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HANDEDNESS DISTRIBUTION IN A TRANSITIONAL  
FIRST GRADE POPULATION

by  
Susan Paladino

A Thesis

Submitted in partial fulfillment of the requirements of the  
Master of Arts Degree  
of  
The Graduate School  
at  
Rowan University  
May 9, 2002

Approved by \_\_\_\_\_  
Professor

Date Approved 5-10-2002

## **ABSTRACT**

Susan Paladino

HANDEDNESS DISTRIBUTION IN A TRANSITIONAL  
FIRST GRADE POPULATION

2001/02

Dr. Joy F. Xin

Master of Arts in Special Education

The purpose of this study was: (a) to investigate the distribution of handedness between T-1 students over the past five years compared to their same-age peers; (b) to investigate the distribution of handedness between T-1 boys, same-age boys, T-1 girls, and same-age girls; (c) to examine the kindergarten teachers' attitudes toward left-handed students; (d) to determine which, if any, instructional and classroom modifications the kindergarten teachers used.

One hundred and twenty-two elementary school children and five kindergarten teachers from a large suburban school district located in the northeastern United States participated in the study. The students completed an 8-item questionnaire and the teachers completed a 21-item questionnaire designed for this study. Data was collected and analyzed. Percentages, means, standard deviations, and ranges were computed.

The data showed that T-1 boys and girls had a higher incidence of left-handedness compared to their same-age peers. It was also found that the teachers "almost never" used classroom accommodations/modifications for left-handed students.

## **MINI-ABSTRACT**

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The purpose of this study was to investigate the distribution of handedness of T-1 students compared to their same-age peers and the kindergarten teachers' attitudes toward left-handed students. One hundred and twenty-two elementary school children and five kindergarten teachers participated in the study. An 8-item questionnaire was completed by the children and another 21-item questionnaire was completed by the teachers. It was found that T-1 boys and girls had a higher incidence of left-handedness and that the teachers "almost never" used classroom accommodations/modifications for left-handed students.

## **Acknowledgments**

I would like to dedicate this thesis to my Aunt, Jacqueline Rose Paladino, who meant so much to me while she was here on Earth. She taught me to live life to the fullest and to enjoy everyday. I only wish she could have seen me accomplish this milestone. I do not know what kind of person I would be or what I would have accomplished if I had not had her in my life.

I want to give special thanks and all of my love to my husband, mother, father, and brother for putting up with me over the past nine months. It has been a chaotic time in our lives. Without their love, support, and understanding, I am not sure I would have succeeded.

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## **Chapter One**

### INTRODUCTION

#### Statement of Problems

##### Transitional First Grade Program

Many school districts offer a transitional program between kindergarten and first grade (Karweit & Wasik, 1992; Mantzicopoulos & Neuharth-Pritchett, 1998; Wang & Johnstone, 1997). That is when children complete regular kindergarten, they will be placed in a transitional first (T-1) program prior to their attending first grade (Karweit & Wasik, 1992). The major purpose of the T-1 program is to identify kindergarten children who are not ready to advance to the first grade at the end of the kindergarten year. The school district provides these children another year of transitional instruction that is designed to increase their readiness skills. It is believed that an effective T-1 program helps the students avoid future failures in their academic careers (Wang & Johnstone, 1997). T-1 classrooms are often smaller in size (15 or so students), which allows each student more individualized attention from the teacher. T-1 classrooms may also have a full- or part-time teaching assistant to support instruction (Mantzicopoulos & Neuharth-Pritchett, 1998).

Children placed in a T-1 program are often developmentally immature or are not



ready for the first grade academic curriculum. These students tend to have late birthdays, such as September or October, which creates a situation where they can be almost an entire year younger than their classmates. In addition, the majority of students placed in T-1 are male, which adds to the immaturity factor. Studies have proven that males develop slower than their same-age female counterparts until they reach physical maturity (Schroeder, 1992).

Placement of T-1 students is often determined by some or all of the following factors: reading tests, math tests, language arts tests, end-of-the year tests, academic readiness, social readiness, classroom teacher's observation, and/or speech and language therapist's observation. These students are evaluated by their kindergarten teachers to decide whether they should be placed in the program. Also, a child's parent/guardian's consent is obtained prior to the placement. If parents/guardians refuse the placement of T-1, the children will stay in the original classroom, and in some instances these children will succeed in the first grade. Other times, their academic placement will be changed during the school year from the first grade to the T-1 program. Occasionally, parents/guardians will still refuse the placement into T-1 when their child is struggling. In that case, their children will be retained in the first grade.

#### Left-handed Children in a Transitional First Grade Program

Americans have a strong cultural bias toward the right hand and have forced many natural left-handers to use their right hands for specific tasks (Kelly, 1996). Historically, educators have tried to force left-handed students to become right-handed. These attempts resulted in confusion, humiliation, and pain. Presently, educators have

come to realize that they do not have to change a student's hand preference. Although the attitudes have changed, instructional practices have not (Kelly, 1996). Left-handed students seem to be a forgotten minority in our schools. Right-handed teachers often do not consider the many problems that left-handed students face daily. For example, a pencil sharpener turns the wrong way for left-handers, notebook rings and composition-book spirals dig into their hands when they write, ink and pencil smudges are ever present, a scissor's cutting edge is upside down, left-handers must sit at the left end of a table or knock into another's elbows, etc (Kelly, 1996).

Learning to use proper penmanship while writing is also a problem for many left-handed students (Lipson, 1984). Factors such as classroom lighting, paper placement, pencil/pen grip, ink/lead smearing, and directionality cause these students to have poor legibility and lack of writing fluency. Left-to-right progression is a readiness skill for both reading and writing. This motor skill is essential if students are to be successful readers and writers (Lipson, 1984).

Perhaps the most significant problems for left-handed students are learning to read and write. Some researchers contend that lefties too often have initial reading problems (Kelly, 1996). However, these problems are not caused by significant intelligence differences between left-handed and right-handed learners. For example, English text reads from left to right. The natural progression of the hands and eyes is from the middle of the body outward. Right-sided individuals naturally look and move to the right and left-sided to the left. Therefore, left-handed students need to learn decoding skills and they have the additional task of training themselves to counter their natural

progression. Researchers have also pointed out that printed letters tend to “read right” which means that most letters “open” to the right, such as L, F, and C (Kelly, 1996). Usually, the body of the letter is seen first, and the open right side of the letter leads the reader to the next letter. Once again, left-handed students have to go against the natural progression of their eye movement. It is understandable that many lefties make letter and word reversals when learning to read (Kelly, 1996).

Many left-handed students suffer from poor self-esteem (Kelly, 1996). For example, they often think of themselves as “weird” or “different” and do not feel positively about themselves. They realize that some tasks take longer for them to complete and they also feel self-conscious about looking awkward in certain situations. These are all factors that teachers can deal with in their classrooms to make left-handed students feel better about themselves. A teacher’s attitude toward left-handed students, as well as the teacher’s accommodations for those students seems important. The present study developed a questionnaire about teachers’ attitudes toward left-handed students. The purpose of the study was to evaluate kindergarten teachers’ attitudes and their use of instructional and classroom modifications for left-handed students, some of which were placed in a T-1 program the following school year.

### Background

A true count of handedness distribution in the human population is impossible. Some experts believe that up to 30% of the population may have left-handed tendencies (Arnold & Askew, 1993). However, most experts believe that a normal distribution of

handedness is approximately 8% left-handedness and 92% right-handedness, with more left-handed boys than left-handed girls (Arnold & Askew, 1993). Questions of ambidexterity, the ability to use both hands efficiently, and ambiguity, the inability to consistently choose a hand preference, complicate the issue further (Kelly, 1996). It is generally thought that the majority of the population has degrees of left- or right-handedness. However, a child's favored hand may become apparent as early as eight months after birth, and by the age of three the preference usually is well-developed (Kelly, 1996).

Through advanced technology, researchers have been able to study the brain and its functions more effectively. It has been found that the left side of the human brain is usually dominant (Gedeon, 1998). The left-hemisphere of the brain controls the right side of the body, therefore it makes sense that approximately 92% of the population is right-handed and the left-handed individuals have a dominant right side of the brain (Gedeon, 1998). Researchers have also found that left-handed and ambidextrous individuals have a thicker corpus collosum which is the fiber bundle linking the left and right hemispheres (Gedeon, 1998). Neurological research has determined that the left hemisphere of the brain is the center for language, science, mathematics, and logic while the right hemisphere synthesizes and is a source of dreams, fantasies, art, music, and feeling (Kelly, 1996). Some scientists argue that right- or left-brain dominance does not determine handedness. They state that a person's academic abilities are related more to other factors, such as intelligence, talent, and background, rather than handedness (Kelly, 1996).

Some scientists believe that it is strictly genetic to be left- or right-handed. They contend that it is passed from parents to children genetically on a chromosome (Kelly, 1996). Other researchers believe that it is caused by loss of blood flow to the infant's left-hemisphere before and during childbirth (Kelly, 1996). The diminished blood supply causes the right hemisphere to develop more than the left. However, most scientists believe that left-handedness is caused by a combination of environmental and genetic factors (Kelly, 1996).

It has been observed that over the past five years a disproportionate amount of T-1 students have been left-handed. The present investigation was designed to find the percentage of left-handed T-1 students compared to their same-age peers. An additional purpose was to examine the kindergarten teachers' attitudes toward left-handed students and determine which, if any, instructional and classroom modifications might be used.

### Significance of the Study

Many studies have examined the distribution of left-handedness in specific populations. Researchers have studied, among others, individuals with autism, dyslexia, immune disorders, deafness, learning disabilities, mental retardation, academic giftedness, allergies, hyperlexia, and pervasive developmental disorders (e. g., Cornish & McManus, 1996; Tonnessen et al., 1994; Healy & Aram, 1986; Annett, Eglinton, & Smythe, 1996; Arnold & Askew, 1993; Wagner, 1985; Soper et al., 1987; Morris & Romski, 1993; Lewis, Feiring, & McGuffog, 1986; Wiley & Goldstein, 1991; Fein et al., 1985). They have studied the link to gender and physical maturity. However, no one has

examined a link between a transitional first grade placement and handedness distribution.

The present study investigated the distribution of handedness between T-1 students over the past five years compared to their same-age peers and the distribution of handedness between T-1 boys, T-1 girls, same-age boys, and same-age girls. It also examined the kindergarten teachers' attitudes toward left-handed students and determined which, if any, instructional and classroom modifications might be used.

### Statement of the Purpose

The purposes of this study are: (a) to investigate the distribution of handedness between T-1 students over the past five years compared to their same-age peers; (b) to investigate the distribution of handedness between T-1 boys, same-age boys, T-1 girls, and same-age girls; (c) to examine the kindergarten teachers' attitudes toward left-handed students; (d) to determine which, if any, instructional and classroom modifications the kindergarten teachers used.

### Research Questions

1. Do left-handed children in Kindergarten, who do not receive instructional and classroom modifications, have a higher percentage of placement in a transitional first grade program?
2. Do left-handed boys or girls in Kindergarten, who do not receive instructional and classroom modifications, have a higher percentage of placement in a transitional first

grade program?

3. Do the teacher's attitude toward left-handed children impact their placement of a transitional first grade program?

## **Chapter Two**

### **REVIEW OF THE LITERATURE**

#### **Introduction**

In Chapter One the author discussed the theories of hand preference determination, the hardships that left-handed individuals face daily, and the ideology of placement in Transitional First Grade. This chapter will review research on possible relationships between specific populations of individuals with special needs and hand preference, and literature about transitional classes.

#### **Hand Preference and Individuals with Special Needs**

In 1986, Lewis, Feiring, and McGuffog studied the skill and ability profiles of young gifted and normal children as it related to gender and handedness. They recruited 48 subjects from The Gifted Child Clinic which serves children between the ages of 15 months and 4½ years. Children were referred to the clinic by parents, pediatricians, and/or early childhood educators. Following the initial referral, parents completed a questionnaire concerning their child's abilities in specific skill areas and information on behavioral milestones, birth history, and important family events. The children were assessed for both intellectual and social-emotional functioning during two separate visits to the clinic. Among the assessments were standardized tests, informal assessments of



skills, and behavioral observations. Parent-child interaction was also evaluated. Lastly, a parental interview was conducted to gather information about the child's temperament, sleep problems, and separation anxiety.

The results showed that twenty-eight subjects (58%) were identified as having a general IQ score of 135 or above; 14 of these children were male and 14 were female. The mean age of the gifted group was 37 months. Fourteen children in the gifted group had a history of left-handedness in their immediate and/or extended family (left group) while 14 did not (right group). Twenty children (42%) showed a general IQ in the high normal range, with a group mean of 124. In this normal IQ group, 10 were male and 10 were female, with a mean age of 36 months. Nine children in the normal group had a history of left-handedness in their immediate and/or extended family and 11 did not (Lewis et al., 1986).

The researchers found, in general, the right-handed group performed better than the left-handed group. The gifted right-handed children performed better than the gifted left-handed children in memory and spatial skills. The ratings of quantitative skills, reading, and play indicated that the gifted left-handed group played more creatively than the gifted right-handed group. In the areas of motor, vocabulary, pre-reading, and quantitative skills, the right- and left-handed groups of gifted children performed similarly. In the normal group, right-handed children scored higher than left-handed children in vocabulary, memory, spatial, and motor skills. There was a tendency for the normal right-handed children to play more creatively than the left-handed children. Reading and quantitative skills did not differ in the right- and left-handed normal

children (Lewis et al., 1986).

Although Lewis et al. (1986) collected a great deal of information about each child, there was a significant flaw in the data in their study. By choosing to study such young children (ages 21 to 56 months), they were unable to know, for certain, if a child was truly right- or left-handed. They placed children in the hand preference groups based on handedness in their immediate and/or extended family according to a genetic link to left-handedness (Geschwind, 1983; Gillberg, Waldenstrom & Rasmussen, 1984). However, left-handedness cannot be predicted simply by mapping a family tree.

In 1991, Wiley and Goldstein also examined the relationship of sex, handedness, and allergy compared to academic giftedness. Subjects were selected through the Talent Identification Program at Duke University (TIP) Talent Search. Seventh-graders who scored in the top 3% of their in-school achievement tests were invited to take the Scholastic Aptitude Test (SAT). Data collected during the 1986 and 1987 Talent Searches were used for this study combined with a Talent Search Questionnaire (TSQ) that contained self-report measures of handedness and allergy.

A subject pool of highly gifted students was selected from this sample. These students earned a score of 700 or higher on the math section of the SAT or a score of 630 or higher on the verbal section of the SAT before age 13. Ninety-six students were identified as highly gifted. A comparison group of 96 students was randomly selected from Talent Search participants who scored less than or equal to 540 on both sections of the SAT. A second comparison group of 96 students was matched by gender. Of the 96 highly gifted students, 11.46% reported themselves to be left-handed. By contrast, only

9.38% students of the control group reported left-handedness. It appears no difference exists between the two groups. On the other hand, highly gifted males had a higher frequency of left-handedness (14.5%) than control males (8%), while gifted females had a lower frequency of left-handedness (3.7%) than did control females (9.9%). Due to complications, this data was not able to be analyzed statistically for significance. The data was further analyzed according to talent. For the males, there was a higher rate of left-handedness among the mathematically talented (16.7%) than among the verbally talented (8.7%). Lastly, by self-report, 32.3% of the highly gifted group and 34.4% of their less gifted counterparts had allergies or asthma, a difference that was not significant (Wiley & Goldstein, 1991).

There were two major flaws in Wiley and Goldstein's research (1991). The first was the use of self-report to obtain data. Self-report is not always reliable because subjects may not answer the questions with total honesty. The second flaw was the inability to statistically analyze the majority of the data. Therefore, there was a great deal of assumptions and interpretations based on the raw data.

Although Wiley and Goldstein (1991) found no significant relationship between giftedness and asthma or allergy, Tonnessen, Hoiem, Lundberg, and Larsen chose to study asthmatic children and their families for immune disorders and dyslexia (1994). In their study, they examined whether they could obtain any support for the Geschwind-Behan-Galaburda hypothesis. This hypothesis proposes that an elevated level of testosterone and/or hypersensitivity to this hormone during pregnancy causes an abnormal development in the left cerebral hemisphere of the fetus, which controls the right hand

and most language functions, and in the thymus gland of the fetus, which leads to an impairment of the child's immune system. This hypothesis would explain a connection between left-handedness and immune disorders.

Tonnessen et al. (1994) chose 32 children with severe asthma between the ages of 8 and 15 years who were attending a Norwegian school as participants in their study. The Raven's Progressive Matrices test was used to obtain information about each child's cognitive ability. A computer-based test battery containing both a word recognition test and non-word reading test was used to assess the students' reading ability. The researchers assessed handedness by asking each child to complete a Norwegian version of the Oldfield Inventory where the students were asked to report their hand preference for performing 12 different manual tasks. A subject was designated a consistent right- or left-hander if he/she reported using the same hand for all activities. Any deviation led to a classification as a mixed-hander. Lastly, a questionnaire regarding reading difficulties, immune disorders and handedness among family members was sent to each parent.

It was found that 70% of the students had less than normal ability to read non-words, yet only 40% had a less than normal ability in whole word recognition (Tonnessen et al., 1994). This indicated there were many students who, despite their relatively adequate word recognition skills, still had a severe deficit in phonological skills. The distribution of the Raven scores were close to the distribution in the normal population. This indicated that the students were not an atypical sample as regards to cognitive abilities. No significant gender differences could be observed either on non-word reading skill or on word recognition skill. No significant relationship was found between

handedness and non-word reading nor between handedness and word recognition. Two students were consistent left-handers and had phonological deficits. Only these two students presented all 3 conditions of immune disorders, decoding deficits and left-handedness. Except for these two, all of the other students were consistent right-handers. Forty-five (70.3%) of the parents completed the questionnaire. Of the respondents, 17 (37.7%) reported they had reading problems. Twenty-nine (64.4%) reported they had one or more immune disorders. Of those parents reporting reading problems, 76% also reported having immune disorders, while 44.8% reporting both immune disorders and reading problems. One of the two students who presented all 3 conditions had a mother, father and sibling with reading problems and immune disorders while the other did not. Of the 26 siblings, 14 (53.8%) reported having reading problems, and 14 reported having immune disorders. Only 7 (26.9%) of the siblings had both immune disorders and reading problems. Four (15.4%) of the siblings were left-handed and 3 (11.5%) were left-handed with reading problems. Only one sibling reported having reading difficulties, immune disorders and left-handedness.

The study found interesting relationships between the three variables, however it could neither prove nor disprove the testosterone hypothesis. Although it was found that the students did not have normal ability in reading skills it was not considered that the cause could be diminished school attendance due to illness. Students who have medical problems often miss days of school. It is possible that the students did poorly because they missed the instruction in these areas rather than because they were left-handed or exposed to high levels of testosterone in utero.

In an earlier study by Healy and Aram (1986) families were investigated for links between handedness, hyperlexia and/or dyslexia, and allergy. Hyperlexia is a syndrome characterized by pervasive language delay, spontaneous self-taught word recognition, deficient comprehension, and notably divergent behavior and cognitive development. The families were those used in their initial study in 1982 in which 11 males and 1 female were identified as hyperlexic. Eleven of the twelve children had a positive history for autistic-like behaviors. No clear trend for pre-, peri-, or postnatal trauma appeared, but a notably high proportion of potential central nervous system (CNS) antagonists were reported, such as maternal medication, toxemia, obstetrical interventions, and infantile seizure.

Healy and Aram (1986) asked 10 mothers and 2 fathers to describe any known problems or unusual learning history of any family member. Complete educational histories were taken for parents and siblings of the subjects. Siblings' language development was investigated and handedness was recorded for all parents, siblings, and any other relatives named. Subjects were classified as right-handed, left-handed, or ambidextrous.

The researchers found a striking incidence of nonright-handedness. Eight of the twelve subjects and fathers (67%), seven of the thirteen brothers (54%), and two of the five sisters (40%) were either left-handed or ambidextrous. Only two of the twelve mothers (16%) were reported to be nonright-handed. The incidence of learning problems was equally interesting. Eleven of the twelve fathers had some problem in their learning history, with eight reporting symptoms of dyslexia. Forty-four percent of siblings (6 of

13 male and 2 of 5 female) had a diagnosed language-learning disorder, including delayed speech, reading comprehension, writing, and spelling difficulties. Two confirmed incidences of hyperlexia were present in male siblings. Second-degree relatives named as having learning disorders were all on the paternal side. A family history of some type of allergy was identified in 8 of 12 families. Of the 12 subjects and 33 first-degree relatives, 37% had some type of allergic condition. Of the 12 subjects, 6 were described as allergic; however, only 3 of the 10 mothers were described as allergic (Healy & Aram, 1986).

Healy and Aram (1986) collected relevant data in the study with a small sample size. Studying only twelve subjects is a great beginning for this research, however a larger sample size would have been beneficial especially when there was only one female subject. It is also difficult to rely on self-reporting of family histories. It can be hard to recall exact information about one's self. Nevertheless, it was fascinating that the handedness, learning disabilities, and allergies were more prevalent in the males and paternal sides of the families.

In a related study, Annett, Eglinton, and Smythe (1996) investigated the types of dyslexia and the occurrence of left-handedness. The sample was a complete year cohort of 9-10-year-olds in nine inner city, suburban, and/or rural schools. In the first year of the study, the total sample included 479 children, 239 boys and 240 girls with a mean age of 121.4 months. The first follow-up (Year 2) consisted of individual tests given to 192 boys and 199 girls with a mean age of 134.7 months. The second follow-up tests (Year 3) were given to 67 boys and 61 girls with a mean age of 145.8 months. Twenty subjects

were excluded from the study because of severe physical or mental disabilities. The 459 children left were assessed for literacy and divided into three groups: poor readers (n=40), poor spellers (n=57) and controls (n=362). The aim was to identify the poorest 10% of the sample for reading and spelling and compare them against the remainder.

The purpose of the first analysis by Annett et al. (1996) was to assess handedness of poor readers and poor spellers, without distinction for phonology. The percentages of left writers in poor readers (12.5%) and poor spellers (12.5%) differed from controls (9.4%), but was not statistically significant. There was also a trend toward an excess of males among poor readers (63%), but not among poor spellers (47%). The children identified by teachers as having literacy problems (n=61) included 15.5% left-writers while the remainder (n=398) were only 9.2% left-writers. The findings showed trends toward more left-handers among children with developmental literacy problems than those among controls.

The purpose of the second analysis by Annett et al. (1996) was to test whether dyslexics with poor phonology (phonols) would be left-handed, while other dyslexics (nonphonols) would not. The percentages of left-writers differed over the 4 groups: phonols (29.4%), nonphonols (0%), poor spellers (13.6%) and controls (9.7%). The differences between phonols and nonphonols and between phonols and controls were significant. Analyses for eye and foot preference found trends consistent with those for handedness. Left eye preference was more common among phonols (41%) than controls (34%), which were more common than nonphonols (22%). However, no comparison for eye, foot, and preference was statistically significant. The gender distribution did not



differ significantly over groups, but there tended to be more males among phonols (70.6%) and nonphonols (66.7%) than poor spellers (47.2%) and controls (48.2%).

The purpose of the third analysis by Annett et al. (1996) was to determine if types of dyslexia differ for handedness of relatives. A questionnaire was distributed to each subject's parent. Left-writers tended to be more frequent among relatives of phonols (28%), than nonphonols (18%), poor spellers (10%) and controls (13%). However, the overall contrast was not significant. Although it was not significant, the contrast between phonols and controls showed a clear trend in the expected direction.

The study by Annett et al. (1996) was longitudinal with a large sample group. The findings showed that subjects with poor phonology tended to be left-handed males, while other dyslexic subjects, poor spellers, and controls tended to be evenly distributed between males and females. Once again, a link was found between family, left-handedness and learning problems. This information is helpful, however the causes for left-handedness, dyslexia and poor spelling are still a mystery.

In 1984, Gillberg, Waldenstrom, and Rasmussen studied the handedness distribution of Swedish 10-year-olds while taking into consideration some background and associated factors. Their subject pool was selected from 21 primary schools in the city of Goteborg, Sweden. The original study group was 985 children ranging in age from 9.4 to 10.4 years. There were 91 left-handed children (56 boys and 35 girls) in the third grade of the public primary schools. Each of the 91 children was paired with a same-sexed right-handed control from the same class. Once permission to participate was obtained only 45 left-handed children (22 boys and 23 girls) and 46 right-handed

children (20 boys and 26 girls) remained in the study. Their ages ranged from 9.4 to 10.2 years. Their parents were asked to complete a questionnaire on hereditary factors such as family history of left-handedness. Medical records of the pregnancy/neonatal period for each child were obtained. Social classification was determined based on the father's occupation at the time of birth. In addition, questionnaires relating to school achievements were completed by teachers. The school nurses individually administered the Birleson's inventory for detecting childhood depression to each child. A child physiotherapist performed a neurological examination on each child to rule out cerebral palsy or mental retardation. Lastly, each child performed a square tracing task in which a pair of squares was presented on a sheet of paper over three trials. They were asked to trace around the squares with their preferred hand, their non-preferred hand, and simultaneously with both hands. All children making 9 or more errors with the non-preferred hand over all three trials were referred to as the target group (TG). Also, all children who took 110 seconds or more to complete the three tasks with the non-preferred hand were included in this group. The target group was then divided into left-handers (TL group) and right-handers (TR group). The remaining children were placed into the comparison group and divided into left-handers (CL group) and right-handers (CR).

Among the left-handed children 44% belonged to the T group. Ten children of the TL group were girls and 10 were boys. Among the right-handed children only 22% belonged to the T group. Six of the TR group children were girls and 4 were boys. The TL group was statistically larger than the TR group. The T group showed significantly

higher neurological dysfunction scores than the C group. Left-handed children, regardless of gender, showed almost exactly the same distribution of social class as did right-handed children with 56% of the children in both groups belonged to social class III (the poorest class). The social class distribution was very similar in the T and C groups. Left-handers had significantly more left-handed relatives than right-handed children. The T group had significantly reduced optimality in the pre-, peri- and neonatal periods when compared with the C group. The T group got significantly lower grades for spelling, writing, and reading than the C group, and learning disabilities requiring special education were more frequent. The differences were mainly accounted for by boys in the TL group receiving particularly low grades and having more problems. The T group showed much more behavioral problems than the C group. Again, the differences were almost solely accounted for by left-handed boys (Gillberg et al., 1984).

Gillberg et al. (1984) concluded that the children in the T group, those with a poor performance with the non-preferred hand, showed a raised frequency of signs and medical histories indicative of brain damage. They hypothesized that since the T group consisted of more left-handers than right-handers, then left-handed children may have sustained brain damage in the early stages of their life more often than the comparison children. It is hard to accept this hypothesis based on so much information obtained by questionnaires. Five separate questionnaires were used, with no certainty that the information provided was accurate. Also, the only true way to determine brain damage would be through medical advances which were not used in this study.

In 1985, Wagner also researched the relationship between handedness and mental

function. He set out to determine the proportion of the learning disabled population that is truly left- or mixed-handed and whether mixed-handers represent a larger percentage of the learning disabled population in school. Thirty-five teachers from two large suburban school districts volunteered to administer a questionnaire with 11 questions on hand preference to their students. Students who were considered truly left-handed were matched with their right- and mixed-handed counterparts. Subjects were 129 students in grades 3 through 12. IQ for all participants was determined with the Wechsler Intelligence Scale for Children-Revised (WISC-R). Reading and mathematics indices included the Wide Range Achievement Test and the Peabody Individual Achievement Test.

Wagner (1985) found that 58% of the students in the learning disabled classes were left- or mixed-handed, with 15% being left-handed and 43% being mixed-handed. There was no statistically significant differences between or within the three groups for either verbal or performance IQs. However, when the mixed-handed and left-handed groups were combined, statistical analyses reached the significant level on both verbal and performance IQs. It was also found that differences between left- and right-handers in regard to reading and mathematical achievement scores (Wagner, 1985). On both assessments, left-handers performed better than right-handers who, in turn, performed better than mixed-handers.

Wagner's results (1985) bring to light a very important point when discussing left- and mixed-handed individuals. It seems reasonable that students who had no one particular hand preference (mixed-handers) experienced more difficulty processing both

verbal and nonverbal information than those students who had established a dominant hand (Wagner, 1985). This helps to explain why 43% of the students in the learning disabled classes were mixed-handers. He hypothesized that perhaps the left-handers had speech function located in the right-hemisphere of the brain and therefore did not have problems with dextrality because the right side of the brain controls the left side of the body. The mixed-handers, on the other hand, had both verbal and nonverbal problems because they did not consistently use either hand which confused the hemispheres of the brain. This, of course, is pure speculation because he was unable to perform tests on the subjects to determine location of specific functions in the hemispheres.

In 1991, Segalowitz and Brown took a different approach to investigating an association between handedness and developmental disability. They examined mild head injury as a source of developmental disabilities. They administered a self-report questionnaire to high school students and examined the relationship between incidence of head injury and various developmental parameters, including subtle academic preferences and nervous system characteristics. The questionnaires were given to all teachers to distribute during their homeroom class at the beginning of the day. They were answered anonymously and included sections on handedness, whether or not the subject had remedial educational experiences, school-subject preferences, and head injury experiences. Segalowitz and Brown (1991) found there were no stable relationships between the head injury variables and handedness as a continuum from left to right. However, there was an increased likelihood of mixed handedness compared to either left or right handedness with a closed head injury (CHI) and unconsciousness.

This was effected more on the boys than on the girls in the sample. When they considered the head injury variable as a three-level continuum from no CHI to CHI without unconsciousness to CHI with unconsciousness, the rate of mixed handedness significantly increased from 19% to 22% to 31%, respectively.

A self-report was used in the study. Segalowitz and Brown (1991) indicated they were unsure if the students over-reported, under-reported, or unreliably reported the occurrence of head injury. Students might not be able to remember exactly when or how a head injury occurred or what the actual results were. Lastly, they reported an increase of mixed-handedness as the subjects moved through the three-level continuum of head injury. This is expected, however, the researchers and the reader do not know if the mixed handedness was genetic or caused specifically by the head injury. It is not known if any of the subjects began their life with one hand preference and changed after a head injury or if the subject always had that hand preference. This would be an interesting topic for a future study.

In 1985, Fein, Waterhouse, Lucci, Pennington, and Humes examined handedness ratios in a sample of children with Pervasive Developmental Disorder (PDD) and investigated the cognitive abilities in left- versus right-handed children with PDD. Their subjects were 62 children attending schools for developmentally disabled and autistic children in Boston and New Jersey. The students consisted of 53 boys and 9 girls with ages ranging from 68 to 211 months. Their mean cognitive mental age was calculated at 106 months. All children had deficits in multiple psychological functions and previously received the diagnoses of autism, childhood schizophrenia, atypical development,

childhood psychosis, or severe emotional disturbance. Handedness was judged from the child's hand preference in performing 3 tasks. Each subject was grouped as left-handed, right-handed, or mixed-handed. All children were also administered the McCarthy Scales for Children's Abilities, the Peabody Picture Vocabulary Test, the Pointing Span, a naming test (Peabody Expressive), and three motor tests.

Fein et al. (1985) found that 36 of the 62 children were right-handers, 8 were left-handers, and 18 were mixed-handers. On all measures, the order of functioning was left-handers highest, followed by right-handers, followed by mixed preference children. Chronological ages were also not significantly different between groups. Although they were unable to find statistical significance on the measures, there was a clear trend for the left-handers to have higher scores than the right-handers, with both of these groups performing better than the mixed-handers. These results again demonstrate that children with mixed-hand preference have a lower functioning than children with established hand dominance (Fein et al., 1985).

Cornish and McManus (1996) also examined hand preference and hand skill of children with autism. The participants were separated into two age groups (younger and older) and three groups (children with autism, children with learning disability, and the control children). The younger children ranged from 3 to 5 years of age including 15 with autism, 14 with learning disability, and 65 with no disability (controls). The older children ranged in age from 11 to 13 years including 20 children with autism, 12 with learning disability, and 24 with no disability (controls). Each child was assessed by a battery of 10 unimanual preference tasks. The battery was repeated 3 times to determine

if a child was right-handed, left-handed, or bimanual/mixed-handed.

The results showed that 23% of the children with autism, 11.5% of the children with learning disability, and 4.4% of the control children were left-handed. It was also found that consistency of handedness differed between groups, with controls being more consistent than the other two groups. There was no significant difference between children with autism and those with learning disability. However, younger children were less consistent than older children. There were no significant differences between autistic and learning disabled children on degree and consistency of hand preference (Cornish and McManus, 1996). This may suggest that higher incidence of left- and mixed-handedness are not specific to autism, but are more general characteristics of children with learning disability.

In 1987, Soper, Satz, Orsini, Van Gorp, and Green investigated handedness distribution in a residential population with severe and profound mental retardation. It was investigated if similar handedness subtypes would exist within the non-autistic retarded population. The subjects were 73 residents from a developmental disability program in California including 38 males and 35 females ranging in age from 54 to 60 years. They were all previously diagnosed as severely or profoundly retarded, with estimated IQs of 11 to 31. The etiology of their retardation was not known to researchers. The subjects were individually administered the Hand Preference Demonstration Test which required them to perform 8 tasks to determine handedness. The test was repeated 3 times over 2 sessions for a total of 48 responses. Each subject was classified as either left-handed, right-handed, or mixed-handed according to his/her



responses. If 90% or more of the responses were made with the right hand, the subject was classified as right-handed. The criteria was the same for the left-handed classification. All others were considered ambiguous-handed.

Soper et al. (1987) found 9.6% of the subjects were left-handers, 45.2% were ambiguous-handers, and 45.2% were right-handers. The ambiguous-handed group tended to be inconsistent both between and within items on the test. This reveals that approximately 45% of the sample had no established dominance for manual tasks. When the authors reviewed the IQ scores of the sample, the right- and ambiguous-handers were almost equivalent with a mean score of 28.1 months and 27.8 months respectively. However, the scores of the manifest left-handers were significantly lower with a mean score of 17.0 months.

Soper et al. (1987) found much higher percentages of left- and ambiguous-handed subjects compared to the expected normal distribution of 8% left-handed, 0% mixed-handed, and 92% right-handed. This reveals an atypical shift to the left in the distribution of manual preference. It also confirms the presence of a third subtype of handedness as was found in the previous studies of individuals with autism.

In a related study, Arnold and Askew (1993) analyzed handedness distribution in a deaf school population with severe learning disabilities. This replicated Soper et al.'s study (1987) with a different population. The subjects were 71 multiply disabled deaf students from Britain whose ages ranged from 6 to 23 years including 47 males and 24 females. They were split into three groups according to their type of deafness: acquired deafness (n=37), genetic deafness (n=8), and unknown deafness (n=26). The same

procedure was used to group these participants into the 3 subtypes of handedness.

Arnold and Askew (1993) found that of 71 subjects, 10 were left-handed (14.1%), 24 were right-handed (32.4%), and 37 were mixed-handed (53.5%). It was found that 19% of the acquired group were left-handed compared with none of the genetic group and 11% of the unknown group. Males and females were not significantly different in handedness or cause of their deafness. There was also no significant difference between the severely deaf and profoundly deaf subjects or the younger (less than 13) or older (13 years and over) subjects in handedness or cause of deafness.

In this study, Arnold and Askew (1993) again found much higher percentages of left- and mixed-handed subjects compared to the expected normal distribution. They also proved the presence of the mixed-handed subtype of subjects. However, once again, they presented percentages of incidence with unknown cause of such incidences.

An additional study was conducted by Morris and Ronski (1993) regarding handedness distribution in the mentally retarded population. However, they chose to study a nonspeaking population of subjects because it represented a specific subset of the mentally retarded population that had a severe specific area of cognitive deficit (speech=language) in addition to their general mental retardation. Their subjects were 40 residents from the developmental disability unit of a hospital in Atlanta and 10 subjects from a school-based program for children. The sample ranged in age from 8 to 37 years and consisted of 30 males and 20 females. Subjects' IQs ranged from 3 to 52 and were sub-grouped by degree of mental retardation: 12 were moderate, 13 were severe, and 25 were profound. They were also sub-grouped by etiology: acquired, genetic, or unknown.

The subjects were individually administered the UCLA Hand Preference Test which required them to perform 9 tasks to determine handedness. The test was repeated 3 times over 2 sessions for a total of 54 responses. Each subject was classified as either left-handed, right-handed, or mixed-handed according to his/her responses. The criteria to place participants in hand preference groups was the same procedure followed in the Soper et al. study (1987).

Morris and Ronski (1993) found that out of 50 subjects, 19% were manifest left-handers, 49% were manifest right-handers, and 32% were ambiguous-handers. There was no significant difference between males and females or retardation level, but there was significant relations between handedness and etiology. The researchers found a high rate of left- and ambiguous-handed individuals in this population and hypothesized that this population most likely has brain damage in both hemispheres. This damage, in turn, makes them unable to lateralize functions to one hemisphere or the other. Therefore, they choose their hands inconsistently for different manual tasks.

Dussart (1994) studied the relationship between clumsy children in school and left-handedness. The Diagnostic and Statistical Manual of Mental Disorders had recently recognized Developmental Coordination Disorder (DCD) as a legitimate diagnosis for individuals with severe clumsiness. Dussart (1994) created his own information checklist for teachers to use when DCD is suspected in a student. He then visited the three primary schools he was working with to administer the Henderson Revision of the Test of Motor Impairment (TOMI) to the students who scored high on his checklist. Exact figures were not given for the sample size or age range.

Dussart (1994) found that in the general population 8% of children are left-handed. In his sample, the children with a TOMI score of less than 3 had an 8.1% incidence of left-handedness which was almost exactly what was expected. Twenty-five percent of the children with TOMI scores between 3 and 6 were left-handed, which is statistically significant compared to the 8% in the general population. However, the children with TOMI scores greater than 6, and therefore qualifying as having DCD, only had a left-handed incidence of 4.6%. This is not statistically significant. Perhaps the group of children with TOMI scores between 3 and 6 had such a high incidence of left-handedness not because they had motor impairments, but instead because of difficulties with left-handedness. It has been stated that left-handed students often have more problems in school with motor skills because they have not been directly taught how to accomplish tasks with their left hands (Kelly, 1996). A problem with this study is the use of a screening checklist that was not properly validated or tested for reliability.

In 1996, Eaton, Chipperfield, Ritchot, and Kostiuk conducted three studies to find if there is a connection between maturational lag and left-handedness. The first study tested the hypothesis that in a large sample of same-aged children, left-handed preference would be associated with lower physical maturity values than would right-handed preference. The participants were 9,976 children (49.8% female) recruited from the National Collaborative Perinatal Project (NCP). The researchers only considered children who were exactly 7.0 years of age at the time of the assessment. They compared relative stature and hand preference. Relative stature was determined by the following equation:  $\text{relative stature} = 100 \times (\text{current stature} / \text{estimated adult stature})$ . Estimated

adult stature was determined by a calculation of measures of child stature, weight, chronological age, and mean parent stature. Hand preference was determined by one measure administered during a pediatric exam. The percentages of children classified as predominantly left-, mixed-, or right-handed were 10.5%, 1.8% and 87.8%, respectively. The three preference groups did not significantly differ on any maturity measure. Although girls and boys did not differ on current stature, girls had a higher relative stature score (73.3) than same-aged boys (68.4). Males, as expected, had larger predicted adult statures (177 cm) than girls (165 cm). This was no evidence for an association between maturational lag and hand preference. However, there seems to be two shortcomings in this study. The first is that only one measure was used to determine hand preference. The other is that father height was unavailable to help determine predicted adult stature. To add more data in this area, a second study was conducted.

In their second study, Eaton et al. (1996) received questionnaires from 837 parents of children attending eight urban elementary schools. The children ranged in age from 5.1 to 11.9 years. Relative stature was determined by a combination of information obtained from the questionnaires and direct measurement. Hand preference was determined by 3 questions that were asked of each child. The children were placed in one of the three hand preference groups according to their response to the questions. The results were that 5.9% of the children were left-handers, 68.2% were right-handers, and 25.9% were mixed-handers. As in Study 1, hand preference was unrelated to any maturity variable. Also, the females' relative statures (78.7) were greater than the males' (73.0) and the males were predicted to be taller as adults (180 cm) than the females (167

cm). This study also failed to find a relation between hand preference and maturation. A third study was conducted.

In Study 3, Eaton et al. (1996) examined a link between relative stature and a different hand-use measure. The participants were 446 children who attended grades 2 or 4 in eight rural schools. Relative stature was calculated by direct measurement and information obtained from a parent questionnaire. Hand preference was also obtained from a six-item parent questionnaire. It was found that 9.6% of the subjects were left-handers, 86.3% were right-handers, and 4.0% were mixed-handers. Hand preference did not differ on any maturity variable and gender was significantly associated with both relative stature and predicted height. Females were more physically mature and males were predicted to be taller as adults. In these three large-sample studies, Eaton et al. (1996) were unable to find any significant connections between left-handedness and physical maturity level.

#### Transitional First Grade Programs

In 1997, Wang conducted four evaluations of Pre-First Grade (P1). The following questions were investigated: Which students were identified as unready for the first grade?; Which students needed the program?; Does the program help unready kindergartners perform better than the similar students from the same kindergarten who refused to participate in the program?; After the transitional program, did P1 students become competitive with their same grade peers who were never recommended for P1?; Do differences between students who refuse P1 (P1-NP) and their same age promoted peers (PRO-SA) become wider over time without the program intervention? Wang's first

study (1997) examined the relationship between students' age, gender, ethnicity, and the P1 selection process. It was found that 40.7% of the P1 students were born in the summer in comparison to only 19% of the students promoted to the first grade. There was a higher than expected percentage of both males and Hispanics in the program. He recorded 8.2% male Hispanics and 33.8% male white students in the kindergarten group, in comparison with 16.6% male Hispanics and 29.5% of male white students in the corresponding pre-first grade. Lastly, a higher than district average percentage (11.3%) of the pre-first recommended students were placed in the special education program in the 1994-95 school year.

In Study 2, Wang (1997) compared pre-first recommended/participated students (P1) with pre-first recommended/refused students (P1-NP). The P1 students were held back a year, their achievement was compared to the previous year's P1-NP students. Wang (1997) hypothesized that with similar levels of ability when exiting kindergarten, participating students should perform better than their non-participating peers if the program was effective. He found that when eligible for retention, more P1 students were retained than the P1-NP students. Moreover, more P1 students were eventually placed in special education and fewer P1 students later passed either the reading or math sections of the state-wide standardized assessment (TAAS). Overall the results showed that the pre-first program may not be effective in reducing retention, reducing special education placement or improving performance on the TAAS (Wang, 1997).

In Study 3, Wang (1997) compared the students who participated in the pre-first program with the non-recommended students (PRO). In this investigation he found more

P1 students were later retained and/or eventually placed in the special education program than the PRO students. Furthermore, fewer P1 students later passed either the reading or math sections of the TAAS. Once again, the results do not favor the legitimacy of the pre-first program (Wang, 1997).

In Wang's final study, Study 4 (1997), he compared students who were recommended for and refused P1 placement (P1-NP) with students who were not recommended for P1 and were promoted to the first grade (PRO). He found that more P1-NP students were retained in elementary school, with most repeating either first or second grade. Additionally, a higher percentage of P1-NP students were placed in special education than their PRO counterparts. PRO students also did better than P1-NP students on the TAAS. Overall, it was found that the students who were considered to be not ready for the first grade did need some help to be competitive with their promoted peers (Wang, 1997).

In summary, Wang's four studies found that with or without the program, recommended pre-first students did not perform as well as their promoted peers in terms of later retention, special education placement, or TAAS scores. It was proved that receiving an additional year of instruction in pre-first did not help students perform better, in later years, than their peers who refused the pre-first program. In addition, more than the expected number of the pre-first recommended students received special education services in later years.

Mantzicopoulos and Neuharth-Pritchett (1998), chose not to perform a longitudinal study such as Wang's (1997), but rather to examined the characteristics of



children referred to Transitional First Grade (T-1) during one school year. Participants in their investigation were 223 children from two schools in a midwestern, middle-class, suburban, public school district. Of the 223 children, 50 (25 boys and 25 girls) were recommended for the T-1 program (T1-R). The majority of the T1-R children were Caucasian (83.3%). The age range for this group was from 67 to 79 months. The nonreferred group (NR) was comprised of 173 children (81 boys and 92 girls) whose age range was comparable to that of the T1-R group. Their mean chronological age was 75.16 months with 75% of the NR children being Caucasian.

In Mantzicopoulos and Neuharth-Pritchett's study (1998) many measures were used, such as a questionnaire for teachers about their personal instructional beliefs and practices, the Academic Competence Scale of the Social Skills Rating System (SSRS) for each child, the Conner's Teacher Rating Scale which evaluated student behavior for each child, and the Parent-Family Involvement Index (PFII) to collect information on parental involvement. In addition to demographic data obtained from school records, the subjects were individually assessed on their self-perceptions of academic and peer competence using the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children. Lastly, the Gesell Developmental Assessment (GDA) was administered to each child to yield a developmental age score.

As expected, statistically significant differences were found on chronological age. T1-R children ( $M=72.10$ ) were significantly younger than their NR peers ( $M=75.16$ ). The average age difference between the two groups was approximately 3 months. Contrary to expectation, there were no differences in the proportions of boys and girls in

the two groups. However, the two groups differed on self-evaluations of cognitive-academic competence. The T1-R children had significantly lower means ( $M=3.56$ ) on this assessment than their NR peers ( $M=3.67$ ). T1-R children did not differ from the NR group on self-evaluations of peer competence. T1-R children, when compared with their NR peers, were rated significantly lower on academic-cognitive competence by their teachers. In addition, T1-R children lagged approximately 4 months behind their peers on the GDA score. Differences were also identified when the groups were compared on the school adjustment factor. T1-R children were reported to be significantly more troubled in school than their NR peers. There were no differences in the proportions of children with preschool experience in the T1-R and NR groups (Mantzicopoulos & Neuharth-Pritchett, 1998).

Overall, the findings within this study were consistent with those of earlier investigations (Mantzicopoulos & Neuharth-Pritchett, 1998). T1-R students were viewed by their teachers as more deficient in cognitive-academic and social skills. The low competence profiles of T1-R children were accompanied by lower performance on the GDA. In addition, T1-R children were younger than their peers. These combined factors make it evident why these students struggle in school.

### Summary

There is a substantial amount of research available concerning specific populations in relation to handedness distribution. The author reviewed associations of hand preference with special needs populations. These populations included: young and

gifted children, academically gifted adolescents, children with allergy and/or asthma, immediate and/or extended family members of left-handed children, individuals with hyperlexia, individuals with dyslexia, students with learning disabilities, students who have sustained mild head injury, children with Pervasive Developmental Disorder (PDD), individuals with autism, individuals with severe/profound mental retardation, deaf children, nonspeaking individuals with mental retardation, children with Developmental Coordination Disorder (DCD), and children with a physical maturational lag. The only common link throughout these investigations is that, in most cases, right-handed individuals perform better than left-handed individuals who, in turn, perform better than mixed-handed individuals on most tasks. There is no known cause for specific hand preference, however, many theories exist.

Although Transitional First Grade programs can be found throughout the United States, there are not many available to parents and students. Due to this limitation, there is not much research available about the positive or negative aspects of the program. The research review shows that a high percentage of T-1 students may ultimately be placed in a special education program. In other words, although T-1 students are not considered to be special education students, they do seem to have some of the same characteristics as individuals with special needs. The present study attempts to examine a possible association between T-1 students and left-handedness and to investigate if there is a correlation between students with left-handed preference in T-1 programs.

## Chapter Three

### METHOD

#### Samples

Students A total of 122, T-1, 1<sup>st</sup>-, 2<sup>nd</sup>-, 3<sup>rd</sup>-, 4<sup>th</sup>-, and 5<sup>th</sup>-grade students attending six elementary schools in a large suburban school district located in the northeastern region of the United States participated in the study. Sixty-one of the students had participated in a T-1 program before entering 1<sup>st</sup> grade (T-1) and sixty-one had not (control). The control group was matched by age and gender to the T-1 group. Because the T-1 students were retained a year behind their kindergarten peers, the T-1 group was matched with their age appropriate peers who were one grade ahead of them in school (see Table 1).

**Table 1**  
Grade and Gender Distribution of the Sample Students

<b>T-1</b>				<b>Control</b>			
<u>Grade</u>	<u>Female</u>	<u>Male</u>	<u>Total</u>	<u>Grade</u>	<u>Female</u>	<u>Male</u>	<u>Total</u>
T-1	5	8	13	1 <sup>st</sup>	5	8	13
1 <sup>st</sup>	4	7	11	2 <sup>nd</sup>	4	7	11
2 <sup>nd</sup>	5	8	13	3 <sup>rd</sup>	5	8	13
3 <sup>rd</sup>	3	8	11	4 <sup>th</sup>	3	8	11
4 <sup>th</sup>	2	11	13	5 <sup>th</sup>	2	11	13
Total	19	42	61	Total	19	42	61

Teachers Five kindergarten teachers from the same school district participated in the study. These teachers were all seasoned educators with at least three years of kindergarten experiences. Three had only an elementary education certification while the other two had more than one certification (see Table 2).

**Table 2**  
Background Information of the Participating Kindergarten Teachers

<u>Background Information</u>	<u>T1*</u>	<u>T2</u>	<u>T3</u>	<u>T4</u>	<u>T5</u>
Years of Teaching Experience	24	14	21	33	22
Years of Kindergarten Teaching Experience	13	3	20	24	10
Number of Certifications Earned	1	3	1	1	3
Master's Degrees Earned	0	0	0	1	0
Right or Left Hand Dominant	R	R	R	R	R

\*T1 = Teacher 1, etc.

Research Design This study used both a comparative and a descriptive research design. The comparative research design was used for the student data. The information collected from the T-1 student questionnaire was compared to the information gathered from the control group. The descriptive research design was used to analyze the teacher data. The information obtained from the teacher questionnaire was a self report of the teacher's background and teaching accommodations and/or modifications for left-handed students.

Procedures The student questionnaire was completed by the researcher in an individualized session with each student. Each student was escorted from his/her classroom to a conference room in the elementary school. The researcher then asked

each question for the student to answer to make sure the students understood. A pencil, ball, toothbrush, and pair of scissors were present so that the students could model and use them with the chosen hand. The teacher questionnaire was completed by the researcher in an individualized session with each teacher in her classroom. The teacher signed the consent form attached to the questionnaire and was asked to respond to each question orally. All the responses were recorded by the researcher.

### Measurement

Student Questionnaire Five measures were recorded from the student questionnaire: (a) age, (b) grade level, (c) group (T-1 or control), (d) gender, and (e) hand preference. Students were placed in the right-handed group if 3 or 4 answers indicated the use of the right hand. The same procedure was followed for the left-handed group. However, if a student answered with 2 answers for the right hand and 2 answers for the left hand, the student was considered mixed-handed (see Appendices A and B).

Teacher Questionnaire The teachers answered a total of 21 questions on the questionnaire. Six questions obtained the teacher's background information (1-6), four questions dealt with the teacher's own hand preference (7-10), ten questions examined the accommodations and/or modifications used for left-handed students (11-20), and one question dealt with the teacher's attitude toward left-handed students (21) (see Appendices C and D).

## Chapter Four

### RESULTS

Student Questionnaire Student questionnaires were analyzed using frequencies.

Descriptive data for each dependent measure for the two groups (T-1 versus control) are presented in Table 3 and Table 4.

**Table 3**  
Frequencies of Gender and Handedness

<b>Group</b>	<b>Number</b>	<b>Gender</b>		<b>Handedness</b>	
		<u>Male</u>	<u>Female</u>	<u>Right</u>	<u>Left</u>
T-1	61	68.9%	31.1%	77%	23%
Control	61	68.9%	31.1%	85%	15%

**Table 4**  
Break Down of Frequencies of Gender and Handedness

<b>Group</b>	<b>Boys</b>		<b>Girls</b>	
	<u>Right</u>	<u>Left</u>	<u>Right</u>	<u>Left</u>
T-1	71.4%	28.6%	89%	11%
Control	81%	19%	95%	5%

Table 3 shows that out of 61 T-1 students questioned, 68.9% were male and 31.1% were female. In addition, 77% reported being right-handed while 23% reported being left-handed. The 61 students in the control group were also 68.9% male and 31.1%

female. However, 85% of them reported right handedness while 15% reported left handedness. The frequency of left handedness in the control group was 8% less than that in the T-1 group.

Table 4 presents the breakdown of handedness distribution as it relates to gender. The males in the T-1 group were 71.4% right-handed and 28.6% left-handed compared to the males in the control group, who were 81% right-handed and 19% left-handed. These frequencies present almost a 10% difference in the right- and left-handed male populations in each group. The females in the T-1 group were 89% right-handed and 11% left-handed compared to the females in the control group, who were 95% right-handed and only 5% left-handed. These frequencies show a 6% difference in the right- and left-handed female populations in each group.

Teacher Questionnaire Teacher questionnaires were analyzed using mean, standard deviation, and range. Descriptive data for both the teachers' background information and their answers to the questionnaire are presented in Table 5, Table 6, and Table 7.

**Table 5**  
Means and Ranges of Background Information of the Participating Kindergarten Teachers

<u>Background Information</u>	<u>Mean</u>	<u>Range</u>
Years of Teaching Experience	22.8	14-33
Years of Kindergarten Teaching Experience	14	3-24
Number of Certifications Earned	1.8	1-3
Master's Degrees Earned	0.2	0-1
Right or Left Hand Dominant	*1.0	*1
*(1 = right, 2 = left)		



**Table 6**  
Means, Standard Deviations, and Ranges of Questionnaire Answers of the Participating Kindergarten Teachers

<u>Question</u>	<u>Mean</u>	<u>SD</u>	<u>Range</u>
Question #1 - teach left-handers to hold their pencil about 1½ inches higher than right-handers	1.4	.89	1-3
Question #2 - seat left-handers so the shadow from the light won't shade their work	1.2	.45	1-2
Question #3 - show left-handers how to point the eraser of their pencil toward their left shoulder	1.6	1.34	1-4
Question #4 - suggest left-handers keep the inside of their wrist flat against the writing surface	1.6	1.34	1-4
Question #5 - provide pencils with hard lead to left-handers to reduce smudging	1.0	0.00	1
Question #6 - encourage handwriting slant that works best for left-handers	3.0	1.41	1-4
Question #7 - provide left-handed supplies	4.0	1.41	2-5
Question #8 - demonstrate a new skill by standing in front of left-handers instead of next to them	2.6	1.82	1-5
Question #9 - seat left-handers to the far left to limit elbow bumping	2.8	.84	2-4
Question #10 - explicitly teach new motor skills using the left hand	2.0	1.22	1-4
Question #11 - believe left-handers are more clumsy and awkward than right-handers	1.0	0.00	1

\*(1 = never, 2 = almost never, 3 = sometimes, 4 = almost always, 5 = always)

**Table 7**  
Means, Standard Deviations, and Ranges of Questionnaire Answers of Each Participating Kindergarten Teacher

<u>Teacher</u>	<u>Mean</u>	<u>SD</u>	<u>Range</u>
Teacher 1	2.27	1.79	1-5
Teacher 2	1.82	1.47	1-5
Teacher 3	2.36	1.21	1-4
Teacher 4	2.00	1.41	1-5

Teacher 5	1.64	1.03	1-4
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\*(1 = never, 2 = almost never, 3 = sometimes, 4 = almost always, 5 = always)

Table 5 presents the background information for the participating kindergarten teachers. This group of teachers is considered to be “experienced” with a mean number of years teaching of 22.8 years. All of the teachers earned a certification in Elementary Education. However, two of them held additional teaching certificates. Teacher 2 held a Kindergarten and a Teacher of the Handicapped certification and Teacher 5 earned a Preschool and a Teacher of the Handicapped certification. Of importance is that all 5 of them reported being right-hand dominant.

Table 6 shows mean, standard deviation, and range of the answers the teachers responded to the eleven questions. Questions 1, 2, 5, and 11 have a mean at or close to 1. This indicates that the teachers “never” use those specific accommodations and/or modifications for left-handed students in their classrooms. Questions 3, 4, and 10 have a mean at or close to 2. This indicates that the teachers “almost never” use those specific accommodations and/or modifications for left-handed students in their classrooms. Questions 6, 8, and 9 have a mean at or close to 3. This indicates that the teachers “sometimes” use those specific accommodations and/or modifications for left-handed students in their classrooms. Lastly, the mean of Question 4 is 4, which indicates that the teachers “almost always” use this specific accommodation and/or modification for left-handed students in their classrooms. There were no question responses reaching a mean of 5. This indicates that the teachers do not “always” use any of the accommodations and/or modifications listed.

The final table, Table 7, presents the mean, standard deviation, and range for each individual teacher's questionnaire answers. All five teachers' responses reached a mean at or close to 2, which indicates that the teachers "almost never" incorporate the listed accommodations and/or modifications for their population of left-handed students. Three of the teachers had ranges from 1-5 and two of them had a range from 1-4.

## **Chapter Five**

### **DISCUSSION**

The purpose of this study was to investigate four aspects of the T-1 program and handedness distribution. The first purpose was to investigate the distribution of handedness between T-1 students over the past five years compared to their same-age peers. It was found that the T-1 population consisted of 77% right-handed students and 23% left-handed students compared to the regular population (control) which consisted of 85% right-handed students and 15% left-handed students. The T-1 population had 8% more left-handed students compared to the regular population

The second purpose was to investigate the distribution of handedness between T-1 boys, same-age boys, T-1 girls, and same-age girls. It was found that 71.4% of the T-1 boys and 89% of the T-1 girls were right-hand dominant compared to 81% of boys and 95% of girls being right-hand dominant in the control group. Conversely, 28.6% of the T-1 boys and 11% of the T-1 girls were left-handed compared to 19% of boys and 5% of girls in the control group (see Table 3).

The third and fourth purposes were to examine the kindergarten teachers' attitudes toward left-handed students and to determine which, if any, instructional and classroom modifications the kindergarten teachers used. It was found that the participating kindergarten teachers "never" believed that left-handed students tended to

be more awkward or clumsy when compared to their right-handed peers. The researcher also found that the teachers “never” or “almost never” used the majority of the accommodations and/or modifications listed for left-handed students. The responses of Question 7 got the highest mean of 4. This question asked if the teachers provided left-handed students with special supplies, such as scissors. This is probably the least involved accommodations/modifications for the teachers to implement because the district supplies these materials for each teacher.

Although this study had some findings by examining responses of student and teacher questionnaires, it was unable to truly answer the three research questions. The first question was to examine if left-handed children in Kindergarten, who do not receive instructional and classroom modifications, have a higher percentage of placement in a transitional first grade program. Only 5 out of 14 kindergarten teachers agreed to participate in the study, therefore it was impossible to determine exact students and their teachers in Kindergarten. Because it lacked a chance to track that information, this study was not able to answer this question.

The second research question was to find if left-handed boys or girls in Kindergarten, who do not receive instructional and classroom modifications, have a higher percentage of placement in a transitional first grade program. Once again, because of the small sample of participating kindergarten teachers, it was unable to determine the answer.

The final research question, Question 3, was to examine if a teacher’s attitude toward left-handed children impacts their placement in a transitional first grade program.

It was found that the participating teachers did not view left-handed students to be more awkward or clumsy as compared to their right-handed peers. However, it was impossible to determine if their attitude impacted on the actual placement of left-handed students in the transitional first program.

Most experts believe that a normal distribution of handedness is approximately 8% left-handedness and 92% right-handedness, with more left-handed boys than left-handed girls (Arnold & Askew, 1993). This study found a much higher incidence of left-handedness in the T-1 population as compared to this normal distribution. This study found that 28.6% of the T-1 boys and 11% of the T-1 girls were left-hand dominant. It was also found that the control population of boys had a higher incidence of left-handedness than the normal distribution of 19%.

There were some limitations of this study. First, there was a very small sample of participating kindergarten teachers. This might limit the findings of the study. Second, because of the small sample of participating kindergarten teachers, the researcher could not trace which teachers placed which students in the transitional first grade program. Third, the researcher was unable to locate all of the T-1 students in her classes over the past five years. Some of the students have moved out of district, which made it impossible to gather all of the data. Fourth, the researcher created the teacher questionnaire, therefore there may be some questions about its reliability and validity. Lastly, the questionnaire was a self-report measure. The results of the responses may be biased and limited.

Overall, the results of the study provide some support that left-handed students

differ from right-handed students in their development. In the future, it would be interesting to determine if a kindergarten teacher's attitude toward left-handed students may impact their placement the following year. It would also be beneficial to see if a teacher's attitude and teaching style are changed when he/she is trained and understands the needs of the left-handed students. By understanding the needs of diverse students including those with left-handedness teachers can eventually better provide meaningful instruction to all children.

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## **Appendices**

## Appendix A

December 17, 2001

Dear Mr. Superintendent,

I am conducting a research study for my thesis work at Rowan University. I plan to have my Master's Degree in Special Education in May, 2002. I am investigating the distribution of left-handed students in Transitional First Grade (T-1) compared with the distribution of left-handed students who did not attend T-1. Along with the data I am collecting about the students, I would also like to obtain some information from teachers. I have created two questionnaires. One is for the 14 kindergarten teachers to answer and the other is for the 140 students to complete. I am asking for your permission to conduct this study in our school district. All of the information that I collect will be confidential, and the data will be destroyed when the semester is over. The name of the school district will not appear anywhere in my thesis. If you agree to allow me to conduct this study, please kindly sign the permission form and return it to me. If you have any questions regarding this matter, please feel free to contact me at ext. 3321. Thank you very much. I truly appreciate your time and consideration.

Sincerely,

Susan Paladino

T-1 Teacher

Superintendent's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix B

### Student Questionnaire

**Directions:** Please circle your answer to each question.

1. How old are you? 5 yrs.-old      6 yrs.-old      7 yrs.-old      8 yrs.-old  
   9 yrs.-old      10 yrs.-old      11 yrs.-old      12 yrs.-old
2. What grade are you in currently? T-1    1<sup>st</sup>    2<sup>nd</sup>    3<sup>rd</sup>    4<sup>th</sup>    5<sup>th</sup>
3. Did you attend Transitional First Grade?      yes      no
4. Gender:                  female                  male
5. Which hand do you use when you write?      right      left
6. Which hand do you use when you throw a ball?      right      left
7. Which hand do you use when you brush your teeth?      right      left
8. Which hand do you use when you use scissors?      right      left

Thank you for your time and participation!

## Appendix C

Dear Kindergarten Teacher,

I am conducting a research study for my thesis work at Rowan University. I am investigating the distribution of left-handed students in Transitional First Grade (T-1) compared with the distribution of left-handed students who did not attend T-1. Along with the data I am collecting about the students, I would also like to obtain some information from teachers. I have chosen you because you are such an important part of each student's early childhood development. Attached is a questionnaire consisting of 21 questions. Some questions are for me to obtain background information and others are to gather data about accommodations and modifications that you may or may not use when dealing with left-handed students.

All of the information that I collect will be confidential, and the data will be destroyed when the semester is over. If you agree to participate in this study, please kindly sign the permission form. If you have any questions regarding this matter, please feel free to contact me at ext. 3321. Thank you very much. I truly appreciate your time and consideration.

Sincerely,

Susan Paladino

T-1 Teacher

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix D

### Teacher Questionnaire

1. How many years of teaching experience do you have? \_\_\_\_\_
2. How many years of kindergarten teaching experience do you have? \_\_\_\_\_
3. How many certifications have you earned? \_\_\_\_\_
4. Please list the certifications you have earned on the line below.

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5. Do you have a Master's Degree in any area? \_\_\_\_\_
6. If so, in what area is your Master's Degree? \_\_\_\_\_
7. Which hand is your dominant hand when you write? \_\_\_\_\_
8. Which hand is your dominant hand when you throw a ball? \_\_\_\_\_
9. Which hand is your dominant hand when you brush your teeth? \_\_\_\_\_
10. Which hand is your dominant hand when you use scissors? \_\_\_\_\_

**\*\*Please answer the following 11 questions as honestly as possible.  
Remember, your answers will be recorded anonymously.\*\***

**Directions:** Please circle your answer to each question.

1. When dealing with left-handed students I teach them to hold their pencil about 1 ½ inches higher than a right-hander so they can see around their hand.

always      almost always      sometimes      almost never      never

2. When dealing with left-handed students I seat them so that the shadow from the light will not shade the work of their left hand.

always      almost always      sometimes      almost never      never

3. When dealing with left-handed students I show them how to point the eraser of their pencil toward the left shoulder - not away from their body.

always      almost always      sometimes      almost never      never

4. When dealing with left-handed students I suggest that they keep the inside of their wrist flat against the writing surface to prevent hooking by helping the wrist stay straight and keeping the elbow close to the body.

always      almost always      sometimes      almost never      never

5. When dealing with left-handed students I provide pencils with harder lead so the hand will not smudge.

always      almost always      sometimes      almost never      never

6. When dealing with left-handed students I encourage a handwriting slant that works best for them.

always      almost always      sometimes      almost never      never

7. When dealing with left-handed students I provide left-handed supplies, such as scissors.

always      almost always      sometimes      almost never      never

8. When dealing with left-handed students I demonstrate a new skill by standing in front of them (mirror image) instead of standing next to them (unless you are left-handed).

always      almost always      sometimes      almost never      never



9. When dealing with left-handed students I seat them to the far left so their left arm does not knock into the right arm of other students.

always      almost always      sometimes      almost never      never

10. When dealing with left-handed students I explicitly teach new motor skills to them using the left hand.

always      almost always      sometimes      almost never      never

11. I believe left-handed students tend to be more awkward or clumsy when compared to their right-handed peers.

always      almost always      sometimes      almost never      never

**Thank you for your time and participation!**

\*\*Adapted from Handy Suggestions for Helping Left-handed Students by Evelyn B. Kelly (1998)