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THE EFFECTS OF BADMINTON, FOLK AND SQUARE DANCING, AND
BEGINNING SWIMMING ON VITAL CAPACITY

A Research Paper
Presented to
the Graduate Council of
Austin Peay State University

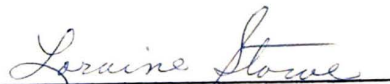
In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in Education

by
Brenda Ann Smith
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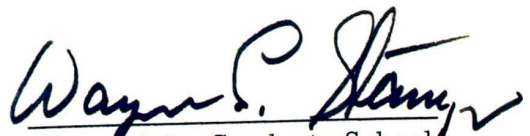
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To the Graduate Council:

I am submitting herewith a Research Paper written by Brenda Ann Smith entitled "The Effects of Badminton, Folk and Square Dancing, and Beginning Swimming on Vital Capacity." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts in Education, with a major in Health and Physical Education.


Major Professor

Accepted for the Council:


Dean of the Graduate School

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CHAPTER I

INTRODUCTION

The emphasis on physical fitness has necessitated a strong physical fitness program in the nation's schools. Exploration of all possible indices of physical fitness has revived the study of the relationship of vital capacity to physical fitness. If physical efficiency and vital capacity are improved with exercise, perhaps one's vital capacity may be used as an index of physical fitness.

Statement of the Problem

The purpose of this study was to determine the effects of three different sports on vital capacity. By using vital capacity as an indicator of physical fitness, it may be implied that some activities will develop physical fitness more readily than others.

Importance of the Study

Before a high level of physical fitness may be attained, health and physical educators must discover methods of detecting fitness. It is hoped that this study will reveal an adequate, yet simple method that teachers may employ in their programs. Also, if some activities tend to develop vital capacity or physical fitness more readily than others, these activities should be recognized and encouraged.

Delimitations

The study involved fifty-four students enrolled in three physical education courses (badminton, folk and square dancing, and beginning swimming) at Austin Peay State University during the winter quarter of the 1968-69 school year.

Limitations

The study was limited as follows:

1. The size of the sample involved only fifty-four students.
2. Only female students eighteen, nineteen and twenty years of age were involved in the study.
3. The physical fitness of the individual participants was determined subjectively.
4. No attempt was made to determine the level of motivation.

Definitions of Terms Used

Explanation of terms used in the study follows:

Vital capacity. This refers to "the maximal amount of gas expelled from the lungs by forceful effort following maximal inspiration." (5)

Physical fitness. The term generally "implies the ability to perform a given task or having those physical qualities developed to the extent demanded by the task." (9)

Survey of Related Literature

Research on pulmonary functions of athletes has been the subject of many studies. Varied results in the studies have led to much disagreement as to whether vital capacity improves with training or remains the same.

Bachman and Horvath (3) reported a significant increase in the vital capacity of swimmers after training. After testing twenty-nine males (control group, swimmers and wrestlers) before training, one month later, and four months after training began, significant improvement was found only in the vital capacity of the swimmers. An explanation of the increased vital capacity was given as the result of increased strength of the intercostal muscles which led to increased inspiratory capacity.

Adams (1) found no significant changes in vital capacity of a college track and field team at the end of the training and competition season. Measurement of vital capacity was taken at the beginning, the middle, and the end of the season. In addition, there was no significant changes in vital capacity of team members grouped according to types of training (distance runners, 440 and intermediate hurdlers, sprinters and high hurdlers, and jumpers and throwers).

Shapiro and other (8) in studying limiting factors of maximum ventilatory performance of subjects in twenty-seven studies found

that highly trained athletes significantly increased their vital capacity during their training program. This unexpected result (because of superb condition) was explained to be due to either enlargement of total volume or to improved strength and contractibility of the respiratory muscles.

Kroll (7) in studying thirty-six varsity wrestlers by giving a battery of tests to evaluate physique found their vital capacity to be 313.29 cubic inches or at least 61 s.s. -11 s.s. above average. The battery of tests was given as the teams came to the University of Illinois for dual wrestling meets.

Davis's (4) study involved subjects swimming middle distances (200 yard crawl stroke), who had less skill than varsity swimmers. He found their lung capacity to be highest after training and conditioning.

Akgum (2) in a study of pulmonary functions of ten Turkish wrestlers of the national team (of different weight categories) and 10 non-athletic students found there was no significant difference in vital capacity, although the wrestlers did tend to have higher vital capacities. The study proved that breathing capacity and peak expiratory flow rate was significantly higher for wrestlers.

Previous research appears to be concerned with vital capacity of males with little regard to females. Although it may be generalized

that the same results would occur in females, subsequent research should verify this.

The studies dealt mostly with comparisons of athletes and non-athletes which is important, but it was felt that more emphasis should be placed upon various activities as they contribute to development of vital capacity for the typical student.

Basic Assumptions

After review of previous literature dealing with vital capacity, it is assumed that one's vital capacity will improve with training.

Hypotheses

This study will endeavor to prove the following:

1. An individual's vital capacity will improve when he engages in exercise such as badminton, beginning swimming, and folk and square dancing.
2. Some activities will contribute more to the development of vital capacity than others.

Organization

The first chapter has been devoted to an introduction, a statement of the problem, importance of the study, delimitations,

limitations, definitions of terms used, survey of related literature, basic assumptions, hypotheses, and organization of the study. Chapter II will describe the methods of procedure used in the study. Chapter III will contain the presentation and analysis of the data and Chapter IV will include a summary of the findings and recommendations.

CHAPTER II

METHODS OF PROCEDURE

The contents of this chapter will deal with the methods used in administering the tests to the subjects. The procedure followed during the study will also be presented.

Method of Collecting the Data

The Subjects. The subjects were fifty-four female volunteer students enrolled in one physical education activity course (badminton, folk and square dancing, or beginning swimming) during the winter quarter of the school year 1968-69, at Austin Peay State University. Additional requirements were that the subjects should be eighteen, nineteen, or twenty years of age; enrolled in only the one physical education activity course; were not engaging in other strenuous physical activity; and were not physical education majors.

This resulted in participation by nineteen students from the badminton class, twenty-one students from the folk and square dancing class, and fourteen students from the swimming class. Originally the study involved fifty-eight student participants, but four students were eliminated from the study due to being absent during the post-test. The subjects met class three hours

a week during the winter quarter (ten weeks) and were not involved in any other conditioning program during that time.

The Tests. Each subject was given two tests, a pre-test given on the first day the class met and a post-test given during the last week in which the subject participated in the sport. The pre-test was given on January 3 to the folk and square dancing and badminton students, and the post-test was given on March 5 to the same students. The pre-test was given on January 4 to the beginning swimming students, with the post-test being given on March 7.

Each testing period involved measurement of vital capacity with the Proper Dry Spirometer which was recorded in centimeters, while measurement of height was taken and recorded in inches. Three practice trials with the mouth piece were given the subjects during both testing periods. One administrator gave instructions concerning the spirometer and other aspects of the testing period and recorded the vital capacity, while another administrator recorded the height of the subjects for both testing sessions and recorded the weight during the post-test only.

Treatment of Data

After the data were gathered, tables were constructed (presented in Chapter III) for each group containing the age, height, weight and vital capacity (pre-test and post-test) for each subject. The difference in vital capacity for the two tests is also included in the tables.

To determine if each activity developed vital capacity significantly, the mean standard deviation and standard error of the mean was computed for each test, along with the standard error of difference of the two means and a T-test for significance.

Using the preceding information and the total differences between the two tests, comparison of the three activities as they contributed to the development of vital capacity was made possible. Again the mean, standard deviation, standard error of the means of each group, standard error of the difference of the two means, and a T-test for significance was computed in order to compare the groups. The results and appropriate tables will be presented and discussed in Chapter III.

The following formulae were used to determine the preceding information: (6)

MEAN

$$M = \frac{\sum X}{N}$$

STANDARD DEVIATION

$$\sigma = \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2}$$

STANDARD ERROR OF MEAN

$$\sigma_M = \frac{\sigma}{\sqrt{N - 1}}$$

STANDARD ERROR OF DIFFERENCE

$$D = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$$

T-TEST

$$t = \frac{M_1 - M_2}{\sigma_D}$$

CHAPTER III

PRESENTATION AND ANALYSIS OF DATA

Pre-Test and Post-Test Results

Tables I, II, and III include the pre-test and post-test measurements of vital capacity, along with the difference between the results of the pre-test and post-test. These tables also contain the age, height, and weight of each subject. It should be noted at this point that the subjects vital capacity either increased or remained the same after the training period and in no case was there a decrease in vital capacity.

Table IV shows the comparison of pre-test and post-test results for the badminton, folk and square dancing, and beginning swimming students. The variability of the mean vital capacity for each group during the pre-test emphasizes the varied developmental levels of vital capacity in the beginning of the training period. The mean increase in vital capacity of 800.05 centimeters showed improvement for the badminton students which was significant beyond the five percent level of confidence adopted for the study and even significant beyond the one percent level of confidence.

The folk and square dancing participants improved their mean vital capacity by 899.74 centimeters, which proved to be significant beyond the five percent level of confidence and also beyond the one percent level. By referring again to the table, it is noted that although the swimmers seemed to increase their vital capacity (2500.93 cm - 2900.71 cm), the improvement was not significant. An explanation of this unexpected result could possibly be due to the fact that many beginning swimmers are not active during a training period because of the difficulty of the sport and the time involved in learning the fundamental skills.

Comparison of the Activities

A comparison of the differences in vital capacity between the pre-test and post-test was used to determine if one activity or activities contributed more to the development of vital capacity than the others. In Table V it is noted that although the mean difference was larger for the badminton students than for folk and square dancing students (.66 centimeters), the difference was not significant.

Table VI contains the results of the comparison of mean differences in vital capacity of the badminton and swimming participants. In analyzing these results, it should be remembered

that the swimmers did not increase their vital capacity significantly from the time of the pre-test to the time of the post-test. Still, it was decided to ascertain if the badminton activity developed vital capacity significantly more than the swimming activity. The increase in the mean difference of vital capacity of the badminton group as compared with the swimming group was significant beyond the five percent level of confidence and at the one percent level of confidence.

The relationship of the improvement of vital capacity of the folk and square dancing participants and the swimming participants is presented in Table VII. The mean differences of the two groups, folk and square dancing and beginning swimming, (700.23 cm and 300.93 cm respectively) shows significant improvement beyond the five percent level of confidence for the folk and square dancing group.

All three activities contributed to the development of vital capacity, but significant improvement appeared only in the badminton and folk and square dancing classes. In determining if some activities contributed to the development of vital capacity more readily than the others, it was found that there was little difference between the contribution of the badminton and folk and square dancing activities. Badminton activity and folk and square dancing developed vital capacity more than beginning

swimming, with the development being higher in badminton than folk and square dancing.

An explanation for the small increase in vital capacity resulting from swimming was probably due to the time spent on teaching fundamental skills with little time given for actual swimming. In badminton and especially folk and square dancing classes, students become involved in activity earlier during the quarter and little class time is devoted to actual instruction.

TABLE I
A COMPARISON OF TOTAL MEASUREMENTS
OF BADMINTON STUDENTS

Subject	Age	Height (in.)	Weight (lbs.)	Vital Capacity (cm)		Difference (cm)
				Pre	Post	
1	19	66-1/4	133	2800	3200	400
2	20	62-1/2	112	1800	2200	400
3	19	62-1/2	114	1300	1500	200
4	19	67	167	2600	3800	1200
5	19	63-1/2	152	2300	3200	800
6	19	66	133	900	2400	1500
7	18	64-3/4	184	1100	2900	1800
8	20	62	100	2700	2700	
9	19	65-1/2	126	3200	3600	400

TABLE I (continued)

Subject	Age	Height (in.)	Weight (lbs.)	Vital Capacity (cm)		Difference (cm)
				Pre	Post	
10	20	66	153	3300	3700	400
11	19	62-1/2	120	1600	2100	500
12	19	57-3/4	97	1000	1600	600
13	18	62-1/2	104	1200	2600	1400
14	18	64	134	1700	3200	1500
15	19	65	126	2500	3500	1000
16	18	58-1/2	110	2400	2800	400
17	18	62	106	2800	3800	1000
18	18	64	106	2700	3000	300
19	18	64-1/2	115	1500	2700	1200

TABLE II
A COMPARISON OF TOTAL MEASUREMENTS OF FOLK
AND SQUARE DANCING STUDENTS

Subject	Age	Height (in.)	Weight (lbs.)	Vital Capacity (cm)		Difference (cm)
				Pre	Post	
1	18	62	103	1000	2300	1300
2	19	61-1/2	114	900	2900	2000
3	18	60-1/2	156	1500	3100	1600
4	18	64	123	1800	2600	800
5	20	64	111	1000	2000	1000
6	20	61-1/2	124	2800	3100	300
7	19	68	156	3300	3600	300
8	18	61	124	900	1900	1000
9	20	62	108	2500	2900	400
10	19	65	120	1700	2900	1200

TABLE II (continued)

Subject	Age	Height (in.)	Weight (lbs.)	Vital Capacity (cm)		Difference (cm)
				Pre	Post	
11	19	63-1/2	123	3500	4000	500
12	19	67	126	3000	3600	600
13	18	66	127	3500	3500	
14	18	60	105	2600	2800	200
15	19	67	135	3000	3300	300
16	19	66	125	2600	3400	800
17	18	61-1/2	143	2600	3400	800
18	18	61	113	2500	2600	100
19	20	63	119	2400	2800	400
20	19	61	106	1900	3000	1100
21	18	64-1/4	152	2800	3300	500

TABLE III
A COMPARISON OF TOTAL MEASUREMENTS
OF BEGINNING SWIMMING STUDENTS

Subject	Age	Height (in.)	Weight (lbs.)	Vital Capacity (cm)		Difference (cm)
				Pre	Post	
1	19	60-1/4	118	2300	2500	200
2	20	62-1/4	105	2900	3100	200
3	18	62-1/2	143	3300	3600	300
4	19	65	106	2800	3400	600
5	20	64-1/4	119	2000	2000	
6	18	70-1/4	174	3000	4000	1000
7	18	63-3/4	138	3000	3700	700

TABLE III (continued)

Subject	Age	Height (in.)	Weight (lbs.)	Vital Capacity (cm)		Difference (cm)
				Pre	Post	
8	18	59-1/2	109	2500	2600	100
9	18	66	124	2800	3300	500
10	18	62-1/4	113	1300	2200	900
11	19	63-1/4	138	3200	3400	200
12	19	67-1/2	124	2700	2700	
13	18	62	152	2300	2500	200
14	19	64	175	2200	2600	400

TABLE IV
A COMPARISON OF THE PRE-TEST AND POST-TEST SCORES
OF
BADMINTON, FOLK AND SQUARE DANCING,
AND
BEGINNING SWIMMING STUDENTS

Activity	Badminton		Folk and Square Dancing		Swimming	
	Pre	Post	Pre	Post	Pre	Post
M	2000.68	2800.68	2200.76	3100.50	2500.93	2900.71
SD	700.54	600.74	400.46	800.09	500.17	500.90
SEM	1.78	1.59	.97	1.77	1.42	1.63
SED	2.39		2.02		2.16	
t ₀₅	3.32*		3.66*		1.75	
N	19		21		14	

* Significant at the five percent level of confidence

TABLE V

A COMPARISON OF THE TOTAL DIFFERENCES IN SCORES
OF THE
BADMINTON, AND FOLK AND SQUARE DANCING STUDENTS

	Badminton	Folk and Square Dancing
M	700.89	700.23
SD	500.10	500.04
SEM	1.20	1.13
SED	1.65	
t_{05}	.40	

TABLE VI
A COMPARISON OF TOTAL DIFFERENCES IN SCORES
OF
BADMINTON AND BEGINNING SWIMMING STUDENTS

	Badminton	Swimming
M	700.89	300.93
SD	500.10	200.89
SEM	1.20	.80
SED	1.44	
t_{05}	2.75*	

* Significant at the five percent level of confidence

TABLE VII
A COMPARISON OF TOTAL DIFFERENCES IN SCORES
OF
SWIMMING AND FOLK AND SQUARE DANCING STUDENTS

	Swimming	Folk and Square Dancing
M	300.93	700.23
SD	200.89	500.04
SEM	.80	1.13
SED	1.44	
t_{05}	2.37*	

* Significant at the five percent level of confidence

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary and Conclusions

The study was conducted in order to determine the effects of badminton, folk and square dancing, and beginning swimming on vital capacity. It was hypothesized that an individual's vital capacity would improve when he engaged in exercise such as badminton, folk and square dancing, and beginning swimming; and that some activities would tend to contribute more to the development of vital capacity than others.

Fifty-four female subjects enrolled in one of three activities at Austin Peay State University during the winter quarter of 1969 participated in the study by taking part in a pre-test, given during the first week of the quarter and a post-test, given during the last week of the quarter.

After analysis of the data both hypotheses were proven to be correct. The students enrolled in each of the activities increased their vital capacity, although the increase was significant only for the badminton and folk and square dancing students. In determining if some activities contributed more to the development of vital capacity than the others, it was found that badminton and

folk and square dancing improved vital capacity more than beginning swimming. Although the mean difference was higher for the badminton students than for the folk and square dancing students, there was not a significant difference in the contribution of these two activities. The results appear to rate the activities according to their contribution to the development of vital capacity in the following order: badminton was first, then folk and square dancing, which was followed by beginning swimming.

Recommendations

The results of this suggest the following recommendations:

1. If vital capacity may be used as one index of physical fitness, badminton, folk and square dancing, and swimming activities should be included in the physical education program to increase physical fitness of the students.
2. In order to increase physical fitness the beginning swimming program should be re-evaluated and improved so that more activity will be included.
3. Subsequent research should ascertain the effect of other sports upon the development of vital capacity so that sports which improve vital capacity may be emphasized in the physical education program.

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