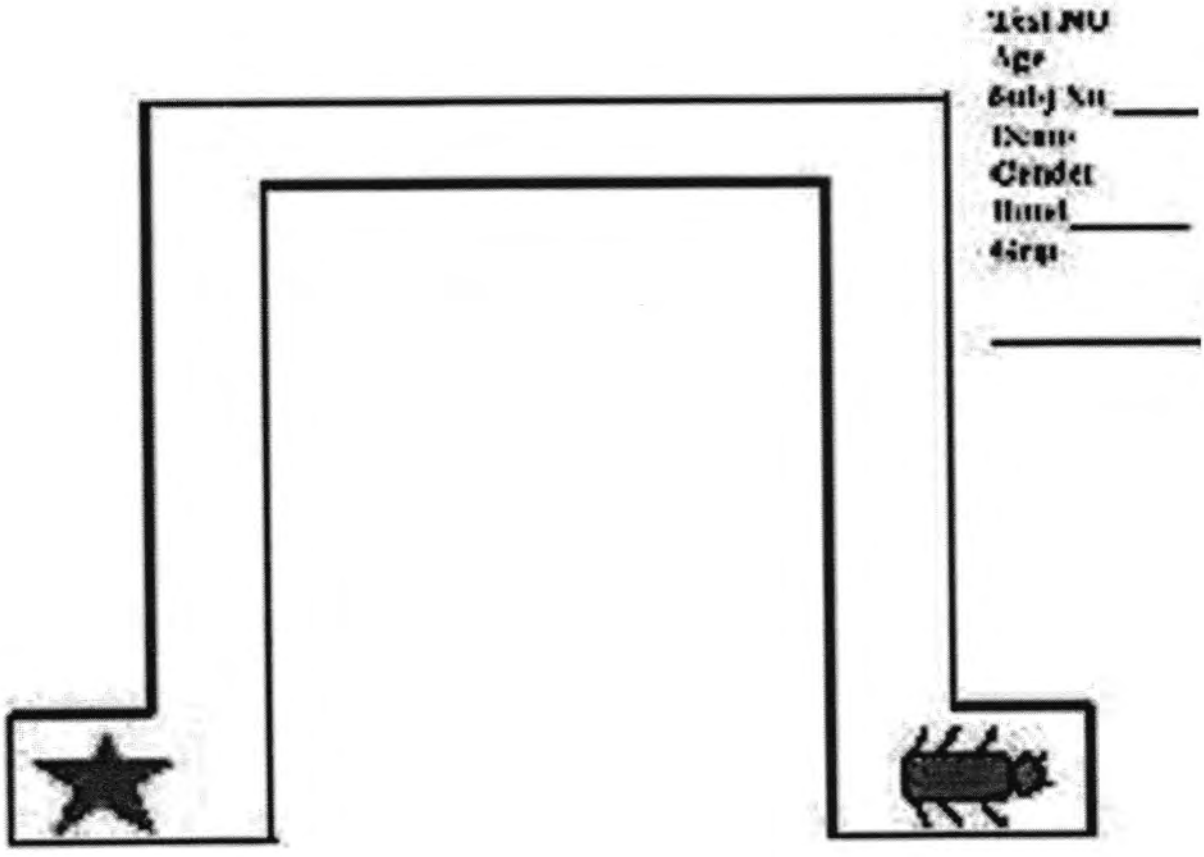
Testing Material

Exam Number _____

Age _____

H AFA AGA

Figure 13. Assessment Cover



Draw a Person

Demographics

1) Is your family from one of the following descendents? (Circle all that apply)
   a. Hispanic
      1. Caribbean Hispanic (Dominican, Puerto Rican, Cuban)
      2. Central American Hispanic
      3. South American Hispanic
   b. African-American
   c. Anglo-American
   d. Other _____

2) Is your family . . . (Circle one) in the United States?
   a. First Generation
   b. Second Generation
   c. Third or more Generation

3) If Hispanic do you speak Spanish at home? (If not Hispanic please skip)
   a. Yes
   b. No

4) Do you observe and practice your culture at home? (Circle one)
   a. Yes
   b. No

5) Do you live in a community populated heavily by members in cultures like your own?
   a. Yes
   b. No

6) Do you help the child with Homework?
   a. Yes
   b. No

7) Do you help the child with writing?
   a. Yes
   b. No

8) Does the child have crayons, markers or paint at home?
   a. Yes
   b. No

9) If so, does the child use them . . . (Please circle one)
Daily 2-3 Times a Week Weekly Rarely

Thank You!

Figure 14. Parent Survey

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