

1-1-1985

A Comparison of Two Training Programs in Preparing for the Army Physical Readiness Test

Herbert E. Lattimore

Eastern Illinois University

This research is a product of the graduate program in [Physical Education](#) at Eastern Illinois University. [Find out more](#) about the program.

Recommended Citation

Lattimore, Herbert E., "A Comparison of Two Training Programs in Preparing for the Army Physical Readiness Test" (1985). *Masters Theses*. 2783.

<http://thekeep.eiu.edu/theses/2783>

This Thesis is brought to you for free and open access by the Student Theses & Publications at The Keep. It has been accepted for inclusion in Masters Theses by an authorized administrator of The Keep. For more information, please contact tabruns@eiu.edu.

THESIS REPRODUCTION CERTIFICATE

TO: Graduate Degree Candidates who have written formal theses.

SUBJECT: Permission to reproduce theses.

The University Library is receiving a number of requests from other institutions asking permission to reproduce dissertations for inclusion in their library holdings. Although no copyright laws are involved, we feel that professional courtesy demands that permission be obtained from the author before we allow theses to be copied.

Please sign one of the following statements:

Booth Library of Eastern Illinois University has my permission to lend my thesis to a reputable college or university for the purpose of copying it for inclusion in that institution's library or research holdings.

20 MAY 85

Date

[Signature]

Author

I respectfully request Booth Library of Eastern Illinois University not allow my thesis be reproduced because _____

Date

Author

A Comparison of Two Training Programs in Preparing
for the Army Physical Readiness Test
(TITLE)

BY

Herbert E. Lattimore

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1985

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

5-14-85
DATE

[Signature]
ADVISER

5-14-85
DATE

[Signature]
COMMITTEE MEMBER

5/14/85
DATE

[Signature]
COMMITTEE MEMBER

5/14/85
DATE

[Signature]
DEPARTMENT CHAIRPERSON

A COMPARISON OF TWO TRAINING PROGRAMS IN
PREPARING FOR THE ARMY PHYSICAL
READINESS TEST

A Thesis Abstract

Presented to

The Faculty of the Graduate School
Eastern Illinois University

In Partial Fulfillment
of the Requirements for the Degree
Master of Physical Education

by

Herbert E. Iattimore

May 1985

ABSTRACT

The purpose of this study was to compare two training programs on male Reserve Officers Training Corps students as it is related to a passing score on the Army Physical Readiness Test.

The subjects were sixteen volunteer students who were randomly placed in two groups, formal and informal. Both groups were given a pretest, before beginning the study, to determine if they were equal.

The subjects in both groups trained for four weeks to prepare for the Army physical fitness test. Each group trained three times a week during the training period. The formal group's training was restricted to performing the three events on the Army Physical Readiness Test; push ups and sit ups in a two minute time limit for each event, and the two mile run. The informal group was allowed to use the universal weight machines, free weights, dip bars and chin up bar. They were allowed to perform as many repetitions as they desired of any exercise during the training period. The only requirement was to run a minimum of two miles at the conclusion of each training period.

The pretest and posttest were administered to both groups simultaneously. As the subject finished the push up and sit up portions of the test, the number of repetitions for each event was placed on their score cards. The subjects

ran eight laps around the one quarter mile track on the three inside lanes. The alternate test was sixteen laps on the inside lanes of the indoor track. During the two mile run, the timer called the time off; as each subject finished the run, the timer recorded their times. The times were recorded to the nearest second on the stop watch.

The data were analyzed utilizing the t-test at the .05 level of significance. The comparison of the results of the formal and informal group's pretest scores were not significant. The comparison of the results of the formal and informal group's posttest scores were not significant. The comparison of the results of the formal group's pretest and posttest scores were not significant. The comparison of the results of the informal group's pretest and posttest scores were not significant.

Based on the findings of this investigation the following conclusion appears warranted. There is no difference in the performance results on the Army Physical Readiness Test utilizing a formal or an informal training program.

ACKNOWLEDGEMENTS

The writer wishes to thank the Eastern Illinois University ROTC cadets for their assistance in the study. A special thanks to the typist, Becky Markwell.

TABIE OF CONTENTS

	Page
LIST OF TABLES	v
Chapter	
1. INTRODUCTION	1
Purpose of the Study	1
Null Hypothesis	1
Delimitations	2
Limitations	2
Definition of Terms	3
2. REVIEW OF THE LITERATURE	4
Cardiovascular Fitness	4
Muscular Fitness	6
Training Systems	6
Training Modes	7
Duration	9
Summary	10
3. METHODOLOGY	11
Subjects	11
Techniques of Training	11
The Formal Group's Training Program	11
The Informal Group's Training Program	12

Chapter	Page
Test Procedures	12
First Event: Push ups	12
Second Event: Sit ups	13
Third Event: Two Mile Run	13
Statistical Procedures	14
4. ANALYSIS OF DATA	15
Comparison of the Results of the Formal and Informal Group's Pretest Scores	15
Comparison of the Results of the Formal and Informal Group's Posttest Scores	15
Comparison of the Results of the Formal Group's Pre and Posttest Scores	18
Comparison of the Results of the Informal Group's Pre and Posttest Scores	18
Discussion	21
5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	23
Conclusion	24
Recommendations	24
BIBLIOGRAPHY	25

LIST OF TABLES

Table	Page
1. Comparison of the Army Fitness Test Pre test Scores	16
2. Comparison of the Army Fitness Test Post test Scores	17
3. A Comparison of the Pre test and Post test Scores of the Formal Group on the APRT Army Fitness Test	19
4. A Comparison of the Pre test and Post test Scores of the Informal Group on the APRT Army Fitness Test	20

CHAPTER ONE

Introduction

The U.S. Army is concerned about the physical fitness and well being of its personnel and is interested in utilizing the most effective methods available to develop recruits. Increased emphasis is being placed on physical fitness in the military, so it is advisable that studies focus on comparing different methods of training to achieve the most desired results. Efficiency in the training program is very important to the military because of a limited time frame and resources to prepare personnel for successful completion of the Army Physical Readiness Test (APRT).

Purpose of the Study

The purpose of the study was to compare a formal and informal physical conditioning program on male ROTC students as it related to a passing score on the Army Physical Readiness Test.

Null Hypothesis

There is no difference in the level of performance results on the Army Physical Readiness Test utilizing a formal or informal physical conditioning program.

Delimitations

The students in the Eastern Illinois University Reserve Officers Training Corps (ROTC), Charleston Illinois, Military Science III were the subjects involved in the study. The subjects were volunteers and were given four weeks to prepare for the Army Physical Readiness Test. The passing score on the Army Physical Readiness Test is 180 points; 60 points each in the three events.

The subjects were all in the same Army age group testing bracket, 17-25 years old, and were graded on the same scale. The scores were not used as an evaluative standard for an academic grade.

Limitations

There were several limitations recognized in preparing and administering the study. The subjects were male third year cadets in the University's ROTC program. Initially, the majority of these cadets chose to join the elite Ranger Company, a highly disciplined and physically demanding organization which made them ineligible to participate in this study, which resulted in a smaller than desired sample. Some subjects, due to inclement weather, ran their two mile run on the indoor track. The training period was limited to four weeks; the Army normally trains six months between each test. The effects of the motivation and incentives, as the subjects participated could not be

controlled or measured.

Definition of Terms

The following are definitions of terms as they were used in this study.

Army Physical Readiness Test (APRT)

The current Army physical fitness test consists of three events; push ups, sit ups, and a two mile run and is graded on a 300 point scale.

Passing Score

Participants must achieve a minimum score of sixty points in each event of the test for a combined score of one hundred eighty points to be considered as passing.

Reserve Officers Training Corps (ROTC)

ROTC is a program conducted on the college level to produce officers for implementation into the Active or Reserve forces of the U.S. Army.

Formal Program

The three events of the Army Physical Readiness Test were performed three times a week.

Informal Program

A variety of developmental and conditioning exercises were performed three times a week with minimum supervision and individually-determined goals.

CHAPTER TWO

Review of the Literature

While research dealing specifically with the efficiency of different training methods is limited, a review of the related literature would be presented under the following topics: (1) Cardiovascular Fitness; (2) Muscular Fitness; (3) Training Systems; (4) Training Modes; and (5) Duration.

Cardiovascular Fitness

The most important concept of a physical fitness program, according to Davis, is the development of the cardiovascular system. Davis stated any proposed program designed to benefit cardiovascular system should be within the following criteria:¹ 1. Lungs must be used without straining or holding the breath, 2. Legs must be used continuously during the exercise period, 3. The exercise should be continued for at least 15 minutes.

Shephard further supported this concept of the cardiovascular system being the most important in the physical fitness program: The other elements of physical fitness, strength and endurance, will be dependent upon the ability

¹ Davis, J. Boyce, and E. Leslie Knight, CVR Fitness: A Basic Guide for Cardiovascular Respiratory Exercise (Dubuque, Iowa: Kendall Hall Publishing Company, 1978), pp. 6-23.

of the cardiovascular system to have provided the extra oxygen necessary to perform the metabolic function when placed under stress.²

In a study on the increased cardiovascular response to the static contraction of larger muscle groups, by Seals et al., it was found the gastronemicus, predominantly a fast twitch muscle, had a greater increase in blood pressure than the soleus, a slow twitch muscle which produced no increase in blood pressure. The cardiovascular response to static constriction is directly related to active mass but it is modified by the fiber composition of the contracting muscle. Seals found a positive relationship between the magnitude of the increase in blood pressure, heart rate, and the size of active muscles.³

Cohen et al., conducted a study on the cardiorespiratory responses of ballet exercises and the VO_2 max. of elite ballet dancers. The study found the strength requirements of the ballet dancers to be not as great as the average

² Shephard, Roy J., Endurance Fitness (Toronto, Canada: University of Toronto Press, 1969), p. 9.

³ Seals, Douglas R., Richard A. Washburn, Peter G. Hanson, Patricia Painter, and Francis J. Nagle, "Increased Cardiovascular Responses to Static Contraction of Larger Muscle Groups," Journal of Applied Physiology Respiratory, Environmental, and Exercise Physiology, Vol. 54, No. 2, February 1983, pp. 434-437.

athlete and their cardiorespiratory requirements and adjustments to equal those of non-endurance athletes.⁴

Muscular Fitness

In the areas of muscular fitness, Johnson and Stolberg stated that endurance and strength were not dependent on the cardiorespiratory systems, but on the localized muscular group activities needed to perform for an extended period of time. Strength and endurance are terminated not because of the inadequate performance of the cardiorespiratory system, but the inability of the local muscle groups to respond further. This applies to the activities of push ups and pull ups; running and jogging require oxygen. These activities can be accomplished anaerobically until one has reached maximal debt tolerance.⁵

Training Systems

The major systems for developing strength are progressive resistance, weight training, isokinetic training, and isometrics. Each system results in strength gains that are highly specific to the type of training.

⁴ Cohen, Jerald L., Karen R. Segal, Ira Witroil, William D. McArdle, "Cardiorespiratory response to Ballet Exercise and the VO_2 Max of Elite Ballet Dancers," Medicine and Science in Sports and Exercise, Vol. 14, No. 3, 1982, pp. 212-217.

⁵ Johnson, Perry, and Donald Stolberg, Conditioning (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1971), pp. 10-15.

Progressive resistance exercise is the practical application of the overload principle and forms the basis of most weight training programs. This method involved three sets of exercises - each consisting of ten repetitions done consecutively without resting. The first set was done with one half of the maximum weight that could be lifted ten times; the second set was performed at three fourths the weight, and the third was done at the maximum. As the subject became stronger, the weight was increased so that continued strength improvement would occur.

Isokinetic strength training allows development of maximum resistance throughout the full range of motion. Any effort encounters an equal and opposing force. This is called an accommodating resistance exercise accomplished with aid of a mechanical device.

Isometric training is highly specific. It consists of isometric muscular contractions of a one second maximum duration or a six second contraction at two thirds maximum. Repeating this contraction five to ten times daily produced greater increases in isometric strength.⁶

Training Modes

A study conducted on the frequency of weight training

⁶ McArelle, William D., Frank I. Katch, Victor L. Katch, Exercise Physiology, Energy, Nutrition, and Human Performance (Philadelphia, PA: Lea and Febiger Publishing Company, 1981), pp. 286-295.

on muscle strength enhancement by Gilliam, found maximum muscular strength improvement could be obtained through weight training five days per week.⁷ In another study, it was found that not only frequency, but speed was determinant in muscular improvement. Adeyanju found that performing isokinetic exercises at two speeds produced two different results. Exercises performed at the faster speed exhibited superior development in muscular power, strength and endurance.⁸

Anderson and Kearney carried this research further and compared the effects of three training programs on muscular strength and absolute and relative endurance. Their subjects used resistance protocols in the following manner: high resistance-low repetition; medium resistance-medium repetition; and low resistance-high repetition. They found high resistance-low repetition produced the greatest amount of improvement in maximum strength. Low resistance-high repetition exhibited the greatest amount

⁷ Gilliam, G. McKenzie, "Effects of Frequency of Weight Training on Muscle Strength Enhancement," Journal of Sports Medicine and Physical Fitness, 21 December 1981, (4), pp. 432-436.

⁸ Adeyanju, Kunle, Thad R. Crews, and William J. Meadors, "Effects of Two Speeds of Isokinetic Training on Muscular Strength, Power and Endurance," Journal of Sports Medicine and Physical Fitness, 23 September 1983, (3), pp. 300-305.

of improvement in absolute and relative endurance.⁹

Duration

An Army study conducted on the reduced training duration effects on aerobic power and endurance exhibited endurance performance remained the same for both short term and long term training was only significantly improved after a ten week period.¹⁰ Another study by Hickson et al., cautioned short termed training was not adequate preparation for prolonged endurance type performance.¹¹ Shephard suggested five sessions per week were needed to improve a person's condition and three sessions per week to maintain any improvement that may have occurred.¹² Other studies have found runners who are engaged in heavy training appear to lack explosive leg strength, which improves with rest and detraining. Swimmers, also, may be prevented from performing

⁹ Anderson, Tim and Jay T. Kearney, "Effect of Three Resistance Training Programs on Muscular Strength and Absolute and Relative Endurance," Research Quarterly for Exercise and Sport, Vol. 53, No. 1, pp. 1-7.

¹⁰ Department of the Army Pamphlet 350-18, The Individual's Handbook on Physical Fitness, May 1983.

¹¹ Hickson, R.C., C. Kanakis, Jr., J.R. Davis, A.M. Moore, and S. Rick Moore, "Reduced Training Duration Effect on Aerobic Power, Endurance, and Cardiac Growth," Journal of Applied Physiology: Exercise, Respiratory and Environment, Vol. 53, June 1982, pp. 225-229.

¹² Shephard, Roy J., Endurance Fitness (Toronto, Canada: University of Toronto Press, 1969), pp. 119-120.

at or near their full potential without a proper rest period.¹³

Summary

The authorities agree that a well functioning cardiovascular system is extremely vital to physical well being. They all agree it is the most important aspect of physical fitness. Studies have also shown that muscular fitness is not entirely dependent on the aerobic system; certain muscles will perform anaerobically until they have reached their maximum debt tolerance. The basis of weight training is the progressive resistance exercise system's application of the overload principle. Strength and endurance can be improved or enhanced by performing certain repetitions at different speeds.

Though training is important, performance can be improved by allowing the muscles an opportunity to rest.

¹³ Costill, David L., Douglas S. King, Robert Thomas, and Mark Hargreaves, "Effects of Reduced Training on Muscular Power in Swimmers," The Physician and Sports Medicine, Vol. 13, No. 2, February 1985, pp. 94-101.

CHAPTER THREE

Methodology

This study was designed to compare a formal and an informal physical fitness training for the purpose of passing the Army Physical Readiness Test. The components of the design are discussed in this chapter.

Subjects

Sixteen male volunteer students from the ROTC program at Eastern Illinois University were randomly placed in two groups, formal and informal. Both groups were given a pre-test, before beginning the study, to determine if they were equal.

Techniques of Training

The subjects in both groups trained for four weeks to prepare for the Army physical fitness test. Each group trained three times each week during the training period; the periods were held at either 0600 or 1600 hours Monday through Friday.

The Formal Group's Training Program

The formal group's training was restricted to performing the three events on the Army Physical Readiness Test; push ups and sit ups in a two minute time limit for each

event and the two mile run. The only additional training allowed was a two to five minute stretching period prior to the two mile run. The results were placed on their Army Physical Readiness Test cards.

The Informal Group's Training Program

The informal group was allowed to use the universal weight machines, free weights, dip bars and chin up bar. They were allowed to perform as many repetitions as they desired of any exercise during the one hour training period. The group's only requirement was that they had to run a minimum of two miles at the conclusion of each training period.

Test Procedures

The subjects in both groups were given a pretest and a posttest which consisted of push ups, sit ups and a two mile run. The test was administered to both groups simultaneously. As the subjects finished each event, their score and/or time was placed on the Department of the Army Form 705, Army Physical Fitness score card. Demonstrations of the push up and sit up procedure were given prior to testing. The following are descriptions of the test procedure for each event.

First Event: Push ups

The subject was given a two minute time limit to perform

as many repetitions of the exercise as possible. For a correct push up, in this study, the elbows must bend lowering the entire body until the top of the upper arms, shoulders, and lower back are aligned and parallel to the ground/floor, then return to the starting position by locking the elbows.

Second Event: Sit ups

The subject was given a two minute time limit to perform as many repetitions as possible. The subject was in the bent knee position and his feet were held by another person. The correct sit up, in this exercise, was performed by interlacing the fingers behind the base of the neck and raising the upper body forward to the vertical position. The base of the neck must reach the vertical position and the body lowered until the upper portion of the back has touched the ground/floor.

Third Event: Two Mile Run

The subjects ran eight laps around the one quarter mile track on the three inside lanes. The alternate test was 16 laps on the inside lanes of the indoor track. During the two mile run, the timer called the time off; as each subject finished the run, the timer recorded the times. The times were recorded to the nearest second on the stop watch.

Statistical Procedures

Comparisons of the pretest and posttest were made on the V-3600 Victor calculator. The data were analyzed using the t-test at 14 degrees of freedom at the .05 level of significance.

CHAPTER FOUR

Analysis of Data

The analysis of the data in this study was based upon the results of the test scores of subjects in the formal and informal training groups. The subjects were given a pretest on the Army Physical Readiness Test prior to the training programs being implemented. The subjects were given a posttest at the conclusion of the training programs. The results of both groups' test were analyzed and the scores were included in the analysis.

Comparison of the Results of the Formal and Informal Group's Pretest Scores

The data for both the formal and informal groups have been included in Table 1. The formal group achieved a pretest mean score of 253 points on the Army Physical Readiness Test with the standard deviation of 25.42. The informal group achieved a pretest mean score of 247 points with the standard deviation of 31.50. The comparisons of the groups on the t-test was 0.599 which was not significant at the .05 level.

Comparison of the Results of the Formal and Informal Group's Posttest Scores

The data for both the formal and informal groups have been included in Table 2. The formal group achieved a

Table 1

Comparison of the Army Fitness Test
Pretest Scores

Formal Group	Informal Group
255	224
280	265
254	260
229	247
231	250
244	192
300	238
232	300
\bar{x} 253 points	\bar{x} 247 points
SD 25.43	SD 31.50

t = .0599

Not significant at the .05 level.

Table 2

Comparison of the Army Fitness Test
Posttest Scores

Formal Group	Informal Group
244	221
300	273
281	253
232	261
251	256
244	250
293	278
242	300
\bar{x} 261 points	\bar{x} 262 points
SD 26.54	SD 23.18

$t = .0505$

Not significant at the .05 level.

posttest mean score of 261 points with the standard deviation of 26.54. The informal group achieved a posttest score of 262 points with the standard deviation of 23.18. A comparison of the two groups revealed a t-score of .0505 which was not significant at the .05 level.

Comparison of the Results of the Formal
Group's Pre and Posttest Scores

The pre and posttest scores for the formal group have been presented in Table 3. The formal group's pretest mean score was 253 points with the standard deviation of 25.42. The group's posttest mean score was 261 points with the standard deviation of 26.25. The t-score was .5998 which was not significant at the .05 level.

Comparison of the Results of the Informal
Group's Pre and Posttest Scores

The pre and posttest scores for the informal group have been included in Table 4. The informal group's pretest mean score was 247 points with the standard deviation of 31.50. The group's posttest mean score was 262 points with the standard deviation of 23.18. The t-score was .8912 which was not significant at the .05 level.

Table 3

A Comparison of the Pretest and Posttest Scores
of the Formal Group on the APRT
Army Fitness Test

Pretest	Posttest
255	244
280	300
254	281
229	232
231	251
244	244
300	293
232	242
\bar{x} 253 points	\bar{x} 261 points
SD 25.42	SD 26.25
$t = .5998$	

Not significant at the .05 level.

Table 4

A Comparison of the Pretest and Posttest Scores
of the Informal Group on the APRT
Army Fitness Test

Pretest	Posttest
224	221
265	273
260	253
247	261
250	256
192	250
238	278
300	300
\bar{x} 247 points	\bar{x} 262 points
SD 31.50	SD 23.18
$t = .8912$	

Not significant at the .05 level.

Discussion

This study investigated the difference in performance on the Army Physical Readiness Test when using two different methods of training. One group trained on a specific (formal) program consisting of the events in the test. The other group (informal) trained with a variety of exercises which were not as specific to the Army Physical Readiness Test. The study was undertaken because of the Army's interest to determine efficient methods to train students in the Reserve Officers Training Program.

The findings did not reveal any appreciable difference in performance on the test between the groups. The training programs were considered different and produced the same results on the test. The Army may want to consider which method is easier from a scheduling and supervision viewpoint. The two groups were shown to be equal initially. The question remains, however, whether the training programs were of sufficient duration to affect a difference. Since both groups participated in running a two mile run one must question the real difference in the training regimens.

In addition to the measured performance there appeared to be other effects that were noticed through observing the groups during training. The informal group may have increased their strength, balance, and flexibility more than the formal group. These abilities were not measured

but should be of interest to the Army. The Army Physical Fitness test may be limited and restricted to power events and endurance. Other fitness components may be developed through a general fitness training program that may be important to successful participation in Army activities. Additional exploration should differentiate the general and specific program better and also extend the duration of training. The addition of teaching the range of motion, balance, agility, and perhaps speed may result in a test battery that would give a better profile of fitness.

CHAPTER FIVE

Summary, Conclusions, and Recommendations

The study was conducted to determine if there was a difference in the performance on the Army Physical Readiness Test utilizing a formal or an informal training program. The Army has interest in its soldiers being both physically fit and preserving resources in the areas of time, money, and material.

The subjects for this study were 16 male volunteer cadets from the Eastern Illinois University Reserve Officers Training Corps. The age range was from 18 to 21 years of age and the average age was 19 years. They represented 40% of the third year students in the program.

They were placed randomly into two equal sized groups and given a pretest to determine if the group's physical fitness levels were roughly equal. One group's training program was designated as the formal group and the other as the informal group.

The formal group's training program was comprised of only performing the events on the Army Physical Readiness Test. There was a two minute time limit on both the push up and sit up portion and the two mile run was a timed event, three times a week. The informal group's training

program was comprised of performing a variety of exercises and running a minimum of two miles at the conclusion of the exercise period. The posttest was given at the conclusion of the four week training program.

Conclusion

Based on the findings in this study there is no difference in the performance results on the Army Physical Readiness Test utilizing a formal or informal physical conditioning program for training.

Recommendations

The following recommendations are presented as a result of this study:

1. Further studies should be undertaken using a larger sample.
2. Further studies should be undertaken over a longer period of time.
3. A study should be undertaken involving females.

BIBLIOGRAPHY

- Adeyanju, Kunle, Thad R. Crews, and William R. Meadors, "Effects of Two Speeds of Isokinetic Training on Muscular Strength, Power and Endurance," Journal of Sports Medicine and Physical Fitness, (3), 23 September 1983, pp. 300-305.
- Anderson, Tim, and Jay T. Kearney, "Effects of Three Resistance Training Programs on Muscular Strength and Absolute and Relative Endurance," Research Quarterly for Exercise and Sport, Vol. 53, 1982, pp. 1-7.
- Cohen, Jerald L., Karen R. Segal, Ira Witroil, and William D. McArdle, "Cardiorespiratory Responses to Ballet Exercise and the VO_2 Max of Elite Ballet Dancers," Medicine and Science in Sports and Exercise, Vol. 14, No. 3, 1982, pp. 212-217.
- Cohen, Louis, and Michael Holiday, Statistics for Education and Physical Education (New York: Harper and Row, Publishers, 1979), pp. 126-212.
- Costill, David L., Douglas S. King, Robert Thomas, and Mark Hargreaves, "Effects of Reduced Training on Muscular Power in Swimmers," The Physician and Sports Medicine, Vol. 13, No. 2, February 1985.
- Davis, J. Boyce, and E. Leslie Knight, CVR Fitness: A Basic Guide for Cardiovascular-Respiratory Exercise (Dubuque, Iowa: Kendall Hunt Publishing Company, 1978), pp. 6-23.
- Department of the Army Pamphlet 350-18, The Individual's Handbook on Physical Fitness, May 1983.
- Dudley, Gary A., William M. Abraham, and Ronald L. Terzung, "Influence of Exercise Intensity and Duration on Biochemical Adaption in Skeletal Muscle," Journal of Applied Physiology: Exercise, Respiratory and Environment, Vol. 53, October 1982, pp. 844-849.
- Field Manual 21-20, Physical Readiness Training, October 1980.

- Gilliam, G. McKenzie, "Effects of Frequency of Weight Training on Muscle Strength Enhancement," Journal of Sports Medicine and Physical Fitness, 21 December 1981, (4), pp. 432-436.
- Gleeson, Todd T., William J. Mullin, and Kenneth M. Baldwin, "Cardiovascular Responses to Treadmill Exercise in Rate: Effects of Training," Journal of Applied Physiology: Respiratory and Environment, Vol. 54, March 1983, pp. 789-793.
- Hickson, R.C., C. Kanakis, Jr., J.R. Davis, A.M. Moore, and Rick S. Moore, "Reduced Training Duration Effect on Aerobic Power Endurance and Cardiac Growth," Journal of Applied Physiology: Exercise, Respiratory, and Environment, Vol. 53, July 1982, pp. 225-229.
- Johnson, Perry, and Donald Stolberg, Conditioning (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1971), pp. 10-15.
- Iarssen, Iars, "Physical Training Effects on Muscle Morphology in Sedentary Males at Different Ages," Medicine and Science in Sports and Exercise, Vol. 14, No. 3, pp. 203-206.
- McArdle, William P., Frank I. Katch, and Victor L. Katch, Exercise Physiology Energy, Nutrition, and Human Performance (Philadelphia, PA: Lea and Febiger Publishing Company, 1981), pp. 286-295.
- Seals, Douglas R., Richard A. Washburn, Peter G. Hanson, Patricia L. Painter, and Francis J. Nagle, "Increase Cardiovascular Response to Static Contraction of Larger Muscle Groups," Journal of Applied Physiology, Respiratory, Environment, and Exercise Physiology, Vol. 54, No. 2, February 1983, pp. 434-437.
- Shephard, Roy J., Endurance Fitness (Toronto, Canada: University of Toronto Press, 1969), pp. 9, 119-120.