

WHEN LEFT IS NEVER RIGHT:  
A SOCIOLOGICAL ANALYSIS  
OF LEFT-HANDEDNESS

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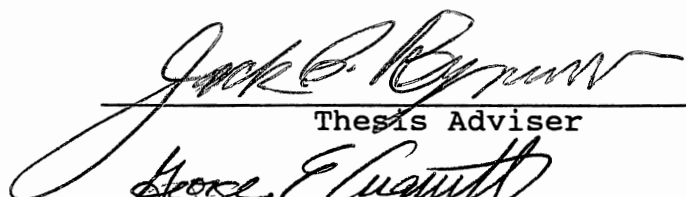
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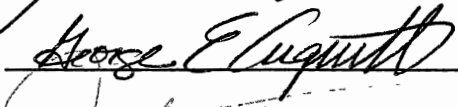
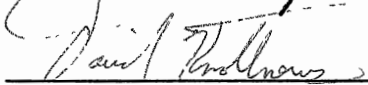
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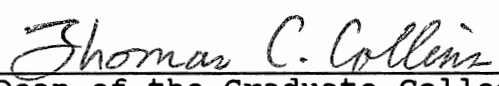
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## CHAPTER I

### INTRODUCTION

#### Statement of the Problem

Differences among people throughout history have been used as a means of social stratification. People are evaluated and ranked on the basis of physical and social characteristics. Sometimes a rare trait is given more valuable status, such as blond hair color and small body shapes in women. Other times, a rare trait is seen as less valuable, as in the case of minority races in the United States. Handedness is no exception.

Historically, the left-handed have had a negative reputation. In hunting and gathering societies, handedness was not an important difference. But with the manufacturing of tools, the difference in handedness became apparent. Discrimination against left-handers was universally accepted. Not only were left-handers different, but they were labeled sinister and associated with evil and witchcraft. Beliefs and treatment of left-handed people today has improved, but remnants of the past still remain. The world is still a right-handed world. Discrimination still exists in tool design, and some societies still restrict the use of the left hand.



Approximately ten to 15 percent of the world's population is left-handed. In comparison, the 1990 Census recorded 12 percent of the United States population as black and nine percent of the population as hispanic (United States 1990). While left-handers are a sizable minority in their own right, little sociological research has been done in this area. Most research on handedness has been in the fields of psychology and medicine.

Not surprisingly, stereotypes of left-handers found their way into scientific research. Science was used to justify these beliefs. Today, handedness research still focuses on socially unacceptable characteristics and behavior.

As stated previously, between ten and 15 percent of the population are left-handed. About 84 percent of left-handed people have two right-handed parents (Ponte 1988). The chances of two left-handed people having a left-handed child is just 50 percent (deKay 1979). The chances of two right-handed people having a left-handed child is only two percent (deKay 1979). Not only are left-handed people a minority in society, but even in their home they are surrounded by a right-handed majority.

Some items are hand neutral or made for the left-handed user, but most must be ordered from special catalogs and stores. Also, because the majority of left-handed people live solely with right-handed people, any tools or equipment become secondary items in the home.

## Purpose of the Study

Handedness is a physical trait. But, just like race and gender, there are social implications from the trait. Left-handers are a sizable minority that have been virtually ignored by sociologists. This thesis is an attempt to apply sociological knowledge, and to stimulate further research in the field of handedness.

There are four objectives of this thesis:

1. To identify and explain current societal responses to left-handed people.
2. To identify the impacts and consequences of societal evaluations on left-handed people.
3. To identify any problems left-handers face due to their handedness, and their methods of adaptation to such difficulties.
4. To determine if left-handed people are significantly different from right-handed people on characteristics other than handedness (e.g. demographic, biological, and attitudinal).

## CHAPTER II

### HISTORICAL OVERVIEW

Historically, left-handedness has been viewed negatively. The word "sinister" is Latin for left, and in other languages left has translated to mean disaster, threatening, awkward, clumsy, sneaky, underhanded, dishonest and evil. (Westra 1989; Economist 1986)

A survey of English dialects taken in the 1950's produced 88 different words for left-handed, very few of which contained positive or neutral connotations (Economist 1986). These included buck-fisted, caggy, corrie-pawed, cuddy-wifter, gar-pawed, golly-handed, kerry, left kelly, scoochy, skiffle-handed, spuddy-handed, keggly-handed, southpaw, squiffy, cack-handed, and keck-fisted. Specifically, cack is another word for excrement. In contrast, the right has signified authority, righteousness, lawfulness, truth, accuracy and power.

However, the divergent views of the right and left have changed over the years. The word "aristocratic" came from the Greek word "aristera" for left. The Latin word "sinister" once signified fortune (Economist 1986), because Rome's augurs originally faced south and looked

left to the east. At some point in history, they began facing north and the word "sinister" signified ill-omen.

The Aztecs believed that life comes from the east where the sun rises (Stocker 1989). Therefore, the top of a map pointed east rather than north. Since the left hand pointed toward the north, it was associated with the dead. But for the Aztecs, this was favorable, as the left became associated with spiritual qualities. To be left-handed was a sign of blessing and many of their gods were left-handed or ambidextrous. The Incan culture also thought left-handedness brought luck (deKay 1979). The third Inca (e.g. king) was called Lloque Yupanqui, which means "Unforgettable Left-handed One" (Knebel 1992).

No one is certain why sentiment toward the left changed. However, one explanation comes from nature. The natural world seems to favor clockwise motion. Most plants curve toward the right, the honeysuckle being an exception (deKay 1979). Seashells that curve to the left are very rare and prized by collectors. Most animals appear to be right-handed. Gorillas are one of the only exceptions, as for most, their left arm outweighs their right.

Most of the world's population lives north of the equator, where the sun appears to move from left to right. The great religions were influenced by sun worship. Buddhist prayer wheels turn clockwise and pilgrims at Mecca walk clockwise around the Ka'ba (Economist 1986).

There is some evidence that right predominance is not as widespread in southern cultures. In 1986, a new king was named in Swaziland (Economist 1986). He was chosen over his brothers in part because of his left-handedness. Also, most southern cultures originated north of the equator, and it is likely that their beliefs were influenced by this heritage.

Derogatory attitudes toward left-handers date back to biblical records. Generally, the right is a place of honor and favored over the left. For instance, Jesus sits to the right of God's throne. Even at crucifixion, the thief that was saved is on Jesus' right side. The right is a symbol of strength, whereas the left symbolizes weakness ("Right and Left" 1978). In the Old Testament, when Jacob gave his final blessing to his grandsons Ephraim and Manasseh, he crossed his hands to touch Ephraim, the youngest with his right hand. His explanation was his belief that Ephraim would be greater than Manasseh (KJV Gen. 48:12-20). The book of Judges records the history of Ehud of the tribe of Benjamin (Barsley 1970). Ehud appears to have been left-handed, as he led a force of 700 sling-shooters who were also left-handed. He was described as "a man obstructed in the use of his right hand." ("Right and Left" 1978) The translation for "obstructed" was also used to describe the deaf, blind or dumb. In fact, the Hebrew phrase for left-handed ("itter yad yemino") literally meant "men who were

inferior or restricted in the use of their right hand" (Harris 1980, 7). The tribe of Benjamin was almost eliminated, until the Israelites assimilated with them. This ancestry eventually included David, Paul and Jonathan.

Over 100 favorable references to the right hand can be found in the Bible, with 25 unfavorable references to the left hand (Barsley 1970). "At Thy right hand there are pleasures for evermore." (KJV Ps. 16:11) "His right hand, and His holy arm, hath gotten Him the victory." (KJV Ps. 98:1) The most often cited verses are in Matthew:

He shall separate them one from another, as a shepherd divideth his sheep from the goats. And he shall set the sheep on his right hand, but the goats on the left. Then shall the King say unto them on his right hand, 'Come, ye blessed of my father, inherit the kingdom prepared for you from the foundation of the world' . . . . Then shall he say, also unto them on the left hand, 'Depart from me, ye cursed, into everlasting fire.' (KJV 25:32-34, 41)

These negative impressions of the left can be traced to Middle Eastern countries. Traditionally, Muslim cultures consider the left hand "unclean" and associate it with death and the devil (Economist 1986). In the past, Muslims were told that God had two right hands. Today, it

is still forbidden to touch food with the left hand, and left-handers are virtually non-existent.

The legend of the "unclean hand" dates back to ancient Hittite and Oriental cultures. The writer, Robert Graves translates the Greek legend:

Uranus fathered the Titans upon Mother Earth, after he had thrown his rebellious sons, the Cyclops, into Tartarus, a gloomy place in the Underworld . . . . In revenge, Mother Earth persuaded the Titans to attack their father, and they did so, led by Cronus, the youngest of the seven whom she armed with a flint sickle. They surprised Uranus as he slept, and it was with the flint sickle that the merciless Cronus castrated him, grasping his genitals with the left hand (which has ever since been the hand of ill-omen) and afterwards throwing them, and the sickle too into the sea by Cape Drepanum.

(qtd. in deKay 1979, 25)

The remains became Aphrodite, the Goddess of Love.

Traces of this myth can be found in the Old Testament story of Noah's drunkenness (KJV Gen. 9:20-28).

The historical treatment of the left has even been applied to moles. Moles on the left side of the body were associated with bad luck, as moles on the right side signified good luck. During the witch hunts, the accused were disrobed in public and examined for signs of

attachment with the devil. "Moles on the right arm and shoulder denote great wisdom; on the left debate and contention . . . . If a man has a mole on a place near the heart, it doth denote him undoubtedly wicked." (qtd. in deKay 1979) "A mole on the left buttock signifies that trouble may be lurking nearby." (qtd. in deKay 1979)

Wearing a wedding ring on the left hand may have originated from ancient Egyptians and Greeks. Death and misery are said to come from the left side, as life and fortune enter on the right. To wear a ring on the left hand, specifically on the third finger was "intended primarily to keep temptations and other bad things from us" (Hertz, trans. in Needham 1973, 12).

Physicians during the 1800's discovered that more diseases and abnormalities such as cancer and epilepsy occurred on the left side (Harris 1980). In contrast, strength and growth on the right side were found to be superior. An accepted belief was that the right female breast had the best milk and was "preferred by infants" (Harris 1980, 28).

A general assumption among researchers today is that 10% of the world's population are left-handed. However, some would increase the number to 15%. Analysis of early cave drawings indicate that the percentage of left-handers may have been greater in the past (Barsley 1968). This conclusion stems from the observation that people who are left-handed prefer drawing profiles that face the right.



Right-handed people tend to draw profiles that face the left. The manufacturing of tools began in the Bronze Age. Tool designs always favored the right-hander (deKay 1979). Armor in the Middle Ages favored the right-hander as well, with the shoulder skirt over the left arm and the lance support on the right side (deKay 1979).

This tool bias has continued to the present day. Virtually all controls on radios, television sets, record players, microwaves, vending machines, and automobiles favor the right-hander, as do can openers, scissors, corkscrews and watches. Faucets are made for the convenience of the right-handed user, and most desks in schools have an armrest on the right. At a bank, the pen that is provided is usually connected to a cord on the right side. Very few items are hand-neutral or favor left-handers. James deKay says one of the only places left-handers have the advantage is at a toll booth (1979).

Until recently, children in United States schools were not allowed to write with their left hand. Cyril Burt remarked that it is mechanically easier to write with the right hand than the left hand:

The easiest pen stroke of all is a rapid line drawn obliquely outwards and upwards. With the right hand, this means moving away from the bottom left hand corner and upwards to the top right hand corner . . . most letters, in ordinary joined handwriting begin with such a

stroke. With the left hand, such a stroke is the most difficult of all; (qtd. in Barsley 1970, 35)

#### Summary

The negative reputation of the left and the left-handed has been well-established throughout history. The bible has a favorable bias for the right over the left, as do Middle Eastern countries in contemporary times. In the past, left-handedness was a sign of wickedness and dishonesty. The unfortunate person born with a mole on the left side of the body could be mistaken for a witch and killed during the 17th Century.

In addition, while much discrimination against left-handers has dissipated in the West, tools still favor the right-handed user. Likewise, the cultural viewpoint placing more value on the right than the left is still prevalent today, and remnants of this are unknowingly transmitted to future generations.

## CHAPTER III

### AN ETIOLOGY OF LEFT-HANDEDNESS

#### Introduction

Many explanations have been proposed on the causes of left-handedness. Reasons ranged from habit and upbringing, the method of nursing a child, inequality of blood supply to the brain and natural selection (Barsley 1968, 19). However, the continuing question has been if left-handedness is an inborn trait, a physical ailment or socially caused. The following describe the most prominent theories.

#### Visceral Distribution

Sometimes called gravitation theory (Barsley 1968), this explanation relied on the belief at the time that the liver and other viscera caused a displacement of a person's center of gravity. When the first humans had to defend themselves, they reached down for a weapon. Since the weight was shifted to the right, they became right-handed. Andrew Buchanan in 1862 reasoned that the natural response to this displacement was for a person to try to put more weight on the left side to maintain balance, thus making it easier to use the right hand and leg (Harris

1980). Other mechanical theorists reasoned that the left hand needed to be free in battle to shield the heart (Blau 1946). So through custom, people used their right hand more than their left hand. Likewise, any left-handers would have been killed in battle, promoting a hereditary bias toward right-handedness.

### Neurological Disorder

Another theory was proposed by Norman Geschwind and Peter Behan (1984). They proposed that excess testosterone before birth affects the thymus in the brain, which affects the immune system. The immune system may be related to handedness. As evidence, they found that left-handed subjects had ten times the rate of learning disabilities and three times as many autoimmune diseases. Moreover, some researchers suggest that sex hormones in the womb also affect the hippocampus. They believe an abnormality of the hippocampus causes schizophrenia (Durdan-Smith & Simone 1984). These researchers would suggest that left-handedness is a neurological disorder which is associated with other neurological disorders. In fact, some studies do show a relationship between left-handedness and learning disabilities, allergies, epilepsy, schizophrenia, depression, phobias, alcoholism and other autoimmune disorders. Still, other investigators suggest that left-handedness is caused by trauma at birth or

oxygen deprivation before birth, which could be associated with a neurological explanation.

### Cerebral Dominance

The most well-known theory of handedness is the theory of cerebral dominance, which was first proposed by Sir Thomas Browne in 1648. Each side of the brain is thought to control the opposite side of the body. Functions that the left hemisphere is thought to provide are logical thinking, mathematical reasoning, phonics, writing, and linear reasoning. The right hemisphere is thought to provide creative thinking, geometric and spatial organization, emotional responses, musical and drawing abilities. As Marshall describes the hemispheres, "If we were to look at life through a zoom lens, the left brain would show us only the extreme close-ups one by one in sequence; the right brain would show us the whole picture simultaneously" (1978, 72).

Most people are born with one larger and more developed hemisphere. However, it is believed that 95% of right-handers' speech language center is in the left hemisphere, as many left-handers rely on both hemispheres for language (Ponte 1988). In contrast, 15 to 50% of left-handers are estimated to have speech language capabilities in the right hemisphere. One of the explanations given for the mixed-dominance of left-handers

is that they must adapt more often to a left hemisphere world.

### Cultural Influences

Acceptance of left-handedness within one's culture should also affect its incidence. Dr. Ira S. Wile did a review of studies in 1934 and found between one to 25.3% of the population throughout the world to be left-handed (deKay 1979). In the early 1900's, the Shorter Oxford Dictionary stated "only two percent of mankind are naturally sinistral" (qtd. in Economist 1986).

Literature in the past used the Bible to estimate the historical incidence of left-handedness. They concluded the population of left-handers in biblical times to be 2.7% (Harris 1980).

Dawson (1972, 1977) found permissiveness within a culture was associated with the percentage of left-handedness. The incidence of left-handedness among Australian Aborigines was 10.5%; Chinese Boat People, 9.4%; Eskimo, 11.3%; Temne of Sierra Leone, 3.4%; and Hakka Chinese, 1.5%. Western cultures such as the United States fell within the two extremes. Provins (1990) interviewed members of Tristan de Cunha who were temporarily evacuated to England in the 1960's. While her sample included 28% of the total population, only 2.6% showed a left-handed tendency and all wrote with the right hand. In 1934, Komai and Fukuoka (qtd. in Provins 1990)

confirmed that left-handed writing in Japanese schools decreased with each school year so that by the eighth grade, less than one percent were still writing with the left hand. In contrast, Scheidemann (1930) found that 47% of a second grade class at a Hollywood, California school wrote with the left hand. Later, it was discovered that both the first and second grade teachers were left-handed (Scheidemann & Colyer 1931a, 1931b).

#### Theoretical Basis From Sociology

A sociological study of left-handedness should begin with Robert Hertz. Hertz, a colleague of Emile Durkheim and Marcel Mauss, wrote an essay entitled "The Pre-Eminence of the Right Hand: A Study in Religious Polarity" (1909). Hertz wrote:

The fact is that right-handedness is not simply accepted, submitted to, like a natural necessity: it is an ideal to which everybody must conform and which society forces us to respect by positive sanctions. . . . the fact of being left-handed is an offense which draws ridicule on the offender and a more or less explicit social reproof. . . . The difference in value and function between the two sides of our body possesses therefore in an extreme degree the characteristics of a social institution.  
(trans. in Needham 1973, 6)

Hertz concluded that the higher value placed on right-handedness was a consequence of the inherent dualism or polarity of all societies. Just as the sacred and profane in religion, so was the left and right a part of the collective conscience (trans. in Needham 1973).

Hertz's essay has received little attention over the years. Its influence has been primarily in the field of anthropology. Not until 1960 was the paper translated into English by Evans-Pritchard (Needham 1973). Unfortunately, Hertz was killed at the age of 33 in the first World War. Had he lived, Hertz's theory of handedness may have been more fully developed by other structural-functionalists.

Another area of sociology emphasizes the concept of socialization. Landis (1989) defines socialization as the "process whereby one learns the expectations, habits, skills, values, beliefs, and other requirements necessary for effective participation in social groups" (441). Throughout this process, we rely on role models. Although ten to 15% of the population is left-handed, over 84% of left-handers have two right-handed parents, and very few left-handers have one left-handed parent (Ponte 1988). As human beings, we rely greatly on the use of our hands. Consequently, early socialization of left-handers is without left-handed role models. When children begin school, this becomes especially evident when their left-handedness conflicts with a right-handed society. The



educational system is right-handed; the desks, scissors, penmanship, and so forth. Not only are there very few role models, but illustrations in books tend to depict right-handed children. Children are told to imitate the teacher, but for the left-handed child, this requires a reversal or mirror image of the enacted behavior.

Symbolic Interactionism is a theoretical school of thought that emphasizes the use of symbols by human beings. George Herbert Mead described three stages of socialization. The first stage is called the preparatory stage, in which a child meaninglessly imitates others. During the next stage, the play stage, a child begins to play the role of others who are role models. At this point, he/she can only play one role at a time. The final stage is called the game stage, in which the child is able to take several perspectives at once. His/Her place within the society is evident, and one understands how behavior affects others. Primary norms of the society have been internalized and accepted.

I would suggest that sometime in early childhood, a left-hander becomes aware of his/her differentness. Edward Sagarin (1975) distinguished between difference and deviance. He reserved deviance to refer to those who are devalued in our society, and referred to left-handedness as having a more neutral reaction. To many, left-handedness is viewed as deviant, but most would not consider it equal to other minority status'. Generally,

today left-handedness is neither given rewards nor sanctions. However, many tools discriminate against left-handers and in this respect, left-handed people are still a minority. Likewise, the stigma associated with left-handedness has only recently dissipated in this society. Many societies of the world still overtly discriminate against left-handers including those in Eastern Europe, the Middle East, Africa, Germany, India and Asia.

The process of socialization may be different and more difficult for left-handers. Without proper role models, they must learn many things by themselves and adapt in ways that right-handers are never asked to do. Consequently, maybe left-handers become unusual and even nonconforming members of society. People who are forced to fend for themselves may become resourceful, resulting in positive or negative extremes of behavior (e.g. intellectually gifted contributors to society or antisocial criminals). Very successful criminals must have clever adaptation skills. As cited earlier, an unusual percentage of left-handed delinquents and criminals has been discovered, but a disproportionate number of left-handers have also been found among members of MENSA. Jack the Ripper and Charles Manson were left-handed as well as Joan of Arc, H.G. Wells and George Burns. The three primary contenders of the 1992 presidential election in the United States; George Bush, Bill Clinton and Ross Perot were left-handed.

Labeling theory acknowledges that labels are used to distinguish groups of people. Once a label is given to a person, he/she is treated accordingly, often powerfully affecting and eliciting subsequent behavior. More so in the past and in other cultures, left-handers were given a negative label. However, in sports left-handers may be labeled as more skilled or desirable, regardless of their talent or ability. Many assume that left-handers are eccentric, creative, or talented artists. Labeling theory assumes that the individual becomes what he/she has been identified as by others. Thus, the left-hander, when confronted with a social judgment becomes confirmed as a left-hander, with all the label implies, leading to a self-fulfilling prophecy.

#### Summary

Many causes of left-handedness have been suggested, most of which are biological or neurological. My premise is that there is an organic cause which has not been sufficiently proven. However, societal influences are much more important in maintaining whatever predisposition to right- or left-handedness there is. In addition, the objective of this paper is to discover how the sanctioned handedness in societies affects those who are different from the norm. Sociological theories are most relevant for this analysis.

There is a cultural bias toward right-handedness. In most societies, right is favored over the left. Through the process of socialization values and beliefs of a society are transmitted to future generations. At some point in this process, a left-handed child, just as other minorities will become aware of these values and realize that he/she is extraordinary. The label "left-handed" will be attributed to the person, along with a value judgment of what this means.

In addition, the process of socialization will be affected by handedness. Learning to write and tie shoelaces will be different for the left-handed child, because direct imitation is usually not possible.

## CHAPTER IV

### REVIEW OF THE LITERATURE

A comparison of handedness research should include consideration of the methods used to define left-handedness, which have varied throughout history. At one time, a comparison of the thumbnails was used to determine handedness (Block 1974; deKay 1979). The thumbnail that is more square and wider at the base was an indication of the dominant hand. Another method was to examine a baby's head (deKay, 1979). If the whorl of the hair turned counterclockwise, it was an indication of left-handedness. Theodore Blau devised the Torque test (Blau 1946; deKay 1979). A person draws an X with the right hand, and a circle around the X. With the left hand, they draw another X, and a circle around the X. The strength and control of the handwriting determine hand preference. In addition, brain dominance is determined by the circles. Right-handed people who are left-brained tend to draw circles counterclockwise with both hands. Left-handed people who are right-brained tend to draw clockwise circles. Drawing circles both directions indicates mixed hemisphere dominance.

Recent measures of handedness or laterality have not been consistent. One measure of handedness is called the Edinburgh Handedness Inventory (Oldfield 1971). Subjects are asked about hand preference for several tasks such as holding a toothbrush, drawing, writing, and throwing. They are asked to put a plus sign in the appropriate box (left or right). If they always use one hand to do the task, they put two plus signs in the box. If they would use either hand, they put a plus sign in both boxes. A simple formula yields a laterality quotient. A left-handed person has a negative laterality quotient.

Some researchers find writing or drawing hand to be the best indicator of handedness. Others look at non-right-handedness or mixed-handedness, rather than left-handedness. Some research also include eye or foot preference as well. For the purposes of this thesis, the author uses left-handedness to refer to all forms of non-right-handedness studies.

The theories of what causes left-handedness, mentioned in the previous chapter still have many adherents. However, very few of these ideas have actually been tested. Most research regarding handedness has been in psychology. For psychologists, left-handedness has been viewed as an abnormality that needs to be studied, as one would study mental illness. Often, their findings supported the current stereotypes of left-handers. For instance, Theodore Blau found left-handers "to be

stubborn, oversensitive, impulsive and embarrassing to the family . . . They have difficulty following directions and are bedwetters beyond the age of 3" (qtd. in deKay 1979). Abram Blau stated "sinistrality is thus a symptom or manifestation of an attitude of opposition or negativism along with such other signs as disobedience, refusal to eat, temper tantrums, rebelliousness, etc." (1946, 91). Blau's explanation for left-handedness was "an unsatisfactory relationship between the child and his mother [leading to a] self-willed, obsessive-compulsive, and anal personality structure" (1946, 183). Blau concluded that "The sinistral himself must be cognizant in early life that he is abnormal and a sort of misfit in this right-handed world" (qtd. in deKay 1979). Even the permissive Dr. Spock discouraged left-handedness (deKay 1979).

Consequently, research on left-handedness has focused on socially unacceptable and aberrant behavior. Early researchers such as Lombroso (1903), Smith (1917) and Das (1925), found left-handedness to be more prevalent among delinquents and criminals (qtd. in Blau 1946). Lombroso believed left-handedness was a "stigma of degeneracy" (qtd. in Fincher 1979, 151). Havelock Ellis in his book, The Criminal wrote:

Left-handedness has, by instinct or from accurate observation, been regarded with disfavour in the proverbial sayings of many

nations. It is decidedly common among criminals. . . . It is also interesting to note the ambidextrous tendency among children, savages, and idiots (1890, 108-109).

He cites a finding by Marro that 17.5% of murderers, 28.5% of arsonists, and 18.1% of burglars were left-handed (Ellis 1890, 109).

Ellis and Ames (1989) gave college students a questionnaire which asked about sidedness for several items. The items were grouped into general handedness, visually guided handedness, eye, ear and foot preference and upper strength. The students were also asked about criminal activities. For males, significant correlations were found for general handedness and serious crimes, delinquent acts and school and family offenses. Visually guided handedness was also correlated with serious crimes and school and family offenses. Among females, significant correlations were found for visually guided handedness and serious crimes. Ear preference was related to school and family offenses, and foot preference was related to delinquent acts. Correlations were generally stronger for males than females, and all significant relationships were in the direction of left-sidedness. The male students were also more left-sided and more delinquent.

Nineteen juveniles who had been referred to court several times were examined using neurological and



psychological tests (Fitzhugh 1973). Another group of ten emotionally disturbed subjects was also examined. All the emotionally disturbed subjects were right-handed, whereas 32% of the delinquents were left-handed. The t test showed a significant difference between the two groups.

Male patients at a psychiatric center were given the Edinburgh inventory to determine handedness (Krynicky 1978). One group of patients had been diagnosed with a behavior disorder called Unsocialized Aggressive Reaction. Each of these patients had at least three recorded incidents of physical assault. Another group had committed delinquent acts that were less violent. A third group was diagnosed with Organic Brain Syndrome. Analysis of variance showed a significant difference between the three groups, indicating more mixed handedness among the violent group and those with Organic Brain Syndrome.

However, Andrew (1980) studied 139 delinquents on probation and found different results. Types of crimes were ranked on violence with smoking being the least violent and voluntary manslaughter being the most violent. From the subjects' records, four professionals gave each a score. Right-handers were found to be significantly more violent than left-handers.

Hare (1979) solicited volunteers from a medium security prison in Canada. The 55 subjects were rated on psychopathy and divided into three groups. There was no

significant difference in handedness between the groups, and 14.5% of the subjects were left-handed.

Watson and Coren (1992) gave a four item handedness survey to a group of male to female transexuals awaiting a sex change operation. Thirty-seven percent indicated they were heterosexual, 28% were homosexual, 19% were bisexual and 16% were asexual. They found a significant number of the transexuals were left-handed (35.6%), compared to 11.6% of a control group.

Another study found an increased incidence of non-right-handedness among 32 homosexual women and 38 homosexual men (McCormick et al. 1990).

Male out-patients of a venereology clinic in London were given a questionnaire with Annett's Handedness Inventory (Lindesay 1987). Sexuality was determined from counselors at the clinic. A significant number of homosexuals were non-right-handed, even though most wrote with the right hand.

Claude Chemtob discovered that 20% of phobics at a Veterans Administration hospital were left-handed (qtd. in Durden-Smith & DeSimone 1984). Of the right-handed patients, many had left-handed relatives, and females outnumbered males nine to one.

College students were given the Edinburgh Handedness Inventory, Fear Questionnaire, and Maudsley Obsessive Compulsive Inventory (Merckelbach et al. 1989). There were no significant differences, but there was a positive

association between social phobia scores and right-handedness.

In another study, handedness of parents of autistic children was determined from questionnaires (Boucher et al. 1990). Mothers of autistic children were significantly more likely to be consistently right-handed.

Researchers found 31% of 58 schizophrenic patients at a hospital wrote with the left hand (Manoach et al. 1988).

A group of epileptic patients with schizophrenia, epileptics with major depressive disorder, functional schizophrenics and neurological patient controls with partial seizures were examined using Annett's Handedness Schedule (Oyebode & Davidson 1990). They found significantly less mixed and left-handedness among the male epileptics with schizophrenia.

Handedness was compared for schizophrenic patients, non-schizophrenic patients, and staff at a treatment unit of a hospital (Wahl 1976). All the patients were receiving major tranquilizers and had been hospitalized for years. Patients were asked about handedness on several tasks, and staff members filled out a questionnaire about their own handedness. A chi-square test revealed no significant differences among the groups, even though the percentage of left-handedness was greater among the patients. However, when handedness was determined through observation, the percentage of left-handed patients decreased.

Fourteen to 18% of alcoholics are left-handed according to a study conducted at Dartmouth Medical School (Ponte 1988). Bakan (1973) also found a high percentage of left-handedness among a group of male alcoholics at a hospital. With writing hand alone as an indicator, 15% of the 47 patients were left-handed. Using a more liberal definition of handedness and including two patients who indicated they were switched as children, 25% of the group would be considered left-handed.

Another study found left-handers experienced greater changes in electrical activity after taking aspirin, antidepressants, sedatives and antihistamines (Ponte 1988). In ten of 15 trials, the most sensitive person was left-handed, whereas a quarter of the subjects with the lowest responses were right-handed (Carpenter 1985). Left-handers were also twice as likely to have autoimmune diseases such as diabetes, ulcerative colitis and rheumatoid arthritis.

Benbow and Stanley (1983) contacted students who had scored 700 or more on the math segment of the SAT test. They found they were more likely to have immune disorders, be left-handed, male, or myopic (nearsighted). The researchers then looked at mathematically gifted seventh graders and found 20% were left-handed, 60% had immune disorders, and 70% were myopic.

In the 1970's Bakan found more left-handedness and perinatal complications among first, fourth, and later

born children (qtd. in Levander et al. 1989). However, Levander et al. for a similar study interviewed subjects' parents by phone, and found no relationship between handedness, birth stress, allergies and autoimmune diseases.

Smith (1987) found a greater percentage of left-handers among patients of an allergy clinic. Among IGE mediated eczema patients, 28.3% were left-handed, and 15.9% of IGE mediated rhinitis patients were left-handed.

Betancur et al. (1990) studied an allergy clinic in France and found no relationship between left-handedness and allergies, familial non-right-handedness, or the severity of allergies. However, she did find the onset of allergies to be substantively significant, as left-handers were more likely to experience symptoms before the age of five.

In response to Geschwind's theory, Hugdahl et al. (1990) compared dyslexic and non-dyslexic children. The researchers found no association between left-handedness and dyslexia or immune disorders. However, they did find a significant number of dyslexics had immune disorders. Seventy-three percent of immune disorders were reported by dyslexic children. More mothers of dyslexics perceived stress during pregnancy, and sex was related to non-right-handedness.

First grade classrooms were randomly selected in St. Paul, Minnesota for a research project (Balow 1963). At

the beginning of the school year, students were given Harris Tests of Lateral Dominance and Gates Reading Readiness Tests. In December and February additional reading tests were given. Handedness was classified as left, right or mixed. Analysis of variance revealed no significant difference in reading achievement and hand dominance.

Other researchers controlling for age and sex, found no significant relationship between handedness and systemic lupus, type I diabetes, or Graves disease among outpatients at a hospital in France (Chavance et al. 1990).

Some research has been directed at the Cerebral Dominance theory. One such study involved faculty at the University of Oxford (Temple 1990). The percentage of left-handers was the same among academic groups, as was the incidence of immune disorders. However, a significant number of math professors reported allergies and suffering from childhood language difficulties. Only five percent of pure mathematicians were left-handed, as 16% of math scientists were left-handed. Among the verbal academics, left-handers reported significantly more rare immune disorders than right-handers.

Monfort et al. (1990) gave students from two universities the Human Information Processing Survey which is thought to differentiate preferred cerebral functions. They found that liberal arts majors preferred right brain

items and business majors preferred left brain items. Other disciplines preferred left and right brain items equally, but there was a tendency for certain majors to prefer one or the other. The highest preference for right brain items came from art, journalism, interior design, and architecture majors. A greater percentage of those preferring right brain items were also more likely to report reading disabilities, math difficulty and hyperactivity. Hyperactivity was significant.

Peterson and Lansky (1974) surveyed faculty and students of architecture at a state college. Twenty-nine percent of the faculty were left-handed and two right-handed faculty reported being switched as children. Twenty-four percent of seniors were left-handed, as 10% of freshmen were. They then asked freshmen and fourth year students to design a space maze. The fourth year students did significantly better. But, all left-handed students were able to design the maze correctly.

Similar results were accomplished in Norway with students of music and architecture (Gotestam 1990). Significantly more left-handers were found in music and architecture, but more reading problems, dyslexia and stuttering were reported among right and left-handed architecture students.

However, Wood and Aggleton (1991) sent a questionnaire to architecture firms asking about handedness and found no significant difference between

male certified architects (10.2%), non-certified architects (11.5%) and a control group (10.5%).

Schachter et al. (1987) sent 2700 questionnaires to people in different professions. The response rate was 41%. They found left-handedness to be related to profession, gender and learning disabilities. They also found 44% of blonds were non-right-handed, as 24% of non-blonds were.

Burke et al. (1989) compared 12 right-handed and 12 left-handed college students. Torrance tests revealed left-handers to be significantly more creative. Left-handers were also more likely to show environmental frustration with household tools and classroom desks. Right-handers were frustrated with musical instruments. Left-handers were also more likely to mention left-handedness as a part of their self concept.

An extensive study of handedness was conducted in France in 1962 (deKay 1979). Miners, metal workers, physicians, musicians and other workers were studied. The research team concluded that there was no relationship between handedness and stammering, but left-handed stenographers did considerably poorer in speed of shorthand than right-handers. Eighty-nine percent of the best speeds were by right-handers. Managers in the construction industry found left-handers to be less accident prone and were considering training right-handers to become more ambidextrous. Left-handedness caused no



work-related problems at a paper mill, elevator manufacturer, clothing factory and a hairdressing school. At a spinning mill, one position was exclusively filled with a left-hander. A similar study was proposed in England, but dismissed as unnecessary.

One researcher who has been mentioned in popular literature recently is Stanley Coren. In 1989 he did a survey of almost 2000 college students. Nine percent were left-handed. They reported the number of accidents by type they had had within the last two years. The accident had to be serious enough to require medical attention. For all categories, left-handers had more accidents. The only significant difference was for accidents that occurred while driving a vehicle. Fifty-two percent of left-handers reported at least one accident in any category, while 36% of right-handers reported an accident. Coren suggested that left-handers may be more accident-prone because most tools and equipment are designed for right-handed users.

A significant number of children admitted to a hospital emergency room were found to be left-handed (Stroh 1992). Patients were divided into a trauma and a non-trauma group regarding their injuries. Eleven percent of the non-trauma group were left-handed, whereas 16.5% of the trauma group were left-handed.

Halpern and Coren (1988) looked at baseball statistics and compared the life expectancy for those who

bat and throw with the same hand. They found the average life expectancy for left-handers to be 63.97 years; for right-handers, 64.64 years. The mortality rate remained the same for both until the age of 33. Using the Wald-Wolfowitz Runs Test, the results yielded a significant difference.

Wood (1988) also examined statistics from The Baseball Encyclopedia finding 18% of batters and pitchers to be left-handed. The average life expectancy of consistent left-handers was 66.7 years, whereas consistent right-handers' expectancy was 66.8 years. The Kolmogorov-Smirnov test showed no significant difference. He concluded throwing hand to be the best indicator of hand preference, and found no significant difference in mortality comparing only throwing hand.

Sports has been an area throughout history where left-handedness has been allowed (deKay 1979). Polo is one of the only exceptions. Although many sports allow left-handed play, it is sometimes difficult to get left-handed equipment. For instance, one can play ice hockey with the left hand, but the sticks are made exclusively for right-handers. Similarly, left-handed golf clubs were only recently manufactured. One still has to get them specially ordered.

Left-handers excel at sports such as tennis, fencing, and baseball (Aggleton 1990). deKay (1979) indicates that 32% of all major league batters, 30% of pitchers, and 48%

of first basemen are left-handed. The requirements of these positions give the left-hander an advantage over right-handed players. In contrast, no major league catchers were left-handed.

Aggleton and Wood (1990) were interested in sports where handedness would not be an explicit tactical or equipment advantage. Handedness of snooker, darts, bowling and golf players were discovered by analyzing pictures, televised tournaments and talking with professionals and experts in the fields. Six percent of dart players were left-handed, ten percent of male bowlers, seven percent of female bowlers, and nine percent of professional snooker players were left-handed. The top 100 golfers on the American Tour and the top 250 on the European Tour were all right-handed. In addition, eight percent of amateur golfers were left-handed. Golf manufacturers reported selling 3 to 12% left-handed golf clubs. The company selling 12% specializes in left-handed clubs. There were no significant differences in left-handedness among all the sports and the general population. However, they found a lower than expected number of left-handers in professional golf and darts.

#### Summary

Handedness has interested researchers for many years. Often, findings have supported stereotypes of left-handers as being deviant and "backward." Present studies

routinely cite literature indicating a significant number of left-handers among schizophrenics, phobics, learning disabled, with allergies and other ailments. However, an analysis of the literature suggest very few definitive conclusions about left-handers. Very few studies could be found to support these common assertions. For instance, Wahl (1976) found no significant difference in handedness among schizophrenic patients and the staff of a hospital. Oyeboade and Davidson (1990) found significantly less mixed and left-handedness among male epileptics with schizophrenia. Merckelbach et al. (1989) found social phobia scores were positively associated with right-handedness among college students. However, research does suggest that left-handers are more prone to allergies, but not all studies have come to the same conclusion. Also, most research found in the area of criminology indicate a delinquent tendency among left-handers. However, Andrew (1980) found right-handers to be significantly more violent offenders. Other researchers have found a disproportionate number of left-handers among homosexuals (McCormick et al. 1990; Lindesay 1987). Other research suggests that handedness may be related to college major (Monfort et al. 1990).

## CHAPTER V

### RESEARCH METHODOLOGY

#### Method

A questionnaire was developed in an attempt to satisfy the research objectives of this thesis and to replicate some of the previous findings in the area of handedness. The questionnaire contained seven sections. The first section included the following demographic information; sex, race, income, grade point average and college major. Also included were questions asking handedness when writing, throwing a ball, and using scissors. Inverted hand posture and eye preference were asked. The second included questions about deviant behavior, accidents, creativity and hemisphere-related items. Other sections consisted of questions used to develop Likert scales designed to measure respondents' skills and abilities, and physical characteristics. Possible responses to statements were strongly agree, somewhat agree, uncertain, somewhat disagree and strongly disagree. Several scales were included to determine if right- and left-handed people differ in other ways which had not been previously investigated. All scales had been

used repeatedly in past research. Previous tests indicated the scales were reliable and valid.

One of the scales was designed to measure personal competence (Campbell et al. 1960). Personal competence is defined as one's sense of control over one's life and environment. Another scale used in this study was the F scale (Adorno et al. 1950; Webster et al. 1955). This scale was designed to measure authoritarianism. Other scales used in this study were designed to measure radicalism-conservatism (Comrey & Newmeyer 1965), alienation (Streuning & Richardson 1965), and religious beliefs (Glock & Stark 1966). A social distance scale was used so that attitudes toward left-handers, black, oriental, and Kuwaiti persons could be determined. Some of the items of the scales were changed slightly to reflect current language and issues, and a few items were added where appropriate. For example, the word "negro" was replaced with the word "black." Kuwait was added to the social distance scale because at the time of the study, the United States was engaged in a war with Iraq on Kuwaiti soil.

One section of the questionnaire was to be answered only by left-handed individuals. The questions were primarily qualitative in order to gain an understanding of the experiences of left-handers in a right-handed society. As in other studies (Hutchison 1973), items were included

to determine what types of equipment left-handers found difficult to use.

Prior to the administration of the questionnaire, a pre-test was conducted with an Introductory Sociology class. In addition to the pre-test results, suggestions for improvement of the questionnaire were solicited and incorporated into the final questionnaire. This resulted in a few word changes, and some of the items were removed in an effort to shorten the questionnaire.

#### Variables Investigated

##### Sex

Subjects indicated if they were male or female.

##### Age

Subjects indicated their birth date on the questionnaire. To simplify analysis, year alone was used to determine the age of subjects.

##### Family Income (INCOME)

A question on the questionnaire asked, What is your family's income per year (before taxes)? Subjects were given eight choices; (1) below 10,000, (2) 10,000-19,999, (3) 20,000-29,999, (4) 30,000-39,999, (5) 40,000-59,999, (6) 60,000-99,999, (7) 100,000 and above, (8) don't know.

#### Educational Classification (EDUC)

On the questionnaire, subjects indicated if they were a freshman, sophomore, junior, senior, or graduate student. Only students were included in the sample for analysis.

#### Grade Point Average (GPA)

Subjects indicated their grade point average. Grade point averages were divided into five categories; (1) 1.00 or less, (2) 1.01-2.00, (3) 2.01-3.00, (4) 3.01-3.49, and (5) 3.50 and higher.

#### Adoption (ADOPT)

Subjects indicated if they were adopted. Subjects responded with yes or no.

#### Writing Hand (WHAND)

Subjects were asked which hand they prefer to use when writing. Choices offered were right hand, left hand, and either hand.

#### Throwing Hand (THAND)

Subjects were asked which hand they preferred using when throwing a ball. Choices offered were right hand, left hand, and either hand.



#### Hand Using Scissors (SHAND)

Subjects were asked which hand they preferred using when cutting with scissors. Choices offered were right hand, left hand, and either hand.

#### Eye Preference (EYE)

The questionnaire asked, What is your eye preference (When taking a picture with a camera, which eye looks through the viewfinder, or which eye looks through the peephole of a door)? Choices offered were right eye, left eye, and either eye.

#### Inverted Hand Position (INVERT)

A question asked subjects if they use the inverted hand position when writing (Your hand is curled, with the pen pointing down). Subjects responded with yes or no.

#### Smear Ink on Hand (SMEAR)

Subjects were asked if they often smear ink on their hand when writing. Subjects responded with yes or no.

#### High School Attended

Subjects were asked the type of high school they attended. Responses given were public, private or both.

### Deviance

Subjects were asked, while under the age of 18, how often did you engage in the following behavior? Choices offered were (1) never, (2) one to two times, (3) three to six times, (4) seven to 10 times, and (5) 11 or more times. Types of behavior were: violate curfew (CURFEW), skip school without parent's knowledge (SKIP), shoplift, beat up or hurt someone on purpose (BEATUP), get into a fist fight (FIST), get arrested (ARREST), consume alcohol (ALCOHOL), smoke marijuana (MARIJ), use other illegal drugs (DRUGS), and seriously consider suicide (SUICIDE). Each behavior was coded one through five as outlined above. In addition, a combined score on all items was used as an indication of overall deviance while under the age of 18.

### Accidents While Driving a Vehicle (ACCIDENTS)

Previous research has indicated that left-handers have significantly more accidents while driving a vehicle than right-handers (Coren 1989). A question was included on the questionnaire in an attempt to replicate this finding. Subjects were asked to indicate the number of accidents they had within the last two years which was serious enough to require medical attention in the following categories; work-related, sports-related, driving a vehicle, with tools or machinery, in the home,

and at school. Very few subjects reported accidents in categories other than driving a vehicle. Therefore, only accidents while driving a vehicle were analyzed. Also, some respondents answered "many" instead of an exact number, so it was decided to code one or more accidents as one.

### Skills and Abilities

Subjects were asked how talented they believed they were at several skills and abilities. Responses were excellent, above average, average, below average and poor. An additional choice of unknown was offered for some items. These included mathematics, statistics, science, spelling, drawing, foreign language, musical instrument, singing, penmanship, writing, art, crochet, sewing, basketball, football, baseball, tying a tie and manual dexterity.

### Physical Characteristics

Previous studies have indicated a significant number of left-handers with certain physical or mental conditions (Betancur et al. 1990; Bakan 1973; Geschwind 1983). In the present study, subjects were given a list of physical characteristics and asked to respond if they or their relatives had the condition. One or more relatives with a condition were coded one. Each subject received a combined score of the total number of conditions for their

self (SPHYS) and their relatives (RPHYS). Physical characteristics included left-handedness, allergies, twins, stuttering, dyslexia, Type I diabetes, leukemia, asthma, eczema, schizophrenia, major depression, homosexuality, multiple sclerosis, systemic lupis, phobia, myopia, epilepsy, myasthenia gravis, alcoholism, Crohn's disease, and mental retardation.

#### Social Distance Scale

A social distance scale was used to measure attitudes toward left-handers, black, Kuwaiti, and oriental persons. Subjects were asked to circle the answer which best reflected their beliefs about each statement. Choices for response were strongly agree, somewhat agree, uncertain, somewhat disagree, and strongly disagree. Subjects responded to the statements, I believe I would be willing to have a [left-handed, black, etc.] person: live in my country, live next door to me, as an acquaintance, as a person I might often visit with, as a member of my extended family, as a close, personal friend, and as a spouse. As an acquaintance was the first statement for response to a left-handed person.

#### Left-Hander Scale

Three items on the questionnaire were designed to elicit beliefs about left-handers. These were (1) I would

like my child to be born left-handed, (2) Most left-handed people have musical talent, and (3) Left-handedness is not a handicap.

### Other Scales

Other scales were included in the questionnaire. These included personal competence, authoritarianism, radicalism-conservatism, alienation, creativity, religious beliefs, the Protestant ethic, and prejudice against international students. These scales were mentioned in the method section of this chapter. Appendix A-H detail the items for each scale which loaded at .30 or higher using factor analysis.

### Adaptability Scale

The author included several items on the questionnaire that she was interested in that were not from a previously used scale. Factor analysis was used to determine what dimensions the items measured. Appendix I lists the items by factor. Items that loaded at .30 or higher are listed. The items appear to measure a lack of adaptability.

### Qualitative Analysis

A section of the questionnaire was to be filled out only by left-handed subjects. Most of the section consisted of open-ended questions to identify their views

on left-handedness, and what problems left-handers face. Appendix J lists the questions from this section.

### Statistical Measures

Several measures of handedness or laterality have been used in previous research. These have included writing hand, throwing hand, drawing hand, foot preference, and eye preference. For this study, writing hand alone was chosen as the indicator of handedness.

The Likert type items on the questionnaire produced interval level data. Analysis of variance was used to determine if the difference in means for each variable was significant for left-handers and right-handers. The general linear models analysis of variance procedure was chosen because it allows for unequal sample sizes. Some variables, such as college major, whether the subject had been adopted or attended a private school were nominal level. Therefore, average scores were meaningless. The chi-square test was used to analyze the nominal variables. The probability level of significance chosen for this study was .05.

Principal factor analysis with orthogonal rotation was used to check that all items on the scales were consistently measuring the same dimensions. Appendix A-I lists the items that loaded high (.30 or greater) on each scale and which items were removed from analysis.

## Sample

The questionnaire was administered to students at Oklahoma State University who were enrolled in sociology classes, during a two week period in the spring of 1991. All respondents were given the opportunity to complete the questionnaire during class time. The response rate was 100%. Seventy-one percent of the respondents were enrolled in Introductory Sociology. The remaining respondents were enrolled in a Social Problems class and a Juvenile Delinquency class. To maintain consistency, only U.S. citizens were considered for the sample. Two people reported they wrote with either hand. To simplify analysis, these two subjects were deleted from the study. The original sample produced 356 usable questionnaires (N=362). Eighty-nine percent of the remaining respondents reported they wrote with the right hand. Eleven percent of the respondents reported writing with the left hand. Because larger sample sizes produce more valid results, the decision was made to solicit more left-handers to increase the sample size. An advertisement was placed in the local campus newspaper on two occasions during the summer of 1991, soliciting students to participate in a research project. The students were asked to go to a particular location to complete a survey, at any time during certain hours on May 1 or June 20, 1991. Notices were also placed on bulletin boards in residence halls and the student union. In addition, the author visited

Introductory Psychology and History classes to solicit volunteers. The resulting sample consisted of 71 left-handers, increasing the proportion of the sample from 11 to 18 percent.



## CHAPTER VI

### MAJOR FINDINGS

#### Characteristics of the Sample

As stated previously, a questionnaire was given to Oklahoma State University students enrolled in sociology classes during the spring of 1991. To increase the sample size, left-handed students were solicited on two separate occasions during the summer of 1991. Because the sampling method varied for left-handers, the three groups were compared with the right-handed group on demographic characteristics using the general linear models procedure for analysis of variance. Table I gives a comparison of the four groups on the means for (EDUC) and (AGE), and age ranges. Group LH1 was the original left-hander group that completed the questionnaire during class time, spring of 1991. Group LH2 were the left-handers who answered the advertisement and completed the questionnaire May 1, 1991. Group LH3 were left-handers who completed the questionnaire June 20, 1991. Group RH were the right-handers who completed the questionnaire during class time, spring of 1991. There was no significant difference among the four groups in sex,  $F(3,382) = 0.76, p < .51$ . There was a significant difference in the mean age of each of the

TABLE I  
MEANS AND AGE RANGE FOR SAMPLE GROUPS

	N	MEANS EDUC	AGE	AGE RANGE
Group LH1	39	2.00	21.89	19-43
Group LH2	18	2.39	22.12	19-31
Group LH3	14	3.64	31.07	16-46
Group RH	315	1.72	20.51	19-41

Group LH1 - Original left-hander group, spring 1991  
 Group LH2 - Left-handers who answered advertisement  
 May 1, 1991  
 Group LH3 - Left-handers who answered advertisement  
 June 20, 1991  
 Group RH - Right-handers, spring 1991

four groups,  $F(3,376) = 45.18, p < .0001$ . The variable (AGE) also accounted for 26 percent of the variance in the sample. Duncan's multiple range test showed that Group LH3 was significantly different and older than the other three groups.

Educational classification (EDUC) was significantly different among the groups,  $F(3,382) = 18.40, p < .0001$ . This variable accounted for 13 percent of the variance found in the sample. Duncan's test showed that Group LH3 was significantly different from other left-handers and right-handers on educational classification, indicating Group LH3 contained more subjects who were further along in their education. In addition, the right-handed group (RH) was significantly different from Group LH2, indicating Group RH contained more students who were freshmen.

Pearson's product moment correlation was used to determine if age and classification were related. A significant relationship was found between EDUC and AGE for the total sample,  $r = .51, p < .0001$ . Therefore, the effects of educational classification and age were considered in the analysis. Because the proportion of left-handers to right-handers was small, significant findings were reevaluated without the third group of left-handers (LH3) to determine if the characteristics of this group had a significant effect on the total sample.

### Measure of Laterality

As noted in the review of the literature on handedness, measures of left-handedness, or laterality, have varied among researchers. Therefore, several indicators of handedness were included on the questionnaire. Subjects were asked which hand they prefer to use when writing (WHAND), throwing a ball (THAND), and cutting with scissors (SHAND). Eye preference (EYE) and inverted hand posture (INVERT) were also included. The three hand use questions (WHAND, THAND, AND SHAND) were correlated using the Pearson product moment correlation as a measure of association. The correlation coefficient for WHAND with THAND was .53. The correlation coefficient for WHAND with SHAND was .49, and for THAND with SHAND was .47. All were significant ( $p < .0001$ ), indicating use of the left hand for one task is related to use of the left hand for another task. Interestingly, when subjects were divided by sampling groups (ie., LH1, LH2, LH3, RH), correlation analysis yielded different results. Correlation coefficients remained significant only for Group RH. Among right-handers, 95.5 percent of the sample wrote with the right hand, threw with the right hand and cut with scissors using the right hand. In contrast, only 36.6 percent of the left-handers use the left hand for all three tasks. Twenty-seven percent of the left-handers wrote with the left hand but use the right hand for other tasks. This would indicate that the left-handed

participants are much more diverse and ambidextrous than the right-handers.

## Analysis

### Chi-Square Results

Sex. There was no significant difference in the proportion of males and females among right- and left-handed subjects,  $X^2(1, N = 386) = 0.86, p < .36$ . This finding does not coincide with most research which has reported that two-thirds of left-handers are male (Ponte 1988). However, the proportion of left-handers who were male (39.44 percent) was slightly higher than the proportion of right-handers who were male (33.65 percent).

Grade Point Average. The results indicate no significant difference between right- and left-handers on grade point average,  $X^2(1, N = 386) = 2.86, p < .58$ .

Adoption. A significant difference was found in the proportion of right- and left-handed subjects who were adopted,  $X^2(1, N = 386) = 8.24, p < .004$ . Of those who were adopted ( $N = 12$ ), 50 percent were left-handed. The effects of the third group of left-handers (LH3) were controlled, to determine if significant differences remained. Differences between right- and left-handers on adoption remained significant,  $X^2(1, N = 372), p < .03$ .

High School Attended. A significant difference between right- and left-handers was found for type of high school attended,  $X^2(2, N = 378) = 6.09, p < .05$ . It is possible that factors such as adoption or income may be related to this variable.

#### Analysis of Variance Results

Accidents While Driving a Vehicle. No significant difference was found among right- and left-handers in the mean number of accidents while driving a vehicle,  $F(1,384) = 0.97, p < .33$ . Coren's (1989) finding was not replicated.

Deviance. No difference was found in the mean number of deviant acts committed by right- and left-handers with one exception. There was a significant difference for SUICIDE,  $F(1,382) = 6.86, p < .009$ . Left-handers were more likely to seriously consider suicide than right-handers.

Skills and Abilities. A significant difference was found for foreign language ability,  $F(1,381) = 4.46, p < .04$ . Duncan's test indicated left-handers perceived themselves as having greater ability in a foreign language than right-handers. Difference in perception of ability in art was also significant,  $F(1,383) = 6.68, p < .01$ , indicating a left-handed perception of greater ability. Drawing ability was significant,  $F(1,381) = 5.28, p < .02$ . However, when the effects of LH3 were controlled, drawing ability lost its significance,  $p < .12$ . A significant

TABLE II  
HIGH SCHOOL ATTENDED BY HANDEDNESS

HIGH SCHOOL	RIGHT-HANDED	LEFT-HANDED	TOTAL
PUBLIC	288 ( 93.20%)	61 ( 88.41%)	349 ( 92.33%)
PRIVATE	19 ( 6.15 )	5 ( 7.25 )	24 ( 6.35 )
BOTH	2 ( 0.65 )	3 ( 4.35 )	5 ( 1.32 )
TOTAL	309 (100.00 )	69 (100.00 )	378 (100.00 )

difference between right- and left-handers was also found for manual dexterity,  $F(1,379) = 5.42, p < .02$ . When the effects of LH3 were controlled, the probability level changed to .057. None of the other abilities showed significant differences.

Physical Characteristics. A significant difference was found for allergies among right- and left-handed subjects,  $F(1,382) = 7.22, p < .003$ , indicating more allergies among left-handers. A significant number of left-handers reported being a twin,  $F(1,382) = 7.04, p < .008$ . In addition, a significant difference was found for major depression,  $F(1,382) = 5.58, p < .019$ , indicating left-handers are more likely to have this characteristic. It is also interesting to note that only two respondents indicated they were homosexual and homosexuality was significantly different for right- and left-handers,  $F(1,382) = 4.53, p < .03$ . Previous research has indicated a disproportionate number of left-handers among homosexuals (McCormick et al. 1990; Lindesay 1987).

Among physical characteristics of relatives reported, epilepsy was significantly related to handedness,  $F(1,382) = 4.60, p < .03$  in the direction of left-handedness. Multiple sclerosis was also significant,  $F(1,382) = 4.60, p < .03$ , as was myasthenia gravis,  $F(1,382) = 4.53, p < .03$ , indicating left-handers were more likely to have these physical characteristics. The effects of LH3 were



controlled, but the difference between right- and left-handers on myasthenia gravis among relatives was no longer significant.

Handedness was not a significant factor for stuttering, dyslexia, diabetes mellitus, leukemia, asthma, eczema, rheumatoid arthritis, myopia or schizophrenia. It must also be recognized that self-reported physical conditions have been found to be inaccurate and unreliable as a measure of actual conditions. In addition, the number of subjects who reported incidence of a characteristic was very small. Therefore, these findings are somewhat speculative.

Scale A: Personal Competence. No significant differences were found between right- and left-handers on personal competence,  $F(1, 379) = 0.47, p < .49$ .

Scale B: Authoritarianism. No significant differences were found between right- and left-handers on authoritarianism,  $F(1, 375) = 0.73, p < .39$ .

Scale C: Radicalism-Conservatism. No significant differences were found between right- and left-handers on a measure of radicalism-conservatism,  $F(1, 375) = 0.32, p < .57$ .

Scale D: Alienation. Alienation was not significantly different among right- and left-handers,  $F(1, 382) = 1.04, p < .31$ .

Scale E: Creativity. Differences in creativity were found between right- and left-handers,  $F(1, 373) = 4.92$ ,  $p < .03$ . Duncan indicated left-handers to be more creative than right-handers. When the effects of LH3 were controlled, the relationship was not significant,  $F(1, 359) = 1.53$ ,  $p < .22$ .

Scale F: Religious Beliefs. Religious beliefs were not significantly different for right- and left-handers,  $F(1, 382) = 0.92$ ,  $p < .34$ .

Scale G: Protestant Ethic. Beliefs related to the Protestant ethic were not significantly different for right- and left-handers,  $F(1, 382) = 1.32$ ,  $p < .25$ .

Scale H: Prejudice Toward International Students. This variable was found to be not significant among right- and left-handers,  $F(1, 380) = 1.49$ ,  $p < .22$ .

Scale I: Adaptability. Results showed no significant differences on this scale for right- and left-handers,  $F(1, 382) = 2.14$ ,  $p < .14$ . Interestingly, when the effects of LH3 were controlled, a significant difference was found,  $F(1, 360) = 4.23$ ,  $p < .04$ .

Left-Hander Scale. A significant difference for right- and left-handers was found on this scale,  $F(1, 378) = 70.34$ ,  $p < .0001$ . Results indicate that left-handers

agreed significantly more with the three statements than right-handers.

### Qualitative Analysis

Subjects were asked if their parents discouraged their left-handedness at any time. The majority (79 percent) of the subjects were not discouraged from using their left hand. The lack of discouragement was mediated in a few cases by a left-handed parent. One subject wrote that her mother had been left-handed and was forced by her grandmother to use her right hand. The grandmother believed left-handedness was a sign of mental retardation. Another subject's father was left-handed and was forced to use his right hand when he was a child. One subject responded, "My dad was left-handed so he encouraged me to use my left hand." One subject mentioned "they believed it was a special characteristic and encouraged it."

Twelve percent reported that their parents discouraged their left-handedness. One subject wrote, "[my parents] would force me to use [my] right hand when eating by sitting too close to my left arm." Another remarked, "at age six, my father attempted to make me use my right hand. . . . told me life would be very difficult as a left-hander. [The] world was designed right-handed."

Nine percent of the respondents indicated a teacher had discouraged their left-handedness. One subject wrote, "Teachers always put the pen in my right hand. I couldn't

cut for a long time. . . . They finally decided I was left-handed and gave me left-handed scissors, but I put them in my right hand." Another subject wrote, " They [parents] bought me left-handed scissors when I was young, but when I was in school I had to use right-handed scissors."

Subjects were asked how other members of the family reacted to their left-handedness. Several subjects mentioned they always sat at the end of the table for meals so as "not to bump elbows with right-handed" family members. Two subjects remarked they were the only "oddball". One subject wrote, "they thought when I would eat with my left hand it was funny."

Almost all subjects acknowledged that they had been called lefty or southpaw. Some said strangers called them by these names. But the overwhelming response was "it didn't bother me." Several mentioned that the nicknames were in fun and not malicious; ". . . it was usually relatives, just teasing me (in a nice way)." Only two responses showed any criticism of nicknames:

"I was sometimes made fun of in grade school, not since then as far as I can remember. It made me angry and embarrassed."

"When I was little my classmates would call me lefty, it never really upset me that much, but it made me feel a little bit different than all my friends."

Some said it made them feel special and "unique." One subject wrote it made him "very proud." Another subject wrote about his baseball coach, "It made me feel good, some of the other kids didn't get a nickname."

Subjects were asked if they ever wished they were right-handed. Seventy-two percent responded they had never wanted to be right-handed. One subject wrote, "It's an honor to be left-handed." Another subject wrote, "[I] never wanted to be like everyone else." One subject responded, "I feel kind of special because I'm left-handed and not like most of the population."

Twenty-eight percent of the sample mentioned they had thought about being right-handed when faced with right-handed tools and equipment. Several used the word "only" as a conditional reason. One subject wrote, "only when I wish my handwriting was better." Another subject wrote, "I hate when the ink on my paper smears or gets on my hand. I also hate the desks here at OSU because most of them are right-handed." Other subjects also mentioned the right-handed desks. One subject wrote, "I hate walking into a classroom and the desktops are for right-handed people only." One person mentioned they wished they were right-handed in elementary school "like first grade, because I was practically the only left-handed person in my class."

Some subjects mentioned they had been teased or ridiculed for being left-handed. One person had attended

a Catholic elementary school and was smacked on the hand if she attempted to write with the left hand. Two subjects mentioned they were allowed to write with the left hand in school, but were not allowed to turn the paper the other direction. One subject witnessed a teacher tell the class left-handers did not have as large a brain as right-handers, which was directed at the subject. The subject reportedly became angry and walked out of the classroom. Another subject found reading articles and books about left-handedness to be insulting. He wrote, "I've felt like I'm from another planet."

Most responded that people were just joking and did not take the teasing seriously. As they said, "it's all in fun" or "all in humor." Sixty percent responded they had not been teased.

Subjects were asked if they had ever been discriminated against because of their handedness. No subjects reported any discrimination. Three subjects reported they were able to adapt to whatever difficulties with right-handed equipment they experienced. One subject adapted by using his right hand to run a cash register.

Subjects were asked to recall something they had an especially difficult time learning to do. Most often mentioned were learning to tie shoes and cut with scissors. A few subjects mentioned tying a necktie as a problem and learning to write.

A section of the questionnaire listed items and equipment. Subjects were asked to check all the items they had found to be difficult to use because of their left-handedness. Table III shows the percentage of respondents who found a particular item difficult to use, and other items that were mentioned. Seventy-seven percent of the subjects found desks of school chairs to cause problems for them. Sixty percent found scissors to be difficult to use. As mentioned previously, learning to cut with scissors was difficult for many subjects. Fifty-two percent found a clothes iron cord to cause difficulty, and forty-two percent found the provided pen at a bank or store to be annoying.

Summary. The majority of left-handed subjects were not discouraged from using their left hand. The discouragement that did occur for a few subjects appeared to be short-lived. Once parents realized the child was not going to be right-handed, they accepted it. However, twelve percent of respondents were discouraged by a parent, and nine percent were discouraged by a teacher.

Most of the subjects had been called lefty or southpaw. All seemed to accept it. Subjects were quick to add that the intent of the namecallers was humorous and

TABLE III

## EQUIPMENT THAT CAUSED DIFFICULTY FOR LEFT-HANDED SUBJECTS

EQUIPMENT	PERCENTAGE
Desks of School Chairs	76.71%
Scissors	60.27
Clothes Iron Cord	52.05
Pen at a Bank or Store	42.47
Can Opener	34.25
Pencil Sharpener	26.03
Watch Winding Mechanism	24.66
Fishing Reel	23.29
Measuring Cup	19.18
Necktie	17.81
Adding Machine	16.44
Butter Knife	16.44
Microscope	16.44
Ashtray/Radio of Auto	13.70
Musical Instruments	13.70
Camera	12.33
Screw Lids of Jars	12.33
Screws and Nuts	12.33
Drafting Tools	9.59
Typewriter	9.59
Ignition and Shift/Auto	8.22
Refrigerator Door	5.48
Corkscrew	4.11
Wall switches	4.11
Computer	0.00

Other items mentioned:

Spiral Notebooks, Ladles and Scoops,

Booths at Restaurants, and Rifles.



not negative. Some subjects felt special and unique because of the label.

The left-handed subjects found several items to be problematic. The most often mentioned problem were school desks. Although several tools and equipment were mentioned, left-handers seemed to adapt to the situation. They experienced difficulties and annoyances, but were willing to accept these challenges.

## CHAPTER VII

### CONCLUSIONS

The purpose of this study was to apply sociological knowledge and to stimulate further research in the field of handedness. The primary objectives were:

1. To identify and explain current societal responses to left-handed people.
2. To identify the impacts and consequences of societal evaluations on left-handed people.
3. To identify any problems left-handers face due to their handedness, and their methods of adaptation to such difficulties.
4. To determine if left-handed people are significantly different from right-handed people on characteristics other than handedness (e.g. demographic, biological, and attitudinal).

To satisfy the first objective, a social distance scale was used to determine right- and left-handers' views about left-handed people. There was no significant difference between right- and left-handers on this measure. Right- and left-handers were equally willing to associate with other left-handed people. The left-hander scale was another measure of attitudes about left-

handedness. There was a significant difference between right- and left-handers, indicating left-handers were less likely to believe left-handedness was a handicap. Left-handers were also more likely to believe that most left-handers have musical talent. However, right-handed subjects did not show any negative attitudes toward left-handedness.

Based on these findings, it would appear that previous negative attitudes about left-handedness have dissipated. Attitudes about left-handedness are neutral or positive. In addition, left-handers view left-handedness more positively than right-handers.

The second objective was to determine the impacts of societal evaluations on left-handed people. The qualitative analysis of left-handers' responses indicate that most left-handers have not experienced negative treatment due to their handedness. In fact, for many subjects left-handedness contributed to a positive self image. But some of the subjects mentioned that someone had tried to discourage their left-handedness, usually when the subject was young. Although students do not have a negative impression of left-handedness, when faced with a left-handed child, the reaction may be different. Attitudes about left-handedness may not have caught up with behavior, especially for parental behavior.

Several scales were used to determine if left-handers are different from right-handers in other ways that had

not been previously investigated. The scale for creativity was significant when the three left-hander groups were combined. Creativity was not significantly different for right- and left-handers when LH3 was removed. This may indicate that creativity varies for older left-handers because group LH3 was significantly older than the other groups. In contrast, the adaptability scale was significant only when LH3 was removed. A high score on this scale would indicate a lack of adaptability. Age or age cohort effects may be a factor influencing the relationship between handedness and creativity.

The third objective of this thesis was to identify any problems left-handers face due to their handedness, and their methods of adaptation to such difficulties. Most left-handed subjects reported experiencing difficulty with tools and equipment. The most problematic for many people were school desks. This problem became especially difficult when they reached college. Several subjects also mentioned difficulty learning basic skills, such as tying shoes, writing and cutting with scissors.

Coren's finding (1989) that left-handers had more accidents while driving a vehicle was not replicated. In addition, the present study did not find a significant number of left-handers and their relatives with schizophrenia and other autoimmune diseases as past research has suggested. However, more allergies were

found among left-handed subjects. But as indicated previously, the self-report method and rarity of conditions present in the sample call for further analysis before final conclusions can be made.

Left- and right-handers were compared on several attitudinal scales which had not been previously investigated in the area of handedness. No significant differences were found for personal competence, authoritarianism, radicalism-conservatism, alienation, religious beliefs, or prejudice toward international students. This finding in itself is worth mentioning as so many studies on handedness emphasize unacceptable behavior.

#### Summary

Results of this study indicate that left-handedness is not overtly sanctioned today among college students. In comparison to historical data, it appears that a shift in attitudes has occurred. The label "left-handed" no longer carries the significance it once did, nor is it associated with negative qualities. Nevertheless, behavior has not completely caught up with new attitudes. Most left-handed subjects reported frustration with some tools and equipment such as desks of school chairs and scissors, and a few mentioned that they had negative experiences as children, trying to learn basic skills. Some of the subjects reported being discouraged from using

their left hand by parents and teachers. Others mentioned that family members thought it "odd" or "funny".

Previously it was postulated that the process of socialization may be different and more difficult for left-handers. Without many role models, left-handers must learn things by themselves and adapt in ways that right-handers are never asked to do. Qualitative analysis of left-handers' responses indicate agreement with this hypothesis. Several people mentioned a behavior that was difficult to learn when the subject was young, including tying shoelaces, cutting with scissors and learning to write. Many subjects reported having difficulty with tools and equipment as adults. The author reasoned that impediments to socialization would make left-handers more unusual and nonconforming members of society, resulting in positive and negative extremes of behavior. One would expect a reversed normal curve, with more left-handers at both ends of the continuum.

With the present sample, results are inconclusive. Grade point average was examined for differences in right- and left-handers, and no significant differences were found. Also, most of the deviance items were not significantly different for right- and left-handers. However, consideration of suicide was significant, indicating left-handers to be more likely to consider suicide. Tentatively, the sample indicates that left-handers were more likely to be homosexual or suffer from

major depression. One must also take into consideration that a sample of college students would necessarily eliminate many people at the bottom of the continuum who did not attend college. Likewise, students who were exceptionally gifted probably would not be attending a state college.

In addition, the creativity scale and the adaptability scale showed significant differences between right- and left-handed subjects. The two scales would appear to oppose each other, and yet they were both significant. This finding may also reflect the shift in attitudes, causing different results for older left-handers.

Future research could more thoroughly investigate the hypothesis that the socialization process is different for right- and left-handers, resulting in extremes of behavior among left-handers. Current views are that people learn initially through imitation. As stated previously, left-handers have to visually reverse enacted behavior before they can accomplish the same task requiring use of the dominant hand. This additional step in the process could result in an unusual ability to adapt to situations or a rejection of established norms.

Robert Merton analyzed the relationship between socially acceptable means and socially acceptable goals, and developed a typology of adaptation (Landis 1989). Merton's types were the conformist, the innovator, the

ritualist, the retreatist and the rebel. The conformist uses acceptable means to achieve acceptable goals, whereas the innovator uses unacceptable means to achieve the same goals. The ritualist has lost sight of the goal, but still maintains the illusion that he/she is working toward it. In contrast, the retreatist gives up and does not attempt to achieve socially acceptable goals, whereas the rebel chooses new goals and means to achieve them.

Merton's theory seems especially appropriate for an analysis of left-handedness. It would be interesting to determine if left-handers are indeed less likely to be conformists, or if their methods of adaptation are significantly different from right-handers' methods.

The effects of socialization could be further investigated by interviewing children in the first grade to determine if left-handedness is a factor in the process of socialization. Parents of the children could be interviewed to discover their reactions to left-handedness. One could compare their behavior to reported experiences of college students to monitor changes in behavior as well as attitudes.

Left-handedness research could also be related to minority and handicapped studies. In the present study, subjects mentioned that family members felt they needed to accommodate left-handers by placing them at the corner of the dinner table. The label of left-handed may be similar



to the label of handicapped, and affect the individual in the same manner.

In the present study it is apparent that a shift in attitudes of left-handedness has occurred. An investigation into possible causes of this change are warranted. Left-handers are not a unified group, nor do they consider a right-handed world significant enough to start a social movement, and yet social change has occurred. Hertz' theory may be a starting point for an explanation. He hypothesized that attitudes toward the left were an outcome of religious beliefs. Human beings stratify characteristics into the sacred and profane as a means for social solidarity. As an extension of structural-functionalist theory, society has become increasingly more technological, from organic to mechanical solidarity. Increasingly we rely on mental rather than physical labor. With this change, handedness becomes less important. An analysis of other historical changes may help explain why left-handedness is no longer a stigmatizing characteristic.

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## APPENDIXES

## APPENDIX A

### SCALE A: PERSONAL COMPETENCE

#### FACTOR 1:

1. I seem to be the kind of person that has more bad luck than good luck.
2. I always feel pretty sure of myself, even when people disagree with me.\*
3. I worry a lot about what others think of me.

#### FACTOR 2:

1. I seem to be the kind of person that has more bad luck than good luck.
4. I'm not the kind of person to plan ahead.
5. I usually finish things I have started.\*

#### FACTOR 3:

1. I seem to be the kind of person that has more bad luck than good luck.
6. I would rather give orders than have others tell me what to do. (Negative loading)\*\*
2. I always feel pretty sure of myself, even when people disagree with me.\*

\* Reverse score.

\*\* Removed from analysis.

## APPENDIX B

### SCALE B: AUTHORITARIANISM

#### FACTOR 1:

1. I have often had to take orders from someone who knew less than I did.
2. I feel that I have often been punished without cause.
3. Teachers often expect too much from students.
4. My parents have often disapproved of my friends.

#### FACTOR 2:

5. I set a high standard for myself, and I feel others should do the same.
6. I think I am stricter about right and wrong than most people.
7. I am a perfectionist.
8. You'd be surprised at some of the immoral things people are doing these days.

#### FACTOR 3:

9. Once I have my mind made up, I seldom change it.
10. Obedience and respect are the most important things parents can teach children.
11. I feel sure that there is only one true religion.
12. Teachers often expect too much work from students.

## APPENDIX B (CONTINUED)

FACTOR 4:

13. It's important to know people in the right places in case you need a favor later on.
14. A person should try to fit in at all times.
10. Obedience and respect are the most important things parents can teach children.

FACTOR 5:

15. One of my aims in life is to accomplish something that would make my mother proud.\*\*
9. Once I have my mind made up, I seldom change it.  
(Negative loading)
1. I have often had to take orders from someone who knew less than I did.
16. I like to poke fun at people.\*\*

FACTOR 6:

17. Politically, I am somewhat of a radical.\*\*
18. Even the idea of giving a speech in public scares me.\*\*

\*\* Removed from analysis.

## APPENDIX C

### SCALE C: RADICALISM-CONSERVATISM

#### FACTOR 1:

1. People of different races should not be allowed to marry.
2. Patriotism is one of the greatest virtues.
3. If the homeless really wanted to, they could go out and find a job.
4. Execution of criminals is never warranted.\*
5. Instead of helping those in Africa, we should take care of the needy at home. (Negative loading)
6. Homosexual behavior is immoral.

#### FACTOR 2:

7. Too much violence in movies should be outlawed.
8. This country would be better off if religion had a greater influence on people.
9. Abortion should be illegal.
6. Homosexual behavior is immoral.

#### FACTOR 3:

10. The government should guarantee every person some kind of job.\*

## APPENDIX C (CONTINUED)

11. The government should guarantee every citizen enough to eat.\*

FACTOR 4:

12. Government control of business is bad for the economy.
13. The federal government has too much power over its citizens.

\* Reverse score.



APPENDIX D

SCALE D: ALIENATION

FACTOR 1:

1. Too many people are just out for themselves.
2. A lot of people don't know what to do with their lives.
3. Few people really enjoy their work.

FACTOR 2:

4. Nobody understands how I really feel.
5. When I was a teenager, I often thought about leaving home.

## APPENDIX E

### SCALE E: CREATIVITY

#### FACTOR 1:

1. I would enjoy working or living in a foreign country.
2. I would rather be a physician than an explorer.\*
3. I sometimes get a kick out of breaking the rules and trying something different.
4. I consider myself creative.
5. I don't like things to be uncertain or unpredictable.\*

#### FACTOR 2:

6. I would rather have a few close relationships than many casual relationships.\*\*
7. Straightforward reasoning appeals to me more than metaphors or analogies.\*
8. It's important for me to have a place for everything, and everything in it's place.\*

#### FACTOR 3:

9. Often I get overly enthusiastic or passionate.
3. I sometimes get a kick out of breaking the rules and trying something different.

## APPENDIX E (CONTINUED)

10. I remember faces much better than I remember names.

\* Reverse score.

\*\* Removed from analysis.

## APPENDIX F

### SCALE F: RELIGIOUS BELIEFS

#### FACTOR 1:

1. The bible should be translated literally.
2. God does not exist.\*
3. The devil actually exists.
4. The miracles of the bible actually happened.

\* Reverse score.

## APPENDIX G

### SCALE G: PROTESTANT ETHIC

#### FACTOR 1:

1. Doing good for others is necessary for salvation.
2. It's important to save money.
3. If a person works hard enough, (s)he's bound to be successful.

#### FACTOR 2:

4. I can't understand people who just waste time.
3. If a person works hard enough, (s)he's bound to be successful.
5. It's un-American to be lazy.

## APPENDIX H

### SCALE H: PREJUDICE TOWARD INTERNATIONAL STUDENTS

#### FACTOR 1:

1. People from the Middle East have many of the same characteristics as Americans.
2. If international students wanted to make friends with us, they'd try.\*

\* Reverse score.

## APPENDIX I

### SCALE I: ADAPTABILITY

#### FACTOR 1:

1. I have trouble thinking of several things at once.
2. I have a hard time talking to strangers.
3. I have a vivid imagination. (Negative loading)\*\*

#### FACTOR 2:

4. I worry about things that are really unimportant.
5. I tend to analyze things.

#### FACTOR 3:

3. I have a vivid imagination. (Negative loading)\*\*
6. I make a lot of lists of things I need to do.

#### Factor 4:

7. I often get my best ideas when I lay down for the night\*\*.
3. I have a vivid imagination\*\*.

\*\* Removed from analysis.

## APPENDIX J

### QUALITATIVE ANALYSIS

1. Did your parents encourage you to use your right hand at any time, or discourage your left-handedness? Explain.
2. How did other members of your family react to your left-handedness?
3. Were you ever called lefty, southpaw, etc.? By whom? How did it make you feel?
4. Did you ever wish you were right-handed? Explain.
5. How many left-handed people do you know (friends or acquaintances)?
6. Do you have any close friends who are left-handed? How many?
7. How close do you feel towards others who are left-handed?
  - (1) very close           (4) not too close
  - (2) somewhat close   (5) not close at all
  - (3) indifferent
8. Would you say you can identify or relate to others who are left-handed?
  - (1) a lot                   (3) not much
  - (2) somewhat           (4) not at all



## APPENDIX J (CONTINUED)

9. Have you ever been teased or ridiculed in any way because of your left-handedness? Explain. If so, how did you cope with this?
10. Try to remember when you learned basic skills, like tying your shoes, writing, cutting with scissors, and tying a necktie. Can you remember if you had an especially difficult time learning to do something? If so, briefly describe the situation(s).
11. Have you ever been discriminated against because of your left-handedness? For instance, were you ever turned down for a job or a specific duty like running a cash register or machinery? Explain briefly.
12. Have you had any difficulty or frustration with the following items, equipment or tools because they are made for right-handed users? Check all that apply.

scissors	fishing reel
tying a necktie	screws and nuts
manual can opener	pen at a bank or store
microscope	desks of school chairs
pencil sharpener	location of wall switches
drafting tools	watch winding mechanism
camera	ignition/shift of autos
adding machine	measuring cup
refrigerator door	location of ashtray/radio
computer	butter knife
typewriter	clothes iron cord
corkscrew	screw lids of jars
musical instrument	other item(s)

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