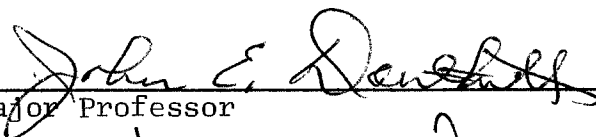
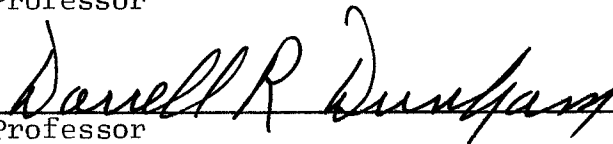



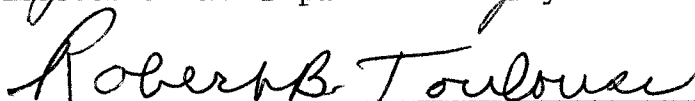
THE EFFECTS OF THREE PHYSICAL EDUCATION
ACTIVITIES ON SELECTED PHYSICAL
FITNESS COMPONENTS

APPROVED:


Major Professor


Minor Professor


Director of the Department of Physical Education


Dean of the Graduate School

THE EFFECTS OF THREE PHYSICAL EDUCATION
ACTIVITIES ON SELECTED PHYSICAL
FITNESS COMPONENTS

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Gary Wade Hampton, B.S.

Denton, Texas

June, 1970

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
LIST OF ILLUSTRATIONS	v
CHAPTER	
I. INTRODUCTION	1
Statement of the Problem	
Purposes of the Study	
Hypotheses	
Definition of Terms	
Limitations	
Assumptions	
II. REVIEW OF LITERATURE	7
III. PROCEDURES	15
Selection of Subjects	
Selection of Measuring Instruments	
Administration of Tests	
Experimental Procedures	
Objectives of the Activities	
IV. PRESENTATION OF DATA	22
Findings of the Study	
Discussion of Findings	
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS..	29
Summary	
Hypotheses	
Conclusions	
Inferences	
Recommendations	
APPENDIX A	34
APPENDIX B	38
BIBLIOGRAPHY	40

LIST OF TABLES

Table		Page
I.	Test Results of Activity Groups on Flexibility of Lower Back and Hip	22
II.	Test Results of Activity Groups on Dynamic Balance.....	23
III.	Test Results of Activity Groups on Endurance.....	24
IV.	Test Results of Activity Groups on Agility.....	25

LIST OF ILLUSTRATIONS

Figure		Page
1.	Course Outline for Bass Test of Dynamic Balance	35
2.	Course Outline for Right-Boomerang Run	36

CHAPTER I

INTRODUCTION

One of the specific objectives of physical education is the development in every individual of those elements considered necessary for a healthy, physically-fit body. In the past, great difficulty has been encountered in deciding what components were necessary for the development of physical fitness. Consequently, a majority of the research in this area has centered on development of tests to measure these essential elements.

At present, little evidence is available concerning the contribution of specific physical education activities to the development of the elements considered necessary for a healthy, physically-fit body. What available evidence can be found is contradictory and in many cases is only a subjective analysis of the possible values derived from physical education activities. This investigation was intended to furnish additional information as to the value of swimming, wrestling, and apparatus gymnastics in developing the desired objectives of physical fitness for the participant.

Statement of the Problem

This study was designed to investigate the relative effects of selected physical education activities upon four components of physical well-being of college men.

Purposes of the Study

The following purposes were intended in this study:

1. To determine if changes occur in endurance, flexibility, balance, and agility by groups participating in either apparatus gymnastics, wrestling, or swimming.
2. To determine the relative contribution of each activity to the development of the specific components of physical well-being for college men.

Hypotheses

The following hypotheses are applicable to these purposes:

1. The posttest scores on the Scott and French Bobbing Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics.
2. The posttest scores on the Scott and French Bobbing Test will be significantly greater than the pretest scores for the group participating in wrestling.
3. The posttest scores on the Scott and French Bobbing Test will be significantly greater than the pretest scores for the group participating in swimming.

4. The posttest scores on the Right Boomerang Run Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics.

5. The posttest scores on the Right Boomerang Run Test will be significantly greater than the pretest scores for the group participating in wrestling.

6. The posttest scores on the Right Boomerang Run Test will be significantly greater than the pretest scores for the group participating in swimming.

7. The posttest scores on the Bass Dynamic Balance Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics.

8. The posttest scores on the Bass Dynamic Balance Test will be significantly greater than the pretest scores for the group participating in wrestling.

9. The posttest scores on the Bass Dynamic Balance Test will be significantly greater than the pretest scores for the group participating in swimming.

10. The posttest scores on the Burpee Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics.

11. The posttest scores on the Burpee Test will be significantly greater than the pretest scores for the group participating in wrestling.

12. The posttest scores on the Burpee Test will be significantly greater than the pretest scores for the group participating in swimming.

13. Apparatus gymnastics will contribute more to the development of the specific components tested than wrestling or swimming.

Definition of Terms

1. Dynamic Balance refers to the maintenance of an organized postural orientation under conditions in which the activity pattern of the muscles is continually changing so as to disturb the gross postural orientation and require further muscular activity to reestablish the orientation (3, p. 150). As applied to this study, dynamic balance will refer to steadiness and stability in leaping from one spot on the floor to another.

2. Flexibility refers to the ease of movement in joints of the body allowing a good range of movement of the body parts (2, p. 271). As applied to this study, flexibility will refer to range of general body movement represented by hip and lower back flexion.

3. Agility refers to speed in changing body positions or in changing directions (1, p. 100). As applied to this study, agility refers to the ability to run a specified obstacle course for a specified time.

4. Endurance refers to two distinct body mechanisms. Muscular endurance refers to the ability to continue muscular exertions of submaximal magnitude. Circulatory endurance refers to continuous contractions of large muscle groups for long periods of time which require an adjustment of the circulo-respiratory system (3, p. 166). In this study, endurance refers to overall bodily endurance involving both muscular and circulatory endurance by repeating the squat thrust (Burpee) for one minute.

5. Apparatus Gymnastics refers to the use of the parallel bars, side horse, high bar, and rings by the participants.

Limitations

1. The results of the study may be limited by the difference in the time during the day that each of the classes was taught.

Assumptions

1. It was assumed that subjects cooperated with the programs and provided honest, maximum effort on each of the test items.

2. It was assumed that outside activities beyond the scope of the regular class period were balanced among the testing groups and no significant changes occurred due to participation in these extra-class activities.

CHAPTER BIBLIOGRAPHY

1. Johnson, Barry L., and Jack K. Nelson, Practical Measurements for Evaluation in Physical Education, Minnesota, Burgess Publishing Company, 1969.
2. Mathews, Donald K., Measurement in Physical Education, Philadelphia, W. B. Saunders, 1958.
3. McCloy, Harold, and Norman D. Young, Tests and Measurements, Health and Physical Education, 3rd ed., New York, Appleton-Century-Crofts, Inc., 1954.

CHAPTER II

REVIEW OF LITERATURE

An investigation of the literature concerning the relative effectiveness of various activities in developing those objectives considered necessary for physical fitness revealed that few such studies have been reported.

In 1943, E. A. Wilbur (5, pp. 326-330) compared the sports method versus the apparatus method in terms of specific physical-fitness indices. The subjects were 366 male freshman students in the required physical education program of the College of the City of New York. The subjects were made as homogeneous as possible with respect to the number of school years they had experienced. The essential nature of the study was to take the differences in physical fitness for each method of participation and compare them with each other for improvement and rate of change.

In the study, the term "apparatus method" referred to a formalized program that consisted of work on the following pieces of equipment: parallel bars, tumbling mats, climbing ropes, horizontal bar, Swedish vaulting box, side horse, and the rings. The term "sports method" embraced a program of instruction and participation in all of the following

activities: boxing, wrestling, track and field, soccer, and swimming.

The test battery that was selected to measure the various elements of physical fitness was taken from Cozen's classification of tests. The test battery consisted of seven items: arm and shoulder-girdle strength, arm and shoulder-girdle coordination, leg and jumping strength, endurance, body coordination and control, and speed and drive of legs.

Wilbur then treated the data statistically by using the critical ratio for obtaining a picture of the effectiveness of the experimental groups. He concluded that the sports method was superior to the apparatus method for improving physical fitness. The apparatus method and the sports method were equal in improvement in speed of legs as measured by the dodging run and jumping or leg strength as measured by the jump and reach. The sports method was superior to the apparatus method for improving arm and shoulder girdle strength as measured by chins, and body coordination, agility, and control as measured by the bar snap. There was no significant improvement in either the shoulder-girdle coordination or the 300-yard endurance run.

The results showed a significant superiority of the sports method over the apparatus method for improving physical fitness in a short period of time; however, no indication was given as to the length of participation in each of the

activities. There was no indication of the relative effectiveness of each of the specific activities. All the activities were simply massed into two large groups.

In a study by Landiss (3), he summarizes the work of Fordham and Berrafato in concurrent but separate studies using freshman and sophomore students at the University of Illinois to investigate the effects of selected physical education activities on muscular endurance. The test battery was composed of chins; pushups, sitting tucks, and hops.

The classes tested by Fordham were apparatus, individual tumbling, badminton, and basic conditioning. The study was conducted over a one semester period. The results showed that the students taking the basic conditioning course made the greatest improvement in mean standard scores, the mean gain of the apparatus group was second, with the individual tumbling group third, and the students taking badminton improved the least.

Using the same test items, Berrafato studied intramural athletics, boxing, weight lifting, wrestling, and volleyball for improvement of endurance. His results showed that the mean gain of the boxing group was the greatest with the groups in weight lifting, intramural athletics, wrestling, and volleyball ranked in that order.

In 1956, Landis (2, pp. 295-302) made a more comprehensive study of eight physical education activities in their

development of physical fitness and motor ability for freshman college men. The activities selected for investigation were elementary courses in swimming, boxing, weight training, tennis, wrestling, volleyball, tumbling-gymnastics, and basic conditioning. The classes met three times a week for one hour for instruction and participation. The primary objective for each course, except the conditioning course, was to develop playing or performance skill in that specific area.

The test used as the criterion for motor ability was the Larson Test of Motor Ability. The test used as the criterion measure of physical fitness was the Physical Fitness Test, which was a slight modification to the Army Air Force PFR.

The subjects were 1,031 incoming freshmen at the Agricultural and Mechanical College of Texas. All subjects were tested using the Physical Fitness Test for the purpose of selecting homogeneous groups for the activities. All groups were then tested using the Larson Motor Ability Test, after which each group was assigned to an activity for the semester. At the end of the semester, all groups were again tested using the same two tests.

The data consisted of records of performance on the individual test items used and total scores for the two tests at the initial and posttest stages. Statistical treatment of the data was made to calculate means and standard deviations for each test item and total test scores, as recorded at both

testing periods. By use of the critical ratio, the significance of the difference in mean gains was studied to determine if there was a significant difference in the relative effect of the various activities on physical fitness and motor ability.

Landiss concluded from these data that improved physical fitness rating was equally well attained by those students participating in conditioning and tumbling gymnastics. The groups participating in wrestling and tumbling gymnastics made the most significant gains in the Larson Motor Ability Test, while tumbling gymnastics was the only group that evidenced a significant gain on each item of the Physical Fitness Test. These results seemed to indicate that the course using the combined program of tumbling and gymnastics best developed all phases of physical fitness and motor ability tested.

Another study reported in 1956 by Bennett (1, pp. 253-259) was designed to determine the relative contributions of modern dance, folk dance, basketball and swimming to selected and general motor abilities of college women. Seventy-nine freshman women enrolled at Indiana University, divided at random into four classes, were given eleven tests designed to measure agility, coordination, general strength, abdominal strength, flexibility, speed, leg strength, power, arm and shoulder-girdle strength, balance, endurance, and general

motor ability.

The statistical analysis of the test scores showed that swimming was as effective as modern dance in the development of all the traits tested in the study. Modern dance was as effective as swimming and basketball in the development of all the traits tested. Basketball was as effective as the swimming and modern dance classes in the development of all the traits tested, except abdominal strength. The folk dance class was found to be least effective of all the classes tested for selected motor abilities.

It was concluded that at the end of sixteen weeks of instruction, the most effective of the activities for the development of specific and general motor ability of college freshman women were swimming and modern dance, with basketball ranking next and folk dance the least effective.

Musker, Casady, and Irwin (4, pp. 5-7) describe a study by a panel of experts comparing values of gymnastics participation with those derived from participation in other activities. In this comparison, eleven physical values, three mental values, and the carry-over value were compared for various body building systems such as gymnastics, track and field, winter sports, combatives, swimming, relays, team games, weight lifting, calisthenics, and dancing. Each factor was subjectively evaluated by the panel, the value scale being one to three--one representing a low quality of

development, and three representing a high quality of development. Total possible score on the fifteen values was forty-five.

Total scores obtained on the evaluation showed gymnastics ranking highest, with a score of forty-three, Swedish gymnastics, track and field, winter sports, combatives, swimming, relays, team sports, weight lifting, group training, body building, calisthenics, and dance following respectively.

A review of the literature concerning the comparative contribution of different physical education activities indicated major discrepancies in what investigators considered the activity that best fulfills the requirements for developing those elements considered desirable for a physically-fit individual.

The important fact, however, lies not in the discrepancies that are found, but in the fact that in each case the participation in activities was of some value to the individual.

CHAPTER BIBLIOGRAPHY

1. Bennett, Colleen, "Relative Contributions of Modern Dance, Folk Dance, Basketball, and Swimming to Motor Ability of College Women," The Research Quarterly, XXVII (December, 1946), 253-259.
2. Landiss, Carl W., "Influences of Physical Education Activities on Motor Ability and Physical Fitness of Male Freshmen," The Research Quarterly, XXXVII, (December, 1956), 295-302.
3. _____, "Influences of Physical Education Activities on Motor Ability and Physical Fitness of Male Freshmen," unpublished doctoral dissertation, Department of Physical Education, Pennsylvania State University, 1953.
4. Musker, Frank F., Donald R. Casady, Leslie V. Irwin, A Guide to Gymnastics, New York, The Macmillan Company, 1968.
5. Wilbur, Ernest, "A Comparative Study of Physical Indices as Measured by Two Programs of Physical Education," The Research Quarterly, IX (October, 1938).

CHAPTER III

PROCEDURES

Selection of Subjects

The data for this study were secured by administering selected tests to second semester freshmen at Rice University, Houston, Texas during the fall semester of the academic year, 1969-1970. One full year of physical education activity is required for graduation from Rice University. Classes are so organized that each student receives a minimum of four weeks of instruction in each of a variety of individual and group activities throughout the year.

At the beginning of the semester, each student was given a battery of tests including (a) a swimming proficiency test, (b) The AAHPER Physical Fitness Test, and (c) a proficiency test involving throwing and catching, jumping and reaching, tossing and hitting, and change of direction for speed. From these test results, students were assigned to homogeneous classes for the entire year.

Twenty-five male freshmen from each of three sections of physical education activities classes meeting on Tuesday-Thursday were selected to participate in the testing program.

Selection of Measuring Instruments

Four tests were used in this study: (1) Bass Test of Dynamic Balance, (2) Right-Boomerang Run, (3) Burpee Test, and (4) Scott-French Bobbing Test. These tests were selected to measure the physical factors: dynamic balance, agility, endurance, and flexibility. (For complete instructions on all test procedures, see Appendix A.)

Dynamic balance indicates steadiness and stability in leaping from one spot on the floor to another. Bass (1) stated that the component elements determining success in this type of balance were the eyes and the sensory-motor kinesthetic response. With this in mind, the Bass Test was used to measure these components.

Bass (1) found the reliability of his test to be .95 using three trials. An r of .74 has been obtained between the Bass Test and ratings of general motor ability of college women.

Flexibility must be considered in terms of a given joint or of adjacent joints (7, p. 311). For an accurate measure of hip and back flexion, the Scott and French Bobbing Test has proved effective.

Magnusson (6) reported a reliability of .70 and .84 respectively on first and sixth grade children using separate trials on the Scott and French Test.

Agility emphasizes the capability for fast reaction in controlled movement where accuracy is also a feature. The ability to handle the body quickly and precisely, not necessarily with force and power, in events where the performer must change the direction of the body rapidly are a measure of agility. The Right Boomerang Run is a measure of agility in which the performer must move quickly and precisely over a given course.

Gates and Sheffield (3) using test, retest, reported a reliability of .92 for boys in the seventh, eighth, and ninth grades on the Right Boomerang Run.

Endurance emphasizes the capacity for continuous exertion with partial recovery during the exercise (2, p. 53). As a measure of overall body endurance, the Burpee Test for one minute is often used for college men.

Administration of Tests

To reduce the chance of errors in collection and recording of data, all tests were administered by the same person.

The procedures involved in the tests for this study were familiar to the investigator, nonetheless, a trial run of all test items was made prior to actual testing. Adjustments were made in the manner and order of testing to facilitate the administration of the tests from a standpoint of time and ease of recording.

At the time of administration of the tests, each item was explained in detail to the subjects prior to performance. In addition, written instructions, including diagrams, were posted on bulletin boards in the testing area. Test results were recorded on individual cards for each subject.

Experimental Procedures

The purpose of the study was to determine what effects swimming, apparatus gymnastics, and wrestling had on the physical-fitness components agility, balance, flexibility, and endurance. To that end, the following experimental procedures were used.

All students in each of the three selected sections of physical education activity classes were administered the Bass Test, Scott-French Test, Burpee Test, and Right Boomerang Run. One of the activities from swimming, apparatus gymnastics, and wrestling was then assigned to each of the sections. All groups received instruction and engaged in their assigned activity for four weeks, totaling approximately eight and one-half hours class participation time. The same instructor taught each of the activities. At the end of the required activity unit, the groups were again tested using the same battery of tests. The data were treated statistically to determine: (a) if there were differences in test scores within groups, (b) if differences existed between group scores on the

tests, and (c) if one group was superior to any other group in terms of significantly greater test scores.

Objectives of the Activities

The procedure for conducting each of the classes was planned in some detail. The courses were primarily instructional with a ten minute warm-up prior to the start of class participation. (For warm-up procedures and sample daily lesson plan, see Appendix B)

In elementary wrestling, the primary objectives were to develop knowledge, skill, speed and agility necessary for acceptable performance in the activity. Skills were taught in an orderly progression consisting of takedowns, breakdowns, reversals, escapes, and pinning combinations. Sessions began with a ten minute preliminary warm-up and mat drill. Body contact was a part of the instructional program, beginning with thirty-second rounds to develop particular skills, and increasing to greater length as the unit progressed.

In elementary gymnastics, the objectives were to develop adequate beginning skills on the side horse, parallel bars, rings, horizontal bars, and trampoline. Stunts were taught in an orderly progression with leadup exercises on the equipment to develop strength and coordination necessary for performance. Students were encouraged to combine skills into routines as the unit progressed.

Students involved in swimming were of low to moderate skill level. The primary objective for this group involved instruction to develop ability in the primary swimming strokes. The strokes taught were the front crawl, back crawl, breast stroke, side stroke, and elementary back stroke. Instruction was also given in survival swimming and various games such as water polo. Students began class with a ten-minute warm-up and a series of dry land drills to develop correct arm and leg motions.

Analysis of Data

The data were treated statistically by using the t -test to determine significance of the difference between means for in-group differences. As a further means of analysis, simple covariance was used to determine if between group differences existed.

CHAPTER BIBLIOGRAPHY

1. Bass, Ruth L., "An Analysis of the Components of Tests of Semi-Circular Canal Function and of Static and Dynamic Balance," The Research Quarterly, X (May, 1939), 33-51.
2. Cureton, T. K., Physical Fitness Appraisal and Guidance, St. Louis, C. V. Mosby Company, 1947.
3. Gates, Donald D., R. P. Sheffield, "Tests of Change of Direction as Measurements of Different Kinds of Motor Ability in Boys of the Eighth, Seventh, and Ninth Grades," The Research Quarterly, XI (October, 1940), 136-148.
4. Johnson, Barry L., Jack K. Nelson, Practical Measurements for Evaluation in Physical Education, Minneapolis, Burgess Publishing Company, 1969.
5. Magnusson, Lucille I., "The Effect of a Specific Activity Program on Children with Low Muscular Fitness," unpublished doctoral dissertation, Department of Physical Education, State University of Iowa, 1957.
6. McCloy, Harold, and Norma Young, Tests and Measurements in Health and Physical Education, New York, Appleton-Century-Crofts, Inc., 1954.
7. Scott, M. and Esther Gladys French, Measurement and Evaluation in Physical Education, Dubuque, Iowa, Wm. C. Brown Company, 1959.

CHAPTER IV

PRESENTATION OF DATA

The data secured for the study included pre- and posttest scores on tests measuring endurance, flexibility, balance, and agility of each of the subjects. To determine if changes in these scores between initial and final tests for each group were great enough to be statistically significant, the t-test as described by Garrett (1, pp. 212-244) was used. To indicate statistical significance, the .05 level of confidence was selected for all statistical analysis.

In Table I are reported initial and final means, standard deviations, and t-ratios of each activity for the test item flexibility.

TABLE I

TEST RESULTS OF ACTIVITY GROUPS ON
FLEXIBILITY OF LOWER BACK
AND HIP (N = 25)

Activity	Initial Mean	Final Mean	S.D. Initial	S.D. Final	t-Ratio
Apparatus Gymnastics	13.99	14.02	1.80	2.36	1.52
Swimming	14.69	16.82	2.05	1.67	3.47*
Wrestling	16.20	16.42	2.18	2.04	1.16

* Significant at .05 level.

Examination of Table I shows that the swimming group demonstrated a statistically significant difference between initial and final scores on the flexibility test. Apparatus gymnastics and wrestling had no statistically significant difference in initial and final scores.

In Table II are reported initial and final means, standard deviations, and t -ratios of each activity group for the test item, dynamic balance.

TABLE II

TEST RESULTS OF ACTIVITY GROUPS ON
DYNAMIC BALANCE ($N = 25$)

Activity	Initial Mean	Final Mean	S.D. Initial	S.D. Final	t-Ratio
Apparatus Gymnastics	63.18	74.74	18.64	13.99	2.48*
Swimming	61.91	72.71	17.50	21.06	1.91
Wrestling	70.20	77.40	20.65	15.87	1.24

* Significant at the .05 level.

Examination of Table II shows that the gymnastics group demonstrated a statistically significant difference between initial and final scores on the balance test. The swimming and wrestling groups had no statistically significant difference in initial and final scores on the balance test.

In Table III are reported initial and final means, standard deviations, and t-ratios for each activity group for the test item endurance.

TABLE III

TEST RESULTS OF ACTIVITY GROUPS ON
ENDURANCE (N = 25)

Activity	Initial Mean	Final Mean	S.D. Initial	S.D. Final	t-Ratio
Apparatus Gymnastics	33.51	37.88	4.76	4.52	3.46*
Swimming	35.20	37.30	6.35	5.87	1.20
Wrestling	35.40	38.50	4.03	3.67	2.48*

* Significant at the .05 level.

Examination of Table III shows that the gymnastics and wrestling groups demonstrated a statistically significant difference between initial and final scores on the endurance test. The swimming group had no statistically significant difference in initial and final scores on the endurance test.

In Table IV are reported initial and final means, standard deviations, and t-ratios for each activity group for the test item agility.

TABLE IV

TEST RESULTS OF ACTIVITY GROUPS ON
AGILITY ($N = 25$)

Activity	Initial Mean	Final Mean	S.D. Initial	S.D. Final	t-Ratio
Apparatus Gymnastics	12.36	11.874	.686	.592	2.86*
Swimming	12.58	12.20	.560	.549	2.33*
Wrestling	12.62	11.86	.675	.608	3.76*

* Significant at .05 level.

Examination of Table IV shows that the gymnastics, wrestling and swimming groups all demonstrated a statistically significant difference between initial and final scores on the agility test.

To determine if any differences existed among groups on any of the test items, analysis of covariance, as reported by Garrett (1, pp. 295-305), was used. Pre-test means were adjusted to equalize all groups on each of the test items, after which initial and final scores were correlated between groups and an F -value of the significance of the difference between means was obtained.

For the test items, flexibility, balance, agility, and endurance, the F -values were 1.11, .24, 1.61, and 1.79 respectively. To be statistically significant at the .05 level,

the critical F -value for three groups and twenty-five subjects was 3.44. No statistically significant F -values between test scores among groups was observable.

Findings of the Study

The use of the t -test for differences in mean scores within groups revealed a number of significant results. These results indicated that some changes in the physical components tested occurred during participation in the different activities.

The group participating in gymnastics reported gains between initial and final test scores in balance, endurance, and agility that were great enough to be statistically significant.

The group participating in swimming reported gains between initial and final test scores in flexibility and agility that were great enough to be statistically significant.

The group participating in wrestling reported gains between initial and final test scores in endurance and agility that were great enough to be statistically significant.

Analysis of covariance of among group means reported no statistically significant differences in any of the test items.

Discussion of the Findings

Several variables exist in this study which are possible reasons for no significant differences among group means.

The four week unit plan used in this study could have been an insufficient amount of time for the physical factors tested to change significantly. Also, meeting class only twice per week could have been detrimental to improvement.

The approach to teaching the activities was one of complete participation, however, due to the size of the classes and the nature of the activity, total involvement was impossible at all times. The types of procedures used in teaching these classes could have been the cause for no significant differences among groups.

Another factor that should be considered was the type of tests administered the subjects. These tests were intended to indicate gross changes in endurance, flexibility, balance, and agility and would not indicate the fine changes that could have existed after the four weeks of participation.

CHAPTER BIBLIOGRAPHY

1. Garrett, Henry, Statistics in Psychology and Education,
New York, McKay Company, 1967.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine if changes occurred in flexibility, balance, agility, and endurance by groups participating in apparatus gymnastics, wrestling, and swimming.

Subjects were seventy-five college freshmen at Rice University during the Spring Semester, 1969-1970. Subjects were from three sections of physical education activities classes, each section being assigned to one of the experimental groups. Each experimental group was tested on flexibility, balance, agility, and endurance, using the Scott and French Bobbing Test, Right Boomerang Run, Bass Test of Dynamic Balance, and Burpee Test. Subjects were retested under the same conditions following four weeks of class participation in either swimming, wrestling, or apparatus gymnastics. The t-test was selected as the statistical technique to analyze the differences between means of the pre- and posttest scores for each group on each of the tests. The .05 level was selected to determine statistical significance for all analyses. Results showed significant increases in balance, endurance, and agility by the group participating

in gymnastics; in flexibility and agility by the group participating in swimming; and in agility and endurance by the group participating in wrestling. To determine whether differences between means in the posttest scores were great enough to be statistically significant, the analysis of covariance was computed. For the test items agility, balance, flexibility, and endurance, there were no significant F-values between groups.

Hypotheses

The following hypotheses are applicable to these purposes.

1. The posttest scores on the Scott and French Bobbing Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics. (Reject)
2. The posttest scores on the Scott and French Bobbing Test will be significantly greater than the pretest scores for the group participating in wrestling. (Reject)
3. The posttest scores on the Scott and French Bobbing Test will be significantly greater than the pretest scores for the group participating in swimming. (Accept)
4. The posttest scores on the Right Boomerang Run Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics. (Accept)

5. The posttest scores on the Right Boomerang Run Test will be significantly greater than the pretest scores for the group participating in wrestling. (Accept)

6. The posttest scores on the Right Boomerang Run Test will be significantly greater than the pretest scores for the group participating in swimming. (Accept)

7. The posttest scores on the Bass Dynamic Balance Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics. (Accept)

8. The posttest scores on the Bass Dynamic Balance Test will be significantly greater than the pretest scores for the group participating in wrestling. (Reject)

9. The posttest scores on the Bass Dynamic Balance Test will be significantly greater than the pretest scores for the group participating in swimming. (Reject)

10. The posttest scores on the Burpee Test will be significantly greater than the pretest scores for the group participating in apparatus gymnastics. (Accept)

11. The posttest scores on the Burpee Test will be significantly greater than the pretest scores for the group participating in wrestling. (Reject)

12. The posttest scores on the Burpee Test will be significantly greater than the pretest scores for the group participating in swimming. (Accept)

13. Apparatus gymnastics will contribute more to the development of the specific components tested than wrestling or swimming. (Reject)

Conclusions

The findings would seem to warrant the following conclusions concerning the effects of four week programs of swimming, apparatus gymnastics, and wrestling upon flexibility, balance, agility, and endurance of the groups tested.

A program of apparatus gymnastics will be useful to increase balance, endurance, and agility of male college freshmen.

A program of wrestling will be useful to increase agility and endurance of male college freshmen.

A program of swimming will be useful to increase flexibility and agility of male college freshmen.

One program is not better than any of the other programs for developing the abilities tested.

Inferences

The following are possible explanations for the findings of this study.

The length of time might have been too short for any appreciable change in the physical factors tested.

The tests used to measure the physical components could

have been insufficient for the activities used.

The difference in physical abilities of the three groups might have caused no one group to change a significant amount.

Recommendations

It is recommended that this type study be performed over a longer period of time with testing and retesting at specific intervals to determine not only physical gains that might be attained, but the amount of time necessary for these gains to appear.

Different measuring instruments should be used to distinguish physical components that are relative to the activity used.

Performance of a similar study using groups of identical ability level from the beginning.

This study might also be of value if performed on different age groups using different activities including tumbling, soccer, volleyball, tennis, etc.

APPENDIX A

The following are the tests used and procedures involved in measuring the physical factors balance, agility, endurance, and flexibility.

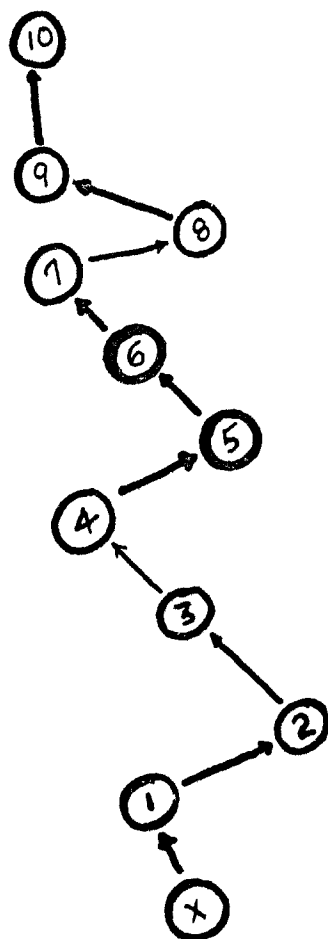
BASS TEST OF DYNAMIC BALANCE

Circles, eleven in number and eight and one-half inches in diameter, are drawn on the floor. (See Figure 1) The performer stands with his right foot on the starting circle, leaps into the first circle with the left foot, leaps into the second circle with the right foot and so on, from circle to circle, alternating the feet. The performer must leave the floor entirely while leaping from one circle before alighting in another, must alight on the ball of the foot, and must not touch the heel to the floor. He must remain stationary in each circle for five seconds. The score for the trip is fifty plus the number of seconds taken to negotiate the test, minus three times the errors. The errors are as follows: (1) touching the heel to the floor, (2) hopping on the supporting foot, (3) moving the foot while standing in the circle, (4) touching the foot outside of the circle, (5) touching the floor with the other foot, (6) touching the floor with any part of the body. Each error counts one penalty point. The test was demonstrated

and each student was given a trial run. In scoring, each subject was given the test twice and the average of both scores was taken as his balance score.

FIGURE 1

COURSE OUTLINE FOR BASS TEST OF DYNAMIC BALANCE



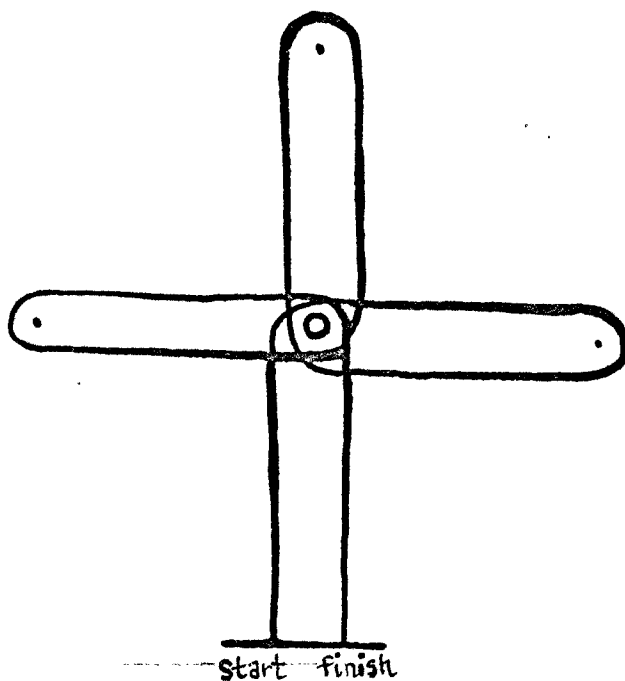
Circles = 8-1/2
diameter
X = starting circle
18' = X to 1
33" = other circles

RIGHT-BOOMERANG RUN

The obstacle course is made by placing a jumping standard seventeen feet from a starting line. One chair is placed fifteen feet on either side of the jumping standard. The performer follows the course indicated in FIGURE 2. He makes a quarter-right turn at the jumping standard and half-right turns at the chairs. His score is the time required to run the course.

FIGURE 2

COURSE OUTLINE FOR RIGHT-BOOMERANG RUN



BURPEE TEST

The squat thrust involves starting from a standing position, squatting with the hands on the floor beside the legs, thrusting the legs back to the front leaning rest position, returning to the squatting position, and back to the stand. Total score is the number of full squat thrusts that can be done in one minute.

SCOTT-FRENCH BOBBING TEST

A twenty inch scale marked in inch units is attached to a bench so that half the scale is above the bench level and half below. In taking the bobbing test, the subject stands erect with toes even with the front edge of the bench and touching the edge of the scale. The subject then bobs downward forcefully three or four times, reaching equally far down with the fingers of both hands. The knees are kept straight throughout. The score is the lowest point reached on the scale in a series of bobbings, measured in inches.

APPENDIX B

The following outline is a brief daily lesson plan for each of the activities used in this investigation.

WARM-UP

Each of the activity units started out with a warm-up period that was identical.

Ten minute warm-up period--(strenuous calisthenics)

trunk twister
jump and reach
squat thrust
climbing mountains
windmill
arm-leg raise
reverse pushups
situps (knees bent)
pushups
back arch (Progression of calisthenics from 10 to 15 to 20 repetitions as unit progressed.)

I. GYMNASTICS--

INTRODUCTION TO PARALLEL BARS AND SIDE HORSE

(Split class into groups of thirteen and twelve)

Parallel Bars

- a. hand walking--legs still
- b. hand walking--high knee lift
- c. hand walking--striding
- d. hand hops
- e. inverted hang-pike hang-birds nest
- f. swing from support
- g. swing hop
- h. dips

Side Horse

- a. squat through
- b. squat through and back
- c. flank over
- d. rear over
- e. front over
- f. feint-five times
- g. wolf vault
- h. travel around horse

II. WRESTLING

Preliminary warm-up--10 minutes

Mat drills

Bridging--reverse bridging

sitouts--turnins

pivot around partner

crab crawl--backward roll--shuffle to side

reaction drill

spinning

Introduce the referees position--let each class member go over both positions (both up and down positions).

Introduce breakdowns for standing position.

Pair off and go through 30 second round on different breakdowns.

III. SWIMMING

Preliminary warm-up--10 minutes

Dry land drill on flutter kick for front and back crawl.

Dry land drill on arm movement for front and back crawl.

Flutter kick while holding on to the wall.

Arm movement for front crawl while standing in shallow water.

Breathing while standing in shallow water for the front crawl.

Practice glide and flutter kick for front crawl.

Practice glide, flutter kick and arm motion for front crawl.

Practice glide, flutter kick, arm motion and breathing for front crawl.

Repeat for the back crawl.

BIBLIOGRAPHY

- Armbruster, David A., and Leslie W. Irwin, Basic Skills in Sports for Men and Women, St. Louis, C. V. Mosby Company, 1958.
- Clarke, H. Harrison, Application of Measurement in Health and Physical Education, New Jersey, Prentice-Hall, Inc., 1967.
- Cozens, Frederick W., Achievement Scales in Physical Education Activities for College Men, Philadelphia, Lea and Febiger, 1936.
- Cureton, T. K., Physical Fitness Appraisal and Guidance, St. Louis, C. V. Mosby Company, 1947.
- Gabrielson, Alexander M., Betty Spears, B. W. Gabrielson, Aquatics Handbook, New Jersey, Prentice-Hall, Inc., 1960.
- Garrett, Henry, Statistics in Psychology and Education, New York, McKay Company, 1967.
- Hughes, Eric, Gymnastics for Men, New York, Ronald Press, 1966.
- Johnson, Barry L., and Jack K. Nelson, Practical Measurements for Evaluation in Physical Education, Minnesota, Burgess Publishing Company, 1969.
- McCloy, Harold, and Norma D. Young, Tests and Measurements in Health and Physical Education, New York, Appleton-Century-Crofts, Inc., 1954.
- MacKenzie, M. M., and Betty Spears, Swimming, Belmont, California, Wadsworth Publishing Company, 1965.
- Mathews, Donald K., Measurement in Physical Education, Philadelphia, W. B. Saunders, 1958.
- Musker, Frank F., Ronald R. Casady, Leslie W. Irwin, A Guide to Gymnastics, New York, The Macmillan Company, 1968.

- Scott, M. Gladys, and Esther French, Measurement and Evaluation in Physical Education, Dubuque, Iowa, William C. Brown Company, 1959.
- Seaton, Don, Irene Clayton, Howard Leibee, Lloyd Messersmith, Physical Education Handbook, New York, The Macmillan Company, 1968.
- Spraks, Raymond E., Wrestling Illustrated, New York, Ronald Press Company, 1960.
- Steel, Robert G., Principles and Procedures of Statistics, New York, McGraw-Hill Book Company, 1960.
- Umbach, Arnold, Warren R. Johnson, Wrestling, Dubuque, Iowa, William C. Brown Company, 1966.

Articles

- Bass, Ruth I., "An Analysis of the Components of Tests of Semi-Circular Canal Function and of Static and Dynamic Balance," The Research Quarterly, X (May, 1939), 33-51.
- Bennett, Colleen, "Relative Contributions of Modern Dance, Folk Dance, Basketball, and Swimming to Motor Ability of College Women," The Research Quarterly, XXVII, (October, 1956), 253-263.
- Gates, Donald D., R. P. Sheffield, "Tests of Change of Direction as Measurements of Different Kinds of Motor Ability in Boys of the Eighth, Seventh, and Ninth Grades," The Research Quarterly, XI (October, 1940), 136-148.
- Landiss, Carl W., "Influences of Physical Education Activities on Motor Ability and Physical Fitness of Male Freshmen," The Research Quarterly, XXXVII (December, 1956), 295-302.
- Wilbur, Ernest, "A Comparative Study of Physical Indices as Measured by Two Programs of Physical Education," The Research Quarterly, IX (October, 1938), 326-330.

Publications of Learned Societies

American Red Cross, Life Saving and Water Safety, New York, Doubleday and Company, 1969.

Unpublished Materials

Landiss, Carl W., "Influences of Physical Education Activities on Motor Ability and Physical Fitness of Male Freshmen," unpublished doctoral dissertation, Department of Physical Education, Pennsylvania State University, 1953.

Magnusson, Lucille I., "The Effect of a Specific Activity Program on Children with Low Muscular Fitness," unpublished doctoral dissertation, Department of Physical Education, State University of Iowa, 1957.

Dictionaries

Good, Carter, Dictionary of Education, New York, McGraw-Hill, 1959.