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### An Attempt to Determine the Effects of Lateral Dominance on Reading Ability

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AN ATTEMPT TO DETERMINE THE EFFECTS OF LATERAL DOMINANCE  
ON READING ABILITY

A Problem Submitted to the Department of Education in Partial  
Fulfillment of the Requirements for the  
Course in Research Problems 390b

By  
Bernice J. Bloomberg

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Pittsburg, Kansas  
July, 1956

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## FOREWORD

Recently published books and articles in leading magazines have raised challenging questions concerning our children and their reading ability. Much adverse criticism toward the teacher has been the result of the general public reading these articles. Teachers, too, are vitally concerned with this particular area and are striving to solve this dilemma. Therefore, this research was the outgrowth of an interest regarding the relationship between cerebral dominance and reading disability.

Part one is a documentary review of all current published literature in the last five years available in Porter Library, Kansas State Teachers College, Pittsburg.

Part two is a case study of Johnny, a ten-year old white male, who had a reading difficulty attributed to an interference in laterality of function.

Part three consists of a battery of tests in an attempt to determine how influential cerebral dominance and laterality of function were with respect to reading ability.

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PART I

SURVEY OF RECENT PUBLISHED RESEARCH AND DISCUSSION TO  
DETERMINE THE EFFECTS OF LATERAL DOMINANCE  
ON READING ABILITY

## INTRODUCTION

### Statement of the Problem

The problem is to survey the available recent research and discussion to determine the effects of lateral dominance on how well our children read. This is a problem of conflicting concepts, a controversial issue which both sides have presented for over twenty-five years, the possible relationship between cerebral dominance and laterality of function.

### Purpose of the Study

The purpose of this study is for the writer to attempt to review all material, pertinent to the importance of laterality in improving children's reading ability, to be found in current literature, preferably of the last five years. Interest in this problem has been shared by many teachers in the past and is currently shown by those who seek a possible answer to some of their reading problems in the intermediate as well as in the primary grades. Therefore, it is the writer's intent to satisfy a desire to find to what extent, if any, lateral dominance does affect reading ability.

### Methods of Research

The documentary research method was used in this problem. This consists of selecting and gathering material which

must be classified, evaluated, and analyzed in the light of the writer's purpose in making his study. "If the categories are poorly set up, his results may be entirely misleading" (3-373) and his problem unsatisfactory and unfruitful in the light of his purpose. This type of research is useful when a person has a practical problem to solve since it supplies information over a wide area and the methods of gathering data may be utilized by other research methods.

#### Limitations of the Study

The discussion will be confined to material gathered from current textbooks and periodicals. This survey does not claim to have included all available or written material either published or unpublished in the last five years but only the material available at this time.

#### PATHOLOGY OF THE RELATION BETWEEN SIDEDNESS AND BRAIN FUNCTIONING

The popular theory, or explanation, of laterality according to Hildreth is: "The neurological condition due to asymmetrical functioning of the two hemispheres, one hemisphere playing the dominant role in determining sidedness." (5-258) Then, according to this theory, handedness, or eyedness, et cetera is due to the dominance of either the left or the right cerebral hemisphere.

Hildreth continues:

In the normal cerebrum the two bilateral asymmetrical hemispheres are connected by nerves to the limbs of the opposite sides of the body. The nerves are crossed, those of the left hemisphere passing to the right side of the body and visaversa. The retina of the eye is connected by both crossed and uncrossed nerve fibers. (5-258)

"Proponents of the cerebral theory claim only functional differences in the cerebral hemispheres, not structural or biochemical differences, because of their failure to detect any structural differences that are marked enough to account for dominance." (50259)

All agree that manual skills and language function independently of one another and have separate but connected centers in the hemispheres. Thus, the centers of a right-handed person will be found in left dominant cerebral hemisphere.

Dominance should be well established by school age, but just when this phenomenon occurs, various authors disagree. Various studies agree that at certain stages of a child's development bilaterality does exist and that alternating unilateral behavior is part of a growth pattern. Martin states in his study that "many people have changed the handedness of their children by education, though of course they could not change the physiological basis in hemisphere dominance. These hemispheric 'changelings' often become stutterers and develop other defects of speech, reading, and writing." (8-529)

Hildreth in her study goes on to say that "Speech and manual habits are simultaneously conditioned. While a child is learning he will fumble not only with his hands but with his speech. Tension arises when there is interference with established motor habits and it is this tension which is revealed in stuttering." (4-44) Martin found in his study that "the rate at which dextrality is acquired seems to be correlated with intelligence; the bright child becomes right sided earlier than the dull one." (8-528)

"Laterality," according to Köpel and Witty, "or sidedness, or dominance, has two primary aspects: the manual and the ocular." (12-243) The former, it is generally agreed, occurs in right hemisphere in about six percent of the population and is twice as prevalent among boys as girls. The latter is more common than left-handedness.

According to Hildreth, "The two halves of the retina are represented by both cerebral hemispheres, so that impulses from each are intermingled with those from the corresponding half of the other retina. (5-261) ...To all intents and purposes the two eyes function as one." (5-258) "No relationship has been established between visual acuity and dominant eyedness. Eyedness is primarily a matter of motor control." (5-271)

Ocular dominance seems to be established in early childhood and normally corresponds to the individual's sidedness and lateral dominance in general, and tends to persist unless



the sighting eye becomes incapacitated. Generally speaking, the hand nearer the sighting eye becomes more important functionally for the hands are dependent upon the vision for accurate movement.

The only conclusive proof to the theory of "lateral dominance" has been the case studies of patients who suffer from a cerebral hemorrhage, aphasia, or similar afflictions. Aphasia which is the interference of language functions, speech, reading, and writing, rarely occurs from right sided lesions. Thus, handedness must be closely tied up with the speech function. These studies have produced conflicting results and have added to the general confusion so that Hildreth concludes that "although automatically and structurally there is a high degree of localization, functionally the brain operates as a unit. It is an organization rather than certain areas that are upset by lesions." (5-261)

#### THE STUDY OF THE PERTINENT MATERIAL AS RELATED TO READING SKILLS AND ABILITIES

"Reading is essentially a motor skill and is subject to the same neuro-muscular controls that govern all motor processes." (4-56) Therefore, reading is a process of interpreting what someone else has written and of obtaining accurate meanings from a printed page. Thus, it is a form of symbolical language closely related to oral speech. In all

discussions of reading disability and associated with the names of Dearborn, Orton, and others, is the assumption that language disabilities are the result of left-handedness, left-eyedness, mixed cerebral dominance or lack of dominance and other similar conditions. "Reading problems are related to lateral dominance in several ways," states Hildreth. (5-220)

First, as a perceptual process involving spatial orientation, and second, because of the linkage with oral speech. ...Mirror writing, when explained in terms of cerebral dominance, is the result of two images in conflict each registered in the two hemispheres that are opposite in orientation, one an inversion of the other. Thus when the image associated with left dominance is preeminent, mirroring occurs. (4-75)

Most case workers have found that children with a strong consistent right dominance rarely have any reading disability. However, reading disabilities do occur to a certain degree in mixed eye hand dominance cases which are often associated with emotional instability, attitudes of resentment, inferiority, and apathy. Thus, an abrupt change of handedness or when strong dominance has never been established along with an emotional problem often causes a child to experience difficulty in reading.

#### SIGNIFICANT RELATED STUDIES

For the last five years, studies or discussions have been made of the relationship of language retardation or deficiency to hand and eye preference. It has been found that without other evident causes, reading disabilities rarely

occurs in cases with strong consistent right dominance. Further, "failure to establish consistent dominance by school age leads to confusion in acquiring psycho-motor skills and it affects speech. It is reasonable to suppose that in such cases reading skills would also be affected." (4-81)

Smith reported in her study in 1950 that "forced change of handedness may be accompanied by (1) mirror writing and reversals, (2) disturbance of emissive language, (3) fatigue, or (4) emotional disturbances." (11-322) She concluded that "change of handedness as a factor in developmental history may warrant consideration in the diagnosis of reading disability cases. However, this study does not show sufficient evidence to establish the importance of this factor." (11-327)

Karlin and Strazzulla concluded their study in 1952 with the statement: "The best that can be said is that cerebral dominance, language function, and handedness are processes that are interrelated and no doubt influence one another developmentally." (6-228)

Witty and Kopel concluded: "Decisive as these findings are, they do not warrant discarding the study of laterality in the diagnostic examination of a reading disability case. Certain conditions of laterality may be contributing factors in emotional difficulties related to the poor reading." (12-224)

## SUMMARY AND CONCLUSIONS

### Summary

In the writer's opinion there has been no significant change, in the last five years, in the importance of cerebral dominance or laterality of function. Evidence on one side of laterality and cerebral dominance theory is quickly refuted by equally strong evidence to the contrary.

### Conclusions

From her research, the writer feels that the following conclusions are feasible:

1. The left hemisphere in right handed persons cannot be considered "dominant" for all nervous functions.
2. In laterality studies the phenomenon should be studied in terms of the total picture the child presents.
3. The studies in the writer's opinion demonstrate more than a chance relationship between lateral dominance and reading disability.
4. These issues cannot be settled without further knowledge of brain pathology.
5. There is a definite need of searching studies of behavior at all stages of development.

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## PART II

### CASE STUDY OF JOHNNY

## INTRODUCTION

### Statement of the Problem

The purpose of this study is to determine, if possible, the probable causes of Johnny's inability to read without difficulty and to speak without stuttering. Johnny illustrates the results of interference, on the part of the parents, with laterality of function, resulting in his poor performance and their lack of insight into his behavior problem.

### Methods of Research

Both the documentary and the non-documentary research methods were used in this problem. (The documentary method was discussed by the writer, supra, page 2, and will not be included in this discussion.) As for the non-documentary methods used for the purpose of this study, they will be discussed under the title of case study.

The case study method is an investigational procedure used in education "for the purpose of studying problem cases, maladjusted pupils and scholarship difficulties" (1: 567) and has been found by scientists "to be particularly fruitful method for stimulating insights and suggesting hypothesis for research." (3: 42)

This type of research emphasizes the process of educational diagnosis, employing longitudinal and cross-sectional

views of the personality, utilizing and analyzing the findings of all investigational methods.

The case study method is useful when applied to individuals or a very large number of individuals since it supplies information that may provide insight into the individuals or group problems and lead to successful treatment and resolution of the problem. However, this method does not meet with widespread favor because of the time and work involved and after it is finished the results apply only to the base being studied.

#### Limitations of the Study

This discussion will be confined to the information obtained from the subject, from his cumulative record, from his teacher, from his family, and from acquaintances and friends in the community. This study does not claim to include all information about the subject, but only that information which the subject, family, and newly made friends have been willing to contribute to the writer.

### THE CASE

#### Identifying Data

Johnny, a normal appearing white boy, age ten years, with black hair and black piercing eyes enrolled in the fifth grade in a rural school for the first time this fall. His family consists of a mother, Lorene, born October 20, 1915; a father, Jack, born June 1, 1917; a brother, Jimmy, born December 31, 1940; a sister, Carolyn, born October 17, 1942;



and Johnny born December 8, 1945. Carolyn and Jimmy remained in the city for advanced studies and special training.

Johnny's father is an incapacitated arthritic unable to assume his normal occupation in the oil fields. His mother, a housewife, remains in the home to care for her family. They live on a forty-acre farm located several miles from a town of about twelve thousand.

### Symptoms

Johnny came to the attention of his teacher because of his inability to pronounce his first name or answer any question without stuttering. The first week of school revealed many other problems along with his speech handicap. His outward appearance in the classroom was one of complete confusion. He fidgeted, bit his nails, wiggled, day dreamed, played constantly with pencils or other objects while his attention wandered anywhere else except on the lesson. He gave the appearance of a frustrated, nervous, and uninterested child desiring escape from the task at hand by many varied and devious methods.

He is very difficult to motivate in the classroom, and presents a false picture of enthusiasm while he daydreams. When pressed, on one occasion he retaliated, "All my friends are smart, I am the 'Dumb Bunny.' All the boys are better students, 'Sissies.' They don't like me; they form gangs against me. I stay away from them."

In written work he is a perfectionist carefully ruling guide lines for his words and recopying for the least mistake. In an original story, in Language Arts, as retold here by his teacher, he expressed his defeatism, his feeling of inadequacy and dependence upon his father.

A colt romping in a meadow with his father. One day he had to go away to a race track. He knew he would never be a race horse. Did not like it. Wanted to go back to the pasture. He did not think he had legs to race. As he went on the race track he heard one of the jockeys say, 'Look at his big legs! He'll never be a race horse.' After several try-outs they sent him back. He was so glad because he did not want to be a race horse.

In drawing he was unwilling to paint and complained that it "smelled funny." After much encouragement he painted a red picture which he repainted black as soon as it was finished.

In an experiment where real money was used, he pocketed a dime. When asked about it, he burst into tears saying, "I was afraid I would not have money to buy my father a Christmas present. That's why I took it."

On the playground he withdraws from his peer group, playing only with the younger children in the role of "bully."

Following this preliminary investigation, the teacher invited the mother to visit the school for a conference. The following statements were made by the mother during this interview: "The standards of our family are high and the other two children are successful and accomplished in music in school and do not receive low grades. No one in this family

gets low grades. I cannot understand a child who cannot read."

She blamed the school methods and remarked:

He should be forced to learn. I think he is just lazy and avoids work. The modern methods of teaching are no good; they do not drill enough. Johnny is the sort that needs a firm hand over him and should be kept in after school until he gets his work. You should make him know that you mean business and not permit him to play in school. However, Johnny is a sensitive child like me and I suppose you can't teach him exactly as you would any other child."

She was then asked if she had ever tried to help him at home with his school work. She stated, "It was just awful. We have a regular battle; Johnny begins to stutter and stammer and I begin to cry. It is a mess, I guess I'm no teacher." (It was noted at this time that the mother was left handed.) She was asked if Johnny used his left hand when he was a small child and she replied:

Yes. But we told him this was a right handed world and through punishment and strong discipline since he was about two years old by the time he entered school at the age of six we had him using his right hand like all other children. And it was at this time he began to stammer and stutter. Oh! And by the time he was in the second grade they had to put glasses on him, too.

I'm defeated with Johnny. He has never made the honor roll. I have always had something to talk about to my friends with the other two children because they always made the honor roll and never had to take a test.

The mother thought Johnny should be as successful and accomplished as the two older children and tried to bring this about by the use of force, pressure, stressing the good points of the other children and referring to Johnny as the "Dumb Bunny." She seemed to desire to hide his inadequacies and to be ashamed of them.

The writer found Johnny to be over sensitive while acting the role of aggressor with the younger children, complete withdrawal from his peer group, unable to read above the third grade level, and having difficulty in keeping up in other fifth grade subjects in addition to the previously mentioned speech handicap.

As part of the investigation of his poor reading ability Johnny was sent, in October of this year, to a children's diagnostic clinic. This examination revealed that he kicked with his left foot, used his left eye when looking through a microscope and was definitely left handed.

#### Examination

The medical examination revealed that, physically, Johnny was a normal healthy ten-year-old, with the exception of a mild hyperopia. His muscle coordination, while adequate, failed to show fine muscular movements. The school dental examination revealed no previous dental repair and none was recommended. He complained of frequent headaches and appeared extremely nervous at various times.

Johnny was given a complete battery of tests early this fall, the results of which are unavailable other than his I.Q. which, according to the Stanford Binet, was 106. His achievement tests showed him to be on third grade level.

### Health and Physical History

Johnny's delivery was normal. His health from infancy to date has been negative with the exception of the usual childhood diseases. There is no record of any major surgery. When he was six years old a minor repair was made of a deep laceration over his left eye. This required several stitches by a physician. His first hospital admission was to Children's Hospital for his clinical examination. The diagnostic report was as follows: "Related reading difficulty to mixed right and left eye and right and left handedness."

### School History

Both the mother and the father are high school graduates. His father completed one semester of college before beginning work in the oil fields where he was employed until his forced retirement due to arthritis. He is still interested in phases of engineering and continues to study at home using all available material.

The mother, after high school, finished a course in advanced sewing from the Singer Sewing Machine Company and sews exceptionally well. She is an immaculate housekeeper and tries, in every possible way, to provide a well balanced diet for her family.

The father seems to take Johnny for granted and shows very little interest in his activities while the mother with her misguided interest has provided Johnny with most of his problems.

The family income (\$140.00 from public assistance) is meager and not adequate to provide all necessities. In the past, the family has had a high standard of living, above the average for a small town in western Oklahoma; thus permitting the family to take annual vacations and providing Johnny with a wide background of learning experiences. The home today places Johnny in a rural community (not considered good enough for his more talented brother and sister) in a four-room house as compared with the six rooms of more prosperous days. His home provides a wide range of magazines and literature among which are: The American, Good Housekeeping, Better Homes and Gardens, a complete set of World Books, and some of the children's classics. The latter, the mother reads to him and he says he enjoys hearing them very much.

The attitudes of both parents toward the present and future are optimistic. The father believes he will overcome his physical condition and will be able to give his family all the good things in life. They accept the low standard of living as only temporary, and believe they will again take their normal place in society.

Johnny's parents are very strict and exacting in their demands. For example, if Johnny should come home late from school they would demand to know why and in minute detail. The household is run on a close schedule and no deviations are permitted. Failure of the child to meet these rigid controls or demands results in a severe criticism often followed by corporal punishment.

### Social History

The family life in the community is very simple. Activities center around a small neighborhood church and a well organized 4-H Club. The mother and father are active in the former while Johnny is reluctant because of his inability to read as others in his age group. He shows no inclination to join the 4-H Club "'cause the boys form a gang against me."

The family visits among the neighbors and with friends on Sunday. They spend all other recreation time with their television set in the living room.

### Diagnosis

There are two contributing factors to Johnny's school difficulties. First, is his emotional maladjustment. He is emotionally disturbed, rejected, defeated, insecure and lacks personal motivation for improvement in his work. His attitude is unenthusiastic, rather passive and resentful. The other factor is his mixed lateral dominance. The lack of consistent dominance of either hand or either eye is due to forced change of handedness. This has been associated with a marked reversal tendency, added word sounds, and confused vowels resulting in a reading problem and a speech handicap.

### Treatment

From the evidence presented it is recommended that:

1. Johnny be sent to a speech specialist.
2. His teacher place him on his own reading level.

3. The father be encouraged to take an interest in Johnny through his hobby.

4. Help be given the mother to accept the child as he is and give him praise, affection, security, and encouragement.

5. Further psychiatric study be made to determine if it might be advisable to change handedness again.

6. Psychological conferences be held with the mother and the mother and son for clearer insight into Johnny's problems.

7. Johnny be encouraged to associate with his peer group, and try to build up his self-esteem through recognition within the group.

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PART III

AN ATTEMPT TO DETERMINE IF LATERAL DOMINANCE  
AFFECTS READING ABILITY

## INTRODUCTION

### Statement of the Problem

The writer, being interested in possible causes of reading difficulties of children, has attempted to determine if children of mixed dominance differ from children of established dominance in specific reading characteristics and skills.

### Purpose of the Study

The purpose of this study was to determine, if possible, to what extent, if any, the lateral dominance does affect reading ability among local students. Interest has been shared by co-workers in the possible relationship between cerebral dominance and laterality of function as it affects the student's reading ability. As a result of this interest, this study was devised.

### Methods of Research

The research procedure used was the questionnaire, "a normative-survey technique, prepared and distributed for the purpose of securing responses to certain questions which are intended to be generally factual." (4:324) The questionnaire "is generally regarded as more dependable when used to obtain statements of fact," (4:66) rather than opinions or judgments.

Advantageous "by its very nature the questionnaire is likely to be a less expensive procedure than the interview.

The skills required to administer it are rather negligible compared to those required in interviewing." (5:156) It could be administered to a larger number of persons through the mail which makes possible studies of a wider scope, with a minimum expenditure of time and money. Questionnaires are usually of an impersonal nature and have "standardized instructions for recording responses, ensuring some uniformity from one measurement situation to another." (5:156)

Barr, Davis, and Johnson (1:66) summarized the disadvantages as "the technique of collecting data by means of questionnaires is frequently ineffective for the purposes of accurate investigation because of (1) improper formulation of questions, (2) improper sampling, (3) inadequate returns, and (4) failure to select respondents who are capable and willing to co-operate." "Thus, one of the major drawbacks of the usual questionnaire is that it requires that the subject have a considerable amount of education." (5:159) Another type of research would perhaps give a much better yield of the general population.

The further effectiveness of the questionnaire could be increased by requiring information that could be supplied by the individual in a minimum of time and effort, being very clear to all concerned as to whether or not it is a questionnaire of fact or opinion.

### Research Design

The participants in this study were thirty-nine sixth grade students from one of the eight elementary schools in a small town in northeastern Oklahoma. Laterality tests were administered to determine sidedness. These tests consisted of a questionnaire for hand and foot preference (See Appendix) and three observed eye preference tests.

Dominance was considered established on the hand and foot preference questionnaire when three fourths of the questions were answered either left or right.

The eye preference tests were administered by the writer on the morning and afternoon that the questionnaire was given. In the morning the students were given a piece of paper and were asked to roll it in the form of a tube after a demonstration. They were then told to look through the tube at a pencil the writer was holding. An assistant helped note the eye preference of each student. This test was repeated in the afternoon using instead a piece of paper with a hole in the middle. The results were identical to the previous examination. Had there been any deviations a third test would have been administered.

The students of mixed dominance were matched with a control group which was composed of those of dominate sidedness drawn at random by the writer's daughter. The names of those selected were written on the second questionnaire (See Appendix) and sent to the reading teacher for evaluation

of reading skills, characteristics, and attitudes.

### Limitations of the Study

The participants may or may not be a representative group of the total population, but for the purpose of this study it will be assumed that it is representative.

The writer could not follow the accepted procedure of administering sample questionnaires due to the time limitations.

These particular questionnaires were constructed as carefully as possible, realizing the failure in some instances to obtain the precise information desired.

### PRESENTATION OF DATA

The questionnaires and tests were devised from reading and writing experiences of the writer in an attempt to determine the effect of laterality on reading ability.

The first questionnaire consisted of twenty-two questions, designed to determine dominance, and was administered simultaneously to thirty-nine students. The results are shown in Table I.

Four of these questions, 18, 19, 20, and 22, established foot preference; while the remaining questions, excluding question 17, established hand preference. Question 17, "On which side do you sleep?" was included by the writer to ascertain if this group substantiated the theory that the

side the person sleeps on was usually the dominant side. This was refuted by the total group being almost evenly divided; nineteen sleeping on their left side while twenty slept on the right side.

TABLE I

## RESULTS OF HAND AND FOOT LATERALITY TEST

Item	Control		Mixed Dominance		Other		Total	
	L	R	L	R	L	R	L	R
1	3	11	4	10	1	10	8	31
2	4	10	4	10	3	8	11	28
3	3	11	4	10	3	8	10	29
4	4	10	2	12	0	11	6	33
5	2	12	3	11	0	11	5	34
6	3	11	5	9	0	11	8	31
7	3	11	4	10	0	11	7	32
8	3	11	4	10	1	10	8	31
9	3	11	4	10	0	11	7	32
10	2	12	2	12	1	10	5	34
11	4	10	3	11	3	8	10	29
12	2	12	2	12	0	11	4	35
13	3	11	3	11	0	11	6	33
14	3	11	2	12	0	11	5	34
15	5	9	3	11	0	11	8	31
16	3	11	2	12	1	10	6	33
17	5	9	5	9	9	2	19	20
18	3	11	3	11	10	1	16	23
19	4	10	4	10	9	2	17	22
20	1	13	3	11	2	9	6	33
21	4	10	4	10	8	3	16	23

The eye preference test revealed that fourteen students were left eyed and twenty-five were right eyed, as shown in Table II.

TABLE II

## RESULTS OF EYE LATERALITY TESTS

<u>Control</u>		<u>Mixed Dominance</u>		<u>Others</u>		<u>Total</u>	
<u>L</u>	<u>R</u>	<u>L</u>	<u>R</u>	<u>L</u>	<u>R</u>	<u>L</u>	<u>R</u>
3	11	11	3	0	11	14	25

As a result of these tests, fourteen students were found to be of mixed dominance, e.g., right handed; etc. Three were left sided and twenty-two were right sided.

The fourteen students of mixed dominance were matched with a dominant control group drawn at random from the remaining twenty-five students. These selected twenty-eight students' names were written on the second questionnaire (See Appendix), consisting of thirty questions which was sent to their reading teacher for evaluation of reading skills and characteristics and attitudes. The results of this questionnaire are shown in Tables III and IV.

This questionnaire revealed that the two groups varied on only eight of the thirty questions. The summary is as follows:

1. Twenty-nine per cent of the mixed dominance group had an auditory or visual handicap while the control group was negative.

2. Twenty-one per cent of the mixed dominance group had a speech defect. The control group had none.

TABLE III

## PHYSICAL CHARACTERISTICS AND ATTITUDES

Item No.	Control				Mixed Dominance			
	Yes	No	Yes	No	Yes	No	Yes	No
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1	0	0	14	100	0	0	14	100
2	3	21	11	79	3	21	11	79
3	3	21	11	79	12	86	2	14
4	3	21	11	79	4	29	10	71
5	3	21	11	79	4	29	10	71
6	1	7	13	93	2	14	12	86
7	0	0	14	100	4	29	10	71
8	0	0	14	100	3	21	11	79
9	4	29	10	71	4	29	10	71
10	2	14	12	86	2	14	12	86
11	1	7	13	93	1	7	13	93
12	3	21	11	79	3	21	11	79
13	3	21	11	79	1	7	13	93
14	12	86	2	14	10	71	4	29
15	8	57	6	43	8	57	6	43



TABLE IV

## READING SKILLS

Item	Control				Mixed Dominance			
	Yes		No		Yes		No	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1	11	79	3	21	11	79	3	21
2	10	71	4	29	12	86	2	14
3	10	71	4	29	10	71	4	29
4	11	79	3	21	11	79	3	21
5	4	29	10	71	5	36	9	64
6	4	29	10	71	4	29	10	71
7	4	29	10	71	3	21	11	79
8	5	36	9	64	8	57	6	43
9	8	57	6	43	3	21	11	79
10	8	57	6	43	10	71	4	29
11	9	64	5	36	10	71	4	29
12	9	64	5	36	10	71	4	29
13	6	43	8	57	7	50	7	50
14	4	29	10	71	4	29	10	71
15	4	29	10	71	4	29	10	71

3. Fourteen per cent more children in the control group moved their lips while reading.

4. Fifteen per cent more children in the control group held their books at the right distance (a visual handicap could be the possible causative factor).

5. Fifteen per cent more children in the mixed dominance group showed more interest in their work.

6. Twenty-one per cent more of the children of the mixed dominance group repeated words.

7. Thirty-six per cent more children in the control group mispronounced words.

8. Fourteen per cent more children were able to sense syllables in the mixed dominance group.

### CONCLUSIONS

Within the limitations of this study, the following conclusions appear to be valid:

1. Children of mixed dominance and children of established dominance do not differ significantly in regard to reading ability.

2. Children of mixed dominance and children of established dominance do not differ significantly in regard to the number of reversals made.

3. Children of mixed dominance and children of established dominance do not differ significantly in regard to omissions or substitutions.

4. Combinations of eye, hand, and foot dominance are not important in the diagnosis of reading disability cases.

5. This study presents no conclusive evidence that cerebral dominance and laterality of function affect reading ability.

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## APPENDIX A

Questionnaire to Determine Dominance

NAME \_\_\_\_\_ DATE \_\_\_\_\_ AGE \_\_\_\_\_  
 GRADE \_\_\_\_\_ SCHOOL \_\_\_\_\_ TEACHER \_\_\_\_\_

Please answer the questions below to tell us with which hand you usually do the things which are mentioned. Put a circle around the R if you usually use your right hand. Put a circle around the L if you usually use your left hand. Be sure to answer each question.

1. When tying your shoe which hand do you use the most? R L
2. When you catch a ball with both hands, which hand is on top? R L
3. When clapping your hands, which hand do you place on top? R L
4. Which hand do you use to throw a ball? R L
5. Which hand do you use to throw a spinning top which you have wound with a string? R L
6. Which hand do you use to place stamps on an envelope? R L
7. When driving a nail directly in front of you in which hand do you hold a hammer? R L
8. When combing your hair in which hand do you hold your comb? R L
9. When brushing your teeth which hand do you hold your toothbrush? R L
10. Which hand do you use to put pegs into a peg-board? R L
11. Which hand do you use to turn the pages of a book? R L
12. Which hand do you use to tune the T.V.? R L
13. Which hand do you use to shoot marbles? R L
14. Which hand do you use to play jacks? R L
15. Which hand do you use to deal a deck of cards? R L
16. In which hand do you hold a ping pong paddle? R L
17. On which side do you prefer to sleep? R L
18. On which foot do you prefer to hop? R L
19. On which foot do you balance yourself better? R L
20. Which foot do you use to kick a soccerball? R L
21. Which hand do you use to write with? R L
22. In jumping which foot do you extend first? R L

## APPENDIX B

Questionnaire to Determine Physical Characteristics  
and Reading Skills

NAME \_\_\_\_\_ DATE \_\_\_\_\_ AGE \_\_\_\_\_  
GRADE \_\_\_\_\_ SCHOOL \_\_\_\_\_ TEACHER \_\_\_\_\_

Please check ( ) the answer to the questions below. Be sure to answer each question.

## PHYSICAL CHARACTERISTICS

YES NO

- |   |       |       |
|---|-------|-------|
| 1. Has he ever changed hands to your knowledge?           | _____ | _____ |
| 2. Does he always write with his left hand?               | _____ | _____ |
| 3. Does he sight with his left eye?                       | _____ | _____ |
| 4. Does he hop on his left foot?                          | _____ | _____ |
| 5. Does he throw a ball with his left hand?               | _____ | _____ |
| 6. Does he show any evidence of an emotional disturbance? | _____ | _____ |
| 7. Does he have any visual or auditory handicaps?         | _____ | _____ |
| 8. Does he have a speech handicap?                        | _____ | _____ |
| 9. Does he withdraw from reading?                         | _____ | _____ |
| 10. Has he ever repeated a grade?                         | _____ | _____ |
| 11. Does he point when he reads?                          | _____ | _____ |
| 12. Does he move his head?                                | _____ | _____ |
| 13. Does he move his lips?                                | _____ | _____ |
| 14. Does he hold his book at the right distance?          | _____ | _____ |
| 15. Does he show expressions on his face while reading?   | _____ | _____ |

## READING SKILLS

- |   |       |       |
|---|-------|-------|
| 1. Does the child pay attention?                            | _____ | _____ |
| 2. Does he show interest in his work?                       | _____ | _____ |
| 3. Does he show any evidence of a plan of working?          | _____ | _____ |
| 4. Does he associate what he reads with his own experience? | _____ | _____ |
| 5. Does he make substitutions?                              | _____ | _____ |
| 6. Does he make omissions?                                  | _____ | _____ |
| 7. Does he make reversals?                                  | _____ | _____ |
| 8. Does he repeat words?                                    | _____ | _____ |
| 9. Does he mispronounce words?                              | _____ | _____ |
| 10. Does he sense syllables?                                | _____ | _____ |
| 11. Does he understand what he reads?                       | _____ | _____ |
| 12. Does he remember what he reads?                         | _____ | _____ |
| 13. Does he guess at words?                                 | _____ | _____ |
| 14. Does he read very slowly?                               | _____ | _____ |
| 15. Does he read word by word?                              | _____ | _____ |