JUMPING ROPE AS A MEANS OF IMPROVING CARDIOVASCULAR ENDURANCE IN TEENAGE GIRLS

By

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Bachelor of Science

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Champaign, Illinois

1975

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
July, 1979

JUMPING ROPE AS A MEANS OF IMPROVING CARDIOVASCULAR ENDURANCE IN TEENAGE GIRLS

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ACKNOWLEDGMENTS

The author wishes to express her sincere appreciation to Dr. Aix B. Harrison, her major adviser, for his guidance, interest, and assistance throughout this study and my entire master's program.

I also want to thank Dr. John Bayless and Dr. Betty Abercrombie for their valuable criticisms and for serving as committee members.

To my students, thank you for making my study possible and your hard work during that time. My thanks to Velda Davis for the excellence in typing the final copy.

I also would like to thank my Aunt and Uncle, Dr. and Mrs. Aix B. Harrison, who gave so graciously of their home and time to accommodate me during my graduate studies.

Special appreciation is expressed to my parents, Mr. and Mrs. Henry Holze, for their support and understanding during the course of my education. A special thanks to my mother for all the typing she has done throughout my education.

Finally, special appreciation, thanks, and love is extended to my husband, Mike. Without his encouragement, unending support, and sacrifices my achievements would not have been possible.

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CHAPTER I

Introduction

> Nobody knows where rope skipping first developed. People of all ages enjoyed it centuries ago in the Far East and Europe. Visitors in the Phillippines have found small fry jumping joyously with lengths of split bamboo. As long as Americans can remember, school children have skipped chanting 'I love coffee, I love tea . . .' But, until recently children and prize fighters were our only really dedicated skippers. Kids jumped for fun; boxers knew it helped their endurance (21, p. 38).

Most people look at a jump rope as a child's toy, yet it is a piece of equipment that may be utilized by all ages (26). Many claims about the benefits of rope jumping have been made by various articles. Some of the these are that it conditions the muscles of the arms, legs, and back; improves posture, coordination, agility, balance, and joint flexibility; strengthens the cardiovascular system; and is an outlet for tension (1, 21, 22, 24, 25). Another advantage claimed, is that ten minutes of rope jumping is equal to 30 minutes of running (6, 2, 22, 25).

In addition to all of the physical benefits, rope jumping can be done at almost anytime and anywhere, with a minimal amount of space. To implement the program, there is a small amount of equipment needed which is very inexpensive. Since time is one of American's most prized possessions, the minute amount of time needed for a program in rope jumping is a definite plus (4, 6, 21, 22, 25, 26).

If these claims are true then physical educators should be interested in implementing a program of rope jumping into their curriculum. Much has been done recently in promoting physical fitness in youth, yet most physical education programs lack activities that develop cardiovascular endurance (10). Also, due to the change made by modern technology, there is a definite need for physical activity. To counter this change made by technology, exercise must be programmed into our present day life. A good age to start this is in the teens so that it becomes a habit in one's life.

It is not the intent of this study to investigate all the claims that have been made about rope jumping but to see if cardiovascular endurance does improve with a rope jumping program in females, ages 13 to 16 years.

Statement of the Problem

The purpose of this study was to determine whether rope jumping would improve cardiovascular endurance, as measured by the 12 minute run, in teenage girls.

Hypothesis

It is hypothesized that there will be no significant difference in cardiovascular endurance between the group that jumps rope and the group that does not.

Limitations of the Study

1. Subjects used for this study were in prearranged classes. Therefore, the selection of subjects and the placement of subjects in

groups was not random which caused the first two levels of randomization to be violated. However, this should not affect the experiment because the intact classes consisted of one entire grade level. For example, the eighth grade class was grouped together so that each group encompassed a large body of subjects.

2. Classes were grouped by grade levels so groups being compared were not the same age. Seventh and ninth grade classes were compared to eighth and tenth grade classes. Because they were not the same age, there was a chance that there would be an initial skill difference in the groups. Using the various ages provided data and information over a wider range. If the groups did not start out equal, the scores would be adjusted statistically to make them equal.

3. No attempt was made to control the subjects' diets, sleeping, or extracurricular activities. Factors, such as rest and daily activity, could not be controlled.

4. Six weeks was a short time to carry out the necessary work to determine whether rope skipping was the cause of any changes observed. Five minutes a day, three days a week, was the total time available for rope jumping.

5. Not all subjects were able to jump rope. Not all of the subjects' abilities started out the same and some spent time learning to jump.

Delimitations

One hundred seven females from four physical education classes at Hiawatha Junior and Senior High School in Kirkland, Illinois, were used as subjects. All students in these four classes took part in the

experiment as part of their physical education class. The four classes were grouped homogeneously as seventh, eighth, ninth, and tenth graders.

Assumptions

1. It was assumed that all subjects were in good health and fit to participate in physical activity.

2. It was assumed that the 12 minute run was a valid measure of one's endurance.

3. It was an assumption that each subject exerted her best efforts on both the initial and final performance test.

4. It was assumed that each subject participated in the conditioning activity program to the best of her ability.

5. It was assumed that the testing conditions for the initial and final test were relatively unchanged.

6. It was an assumption that the age span used resulted in no great initial difference in cardiovascular difference (15).

Significance of the Study

It would be of significance to the profession to determine if a program of rope jumping could supplement a program of regular activities to improve cardiovascular endurance. "Often thought of as just a pastime for children and boxers, rope jumping can be the mainstay of a physical fitness program for adults" (26, p. 23). Since rope jumping can increase physical fitness in adults, it follows that it may provide the same advantage to teenage girls. Since very little research has been done on teenage girls, this study may bring to light a

valuable program to implement into physical education classes.

Teenage girls are prone to participate in things which they consider fun. "There are many jump patterns, making up your own can add interest and creativity to the routine" (26, p. 23). Jumping rope also becomes a social activity involving games and the competition that goes with them. As a result of the enjoyment of this interaction, it is easier for more students to become involved in this program. The time needed to perform such a conditioning program is relatively short. Therefore, since jumping rope takes up little of one's time and is fun, teenage girls may perform this program without the work and drudgery that is involved in other endurance programs.

Definition of Terms

Cardiovascular endurance: Exercise that is carried on with sufficient duration and intensity to place stress on the heart circulatory and respiration system (3).

Conditioning methods: Conscious or voluntary training program used to increase physical fitness (8).

Control group: Group that did not jump rope but did everything else that the experimental group did.

Endurance: "Physiological capacity of the individual to maintain movement over a period of time" (8, p. 576).

Experimental group: Group that jumped rope five minutes a day, three days a week, for six weeks and did everything else that the control group did.

Jump rope program: Subjects jumped rope for a total of a five

duration, three times per week for six weeks (see Appendix B).

Physical fitness: Reflects cardiorespiratory fitness or the ability to adapt to and recover from strenuous exercise (27).

Twelve minute run: A measure of cardiovascular endurance, that is generally accepted as a valid predictor of maximal oxygen intake capacity (7).

CHAPTER II

REVIEW OF LITERATURE

Frequency of Training

It has been shown that if conditioning programs are done three days a week, the subjects will show as much improvement as when done five days a week (9) (23). However, Gittman, Pollock, Purstine, Ward, Ayres, and Linnerud (13) investigated the physiological responses of males for one-day, three-day, and five-day per week frequencies of running, and concluded that five-day per week frequencies seemed to be more significant than three-day per week frequencies in eliciting changes in cardiovascular endurance.

Moffat (23) and Crews (9) have added some knowledge on this matter. Crews' and Roberts (9) study was done to determine the effect of the interaction of frequency training (walking and/or jogging) on the cardiovascular function of adult males. Subjects were trained at three different time frequencies: one day, three days, and five days a week. It seems that both the three and five-day per week groups had a significantly greater improvement than the one-day per week. There was no significant difference found between the three and five-day groups. Moffatt's, Stamford's, and Neill's (23) research was performed to determine whether the placement of tri-weekly training sessions would improve one's fitness. One group did interval training Monday, Wednesday, and

Friday. Another group had interval training Monday, Tuesday, and Wednesday. The other group served as a nonexercising control. Moffat's (23) study found that there is an improvement when training three days a week and the placement of these three days makes very little difference.

Studies Directly Related to Rope Jumping

There have been various studies done using a jump rope program as part of the research. Some of these have shown very little difference in physical fitness due to a jump rope program. Using a ten minute period of progressive rope jumping exercises, with college females, (N=27), Donaghe (11) was unable to find an improvement in endurance. The subjects also played badminton and were compared to a group of females that played only badminton (N=29). The activity used for testing endurance was squat thrusts, which is usually not considered a good cardiovascular test. Another study that did not support rope jumping as increasing fitness was done by Lofgren (20). Her study was done to test the effects of progressive rope jumping on recovery pulse rate. Ninth grade girls (N=100) were divided into a control group and three experimental groups having 0 to 1, 1 to 2, and 2 to 3 minutes of rope jumping twice weekly for eight weeks. Pulse rate recovery from a step test was measured before and after the program (20). The results showed that jumping rope produced no significant improvement in pulse rate recovery. This could be attributed to the two day per week frequency of the program and the small amount of time each day to jump rope.

There were many studies found to support the idea that jumping rope may improve one's level of fitness. In an investigation done by

Cascino (5) the subjects skipped rope for ten minutes a day, five days a week, for eight weeks. Subjects consisted of nine adult males. At the end of the program there was a 25 percent improvement in the Step Test and a 13 percent improvement in maximal oxygen consumption, predicted from the Astrand nomogram. The results showed that Cascino's (5) subjects improved considerably in cardiovascular fitness. He concluded that rope skipping can be a convenient and inexpensive method of promoting cardiovascular fitness in adult men (5).

Lengkeek (19) did a study with college women (N=31) comparing rope jumping and cycling groups to a control group. The subjects were randomly divided into a cycling group, a rope jumping group, and a control group. Subjects who were college females performed in their groups four days per week for five weeks. Each were tested before and after five weeks on predicted maximum oxygen consumption using a treadmill. Lengkeek (17) found that both cycling and rope jumping produced improvement in this area.

Baker (2) concluded that ten minutes of rope jumping is equivalent to 30 minutes of jogging in regard to cardiovascular efficiency. The Harvard step test was administered to the male subjects (N=92) before and after the conditioning program. The subjects were randomly divided into two groups. One group jogged for 30 minutes and the other group skipped rope for ten minutes. The program was done daily for six weeks. Comparisons in the pre- and post-exercise data showed that both programs significantly increased cardiovascular efficiency at the .05 level.

Another study, very similar to the last two, was one in which jumping rope was compared to other exercise programs. The research done by Garrett, Sabie, and Pangle (12) compared four treatments, running in

place (N=13), rope skipping (N=12), bench stepping (N=9) and volleyball-activities (N=9). The four treatments, which lasted from three to four minutes, were given to the male college students after all had received 35 minutes of volleyball instruction. Scores on the Harvard Step Test provided the criterion measure of cardiovascular fitness. The researchers found that the cardiovascular fitness increased significantly for the subjects who skipped rope, the improvement by the subjects who ran in place was approximately the same.

Powell's (24) research involved taking a random sample (N=5) of boys, ages nine to eleven. A battery of 138 different tests and measurements were given to appraise the areas of physique, organic fitness, and motor ability. A test, experimental program, and retest procedures were followed. The program lasted ten weeks and each subject skipped rope fifteen minutes a day at home. It was found at the end of the program that there were gains over and above the gains normally expected from growth and development. A weakness in this study was the small number of subjects used and no control group was used.

A final support of rope jumping was reported by Jones, Squires, and Rodahl (17). Untrained nonathletic women (N=7) 19-42 years of age participated in a five minute rope skipping program during a four week period. As a result of this training program, there was a significant improvement in physical work capacity as judged by pulse response taken at the end of five minutes. Very few subjects were used to support these findings and control group was lacking in this research.

From the research there seems to be a need to determine if as little as five minutes per day, three days per week will improve

cardiovascular endurance significantly over a control group in 13 to 16 year old females. It seems that there is general agreement that rope jumping is a good cardiovascular endurance activity for any age if practiced long enough and often enough. The question is: Does it provide a training benefit in less time than other activities, such as jogging?

CHAPTER III

PROCEDURES

The purpose of this study was to determine whether rope jumping would improve cardiovascular endurance as measured by the 12 minute run, in teenage girls.

Subjects

One hundred and seven female subjects participated in this study. The subjects were students from four physical education classes at Hiawatha Junior High and Hiawatha Senior High School in Kirkland, Illinois. Classes consisted of seventh, eighth, ninth, and tenth grades containing 22, 27, 35, 23 students respectively. All students included in these classes were subjects in this study. All students had been in a regular physical education class all year long. Classes met five times per week and were all taught by the author. Previous to the experiment, the classes had been doing five to ten minutes of warm ups consisting of jogging and calisthenics, then participated in 25 minutes of activity. This same routine was followed for both the experimental and control groups, except the experimental group jumped rope after warm ups.

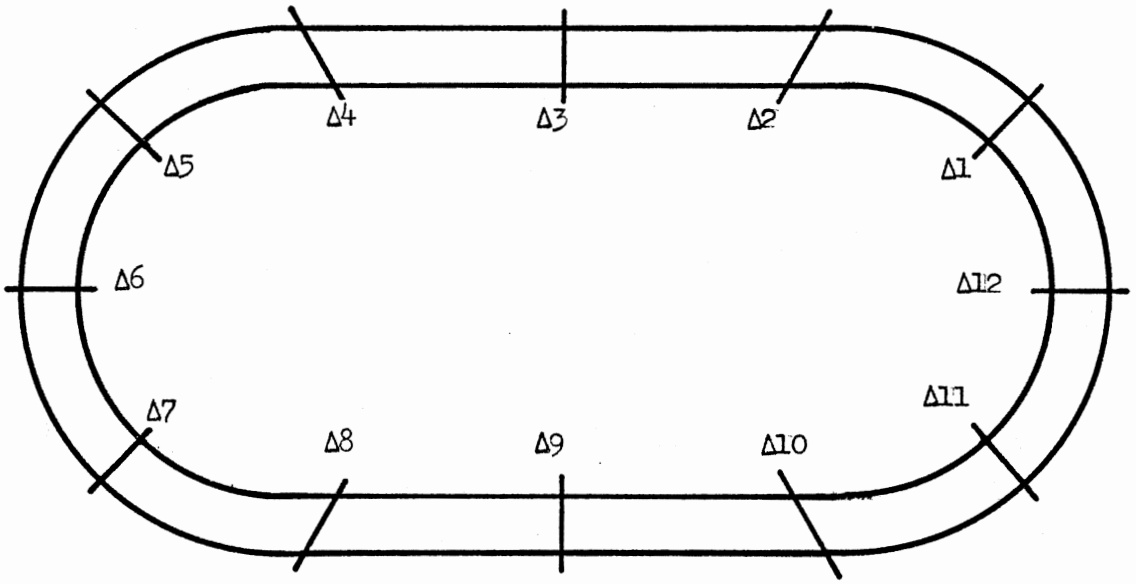
Grouping Subjects

Intact classes were used, therefore violating the first two levels

of randomization. Subjects were not randomly picked nor were they assigned to groups randomly. Stratification by grade level with random assignment was used. The treatment (rope jumping) was randomly assigned to the groups. Due to closeness in age, one class from the seventh and eighth grades and one class from the ninth and tenth grades were chosen to receive the treatment. The group that was involved in the jump rope program was decided by a flip of a coin. After performing two flips of the coin the seventh and ninth graders were selected to be the experimental groups. The eighth and tenth graders participated in the usual activity with no rope jumping and were used as the control group.

Pretesting of Subjects

All subjects were pretested to see if the groups were initially equivalent and to obtain a basis from which to judge improvement. Each subject was given the 12 minute run on the Wednesday the week before the program was to start (April 11). The 12 minute run which is generally accepted as a valid predictor of maximal oxygen intake capacity, was used to determine cardiovascular endurance (7). The subjects ran and/or walked as far as they could in 12 minutes. The subjects ran around the outside of the football field where 12 cones were placed every 110 feet. A partner was assigned to each subject to count the number of laps finished in the 12 minutes. In addition, the researcher counted the laps completed. When 11 minutes were up, the remaining time was called out. At the end of 12 minutes, a whistle was blown, and the number of cones the subjects passed were counted. The partner then gave the number of laps completed and the number of cones passed on the last lap to the researcher. The arrangement of the track and how the cones were laid out are shown in Figure 1.



Note: 440 track - 12 cones - 36.6 yds. apart

Figure 1. Layout of Track for the 12 Minute Run

The Study

On Tuesday, following the pretest, the study began. Two groups, eighth and tenth graders, continued with their ordinary routine of warm ups and then with an activity. The seventh and ninth graders did the same activities; however, after warm ups they jumped rope. Activities were the same for all classes, except that the seventh and eighth graders did a few activities in track and field to prepare them for a track and field day. The three track activities done were the long jump, high jump, and 50 yard dash. All classes participated in tennis, usually indoors due to the weather, various indoor activities, archery and softball. A detailed outline of the subject's activities may be found in Appendix A. During the six weeks, the subjects jumped three times in a week, although not always on Monday, Wednesday, and Friday. At times, the subjects jumped two consecutive days due to being gone on holidays or for school activities. Any student who was absent more than two days in one week was dropped from the study because they were unable to jump the required three times a week. Some subjects were also eliminated due to medical reasons. During the first week of rope jumping, the researcher had the subjects jump for one minute and then rest for one minute and continued in this fashion until the subjects had jumped a full five minutes. The second and third week the subjects jumped for one and a half minutes, rested for a minute and continued in this fashion. For motivation during these weeks, there was a contest for the number of jumps an individual could do in the minute and a half. For instance, the number of times one could jump backwards in a minute and a half. The fourth week, for a change of pace, the subjects jumped 700 times at their own pace. About the maximal amount one was able to jump

in five minutes was 700. By the fifth week, the subjects had worked up to jumping two minutes and resting one minute, continuing to a total time of five minutes. The subjects jumped a total of 800 times at their own pace during the sixth week. The researcher observed the rope jumping and gave encouragement at various times so that the subjects would continue to give their best efforts. The subjects did not jump five days a week although the researcher had them in class all week. The researcher felt that the subjects would become bored as the novelty wore off; therefore, they would not be as motivated. Also, the author felt that the time was needed for regular class activity.

Posttesting

The final test was given on the Friday after the program was finished (May 25th). The same procedures used on the pretesting were used after the six week program. Subjects were given the same instructions. Although the study started out with 107 subjects, the posttest was given to 100 subjects. Seven subjects were dropped due to medical reasons and absenteeism. This left 45 in the control group and 55 in the experimental group.

Treatment of Data

For each group the mean, range and standard deviation of the pretest were determined. After comparing the means, the researcher felt that an analysis of covariance was needed on the final statistics to overcome the differences between groups on the pretest means. After the posttest the range, mean, and standard deviation were again found

for each group. Then an analysis of covariance was run to determine if the experimental group showed significantly greater improvement than the controls. The statistics were run at Northern Illinois University Computer Center - Program SAS 76.

CHAPTER IV

RESULTS AND DISCUSSION

Pretest Data

After the pretest 12 minute rune was completed the range, mean and standard deviations were found. Table I shows these statistics for each class.

TABLE I

PRETEST 12 MINUTE RUN DISTANCES (MILES)

	7th Grade	8th Grade	9th Grade	10th Grade
Range	1.06-1.47	.83-1.47	.62-1.56	.87-1.39
Mean	1.275	1.187	1.237	1.177
Standard Deviation	.126	.168	.184	.131

In the following table the seventh and ninth graders and the eighth and tenth graders are combined to show the data for the experimental and control group (Table II).

TABLE II

PRETEST 12 MINUTE RUN DISTANCES (MILES)

	Control (7th & 9th Grades)	Experimental (8th & 10th Grades)
Range	.87-1.47	.62-1.56
Mean	1.182	1.234
Standard Deviation	.150	.177

Although the classes met at separate times, the two experimental groups and the two control groups were pooled together to provide enough subjects for greater validity. In the following graph the mean pretest distance for each class is shown (Figure 2).

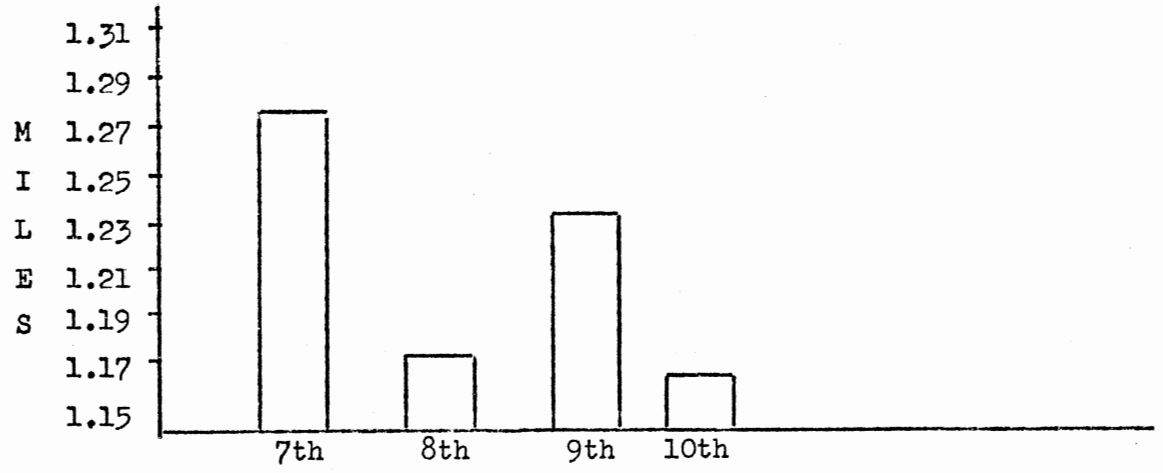


Figure 2. Pretest Means

Looking at the graph by classes a maturation or aging trend cannot be seen. However, a trend that does show is that the later in the day the class met, the lower the scores became. Seventh graders met the first hour of the day, eighth graders met the last period, ninth graders met the second period, and the tenth graders met the third period of the day.

One can also see from the graph that the experimental group started out better on the pretest. Therefore, an analysis of covariance was run to compare the final scores, based on statistically equalized pretest means. Since the groups started out differently, the analysis of covariance was the proper procedure to make the desired comparisons.

Posttest Results

After a six week period of the experimental group jumping rope, the 12 minute test was given again. In Table III and IV the range, mean and standard deviation of the separate classes, and the combined experimental and control groups are shown respectively.

TABLE III

POSTTEST 12 MINUTE RUN DISTANCES (MILES)

	7th Grade	8th Grade	9th Grade	10th Grade
Range	1.1-1.147	.88-1.56	1.0-1.64	.93-1.64
Mean	1.297	1.225	1.3	1.218
Standard Deviation	.111	.196	.21	.192

TABLE IV

POSTTEST 12 MINUTE RUN DISTANCES (MILES)

	Control (7th and 9th Grades)	Experimental (8th and 10th Grades)
Range	.88-1.64	1.0-1.64
Mean	1.222	1.299
Standard Deviation	.192	.176

A graph of the posttest means is presented in Figure 3. A comparison of the pretest and posttest means shows that all classes improved about the same. The ninth grade class, an experimental group meeting the second hour, made the most improvement. The trend previously noted in Figure 2 still holds true, that is, that the classes meeting earliest in the day made the best score.

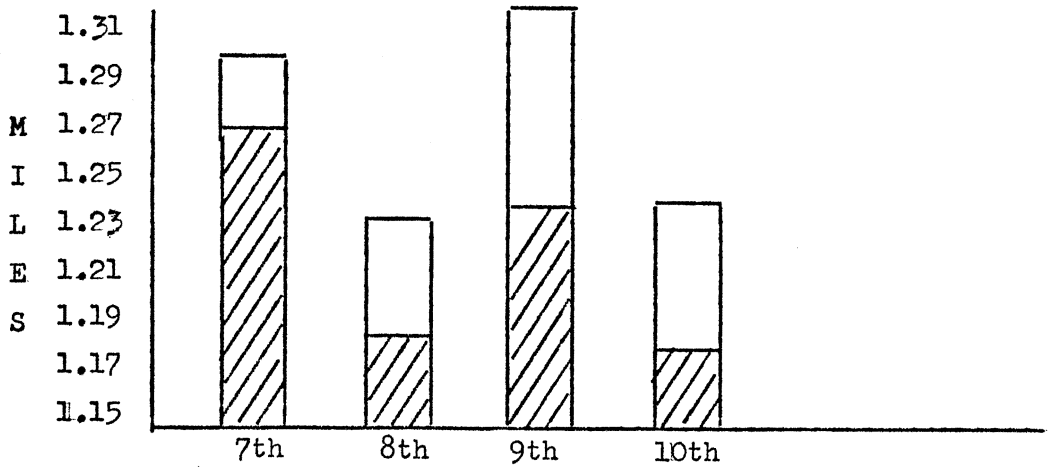


Figure 3. Posttest and Pretest Means

Analysis of Covariance

An analysis of covariance was ran on the final results. In Table V the results are shown. (Computer System-SAS-76)

TABLE V

ANALYSIS OF COVARIANCE TABLE NO TRAINING-
JUMP ROPE TRAINING COMPARISON

	Sum of Squares	Degrees of Freedom	Mean Square	F Ratio	Critical F (5% Level)
Between Groups	1.459	1	.7295		
Within Groups	1.98	98	.0204	2.01	3.94
Total	3.44	100			

The F ratio came out to be 2.01 and a 3.94 or better was needed to indicate statistically significant improvement at the five percent level from the rope jumping program.

Another way to look at the data is to look at the number who improved, stayed the same or decreased. As a summary of this, Table VI is presented.

TABLE VI

SUMMARY OF RESULTS FROM PRETEST TO POSTTEST FOR THE 12 MINUTE RUN

	7th Grade	8th Grade	9th Grade	10th Grade
Improved	13	15	23	14
Stayed the Same	3	2	1	2
Decreased	6	7	9	5

The results show that quite a percentage increased whether it be control or experimental groups that one looks at.

Discussion

Both the experimental and the control groups showed improvement from pretest to posttest. A reason for this may be that some learning took place for everyone previously taking the test. Also the overall improvement could be contributed to the activities done during those six weeks. A reason for the experimental group not showing a significantly greater improvement than the control group could be the motivational level. After six weeks of jumping rope, then having to run another day for 12 minutes, the subjects may not have been as motivated the second time.

Although the experimental group improved, the improvement was not enough to be significantly greater than that of the control group.

This is not to say that a jump rope program has no value. Even though the value did not stand out through this study there was a greater amount of improvement in the experimental group. The researcher also feels that if the duration of the program had been longer a larger increase in cardiovascular endurance would have been seen.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The purpose of this study was to determine whether rope jumping would improve cardiovascular endurance, as measured by the 12 minute run, in teenage girls. After the study was concluded, the null hypothesis was accepted. Therefore, in conclusion the rope jumping produced no significant improvement in cardiovascular endurance of these subjects.

Recommendations for Further Study

1. The study should be done for a longer period of time than six weeks.

2. A different type of test should be used such as the treadmill test (although the larger number of subjects would encompass too much time) so that motivation would not be such a big factor.

3. If done at a high school, it should not be done at the end of the school year. As weeks go by, apathy begins to become more apparent.

4. The test should be run at the same time of the day.

5. More time should be spent jogging for 12 minutes so that the subjects would be more accustomed to that length of time.

6. Two tests for cardiovascular endurance should be used to give a

better chance to show an increase, such as the step test and the 12 minute run.

7. It would be better to jump ten minutes each time.

8. Jumping four and five days per week rather than three should be tried.

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APPENDIXES

APPENDIX A

PRETEST AND POSTTEST SCORES FOR 12 MINUTE RUN

DISTANCE IN MILES AND EACH SUBJECT

Subject	Pretest	Posttest	Subject	Pretest	Posttest
1	1.08	1.25	1	1.33	1.54
2	1.29	1.37	2	1.41	1.19
3	1.45	1.43	3	1.08	1.47
4	1.29	1.41	4	.83	.88
5	1.25	1.35	5	.98	.98
6	1.33	1.10	6	1.33	1.41
7	1.37	1.10	7	1.06	1.20
8	1.43	1.43	8	1.50	1.52
9	1.33	1.35	9	1.31	1.56
10	1.12	1.25	10	1.47	1.54
11	1.47	1.33	11	1.04	1.00
12	1.20	1.10	12	1.35	1.18
13	1.25	1.31	13	1.08	1.10
14	1.27	1.25	14	1.27	1.10
15	1.18	1.31	15	1.08	1.00
16	1.35	1.37	16	1.10	1.10
17	1.06	1.31	17	1.08	1.16
18	1.31	1.31	18	1.18	1.23
19	1.06	1.10	19	1.22	1.29
20	1.18	1.31	20	1.18	1.37
21	1.31	1.33	21	1.02	1.14
22	1.47	1.47	22	1.04	1.12
			23	1.33	1.16
			24	1.22	1.16

	9th Grade			10th Grade	
Subject	Pretest	Posttest	Subject	Pretest	Posttest
1	1.56	1.62	1	1.22	1.25
2	1.33	1.47	2	1.08	1.10
3	1.31	1.56	3	1.12	1.00
4	1.16	1.29	4	1.29	1.31
5	1.06	1.16	5	1.25	1.64
6	1.33	1.18	6	1.16	1.20
7	1.27	1.31	7	.87	.93
8	1.31	1.35	8	1.25	1.22
9	1.10	1.16	9	1.25	1.25
10	1.10	1.18	10	1.10	1.00
11	1.16	1.25	11	1.10	1.12
12	1.10	1.16	12	1.08	1.12
13	1.56	1.62	13	1.08	1.16
14	1.08	1.02	14	1.39	1.54
15	.91	1.04	15	1.39	1.52
16	1.00	1.18	16	1.31	1.50
17	1.41	1.31	17	1.08	1.10
18	1.25	1.18	18	1.16	1.14
19	1.29	1.35	19	1.37	1.29
20	1.35	1.39	20	1.08	1.08
21	1.33	1.25	21	1.08	1.10
22	1.33	1.41			
23	1.08	1.41			
24	1.02	1.00			
25	1.27	1.60			
26	1.08	1.00			
27	1.37	1.64			
28	1.06	1.25			
29	1.56	1.75			
30	1.00	1.00			
31	1.08	1.00			
32	.62	1.50			
33	1.37	1.31			

APPENDIX B

DAILY ACTIVITIES OF SUBJECT

Warm ups each day consisted of five minutes of jogging and five minutes of calisthenics consisting of: side flexions, squat thrusts, toe touches, straddle-stretches, leg lifts, sit ups, push ups.

1st week: April 16-20

Monday, April 16th - No School - Easter Vaction

Tuesday, April 17th

7th and 9th grades - Warm ups	10 minutes
Jump rope 1 minute - rest one minute up to 5 minutes	10 minutes
Tennis forehand against wall	20 minutes
8th and 10th - same as above only no jumping rope	

Wednesday, April 18th

7th Grade - warm ups	10 minutes
Jump rope 1 minute - rest one minute	10 minutes
Tennis forehand against wall	20 minutes
8th Grade Same as above except no jumping rope	
9th Grade - warm ups	10 minutes
Jump rope 1 minute - rest one minute	10 minutes
Tennis forehand and back hand against wall	20 minutes
10th Grade - Same as 9th Grade except no rope jumping	

Thursday, April 19th

7th and 8th Grade - warm ups	10 minutes
½ group tennis on court ½ group softball - work up	30 minutes
9th Grade - warm ups	10 minutes
Jumped rope one minute- rest one minute	10 minutes
½ group tennis on court ½ group softball	20 minutes
10th Grade - Same as 9th Grade - except no jumping rope	

Friday, April 20th

7th Grade - Warm ups	10 minutes
Jumped rope one minute - rest one minute	10 minutes
Wiffle ball	20 minutes
8th Grade - Same except no rope jumping	
9th and 10th Grades - 2/3 of students gone to chorus and band trip others played volley ball	45 minutes

2nd week - April 23-27

During the next two weeks subjects in the seventh and ninth grades had competition between themselves in the number of times they could jump in the time allotted.

Monday, April 23

7th and 9th Grade - warm ups	10 minutes
Jumped rope one and a half minutes - rest one minute	8 minutes
½ group played tennis, ½ group work up softball	20 minutes
8th and 10th Grade - Same as 7th only no rope jumping	

Tuesday, April 24

7th-10th Grade - warm ups	10 minutes
Wiffle ball	30 minutes

Wednesday, April 25

7th and 9th Grade - warm ups	10 minutes
Jumped rope one and a half minutes - rest one minute	8 minutes
Floor hockey	20 minutes
8th and 10th Grade - same no rope jumping	

Thursday, April 26

7th-10th Grade - Warm ups	10 minutes
Floor Hockey	30 minutes

Friday, April 27

7th and 9th Grade - warm ups	10 minutes
Jump rope one and a half minutes - rest one minute	8 minutes
Volley ball	20 minutes
8th and 10th Grade - Same as above no rope jumping	

3rd week - April 30-May 4

Monday, April 30

7th and 9th Grade - warm ups	10 minutes
Jumped rope one and a half minutes - rest one minute	8 minutes
Floor Hockey	20 minutes
8th and 10th Grade same as above no rope jumping	

Tuesday, May 1

7th Grade - warm ups	10 minutes
Jumped rope one and a half minutes - rest one minute	8 minutes
Tennis backhand against wall	20 minutes
8th Grade - Same as the 7th except no rope jumping	
9th Grade - warm ups	10 minutes
Jumped rope one and a half minutes - rest one minute	8 minutes
Tennis serve against wall	20 minutes
10th Grade - Same as 9th except no rope jumping	

4th week - May 7-11

Monday, May 7

7th Grade - warm ups	10 minutes
Jumped 700 times at own pace	10 minutes
Ran 50 yard dashes for time	20 minutes

8th Grade - Same as 7th but did not jump rope
9th Grade - warm ups 10 minutes
Jumped 700 times at own pace 10 minutes
½ tennis on court - ½ softball 20 minutes

Tuesday, May 8
7th and 8th Grade - warm ups 10 minutes
Long jump 30 minutes
9th and 10th Grade - warm ups 10 minutes
½ tennis - ½ softball 30 minutes

Wednesday, May 9
7th Grade - Warm ups 10 minutes
Jumped rope 700 times 10 minutes
Measured long jumps 20 minutes
8th Grade - Same but did not jump rope
9th Grade - warm ups 10 minutes
Jumped rope 700 times 10 minutes
½ tennis - ½ softball 20 minutes
10th Grade - Same as 9th but did not jump rope

Thursday, May 10
7th and 8th Grade - warm ups 10 minutes
High jump 30 minutes
9th and 10th Grade - warm ups 10 minutes
½ tennis - ½ softball 30 minutes

Friday, May 11
7th and 9th Grade - warm ups 10 minutes
Jumped rope 700 times 10 minutes
Wiffle ball 20 minutes
8th and 10th Grade - Same but did not jump rope

5th week - May 14-18

Monday, May 14
7th and 9th Grade - warm ups 10 minutes
Jumped rope two minutes - rest one minute 7 minutes
Started archery 23 minutes
8th and 10th Grade - Same but did not jump rope

Tuesday, May 15
7th-10th Grade - warm ups 10 minutes
Archery 30 minutes

Wednesday, May 16
7th and 9th Grade - warm ups 10 minutes
Jumped rope two minutes - rest one minute 7 minutes
Archery 23 minutes
8th and 10th Grade - Same but did not jump rope

Thursday, May 17
7th Grade - warm ups 10 minutes
Jumped rope two minutes - rest one minute 7 minutes
Reviewed long jump, high jump and 50 yard dash 23 minutes
8th Grade - Same but no rope jumping
9th Grade - warm ups 10 minutes
Jumped rope two minutes - rest one minute 7 minutes
Archery 23 minutes
10th Grade - Same but no rope jumping

Friday, May 18 (Did not jump because researcher was gone)

7th and 8th Grade - Track and Field Day all day	
9th and 10th Grade - warm ups	10 minutes
Softball	30 minutes

6th Week - May 21-25

Monday, May 21

7th and 9th Grade - warm ups	10 minutes
Jumped rope 800 times at own pace	10 minutes
Archery	20 minutes
8th and 10th Grade - Same but no rope jumping	

Tuesday, May 22

7th-10th Grade - warm ups	10 minutes
Archery	30 minutes

Wednesday, May 23 and Thursday, May 24

7th and 9th Grade - warm ups	10 minutes
Jumped rope 800 times	10 minutes
Archery	20 minutes
8th and 10th Grade - Same but did not jump rope	

Friday, May 25

7th-10th Grade - Final - 12 Minute run.

VITA

Deborah Jean Wendt

Candidate for the Degree of

Master of Science

Thesis: JUMPING ROPE AS A MEANS OF IMPROVING CARDIOVASCULAR ENDURANCE IN TEENAGE GIRLS

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