THE EFFECTS OF A TRAINING PROGRAM UPON FACE-OFF PROFICIENCY IN THE GAME OF LACROSSE

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY
ROBERT W. MURPHY

1970

ABSTRACT

THE EFFECTS OF A TRAINING PROGRAM UPON
FACE-OFF PROFICIENCY IN THE
GAME OF LACROSSE

By

Robert W. Murphy

Statement of the Problem

To determine the effect of a training program upon face-off proficiency in the game of lacrosse.

Methodology

Twelve male members of the Michigan State Lacrosse Club were used as subjects for this study. All subjects were given a pre-test on face-off proficiency as measured by their ability to win a face-off. Each subject was ranked according to his proficiency on 55 trial face-offs.

Each subject was retested against each other subject three weeks after the pre-test. The pre-test--retest score for reliability showed to be +.93.

Using their proficiency score made on the pre-test, they were randomly assigned to groups, resulting in two groups that were as close to equal as possible. Six subjects were assigned to a control group, and six subjects were assigned to an experimental group. The experimental

group participated in a training program, orientated towards developing strength and speed, for a period of five weeks. The training program consisted of weight-training exercises for the wrist and lower leg, and agility drills that required quick reactions. During this same five week period, both the control group and the experimental group participated in the regular lacrosse practice sessions.

At the end of five weeks both groups were tested in the same manner as on the pre-test. Evaluation consisted of a t-test to determine the difference between mean changes of the control and experimental groups.

Conclusions

1. The training program, orientated toward developing strength and speed in this limited study, did not significantly improve face-off proficiency at the .05 level of confidence.
2. The sample size was not necessary or sufficient in this study. Thus, the power of the t-test could not be stated.

Approved Randolph W. Webster

THE EFFECTS OF A TRAINING PROGRAM UPON FACE-OFF PROFICIENCY IN THE GAME OF LACROSSE

By

Robert W. Murphy

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Health, Physical Education,
and Recreation

1970

DEDICATION

This thesis is respectfully dedicated to my mother

Mrs. Theresa Murphy

ACKNOWLEDGMENTS

Thankful appreciation is extended to Dr. Randolph Webster and Dr. William Heusner whose advice and assistance has made this study possible. Gratitude is also expressed to Coach Robert Kauffman, Coach Paul Caldwell, Mr. Richard Cadigan, Mr. Anthony Paige, and the members of the Michigan State Lacrosse Club who donated their time and effort.

R.W.M.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION TO THE PROBLEM

In competitive lacrosse today it is very important to have control of the ball. The team that can consistently gain possession of the ball at the face-off will have a decided advantage. The speed with which man can move and the strength with which he moves are often limiting factors in the performance of a motor skill.

The possibility that strength and speed are highly correlated with face-off proficiency leads in turn to the possibility of increasing one's ability to face-off by increasing their strength and their speed. Man is continually in need of further information regarding the specificity of training for the improvement of strength and speed.

Interpretation of the Problem

The center-midfielder is the person who faces-off in lacrosse. Beginners are said to have problems mastering one specific technique. One technique used by a face-off man is called the "flip" technique. This method of facing-off involves a rotation of the wrists. The face-off man undercuts his opponent's stick and using

an upward force, flips the ball up and in front of himself.

Another technique is known as the "rake." The face-off man applies a force downward with his right hand, and at the same time he rakes the ball with his stick to the left of himself. These are but two of a variety of techniques a face-off man may use.

Their inability to master one specific technique may be attributed to their lack of strength in the wrist, forearm, and lower leg areas. But no matter which technique one uses there is a certain degree of strength and speed needed to master any face-off technique.

The author believes that a training program emphasizing a combination of strength and speed will improve face-off proficiency.

Statement of the Problem

The problem of this study was to investigate the effect of a training program upon face-off proficiency.

Need for the Study

Very little research has been done in the game of lacrosse. No research has been done specifically with the face-off. In the face-off the swiftness of the individual and his strength play an important part. If a training program that improves strength and speed could be developed, coaches and players would be able to

use the training program which might improve face-off proficiency.

Since the entire field is almost totally unexplored, the author hopes that this study will show a better understanding of how the face-off is won, and will make way for further research in this field.

Purpose of the Study

The purpose of this study was to determine if it were possible to improve face-off proficiency through a training program orientated toward improving strength and speed.

In order to realize this purpose the training program was selected because it required a minimum of equipment, time, and financial support.

Limitations of the Study

The effectiveness of the study was limited to:

1. Twelve male members of the Michigan State Lacrosse Club who represented an available sample.
2. The fact that strength and speed were not measured either before or after the training program.
3. The amount of time available for the programs administered.

4. The difficulty in preventing subjects from missing the training sessions.
5. The difficulty in motivating the subjects to perform maximally in the training and testing procedures.

Definition of Terms

Face-Off

The method by which the ball is put into play at the beginning of each quarter and after each goal scored. Each player attempts to direct the course of the ball to a team member or to himself by a movement in a manner he desires.

Set-Position

A crouched position facing the attacking goal with the weight of the body distributed between the balls of the feet and the hands. The right hand is supinated while the left hand is pronated in holding the lacrosse stick.

Proficiency

The ability to react to the whistle and win the face-off.

Technique

A specific method used in trying to win a face-off.

Initial Movement

The person's first reaction toward the direction of the lacrosse ball.

CHAPTER II

REVIEW OF THE LITERATURE

Although it has been established that the correct technique is essential in lacrosse there does not seem to be agreement as to which method is superior. Each man has a peculiar style of his own. There is no way to measure the psychological aspect involved in the preference of one technique over another. Perhaps a person has had continued success with one technique and does not wish to experiment with another. The author feels that the most common reason for using one particular technique all of the time is that the person has been advised to do so from someone whose opinion is respected, or he is imitating a favorite all-american.

Since there is no research dealing with lacrosse in the literature, this chapter will chiefly concern itself with strength, reaction time, and weight training programs. It will be necessary to consider these terms in relation to each other.

"Speed is a word used to indicate various types of quickness or rapidity" (20, p. 93). "In sports it may refer to either quickness in seeing or in acting, but it

usually refers to a combination of perception with muscular action" (19, p. 10).

Applewhaite mentions the need for reaction time and speed of motion in his descriptive paragraph,

> The runner crouches ready to spring foreward at the crack of a starter's pistol. The rugby football back and the association footbal keeper crouch ready to spring in any direction, the former to get into tackle, the latter to divert or catch the ball (3, p. 22).

The factors determining the speed of a response in a simple reaction are undoubtedly very complex and include more than one organic variable. Myers (25) believes that reaction time is dependent upon the time occupied at the peripheral sense organ.

According to Woodworth (33), a simple reaction time depends upon the subjects being prepared or "ready" to receive the stimulus or to perform an act.

Smith (29) studied the individual differences in strength, reaction, latency, mass and length of limbs, and their relation to maximal speed of movement. A conclusion drawn from this study was that individual differences in speed of limb movement are almost completely unrelated to measured static strength or the ratio of static strength to limb mass.

Another study was conducted by Henry (15) to study the factorial structure of speed and static strength in a lateral arm movement. Speed of movement in a lateral adductive arm swing was timed at seven equidistant points

on an arc of one hundred and twenty degrees. Static strength and effective arm mass were measured in the movement pattern. Conclusions drawn from this were that measured static strength available for a movement and speed in the movement are possibly correlated to a slight degree. Also the low relationship between static strength and speed of movement supports the hypothesis of high neuromuscular specificity.

Zorbas and Karpovich (34), while studying the effect of weight lifting upon the speed of muscular contractions, found that weight lifters were faster in their rotary motions of the arm than the non-lifters.

Goldenberg expressed the following thought concerning progressive weight training: "A muscle developed over a long period of time remains in good condition for a long time, and a muscle developed through heavy weights with a few repetitions lasts a short time" (14, p. 33). Thus he suggests that light weights be used and that three bouts of ten or fifteen repetitions is sufficient for developing long range strength.

Berger (4) found that lifting once a week produced a significant increase in strength. In another study Berger (5) found that three to nine repetitions maximally to be the optimum number of repetitions with which to train for quickest strength improvement.

Chui (9) compared a weight training group to a group in a required physical education class in an attempt to ascertain the effects systematic weight training had on athletic power. It was concluded that the weight training group improved in muscle power over the control group, and that the results indicated that speed could probably be increased through systematic weight training.

It was the intent of Wilkin to test the hypothesis that training with exercise of the heavy resistance type causes an incipent muscle-bound condition, defined in part as impaired speed of movement (32). In order to test this hypothesis, speed of movement of the arm action was tested before and after resistance training. The conclusion was that over a period of one semester, weight training had no slowing effect on speed of arm movements.

In an article concerning the explosive power of athletes, Steitz (31) cited several reports concerning the development of leg strength by using an overload training program. A general conclusion drawn from these articles was that a five week weight training program was sufficient to significantly improve vertical jump and leg strength. He also suggested that heel raises and deep knee bends with an application of the overload principle were two very good exercises for increasing leg strength.

Brown and Riley (7), in an attempt to determine the effect of weight training on leg strength, used a weight training program of five week's duration to train one group of a matched sample while the other group did not train at all. A simple heel raising exercise with weighted bar bells on the subject's shoulders was used to increase leg strength. From the results it was concluded that a five week weight training program using only the heel raising exercise will increase leg strength, and consequently, vertical jump.

Berger and Hardage (6) concluded that the weight training program, employing maximum or near maximum loads for each of ten repetitions, was more effective for increasing strength than a program involving the performance of ten repetitions with the 10-RM, among lifters with no previous lifting experience and when training occurred three times weekly for eight weeks.

Morehouse (23) concluded that the degree and rate of strength development was about the same for groups of subjects with different initial strengths when one, three, five or ten contractions were performed in training sessions held four times each week.

Hoffman defines the purpose of physical training as

> . . . preparing the body for instand response to physical demands and strengthening it for efficient activity during a reasonable length of

> of time. An athlete should possess above average strength in all the muscles of his body, and have superior strength in all the muscles used most often in his sport (16, p. 63).

Hoffman (16) also relates that healthy muscles will increase in their ability to operate the levers of the body as reasonable demands are placed upon them, and that the organs of the body, including the muscles, will retain a degree of operating ability that is equal to normal demands.

Studies such as these that have been mentioned in this chapter make it apparent that there was a positive relationship between strength and general strength and physical condition. Mathews and Kruse (21) point out that although there is an accepted procedure which will bring about an increase in strength through physical training, we must consider that individuals, regardless of the exercise frequency, react in a manner peculiar to themselves. The American Association for Health, Physical Education, and Recreation (1) states that individuals respond differently to weight training within almost every group working with weights. There is no specific weight training program for all and continual changes in procedures and techniques may be necessary to elicit strength gains. For these reasons the author feels that a weight training program can help an individual in a motor task.

CHAPTER III

METHODOLOGY

The Problem

The problem of this study was to investigate the effect of a training program upon face-off proficiency in the game of lacrosse.

Experimental Subjects

This study was initiated at the beginning of winter term of 1968 at Michigan State University. For the purpose of this study the available sample was defined as males between the ages of eighteen and twenty-one and twelve who participated in lacrosse as an athletic event. The criterion for selection from the sample was based upon lacrosse experience. Those chosen for the study could not have had more than three months of lacrosse experience. Eight of the subjects chosen for the study had had no previous lacrosse experience and the remaining four subjects chosen for the study had only two months of previous lacrosse experience.

Experimental Design

From January 29 to February 2 all subjects were administered a pre-test for face-off proficiency at the

dirt arena of the Men's Intramural Building. Each subject faced-off with each other subject. This gave each subject a total of 55 trial face-offs.

Instructions as to the rules governing the face-off were given to each subject. The author did not demonstrate any face-off technique. Only the set-position was shown to each subject. Each subject was asked by the author not to go into research on face-off techniques, nor ask for assistance from a team member.

The ball was placed between the two sticks. A command of "set" followed by the sound of a whistle was carried out throughout the study. Each subject reacted to the sound of the whistle and each subject tried to get to the ball first.

The test measured the subject's ability to get to the ball and win the face-off. The first subject touching the ball with his stick after the initial movement was declared the winner by the author.

Face-off proficiency was retested between the period of February 26 to March 1 by the author using exactly the same procedures as had been used on the pre-test. This was done so that the author might obtain a test for reliability.

Each subject was randomly assigned into a group according to their rank on the pre-test. Six subjects

were assigned to a control group and six subjects were assigned to an experimental group.

For five weeks beginning on April 1, the control group participated exclusively in the regular practice sessions as directed by the coach of the team. During this same five week period, the experimental group engaged in both the regular practice sessions and an experimental training program (see Appendix I). The weight training part of the program was done by each subject three times a week on Monday, Wednesday and Friday.

The weight-training program consisted of exercises designed to strengthen the wrist, forearms and lower leg. The exercise involving toe-raises was done with weights over the shoulders of each subject. The subject would stand so that the phalanges and metatarsals of the feet were supported by hard rubber mats that measured three inches high. The heel of each foot was extended beyond the edge of the mats. Thus, the supported weight was raised with concentric plantar flexion of each foot.

During the first week of weight-training each subject lifted 125 pounds of weight. Each week 20 pounds was added to the original weight, and at the end of five weeks each subject was lifting a maximum of 205 pounds.

The second phase of the training program, the outdoor agility drills, were performed five days a week. The first drill was entitled "Reaction to the whistle"

by the author. Each subject was placed in a set face-off position without his stick. Each subject reacted to the sound of the whistle and to the command direction given by the author. The command given was done by the hand of the author and in the right, left, foreward, or backward direction. The purpose of this drill was to improve the speed of each subject by lowering their center of gravity and by increasing their agility in a variety of directions.

The second drill of the outdoor agility phase was entitled "Blind spot." Each subject was placed in the set face-off position with his stick but with his eyes closed. Approximately one second before the sound of the whistle, the author threw the ball within a radius of five yards around the subject, and then the author blew the whistle. At the sound of the whistle the subject reacted in the direction of the ball.

During many face-offs a center-midfielder loses the sight of the ball for a split second. The purpose of "Blind spot" was to have each subject find the ball, and react towards it as quickly as possible.

Between May 6 and May 10, each subject was administered the post-test for face-off proficiency. The post-tests were conducted at the same place and in the same manner as were the pre-tests.

Statistical Method

The Pearson Product-Moment Coefficient of Correlation was used to correlate the pre-test and the retest for reliability.

The t-test for determining the difference between mean changes was used to test for significance between the improvement of the control subjects and the improvement of the experimental subjects. The mean changes refer to the improvement as noted by the difference of the group means on the pre-test and post-test scores. The .05 level of confidence was used to indicate significance.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The purpose of this study was to determine the effect of a training program upon face-off proficiency in lacrosse.

A pre-test--retest correlation on face-off proficiency was run, and a pre-test--post-test was administered to test for mean changes between the control and experimental groups.

Reliability Results

Appendix II shows the pre-test and retest scores for face-off proficiency for all twelve subjects. The "d" indicates the difference between these tests. A Pearson Product-Moment Coefficient of Correlation was found between the pre-test and the retest for face-off proficiency to determine the reliability of the two tests. A correlation of +.93 was found on the face-off proficiency tests.

The means for the pre-test and the retest were identical at 27.5. Each test also had a standard deviation of 10.35.

The Effects of the Training Program Upon Face-Off Proficiency

Using the t-test for determining the difference between mean changes, the improvement of face-off proficiency of the control subjects was compared to the improvement made by the experimental subjects. The t-test of the difference between mean changes produced a t = +1.45. This was not significant at the .05 level of confidence.

There was no significant difference between the mean average proficiency of the control group and the mean average proficiency of the experimental group.

Table 1 shows the pre-test and the post-test face-off proficiency scores for both the control group and the experimental group.

TABLE 1.--Improvement of the average face-off proficiency from the pre-test to the post-test in the control and experimental groups.

Group	Pre-test Mean	Post-test Mean
Control	28.50	27.20
Experimental	27.67	30.75
Difference	+.83	-3.55

[t] = +1.45

Appendix III shows the scores recorded by the control subjects and the experimental subjects on the pre-test and the post-test. The "d" indicates the difference between these two tests.

Thus, the particular training program devised for this study may not be effective in increasing face-off proficiency.

CHAPTER V

DISCUSSION, SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

Face-off proficiency in the tests may rely heavily on the reaction time of the subject as well as his wrist and leg strength. Perhaps, if reaction time, wrist strength, and leg strength were measured before and after the training program, a more valid criterion for evaluating face-off proficiency would have been obtained.

One possible explanation for the lack of statistically significant change in face-off proficiency in this study is the lack of motivated subjects. Several of the subjects, particularly during the weight-training phase of the program, were not highly motivated. Another possible explanation is the lack of a necessary and sufficient sample size. With the groups as small as they were, the power of the test could not be stated. Also, if three or four subjects are poorly motivated, then the subjects have a negative influence on the results of the study.

Summary

The purpose of this study was to investigate the effect of a training program upon face-off proficiency in the game of lacrosse. The need for such a study is indicated by the lack of literature concerning lacrosse and the face-off in lacrosse. The possibility that an increase in strength and speed would increase face-off proficiency was the main motivation behind this study.

Twelve male members of the Michigan State Lacrosse Club were used as subjects for this investigation. All subjects were given a pre-test on face-off proficiency as measured by their ability to win a face-off. Each subject was ranked according to his proficiency on 55 trial face-offs. Using their proficiency score, they were randomly assigned to groups, resulting in two groups that were as close to equal as possible.

Six subjects were assigned to a control group, and six subjects were assigned to an experimental group. The experimental group participated in a training program for a period of five weeks. During this same five week period, both the control group and the experimental group participated in the regular lacrosse practice sessions. At the end of the five weeks both groups were tested in the same manner as on the pre-test.

Conclusions

1. The training program, orientated toward developing strength and speed in this limited study, did not significantly improve face-off proficiency in the game of lacrosse at the .05 level of confidence.
2. The sample size was not necessary or sufficient in this study. Thus the power of the t-test could not be stated.

Recommendations

1. This study should be repeated or a similar study should be conducted with a larger sample size.
2. Strength and reaction time should be measured and correlated with face-off proficiency.
3. A similar study should be conducted to investigate the influence of strength and reaction time upon the different face-off techniques. This could be statistically analyzed with an analysis of variance test.
4. The training program should be limited to fewer exercises.

APPENDICES

APPENDIX I

STRENGTH AND AGILITY IMPROVEMENT

This lacrosse training program was developed by the author for the player who desires to become more proficient at the face-off. It strengthens the wrists, forearms, and legs and it increases the player's agility.

Wrist-rotator, wrist-curl, and toe-raises were completed with three sets of ten repetitions, and this was done three times a week. Hand-grips were also done in three sets, three times a week but in repetitions of twenty-five.

The outdoor agility drills were done five days a week with five repetitions of each drill weather permitting.

Program

Exercise	Sets	Repetitions
wrist-rotator	3	10
wrist-curls	3	10
hand-grips	3	25
toe-raises	3	10
outdoor drill (1)	1	5
outdoor drill (2)	1	5

APPENDIX II.--Test-retest measurements.

Subject	Score on Pre-test	Score on Re-test	d
1	40	39	-1
2	34	30	-4
3	33	29	-4
4	32	28	-4
5	31	34	+3
6	29	32	+3
7	29	31	+2
8	27	28	+1
9	25	21	-4
10	20	25	+5
11	16	16	0
12	14	17	+3

Group Mean = 27.5

Group Standard Deviation = 10.35

r for reliability = +.93

APPENDIX III.--Pre-test--post-test measurements.

Subject	Pre-test	Post-test	d
	Control Group (A)		
1	40	38	-2
4	32	30	-2
5	31	29	-2
8	27	26	-1
9	25	25	0
12	14	15	+1
Totals	169	163	-6
Mean	28.50	27.20	--
	Experimental Group (B)		
2	34	35	+1
3	33	33	0
6	29	30	+1
7	29	31	+2
10	20	22	+2
11	16	16	0
Totals	161	167	+6
Mean	26.67	30.75	--

BIBLIOGRAPHY

BIBLIOGRAPHY

1. American Association for Health, Physical Education, and Recreation. Weight Training in Sports and Physical Education. New York: 1962.

2. Anderson, Robert E., and Evans, G. H. Lacrosse Fundamentals. New York: A. S. Barnes and Company, Inc., 1966.

3. Applewhaite, H. P. Major. Lawn Tennis. London: Educational Productions Ltd, 1956.

4. Berger, Richard A. "Comparison Between Resistance Load and Strength Improvement." Research Quarterly, 33 (December, 1963), 637.

5. _____. "Optimum Repetitions for the Development of Strength." Research Quarterly, 33 (October, 1962), 334-338.

6. Berger, Richard A., and Hardage. "Effect of Maximum Loads for each of Ten Repetitions on Strength Improvement." Research Quarterly, 38 (December, 1967), 715.

7. Brown, R. J., and Riley, D. R. "Effect of Weight Training on Leg Strength." Scholastic Coach, 27 (December, 1957), 44-47.

8. Burke, R. K., and Rasch, P. J. Kinesiology and Applied Anatomy. Philadelphia: Lea and Fabiger, 1964.

9. Chui, Edward. "The Effect of Systematic Weight Training on Athletic Power." Research Quarterly, 21 (October, 1930), 188-194.

10. Cochran, W. G. Sampling Techniques. New York: John Wiley and Sons, 1953.

11. Crowder, V. R. "A Comparison of the Effects of the Two Methods of Strength Training on Reaction Time." Unpublished Master's thesis, Louisiana State University, 1966.

12. Dubick, H. "Fundamentals of Lacrosse." Athletic Journal, 34 (January, 1954), 7-11.

13. Freund, John W. Modern Elementary Statistics. Englewood Cliffs, New Jersey: Prentice Hall, 1967.

14. Goldenberg, Joseph. "A General Progressive Weight-Training Course for all Athletes." Scholastic Coach, 31 (October, 1961), 408.

15. Henry, Franklin M. "Factorial Structure of Speed and Static Strength in a Lateral Arm Movement." Research Quarterly, 31 (1960), 440.

16. Hoffman, Robert. Weight Training for Athletes. New York: Ronald Press Co., 1961.

17. International Lacrosse Magazine. New Jersey: Contact Publishers, 1966.

18. Kerr, B. A. "Relationship Between Speed of Reaction Time and Movement in a Knee Extension Movement." Research Quarterly, 37 (March, 1966), 55-60.

19. Lanier, Lyle H. "The Interrelationship of Speed of Reaction Measurements." Journal of Experimental Psychology, 17 (1934), 397.

20. Lawther, John D. Psychology of Coaching. New York: Prentice Hall, Inc., 1951.

21. Mathews, D. K., and Kruse, Robert. "Effects of Isometric Flexor Muscle Groups." Research Quarterly, 28 (1957), 26-37.

22. Moore, A. C., and Waglow, I. F. "Fundamental Lacrosse Skills." Scholastic Coach, 24 (April, 1955), 24.

23. Morehouse, F. L. "Development and Maintenance of Isometric Strength of Subjects with Diverse Initial Strength." Research Quarterly, 38 (October, 1967), 449.

24. Morrill, Kelso W. Lacrosse. New York: The Ronald Press Co., 1966.

25. Myers, Charles S. A Test-Book of Experimental Psychology. 3rd ed. New York: Longsman, Green and Company, 1928.

26. National Collegiate Athletic Association's Lacrosse Guide. Phoenix, Arizona: College Athletic Publications Service, 1967.

27. Rasch, Phillip J. Research Quarterly, 27 (1956), 333-337.

28. Schlaifer, R. Probability and Statistics for Business Decisions. New York: McGraw-Hill Book Co., 1959.

29. Smith, Leon F. "Individual Differences in Strength, Reaction Latency, Mass and Length of Limbs and their Relation to Maximal Speed of Movement." Research Quarterly, 32 (1961), 208.

30. Stanwick, Tad. Lacrosse. New York: A. S. Barnes and Company, 1940.

31. Steitz, Edward S. "Increase the Explosive Power of Your Athletes." Athletic Journal, 39 (February, 1959), 18.

32. Wilkin, Bruce M. "The Effect of Weight Training on Speed of Movement." Research Quarterly, 23 (October, 1952), 361-369.

33. Woodworth, Robert S. Experimental Psychology. New York: Henry Holt and Company, 1938.

34. Zorbas, William S., and Karpovich, Peter U. "The Effect of Weight Lifting Upon the Speed of Muscular Contractions." Research Quarterly, 22 (May, 1951), 145-148.