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A Comparison of Two Practice Schedules to Achieve Bilateral Skill in Lacrosse Cradling

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To the Graduate Council:

I am submitting herewith a thesis written by John Frederick McCabe entitled "A Comparison of Two Practice Schedules to Achieve Bilateral Skill in Lacrosse Cradling." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Recreation and Sport Management.

Andrew J. Kozar, Major Professor

We have read this thesis and recommend its acceptance:

E. Capers, Ben A. Plothnicki

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

July 2, 1970

To the Graduate Council:

I am submitting herewith a thesis written by John Frederick McCabe entitled "A Comparison of Two Practice Schedules to Achieve Bilateral Skill in Lacrosse Cradling." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Physical Education.

Andrew J. Kozar
Major Professor

We have read this thesis
and recommend its acceptance:

E. Cayer

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Accepted for the Council:

Hilton A. Smith
Vice Chancellor for
Graduate Studies and Research

A COMPARISON OF TWO PRACTICE SCHEDULES TO ACHIEVE BILATERAL SKILL IN LACROSSE CRADLING

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

---

by

John Frederick McCabe

August 1970

ACKNOWLEDGMENT

The writer wishes to express his appreciation to Dr. Andrew J. Kozar, Professor and Head of Men's Physical Education at the University of Tennessee, for his guidance and supervision in this study, and to Dr. William Gilley, who aided in the statistical analysis. Moreover, the researcher would like to thank other members of the faculty for their patience and leadership. The investigator would also like to thank his wife Cathy for her encouragement and understanding.

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ABSTRACT

Statement of the Problem

It was the purpose of this study to compare two practice schedules in achieving bilateral skill in lacrosse cradling. The two practice schedules consisted of (1) alternating the lacrosse stick from one side of the body to the other after every 30 seconds of practice time, and (2) a continuous schedule which consisted of practicing on one side of the body until the ball could be cradled continuously for 30 seconds before beginning to practice on the other side.

Procedure of the Study

Thirty male physical education students from the University of Tennessee, Knoxville, required physical education classes volunteered as subjects. The subjects were randomly assigned to one of two practice schedules.

The skill to be learned consisted of cradling a tennis ball with a box lacrosse stick continuously for 30 seconds on each side of the body in succession. The first practice schedule consisted of alternating sides after every 30 seconds of practice time. The second schedule consisted of continuous practice on one side until the ball could be cradled for 30 seconds and then continuous

practice on the opposite side until the ball could again be cradled for 30 seconds.

The results were measured by two different methods: the total number of attempts necessary, and the total amount of time necessary to achieve the criterion.

The t statistic was used in analyzing the differences between the continuous schedule results and alternate schedule results.

Summary of Findings

The findings of this study indicate that there was no significant difference statistically between the scores for the continuous practice schedule and those for the alternate practice schedule. The schedules, when compared according to the number of attempts, were found to produce a t of 1.597. The total times, when compared, achieved a t of 1.308. In order to be statistically significant at the 5 percent level of confidence, the t in both cases would have to have been 2.05.

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CHAPTER I

INTRODUCTION

In many physical activities, one of the requirements for successful participation is the ability of the performer to demonstrate the skills using either side of the body.

> . . . While the punter in football and the pitcher in baseball would have little need to perform with their opposite limbs, numerous situations exist in sports and in everyday life in which bilateral skill is desired. For example, the soccer player must develop kicking skill with both feet. Making effective use of transfer techniques may conserve practice time for the teacher. In addition, a more thorough analysis and understanding of the skill may result if the opposite side is used. . . . By taking full advantage of bilateral training and transfer, teachers will avoid developing 'one handed' performers who can turn or break in only one direction. (15, p. 81)

Schrecker (16, p. 45) suggests that the continued use of one side of the body will result in postural unsymmetry and excessive side dominance. This difficulty can only be overcome by the development of bilateral skill of the individual, especially in normal activities.

Although Cratty (11, p. 291), Oxendine (15, p. 81) and Singer (17, p. 245) mention the importance of teaching for bilateral transfer of skill, no attempt is made by these authors to recommend a desirable practice schedule in order to achieve bilateral skill.

Since few studies have been completed in this specific area of physical education and psychology, the importance of developing an efficient practice schedule so as to achieve bilateral skill should be obvious.

I. THE PROBLEM

Statement of the Problem

The purpose of this study was to compare two practice schedules and their results in achieving bilateral skill in lacrosse cradling. The first practice schedule was one of continuous practice with one side until the ball could be cradled for 30 seconds followed by the same skill on the opposite side until this criterion was met. The second schedule consisted of practicing the skill on either side for 30 second time periods until the ball could be cradled continuously for 30 seconds on each side in succession.

Importance of the Study

It is frequently necessary in athletic competition as well as in everyday activities for a participant to perform a skill with either side of the body. Unfortunately there is some difficulty for individuals to learn a skill using the non-dominant side of the body.

It appeared to the researcher that an efficient method of achieving bilateral skill in any activity would aid skill instruction in physical education and athletics.

II. DEFINITIONS OF TERMS USED

Bilateral skill. A physical skill that can be performed by either side of the body.

Bilateral transfer. The transfer of the effects of practice in performing a skill on one side of the body to the opposite side.

Continuous schedule. The subject practices cradling the ball on one side of the body until the skill can be performed continuously for a period of 30 seconds. At this point the subject changes sides and practices the skill on the opposite side until the same criterion is met.

Alternate schedule. The subject practices cradling the ball with one side for a period of 30 seconds and then changes sides and practices on the opposite side. This alternation of skill practice continues until the criterion is met.

Lacrosse cradling. The subject is required to raise a lacrosse stick from a position parallel to the floor to an angle of 45 degrees with the floor and back again to the parallel position. In the process the ball must remain in the pocket at the end of the stick and the stick must be completely inverted at the uppermost position.

Skill criterion. The subject was required to cradle the ball continuously for a period of 30 seconds with each side in succession.

CHAPTER II

REVIEW OF THE LITERATURE

Few studies concerning the bilateral transfer of skill have been conducted in the field of physical education. Most of the investigations have been completed by psychologists, with the studies primarily concerned with fine motor tasks in relation to gross motor tasks that physical educators usually deal with. In this review of literature, the researcher has related only those studies pertaining specifically to bilateral transfer of skill.

I. BILATERAL TRANSFER OF SKILL

"Bilaterality refers to the transference of any skill from one side of the body to the other side" (15, p. 79). Many studies have been completed that confirm this occurrence. In addition, Bray (6), Weig (20), and Ammons (2) have presented reviews of research concerning bilateral transfer.

One of the first studies dealing with the transfer of skill was done by Swift (18). He reported that the ability to juggle two balls with one hand is positively transferred to the other hand.

Not only was Swift's study completed comparatively early, but it is one of the few studies that deals directly with a gross motor skill.

Gibson, et al. (13) conducted a study which showed that approximately 62 percent of a group trained to respond with the right hand transferred the training to the left hand. The subjects were classically conditioned to respond to a buzzer in order to escape a shock. The transfer effect was only noticed when the left hand was placed on the electrode, showing that transfer was only possible under very similar conditions.

Munn (14) demonstrated bilateral transfer of training in a task which involved flipping a ball into a cup. The ball and cup were attached together by a string. Both the experimental group and the control group made 50 attempts with the left hand. While the control group was resting, the experimental group then attempted the task 500 times with the right hand. Finally, both the control group and the experimental group made 50 attempts at the skill again with the left hand.

The results showed that the experimental group improved 61 percent and the control group improved 28 percent. This difference in improvement was attributed to bilateral transfer of skill.

Cook (7, 8) made several studies involving the use of a mirror in tracing a star-shaped maze. From these extensive studies Cook made some observations that are directly concerned with bilateral transfer. He concluded that there was some transfer to all muscle groups, but that the greatest amount of transfer was to the symmetrical muscle group on the opposite side of the body (7, p. 160). He also reported that there was no significant difference between the transfer from hand to foot and foot to hand (8, p. 700).

Barch (4), using a rotary pursuit, reported that the warm-up effect can be bilaterally transferred from one hand to the other. Barch's subjects demonstrated a decrement in performance after a one week rest period, but on changing hands the subjects' performance returned to the pre-rest level of performance. This change in performance was attributed to the bilateral transfer of the warm-up effect.

Ulich (19) reported that bilateral transfer of training is not necessarily dependent on actual participation by the subject. His study showed an equal amount of bilateral transfer when the subject simply watched another individual perform the task with the opposite hand as did actual practice with his own opposite hand. This study

pointed out the importance of the visual processes in the learning of motor skills.

Bell (5), in a study concerned with the transfer of training in a manual crank device, reported that the work decrement effects in one hand do not readily transfer to the other hand. Thus, a decrease in skill level on one side of the body will not necessarily mean that there will be a decrease in the skill level on the other side of the body.

In summary, a review of the related literature has shown a consensus that bilateral transfer of skill does exist, that is, a skill which is learned on one side of the body can be transferred to the opposite side, producing an effective learning situation.

Ammons (2, p. 168), Cratty (11, p. 200), and Oxendine (15, p. 80) suggest several reasons why bilateral transfer of training takes place. They include generalized muscular tension associated with concentration on the task, formulated principles for efficient performance of the task, familiarity with the nature of the task and past learning of highly similar skills.

II. PRACTICE SCHEDULING AND BILATERAL TRANSFER

It has been shown that bilateral transfer of skill does exist; however, this researcher is concerned with the

most efficient practice schedule that will produce bilateral transfer or cross education of a skill.

Dashiell (12), using several conditions involving transfer of training other than bilateral transfer, reported that a complete method of learning two skills was more efficient than an alternate method of learning two skills. The complete method refers to learning one skill first before attempting the second. The alternate method refers to practicing one skill and then the other in an attempt to learn both skills simultaneously. The tasks Dashiell studied included maze running by rats, children and adults, card sorting by adults, and adding by adults. In all cases he reported the complete method being more economical than the alternate method.

Crafts and Allen (9, 10) agree somewhat with Dashiell's findings in a study to determine whether an activity requiring ultimately the simultaneous use of the two hands would be better learned by practicing it first with each hand separately (the successive method), or by practicing with both hands together from the beginning (the simultaneous method).

The task required that two identical objects be traced as seen in a mirror. The results showed that the successive group performed better with each hand individually and with both hands together than did the simultaneous group.

The results were measured according to the number of errors and amount of time to completion.

Allen (1), in a later study, reconfirmed the findings that he and Crafts had made. Allen suggests two reasons why the successive method is more economical than the simultaneous method--the subject is only concerned with the learning of one skill at any given time and the learning is massed so as to allow for elimination of errors.

In summary, all the studies appear to show that learning which involves one side at a time is more efficient than attempting to learn the skill using both sides at the same time. However, this researcher suggests that there are two questions which remain unanswered. Can these findings be generalized to include the more frequently used gross motor skills and if the skill requires that both sides of the body perform the skill, but at different times, will alternate learning produce bilateral transfer from one side to the other?

CHAPTER III

PROCEDURE

I. SUBJECTS

The subjects in this study were 30 male physical education students enrolled in the required physical education classes at the University of Tennessee, Knoxville, during the winter quarter, 1970. These students ranged in age from 18 years to 23 years.

II. TESTING EQUIPMENT

The equipment used in this study was as follows: a regulation box lacrosse stick measuring approximately 45 inches long and 6 inches at the widest part of the mouth, a Wilson "Championship" tennis ball, two stop watches, recording sheet, and a pencil.

III. DATA COLLECTION PROCEDURE

This study was designed so that the subjects learned to cradle the tennis ball with both hands during one of two practice schedules.

The subjects were 30 dominantly right-handed physical education required-program students who volunteered as subjects and were randomly assigned to the two testing groups.

While the study was taking place only one subject at a time was tested. The instructions to all the subjects were the same. The only difference between the groups was the practice schedule they followed (See Appendix for instructions).

During the instructions the subject was shown how to hold the stick, starting with the upper part of the shaft in his right hand and gripping the lower part of the shaft in the left hand. The investigator then demonstrated the skill, pointing out the fact that the head of the stick moves in an arc of a circle and that at the top of the cradle the mouth of the stick is completely inverted. The subject was told that the required skill level was reached when he could cradle the ball continuously for 30 seconds with each hand in succession. The subject could only practice the skill when the ball was in the pocket of the lacrosse stick.

In one situation the practice session consisted of alternating sides every 30 seconds while learning the skill. This group was called the alternate group. In the other testing situation the individuals continuously practiced the skill with one side until the ball could be cradled for 30 seconds and then changed sides and practiced on the other side until again the ball could be cradled for 30

seconds. The subject then had to return to the original hand to fulfill the criterion.

The criterion to be met by both groups was that the ball had to be cradled in each hand continuously for 30 seconds in succession.

The investigator recorded the total amount of time it took to learn the skill, which required one stop watch; he also measured the continuous time that the ball was cradled, which required a second stop watch. In addition, the researcher recorded the number of attempts each subject made in learning the skill. An attempt was defined as the point from which the subject began to cradle the ball to the point at which the ball left the pocket of the stick or the subject reached the learning criterion.

CHAPTER IV

ANALYSIS OF DATA

I. STATISTICAL PROCEDURE

The t statistic was used to determine if a significant difference occurred in the learning of the lacrosse skill as a result of the alternate and continuous practice schedules. The formula used was

$$t = \frac{\bar{X} - \bar{Y}}{\sqrt{\left(\frac{\Sigma X^2 + \Sigma Y^2}{n_x + n_y - 2}\right)\left(\frac{n_x + n_y}{n_x \cdot n}\right)}}$$

where:

$\bar{X}$ = the mean of the alternate schedule scores

$\bar{Y}$ = the mean of the continuous schedule scores

ΣX^2 = the sum of the squared deviations in X from the mean

ΣY^2 = the sum of the squared deviations in Y from the mean

n_x = the number of cases in X

n_y = the number of cases in Y

The t was determined according to the length of time and the number of attempts required to learn the skill.

II. RATE OF LEARNING BY USE OF THE ALTERNATE PRACTICE SCHEDULE

In the alternate practice schedule the fewest attempts by an individual to reach the criterion was 17, the greatest number was 437. The mean number of attempts was 142.33 with a standard deviation of 104.981 (See Table I).

The shortest time required to learn the skill was 9 minutes and the longest time was 97 minutes. The mean time required was 31.266 minutes with a standard deviation of 22.019.

III. RATE OF LEARNING BY USE OF THE CONTINUOUS PRACTICE SCHEDULE

In the continuous practice schedule, the fewest attempts required by an individual to learn the skill was 4, the greatest number of attempts was 205. The mean number of attempts was 91.4, with a standard deviation of 65.090 (See Table II).

The shortest amount of time required by an individual to learn the skill was 3.5 minutes, the longest time was 55 minutes. The mean amount of time to learn the skill was 22.333 minutes with a standard deviation of 14.638.

TABLE I

DATA ON THE ALTERNATE PRACTICE SCHEDULE

Subject	Attempts (Number)	Total Time (Minutes)
1	437	97
2	50	12.5
3	252	38
4	17	9
5	148	36
6	103	32.5
7	42	10
8	184	35
9	160	34.5
10	118	26
11	156	41
12	72	13
13	195	40
14	48	8.5
15	153	36

TABLE II

DATA ON THE CONTINUOUS PRACTICE SCHEDULE

Subject	Attempts (Number)	Total Time (Minutes)
1	43	7.5
2	58	17
3	37	14
4	65	11
5	47	18
6	4	3.5
7	155	20.5
8	200	55
9	205	29
10	92	35
11	111	40.5
12	65	15
13	165	34
14	9	4.5
15	115	30.5

IV. COMPARISON OF THE TWO PRACTICE SCHEDULES ACCORDING TO THE NUMBER OF ATTEMPTS

The mean difference of the number of attempts between the two practice schedules was 50.93, the greater mean being that of the alternate schedule. The t was computed to be 1.597 which was not statistically significant (See Table III).

It should be noted, however, that the difference of the raw score means was large and normally would have been significant except for the extreme intragroup variance of both schedules.

V. COMPARISON OF THE TWO PRACTICE SCHEDULES ACCORDING TO THE LENGTH OF TIME

The raw score mean difference between the two schedules was found to be 8.933 minutes, the greater time being that of the alternate schedule. The t was computed to be 1.308 and was found not to be statistically significant (See Table IV).

TABLE III

SCHEDULES COMPARED AS TO THE NUMBER OF ATTEMPTS

Practice Schedule	Mean	Standard Deviation	Mean Difference	t
Alternate	142.33	104.981	--	--
Continuous	91.4	65.090	--	--
Difference in alternate and continuous schedules	--	--	50.93	1.597

TABLE IV

SCHEDULES COMPARED AS TO THE LENGTH OF TIME

Practice Schedule	Mean	Standard Deviation	Mean Difference	t
Alternate	31.266	22.019	--	--
Continuous	22.333	14.638	--	--
Difference in alternate and continuous schedules	--	--	8.933	1.308

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

I. SUMMARY

It was the purpose of this study to compare two practice schedules in achieving bilateral skill in lacrosse cradling. The two practice schedules consisted of alternating the lacrosse stick from one side of the body to the other after every 30 seconds of practice time and a continuous schedule which consisted of practicing on one side of the body until the ball could be cradled for 30 seconds before changing sides.

Thirty male physical education students from the University of Tennessee, Knoxville, required physical education classes volunteered as subjects. The subjects were randomly assigned to one of two practice schedules.

The skill to be learned consisted of cradling a tennis ball with a box lacrosse stick continuously, for 30 seconds on each side of the body in succession.

The first practice schedule consisted of alternating each side after each 30 seconds of practice time. The second schedule consisted of continuous practice with one side until the ball could be cradled for 30 seconds and then continuous practice with the opposite side until the ball could again be cradled for 30 seconds.

The results were measured by two different methods--the total number of attempts necessary and the total amount of time necessary to achieve the criterion.

The t statistic was used in analyzing the differences between the continuous schedule results and the alternate schedule results.

According to the evidence found in this study, there was, statistically, no significant difference in the scores for the continuous practice schedule and for the alternate practice schedule. The schedules, when compared according to the number of attempts, was found to produce a t of 1.597. The total time when compared achieved a t of 1.308. In order to be significant at the 5 percent level of confidence, the t in both cases would have to have been 2.05.

Although the differences were not statistically significant, there was a large difference in the raw score means. The difference in the means for the number of attempts was 50.93 in favor of the continuous schedule. For the total time measured the difference was 8.933 minutes, again in favor of the continuous schedule.

II. CONCLUSIONS

The conclusions from this study on the bilateral transfer of skill in lacrosse cradling are as follows:

1. There was statistically, no significant difference between continuous and alternate practice schedules in achieving bilateral skill.
2. The continuous practice schedule produced a lower raw score mean than the alternate schedule when measured according to the number of attempts and length of time to learn the skill.

III. DISCUSSION

In a study of this type it is difficult to make an accurate measurement of actual learning. The investigator can only assume that an individual's performance is an indication of the amount of previous learning.

The performance of the skill used in this study may have been affected by muscular fatigue, boredom or frustration of the individual and may not be a true indication of the amount of learning.

Although the study produced no statistically significant difference, the fact that there was a considerable difference in the raw score means of the two practice schedules may indicate that perhaps one practice schedule is better than the other.

IV. RECOMMENDATIONS

It is recommended that additional studies in this area be undertaken. They may consist of a similar study with a larger sample, a different skill to be learned and perhaps a post-test which may help to eliminate some of the performance variables.

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APPENDIX

INSTRUCTIONS READ TO THE SUBJECTS

Place the upper end of the shaft of the stick between the first and second joints of the fingers on your right hand. Hold the lower end of the stick in your left hand between the thumb and first finger so that the stick can rotate between them.

This skill, called cradling, requires that you raise the stick with your right hand from a position parallel with the floor to a position at an angle of 45 degrees with the floor and to return it to the original position without dropping the ball.

The correct sequence of movements is elbow, wrist and finger flexion in the upward motion, and elbow, wrist and finger extension in the downward motion.

Notice that the head of the stick moves in an arc of a circle and that the stick is inverted at the top of the cradle.

To fulfill the requirements you must cradle the ball for 30 seconds continuously in each hand and in succession.

Only attempt the skill when the ball is in the pocket.

Begin practicing with your right hand. I will tell you when to change sides and when you should cease.

VITA

John Frederick McCabe is a graduate of Dorchester Consolidated High School, Dorchester, New Brunswick. He received his Bachelor of Physical Education Degree in 1967 and the Bachelor of Arts Degree in 1969, both from the University of New Brunswick. He taught at the Riverview School, Port Cartier, Quebec, for the school year 1967-1968. He is married to the former Cathy Mead, Montreal, Quebec. The researcher will continue his studies at the University of Tennessee toward a Doctor of Education degree.