ABSTRACT

Neubauer, Jeffrey C. A comparison of left-handed and righthanded students in the acquisition of a novel motor skill. M.S. in Physical Education 1978 p. 30(Dr. Ralph E. Jones)

This study created two skill learning situations and attempted to locate any significant learning differences among righthanded and left-handed students. A demonstration of a simple movement pattern was viewed by college students (N = 80) who then performed the required skills until mastering them. The subjects were broken down into four groups of 20 (two lefthanded and two righthanded). Subjects were exposed to models of either the same or opposite dominant hand. Trials to completion were used to determine learning rates. A one-way ANOVA indicated $P < .01$. The Scheffe' Post Hoc test indicated that the differences among the groups existed when left and righthanded students were taught by a righthanded model. Righthanded students learned significantly faster when they worked with a model of the same dominant hand.

A Comparison of Lefthanded and Righthanded Students in the Acquisition of a Novel Motor Skill

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A Thesis Presented

to

The Graduate Faculty

University of Wisconson - La Crosse

In Partial Fulfillment

of the Requirements for the

Master of Science Degree

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by

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August 1978

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Master of Science in Physical Education

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ACKNOWLEDGEMENTS

The writer would like to express his appreciation to committee members Dr. Clark E. Himmel, Dr. William D. Van Atta and Dr. Ralph E. Jones.

A special thanks to committee chairman Dr. Ralph E. Jones for his patience and encouragement throughout the study.

The writer would also like to pay tribute to the three men in my life whose contributions have greatly influenced me; Phil Esten and Ralph Jones, my college track coaches, and Don Neubauer, my father.

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CHAPTER I

Introduction

Background

The area of handedness has always interested the researcher of this study for the simple reason that he is lefthanded in a righthanded society. The interest does not lie in the area of what causes handedness, but rather in the ability of lefthanders to adapt to the righthanded world in the area of physical education and athletics.

What the researcher means by adapting is that most of the skills taught in physical education and athletics are taught in the initial stages by a demonstration. If the demonstration is doen by a righthanded model (teacher or film), lefthanded people will have to interpolate before grasping the demonstration. It has been estimated that only about ten percent of the population of the world is lefthanded (Herron, 1976). Why should teachers, administrators and learning specialists spend the time to worry about so few?

The intent of this study is to find out if the time spent interpolating a demonstration causes a learning difficulty (when there is a cross-over from model to student, model and student having different cominant hands).

If there is a time lag caused in the translation from right to left or left to right, teachers must then be aware of the problem when working in a cross-over situation.

Statement of the Problem

With a majority of the world being righthanded, do lefthanded people learn motor skills at a slower rate in the initial stages of learning?

Purpose of the Study

The purpose of this study was to determine if a student can learn a motor skill faster if taught by a model who has the same dominant hand as the student's dominant hand.

Need for the Study

The need for this study comes from one simple statement that the researcher has heard in the past as a student and still hears today far too often from the teachers. That simple statement is, "You lefties in class do everything just the opposite".

Lefthandedness is not a mirror of righthandedness (Herron, 1976). Lefthanders are different in at least two particular ways: they use their nonpreferred hand much more often and many have a different brain organization (Herron, 1976).

Today important new work is being done not to explain handedness, but is concerned with the very different functions and cognitive styles that become apparent in the two hemispheres of the brain.

The researcher believes that the educators of today still need to know more about the brain and it's operations, and the differences between right and left dominance in the psychological makeup of an individual.

Hypothesis

The hypothesis for this study was stated in the null form. It has been formulated to read:

There is no difference in learning rates when students are taught by a model of either the same dominant hand or opposite dominant hand.

Assumptions

This study had one assumption:

All subjects had previous experience with the components of the movement pattern.

Delimitations

This study had three points of delimitations:

(1) Subjects for the study were volunteers who were undergraduates for the spring semester of the 1977-78 school year at the University of Wisconsin La Crosse.

(2) The determining factor of lefthandedness for this study was the hand with which the subject threw a ball.

(3) The sample for this study contained both male and female subjects.

Limitations

There were two limitations of this study:

(1) It was impossible to obtain lefthanded samples through true random sampling techniques.

(2) The sample size for practical reasons was set at twenty subjects in each of the four groups.

Definition of Terms

(1) Interpolate - to reverse the process or change the order of

succession.

(2) Laterality - awareness of the two sides of the body.

(3) Sinistral - the inclination toward use of the left side of the body.

(4) Dextral - the inclination towards use of the right side of the body.

(5) Hop - taking off from one foot and landing on the same foot.

(6) Step - transferring weight from one foot to the other with at least one foot in contact with the ground at all times.

(7) Leap - taking off with one foot and landing on the other foot with both feet being off of the ground at the same time before landing.

CHAPTER II

Review of Related Literature

Possible Causes of Lefthandedness

When working with the lefthander in a skill learning situation, the question that will come to mind sooner or later is, "Why are there lefthanded people?", or "What causes a small group of people to use the left hand as the dominant hand?" Myths on lefthandedness are many and range in theories. Possible causes for lefthandedness have been linked with almost everything from gravitational levels of the earth during certain phases of the moon during pregnancy, to the way in which a mother holds the baby during the nursing period. The most radical theory that this researcher located was that of Dr. Paul Bakan, Canadian psychologist of Simon Fraser University. According to Dr Bakan the left hemisphere of the brain (controlling the right hand) needs more oxygen than the right. If an oxygen shortage occurs during pregnancy, Dr. Bakan believes that handedness is switched to the right hemisphere which would result in a righthanded embryo or infant becoming lefthanded (Pogash, 1977). To help point out how the lefthander is misunderstood, Dr. Harris, Child Psychologist, surveyed more than 200 articles on lefthandedness and reported finding more errors than facts in the articles reviewed (Pogash, 1977).

Basically, there are two types of theories that attempt to explain the development of handedness in man. The first is that there are physiological causes which lead to the favoring of one hand over the other.

The second type of theory suggests that social or environmental pressures have led to a high incidence of dextrality in man (Coren & Porac, 1977). After studying paintings, weapons and tools of man in all areas of the world from 3000 BC to present, it was found that percentages of left-handers in societies have not changed (Coren & Porac, 1977). This evidence seems to support the physiological theory of handedness rather than the environmental or sicoal theory. The intent of this study is not to determine the cause of lefthandedness, but to study lefthanders in a skill learning situation. The researcher of this study does believe that lefthandedness may not be just the opposite of righthandedness, and special attention should be given to the lefthanders in a skill learning setting. The problem that lefthanders have in skill learning is one of translation. "In the world of the lefthander, instructions must be reversed before they can be followed, a confusing and unnecessary process" (O'Connor, 1976).

Brain Organization

Research in brain organization indicates that humans have two brain hemispheres, each rather complete in itself. The left hemisphere specialized in processing data whose significance is build on relationships across time. (Example; You will use your left hemisphere to relate information from one paragraph to the next when you are reading.) The right hemisphere in most humans specializes in data whose significance is based on relationships that must be perceived across space. (Example: being aware of where you are in a building, recognizing a face or understanding a map or chart (Hunter, 1977). The two hemispheres of the brain are common in man but brain organization is not, some lefthanders

have a completely different brain organization (Herron, 1976). Knowing this, attempts must be made to help the lefthanders. It should be pointed out that there is no difference in general intelligence levels between right and lefthanders (Haefner, 1929).

Motor Learning and Laterality

The research located and available in the field of laterality and motor learning usually deals with topics such as acquisition of skills in the nondominant hand, transferring skills learned from one hand to the other and laterality and reading problems. However, one study which proved most interesting was done by Mary Scott in 1970. The hypothesis of this study was that lefthanders would learn skills faster with their nondominant hand as compared to righthanders learning skills with their nondominant hand. The hypothesis was made with the assumption that the lefthanders have adapted all their lives to a righthanded world and that in a skill learning situation would adapt faster than the righthanders. The assumption was based on the fact that lefthanders are forced to perform many tasks with their right hand. These tasks or social skills were such things as cutting with a scissors, writing or eating. In two areas of the study, it proved to be just the opposite effect. The righthanders performed better than the lefthanders when both groups were using the nondominant hand. The author of the study had no explanation as to why it happened.

Modeling and Motor Learning

Motor learning is done in the initial stages by mimicking a model (Lockhart, 1944). After seeing a model, subjects then try to pattern themselves after it. Similarity of behavior between a model and observer

is known as imitation (Zuckerman, 1973). A study done on the effects of modeling (Zuckerman, 1973) questioned the value of a model in skill learning. The results of that sutdy indicated that modeling did not facilitate the acquisition of the task involved. This particular study employed the skill of rolling a ball up a ramp and hitting a target and taught the skill with the aid of two films. One film had the model hitting the target. The other film had the model missing the target. The films were viewed by two different groups. The hypothesis was that the students seeing the model hitting the target would score higher when an actual test was given of rolling balls up a ramp trying to hit the target. Learning rates of the two groups showed no difference and Zuckerman questioned the effect of modeling on skill development.

Modeling Effects on Students

Demonstration is of great value in the presentation and practice of formalized skills at all levels of learning (Corbin, 1973). When presenting instruction to subjects, they must have an intellectual concept, or clear picture of what is expected (Lockhart, 1944). This statement was made after a very complete study on the effects of a motion picture on skill learning. The study determined that the motion picture was an aid to motor learning (Lockhart, 1944). Assuming that the above statements are correct, then teacher models will be a definite factor in the learning rates of students. Looking at the very formalized motor skill of handwriting gives the researcher strong support on the effects of modeling. "If you are a dextral teacher you will be at a decided disadvantage when teaching handwriting to the sinistral child, especially in the initial stages. If you are a sinistral teacher, you are best

qualified to work with other sinistrals." (Foerster, 1975). Foerster was of the opinion that many of the lefthanders' problems in the skill of handwriting come from being taught by righthanded teachers. A suggestion of Foerster was that lefthanders in a class be taught by the lefthanded students in the upper grades, teacher aides or other left-handed models available (assuming though that the model possesses good writing technique).

The areas explored in the review of literature are not all directly related to the topic of this study. After completing the search for information, the researcher knows of no study or research done directly related in the area of lefthandedness and skill acquisition.

CHAPTER III

Methods

Introduction

This chapter is divided into the following areas: (1) subject selection, (2) procedures, (3) development of instrumentation, and (4) statistical treatment of data.

Subject Selection

Subjects for this study were selected by the use of two different methods. The researcher started with the use of a student pool in the psychology department. All students in Psychology 201 are required to take part in a research experiment. The researcher was allowed to use this pool. The second method used to select subjects was to solicit volunteers from the Physical Education classes.

This study called for a total of eighty participants which was broken down into four groups of twenty.

Procedures

After the subjects reported, the researcher tested them individually in the privacy of a closed classroom. The time intervals were twenty minutes in length.

As the subjects reported for the testing, they were seated in the classroom and were briefed. The briefing covered five basic points. The first point covered was to ask if the subjects were familiar with the study in any way. Next the researcher informed the subjects that

they would be given a full explanation when they had completed the task. At this time subjects were asked not to talk to anyone about the study because of contamination reasons. Now the subject was handed a ball and told that it would be thrown as part of the task to be completed, but not to worry about doing damage by throwing a ball in a classroom, for it was a Nurf ball. Finally, the researcher explained to the subject that the study was in visual perception and the researcher could not offer any verbal input.

After the briefing was done, a form was completed for testing use (See Appendix A), and a set of final written instructions given to the subject (See Appendix B). The subject was told that the instructions could be read as many times as necessary and at any time during the study, if so desired. The researcher then waited for the subject to indicate that he/she was ready. At this time the film was shown. When the first viewing was completed, the researcher suggested to use a starting line placed on the floor to allow for adequate floor space.

To help in the administration of the testing procedure, the researcher ran a pilot study of six subjects to help set guidelines for consistency.

Development of Instrumentation

This study used as its model, a 16mm film which had double sprockets put into it. The double sprockets allowed the film to be used on either side which could give the model the appearance of being right or left-handed. The film was shot at normal speed.

Skills chosen to be used for the demonstration were: a hop, step or leap, 360 degree spin and the throwing of a ball. To successfully

complete the pattern subjects had to hop with the leg which was on the same side of the body as the throwing hand, step or leap, make a full turn in the correct direction and release the ball by throwing it with the natural throwing hand. (Subjects could control the speed in which they performed the skills.)

The distance from the projector to the screen remained constant throughout the testing (approximately twenty feet). It should be mentioned that the film was run at normal speed during the testing.

For this study the researcher counted trials to completion and recorded elapsed time. The watch was stopped whenever the film had to be rethreaded and did not start again until the projection of the film.

Statistical Treatment of Data

The data were analyzed by a one-way analysis of variance which indicated significant difference. The significant difference led to the running of the Scheffe' Post Hoc test.

CHAPTER IV

Results and Discussion

Introduction

The purpose of this study was to determine if a student can learn a motor skill faster if taught by a model of the same hand as the student. The testing was done with the aid of a 16mm film. The film projected a series of movement skills and the subjects were asked to duplicate the skills as they pertained to their natural throwing hand.

Subjects

All subjects in the study were volunteers and college students. There was no distinction made between males, females, years in school or academic major.

Subjects for this study were randomly placed into groups, two lefthanded groups and two righthanded. Next, two different learning atmospheres were created. The first was teaching with the use of a righthanded model and two learning groups, one group righthanded, the other being lefthanded. The second situation created was teaching with the use of a lefthanded model with two learning groups, one group righthanded, the other group being lefthanded (see Figure I).

FIGURE I

Diagram of the Two Different Learning Settings

M - Model

S - Student

R - Righthanded

L - Lefthanded

Results

The criterion used for statistical analysis was counting the number of trials to completion. This involved a one-way analysis of variance of the means of the four different groups. The analysis of variance yielded an F socre of 4.51 which indicated a significant difference ($p < .01$) among the groups (See ANOVA Table). The Scheffe' Post Hoc test was used to locate the significant differences. The differences that were located existed in the groups with righthanded model teaching left and righthanded students. The other significant difference located was when righthanded students had different models to learn from, one model lefthanded the other model righthanded (See Table I).

ANOVA Table of Learning Trials

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square
Between Groups	1569.05	3	523.017
Within Groups	8810.50	76	115.928
TOTAL	10379.6	79	

TABLE I

Results of Scheffe' Test

Group Mean	Model	Student	Group
7.75	Left	Left	A
15.3	Left	Right	B
5.4	Right	Right	C
15.25	Right	Left	D

Comparing Groups

A - D
A - C
C - D *
B - A
B - C *
B - D

* Groups with significant Difference at .05 level

Implications

Based on the statistical results of this study, there is a need for some discussion as to the outcome. It appears that when the model was righthanded with right and lefthanded students, the righthanded students have an advantage or learned at a significantly faster rate. Another implication of this study was that if two righthanded students are given different models to learn from, one righthanded, the other lefthanded, the righthanded student with the righthanded model will learn significantly faster than the righthanded student with the lefthanded model.

It was interesting to discover in this study that lefthanded students had no significant advantage over righthanded students when both groups were learning from a lefthanded model. Results also indicate that there is no significant difference in learning rates of lefthanded students when exposed to a right or lefthanded model.

This fact proves to be even more misunderstood after listening to the comments of the lefthanded subjects. Most of the lefthanded subjects expressed the feeling of confusion when given instructions from a righthanded viewpoint and then asked to perform them lefthanded in everyday life. But when given lefthanded demonstrations, the lefthanders did not perform the task significantly faster. One explanation might be that lefthanded people very seldom have the opportunity to learn from other lefthanded models and were not accustomed to seeing a lefthanded model.

So, the answer to the problem, "Do lefthanded students learn motor skills at a slower rate because of the majority of teachers being righthanded?" seems to be yes, from looking at the results of this study.

CHAPTER V

Conclusions

Summary

The purpose of this study was to determine if a student could learn motor skills faster if model and student were of the same dominant hand.

The first step was to determine what skill to use as a model and what test design to use. The skill used was a movement pattern consisting of a hop, step, 360 degree spin and the throwing of a ball in that order. Presentation of the movement pattern was done with the aid of a 16mm projector. Test design for the study was to create two teaching settings. Both teaching settings created had two groups of students, righthanded and lefthanded. The only difference in the teaching setting was the model. One model was righthanded, the other lefthanded. A one-way analysis of variance was used to determine if there were differences among the groups. Results indicated significant differences at the .01 level. The Scheffe' Post Hoc test indicated that the righthanded group performed significantly better than the lefthanded group when both were taught by a righthanded model. Results also indicated that righthanded students could learn significantly faster from a righthanded model than from a lefthanded model.

In righthanders, learning is related to handedness and results indicated that lefthanded students are at a disadvantage in skill learning situations if the model is righthanded.

Conclusions

Based on the analysis of the data collected from this study, the researcher believes that in the typical educational setting (righthanded teacher with right and lefthanded students) the lefthanders will learn skills at a slower rate if no attempt is made to specialize information or instruction for the lefthanders in class.

Recommendations

At the completion of this study it is recommended that further work be done in the area of handedness in skill acquisition. This recommendation is based on the fact that the review of literature did not locate studies directly related to the topic and also because of the surprising results that the lefthanded students did not learn significantly faster when working with a model of the same hand. The researcher would also like to see studies done in the area of handedness and skill acquisition with elementary school age children.

It is also recommended that whenever possible, demonstrations be given both left and righthanded and that instructional films be double-sprocketed to allow the film to be used as either a right or lefthanded model.

Finally, the last two recommendations would be, if you are a teacher with a student whose dominant hand is different than yours, be aware of the fact that the student will be translating information from one hand to the other and will learn at a little slower rate. The last recommendation would be to analyze the data collected by comparing the effectiveness of the two different models and to look at the learning rates of the students combined, all lefthanders and all righthanders.

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APPENDIX A

APPENDIX A

Data Score Card

Name _____ Sex - Male or Female.

Natural Throwing Hand - Left or Right

Model Viewed - RM or LM.

Trials

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

TOTAL TIME

APPENDIX B

APPENDIX B

Written Instructions

Closely watch this series of movement skills and duplicate them as they pertain to your Natural Throwing Hand. If you do not perform the pattern correctly I will simply say (NO). You will again look at the series of movement skills, and try to correctly perform the pattern. After every incorrect attempt you will see the film again until you can perform the pattern correctly.

APPENDIX C

APPENDIX C

Raw Data

Model Right Trials	Student Left Time	Model Left Trials	Student Left Time
2	1:09	4	2:01
19	10:59	2	1:00
3	2:15	4	2:09
11	10:01	14	6:19
6	3:30	16	6:00
16	8:19	5	2:12
3	1:31	4	1:17
8	3:41	9	6:18
25	18:57	37	20:21
6	3:49	9	5:21
8	5:21	7	3:54
6	3:36	2	1:31
38	33:17	3	1:06
52	30:01	7	2:59
8	4:03	7	4:22
77	4:13	3	1:04
39	32:20	2	:37
13	8:31	14	6:31
6	3:41	2	1:31

APPENDIX C (cont.)

Model Right Trials	Student Left Time	Model Left Trials	Student Left Time
14	8:52	3	1:16
11	4:05	2	:48
2	:48	2	:43
7	5:30	3	1:17
50	44:08	3	1:17
9	4:03	5	2:27
4	3:09	2	:46
38	22:09	6	3:16
13	7:56	2	:45
4	2:00	8	6:03
3	:44	2	:57
15	9:33	6	2:49
19	9:52	20	12:51
5	2:14	4	2:13
38	18:28	3	3:24
12	7:17	2	:51
23	17:03	2	:51
11	7:17	14	9:30
20	10:03	8	3:05
8	4:51	6	4:01

APPENDIX D

APPENDIX D

F Scores From the Scheffe' Test

Model	Student	Group
Left	Left	A
Left	Right	B
Right	Right	C
Right	Left	D

Comparing Groups	F Score
A - D	4.85
A - C	.47
C - D	8.36
B - A	4.9
B - C	8.45
B - D	2.15

Needed F score to exceed 8.22 for significant difference