6-1-1966

A Comparison of Physical Fitness Levels Between Male Honor Freshmen Students Enrolled in Physical Education 101 at the University of North Dakota

Douglass A. Hallatt

This abstract, submitted by Douglas A. Hallatt in partial fulfillment of the requirements for the Degree of Master of Science at the University of North Dakota, is hereby approved by the committee under whom the work has been done.

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A COMPARISON OF PHYSICAL FITNESS LEVELS BETWEEN MALE FRESHMEN HONOR STUDENTS AND MALE FRESHMEN STUDENTS ENROLLED IN PHYSICAL EDUCATION 101 AT THE UNIVERSITY OF NORTH DAKOTA

Douglas A. Hallatt, Master of Science

The thesis here abstracted was written under the direction of Walter C. Koenig and approved by Dr. John L. Quaday and Dr. Russel A. Peterson as members of the examining committee, of which Mr. Koenig was chairman.

The purpose of this study was to compare the physical fitness levels of male freshmen honor students and male freshmen students enrolled in Physical Education 101 at the University of North Dakota.

This study was directly concerned with physical fitness as measured by the American Association for Health, Physical Education, and Recreation Physical Fitness Test. The students involved were all freshmen male students enrolled in the required physical education service program and twenty-seven of the forty-seven male freshmen honor students at the University of North Dakota.

The test was administered to both groups the sixth week of the first semester of the 1965-66 school term.

The null hypothesis was assumed with respect to

the differences between the means of both groups. The hypothesis was tested with the "t" technique for the difference between means derived from uncorrelated scores from a combined sample.

Some of the conclusions indicated by this study were:

1. The required physical education course which the service group engaged in produced significant results in all of the selected measures of physical fitness except the shuttle run at the criterion .01 level.

2. The honors students were not required to participate in any phase of the physical education program. As measured by the prescribed test, this group achieved fitness below the levels achieved by the average university freshman of 1965-1966.

3. Some of the honors students did not seem to understand the true meaning of physical education.

4. The elective status of physical education for honors students presently in force, seems not to meet the needs of nearly 90 per cent of those students since only five enrolled voluntarily in Physical Education 101 during first semester 1965-1966.

A COMPARISON OF PHYSICAL FITNESS LEVELS BETWEEN MALE FRESHMEN HONOR STUDENTS AND MALE FRESHMEN STUDENTS ENROLLED IN PHYSICAL EDUCATION 101 AT THE UNIVERSITY OF NORTH DAKOTA

by

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B.S. in Physical Education
University of North Dakota
1965

A Thesis
Submitted to the Faculty
of the
Graduate School
of the
University of North Dakota
in partial fulfillment of the requirements
for the Degree of
Master of Science

Grand Forks, North Dakota

June
1966

ACKNOWLEDGEMENTS

The author wishes to acknowledge the assistance of all those whose interest, time, and effort made this study possible. Special recognition is extended to those University of North Dakota students who served as subjects for this investigation, for their efforts and cooperation.

Appreciation is also extended to Dr. John Quaday for the helpful instruction, resource material, suggestions, and criticism.

The gratitude of the author is respectfully accorded Mr. Walter C. Koenig, director of this thesis, for his guidance, understanding, and helpful criticism which have aided statistically and materially in the successful completion of the study.

Finally, for her constant encouragement, assistance, and inspiration, the writer is deeply grateful to his wife, Margaret Marion.

This thesis, submitted by Douglas A. Hallatt in partial fulfillment of the requirements for the Degree of Master of Science at the University of North Dakota, is hereby approved by the committee under whom the work has been done.

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CHAPTER I

INTRODUCTION

Nature of the Problem

The total physical education program with which most colleges and universities are concerned consists of three aspects, namely: the service, intramural, and intercollegiate programs. Each phase is important, and no physical education program is complete unless each of these aspects is well developed and co-ordinated. The service program is that which is ordinarily required by state law or local regulation. The emphasis is instructional, and the objective is to provide each student with the minimum essentials of physical education.

The service program requirement at the University of North Dakota is stated as follows:

> Any able-bodied male student entering the University as a Freshman must successfully complete Physical Education 101 and 102 or Military Science 101 and 102. There are special regulations concerning this requirement for veterans. Students twenty-four years of age or older are not held for this requirement. Physical Education is required for all first-year women students at the University.[1]

The University of North Dakota instituted an Honors Program in the fall of 1961 under the direction

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[1]Bulletin of the University of North Dakota, Vol. LVI (August, 1965).

of a co-ordinator and a faculty committee. The stated purpose of the program was to provide for the exceptionally capable students an educational experience in breadth and depth which would stimulate them to accomplish much and to seek even more.

In the spring of 1962, the Honors Committee of the University of North Dakota requested that no student enrolled in the Honors Program should be required to take physical education. The University of North Dakota Faculty Senate passed this request February 7, 1962.[2] As a result of this ruling, Dr. John L. Quaday, Chairman of the Department of Physical Education for Men, University of North Dakota, undertook a preliminary study of all male freshmen honors students. The purpose of this study was to determine the physical education background and the attitude of each student toward physical education.[3]

The results of this study were reported by Dr. Quaday at a meeting of the Honors Committee, October 8, 1962. An outgrowth of this report was a letter to Dr. Quaday from Richard W. Johnson, Ph. D., Assistant Professor of Psychology, Honors Committee Member. In

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[2]University of North Dakota Faculty Senate, Proceedings of the February 7, 1962, Meeting (Grand Forks, North Dakota, 1962).

[3]Interview with Dr. John L. Quaday, Chairman of the Department of Physical Education for Men, University of North Dakota, September, 1965.

his letter Dr. Johnson said:

> You may well be able to convince me of the desirability of the Physical Education requirement if you can demonstrate to me that the Honor Program students are actually in need of such additional Physical Education. Perhaps the preliminary testing results suggested earlier could be compared with past freshman or past sophomore year testing results for both Honor Program students and for regular University College students. If Honor Program students have not kept pace with the regular University students in terms of their Physical development, the importance of the Physical Educational requirements for all students would be supported. Perhaps some interested graduate student in Education could assume this task with modifications as a master's or doctoral research project.
>
> In conclusion, I am in sympathy with the goal of youth fitness. In addition, I am sure that the Physical Education courses are beneficial for a good many students, including Honor Students. I do not believe, however, that it is necessary to make the course required for all students. Perhaps some convincing demonstration, such as that outlined in the letter, will be able to point out the fallacy in this argument.[4]

This study was undertaken as a direct result of Dr. Johnson's proposal.

Statement of the Problem

The problem of this study was to compare the physical fitness levels of male freshmen honor students and male freshmen students enrolled in Physical Education 101 at the University of North Dakota.

The specific problems of the study were as follows:

1. To find out the status of fitness of both

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[4]Letter from Richard W. Johnson, Ph. D., Assistant Professor of Psychology, Honors Committee Member, University of North Dakota, January 10, 1963.

groups as measured by the American Association for Health, Physical Education, and Recreation Physical Fitness Test.

2. To determine any statistical difference in the fitness levels of the two groups.

3. To determine the physical education background, and the attitude of each of the freshmen male honor students toward physical education.

Justification of the Study

Because this study was recommended by a member of the Honors Committee[5], the writer felt that this was one justification for the study. The fact that only five of a possible forty-seven male freshmen honor students elected to take physical education during 1965-1966 indicated a need for the study.

Dr. Quaday in his report to the Honors Committee discussed the justification of physical education for the honor male students when he said:

> Since I first heard from some of these freshmen boys during registration that they were not being held for the physical education requirement, I have been digging around trying to find out some things. On every hand I have been told that these boys are so busy that they just don't have time for instruction in physical education. If this is actually true, if a boy of 18 cannot find two hours a week for activity other than that dealing primarily with mastery of linguistic skills, then I must conclude that he is just too busy, his life is not well balanced and neither is his work load. The directive from history seems quite clear on this point. Required physical education programs for college students were originally

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[5]Ibid.

> directed toward providing exercise for superior students who studied so long and so hard that their health (physical, emotional or mental) failed before they could even graduate. Nervous breakdown and tuberculosis among top students became such a problem in higher education that administrators sought to alleviate the situation by requiring daily exercise periods for all students. This was the only way they could provide for those who needed exercise most but who were just too busy to get to it. Scholars of today claim to be able to learn from history. Let us not gamble with the personal health of our best students in an uncontrolled experiment of this kind. Let us not regress.[6]

This study was concerned with only one aspect of the much-needed research that could and should be directed toward this area.

Delimitations

This study was directly concerned with physical fitness as measured by the American Association for Health, Physical Education, and Recreation Physical Fitness Test. The students involved were all freshmen male students enrolled in the required physical education service program and twenty-seven of the forty-seven male freshmen honor students at the University of North Dakota. The average age of both groups was eighteen years.

Limitations

The participation of the male freshmen honor

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[6]Report to the Honors Committee by Dr. John Quaday, Chairman of Department of Physical Education for Men, University of North Dakota, October 8, 1962. (In the files of the department.)

students was on a volunteer basis. Five of the twenty-seven male freshmen honor students were enrolled in Physical Education 101.

Definitions

Physical fitness is one phase of total fitness. The components of physical fitness are resistance to disease, muscular strength and muscular endurance, cardiovascular respiratory endurance, muscular power, flexibility, speed, agility, coordination, balance and accuracy.[7]

The American Association of Health, Physical Education, and Recreation Youth Fitness Test included sit-ups, pull ups, shuttle run, standing broad-jump, 50-yard dash, shot-put, and the 600-yard run-walk. The shot-put was substituted for the softball throw at the University of North Dakota as a measure of shoulder strength.

The Service Group consisted of 371 male freshmen enrolled in Physical Education 101 at the University of North Dakota.

The Honors Group consisted of 27 male freshmen enrolled in the Honors Program at the University of North Dakota.

Review of Related Literature

Physical fitness improves health. Paul Hunsicker asked the question "Why be Physically Fit?" and answered

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[7]Thomas Kirk Cureton, Physical Fitness Appraisal And Guidance (St. Louis: The C.V. Mosby Company, 1947), p. 21.

it with "Fitness Improves General Health."[8] He went on to say:

> During the last decade an increasingly large volume of medical literature has appeared which supports the premise that it is desirable from a health standpoint to continue physical activity throughout life.[9]

Because physical fitness contributes to health, it also contributes to intellectual life. The Educational Policies Commission had this to say in 1961:

> The school must be guided, in pursuing its central purpose (the development of the rational powers) or any other purposes, by certain conditions which are known to be basic to significant mental development. The school has responsibility to establish and maintain these conditions.
>
> One of them is physical health. The sick or poorly nourished pupil, the pupil suffering from poor hearing or vision, is hampered in learning. An adequate physical basis for intellectual life must be assured.[10]

For those people who argue that because of conveniences and luxuries of modern living there is not a need for a high degree of fitness, Nagle[11] insisted that everyone must be ready to meet emergencies. In any given emergency the individual may utilize the maximum

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[8]Paul Hunsicker, Physical Fitness (Washington: Department of Classroom Teachers and American Educational Research Association, a department of the National Education Association, 1963), p. 11.

[9]Ibid.

[10]Educational Policies Commission, The Central Purpose of American Education (Washington: National Education Association, 1961), p. 15.

[11]Francis J. Nagle, "How Much Fitness?" A pamphlet published by the National Education Association.

potential of his body.

To illustrate again the diverse nature of physical fitness, Carolyn and Karl Bookwalter reported a research study which involved ten physically strong boys and ten weaker boys from their childhood through adolescence.

> At the end of adolescence, the stronger boys were rated superior to the weaker boys in physical strength, size, early maturity, proficiency in athletics, high popularity, social prestige, good emotional adjustment.[12]

From the current literature and research, readers became aware of the glaring reality that physical fitness can give benefits at all age levels. The earlier one becomes physically fit, the more one will enjoy life.

Several years ago, McCloy[13] observed that the person who lacked normal fitness was handicapped by fatigue, susceptibility to infections, muscular inefficiency, and improper functioning of the organic system.

The purpose of Bergquist's study[14] was to determine the physical education practices in America and more specifically those practices in North Dakota. After reviewing vast amounts of current literature Bergquist

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[12]Karl and Carolyn Bookwalter (ed.), Fitness for Secondary School Youth (Washington: American Association for Health, Physical Education and Recreation, 1956), pp. 42-43.

[13]Charles H. McCloy, "How About Some Muscle?" Journal of Health and Physical Education, III (May, 1936), p. 32.

[14]Harold Bergquist, "Physical Fitness: Its Relation to the Individual and the Nation: A Projection of the Status of Fitness in North Dakota" (unpublished research paper, Department of Physical Education, University of North Dakota, 1961)

concluded that the fitness level of the nation in general was quite low. For North Dakota, Bergquist tested two schools using two different fitness tests. In one school he used the President's Council Physical Fitness Test. In the second school he used the Minnesota Physical Efficiency Test.

Bergquist concluded that the students involved in these tests were lacking in fitness. He recommended, among other things, a more vigorous program of activities designed to promote physical fitness in the high schools.

When physical education is elective, many do not take it. These are the very ones that need it most. For the most part, those who enjoy physical education and benefit from it, will elect to take it. But the unskilled and uncoordinated will not take part. True, if physical education is required, the physical education teacher has a tremendous selling and teaching job to do, but this job cannot be done if these people are not present.

Any review of related literature would be incomplete without a look at the report submitted to the Honors Committee by Dr. Quaday. Because of the clarity and conviction with which Dr. Quaday wrote, this writer cannot do justice to it without quoting directly.

> Perhaps the most distressing thing to me about all of this is that, as far as can be determined at this time, little consideration has been given to what the needs of these particular students

might be for educational activities which could be provided for them through our department. For example:

1. Do these boys know how to swim or are they like 75 per cent of the rest of our male freshmen over the last 7 years time who have been unable to swim even well enough at the time of enrollment to pass a Beginner's test?
2. Are they possessed of minimum standards of physical fitness, or are they like 35 per cent of last year's freshman men who could not even approach the national norms, or are they like our ROTC boys who performed so poorly in fitness tests in Summer Camp as to embarrass our president and the deans who had come to observe?
3. Have these boys been given proficiency tests which could be used to evaluate their skill backgrounds in leisure time activities and hobbies of an active nature? For the kind of work most of them will be doing, let's face it, they will need activities which will take them outside, away from offices and into recreational activities. There is one thing we do know definitely and that is, that once they finish school, they will have more leisure time than any group of working men has ever had.
4. Has an inquiry been made into the nature of the program to see what is being missed, or is the "Waste of Time" assumption being made arbitrarily and without question?
5. Could the chairman of the physical education department have been called in and asked to attempt to justify the requirement for the students concerned?

You see, if just so happens that I am very interested in each of these boys. They are our future governors, legislators, professional, business and civic leaders. For the best interests of the University of North Dakota in future years, I must do everything I can to see to it that their attitudes toward our physical education program are based upon something other than abysmal ignorance.

My opinion is that, unless reasonable evidence is available, no individual or group is entitled to inculcate students' minds with the notion that any part of the University program is a waste of time. In a sense, all of us live in glass houses, and we do need to be just a bit careful about throwing stones. Permit me to illustrate hypothetically. Many of these students are strong in English. Suppose English proficiency tests revealed reasonably good

mastery of basic fundamentals. Would it be safe to make English 101 optional? If this were done, how many of the students do you think would enroll in it? My point is that Freshman boys may not be ready yet to exercise such choices in their own best interests. Five of the boys who are not now enrolled in physical education have told me that you (their counselors) recommended that they enroll in physical education, but that they did not do so. Isn't this precisely what must be expected? Since when do boys of this age follow adult recommendations? My experience with these rascals over a period of the last 15 years has convinced me that most of them will attempt to escape any possible requirement, if for no other real reason than that it is a requirement. The real tragedy inherent in making physical education optional for Honors Students is that those who stand to profit most from experiences of this kind will be the very ones who will never enroll. For example, only two of the boys not enrolled have had any instruction in swimming during high school years and those two had only the most basic rudiments. When asked if they would like to become more proficient swimmers, all but one indicated receptiveness, and that one blanched at the very mention of the word water. The question is, where and when will they learn? Over half of these boys live or work on farms each summer. The golden opportunity is here and now while they are students at the University. I doubt that the good people of North Dakota who have provided us with one of the finest swimming pools in this area meant to have us act to deter their more talented sons from learning to swim in it.

I think sometimes it is entirely too easy for some of us who may have grown up in other geographical areas, to forget how meager the backgrounds of real life experiences of many of our best students have been. Many rural students in North Dakota climb on the bus a few minutes after their last class ends. Most of the boys in question have done very little toward developing their own physical fitness or skill in leisure time activities. Farming with today's methods simply does not do the job and may in fact hinder normal organic and muscular development of adolescent boys. Three of these boys participated only in basketball and two of these were excused from physical education classes as a result of such participation. One-sport-men are not physically educated. Actually, only one boy out of this group has what I would characterize as a well-rounded activity background.

. . . . . .

I must admit to you that I was skeptical from the start as to just how busy these students really were. I just had to know. Now I can report to you that there is not one single one of these boys who could not fit a physical education 101 class into his present class schedule as it now stands. In fact, one of them is enrolled in 14 semester hours of work and two are enrolled in 15 hours---not even average loads in terms of 8 semesters for graduation. Over-all, their average loads during the present semester are 16.4 semester hours.

Most of them do not feel that they are unable to work in two hours of laboratory experience in physical education per week into their present schedules. What they do say, though, are things like these:

1. I saw a chance to grab a couple of extra hours and took it.
2. It was a chance to take another course in which the honor points would count.
3. I didn't think I needed it that bad.
4. I thought I would need the time for study.

Incidentally, only two of these boys have any definite plans to participate in vigorous activities in the intramural sports program.

Now, I want to be able to support the honors program, but I would like to be able to believe that ours is a program of enrichment, not a program of deprivation. We are literally guiding impressionable youngsters away from an opportunity to learn useful safety skills and leisure time skills while in the process of improving their own personal fitness for the challenges of their academic load. In the most recent study to come out of France, in this area, university students who exercised vigorously as an organized part of their school day obtained significantly higher grades than did students who did not participate in such activities. In my opinion, if there is one single group of boys on campus who should most emphatically not be excused from physical education, it is the very group in question. Let's find out what they need and guide them into, not away from it. American boys should no longer grow up unable to at least walk and chew gum at the same time. Ours is a flexible program. We offer twenty-four different activities in our instructional program during the current semester. Next semester, this number will be increased by at least 12 additional activities which are not offered currently. Many of the boys I talked to expressed a desire to elect an activity of their own choice

> rather than to take the prescribed 101 routine of Physical-fitness-oriented activities which is introduced into our first semester this year for the first time. Election of this type could easily be handled for a group of this size if the committee chose to consider such an alternative. After I had finished visiting with one boy, he asked me if it was still possible for him to enroll in physical education during the present semester. He may just now, for the first time, be finding out that it may not be entirely desirable for active boys to become suddenly inactive. This, the rest should know also.
>
> And now for one parting shot. I do not wish to appear critical of the Honors committee. I believe that I can appreciate many of the problems faced in trying to plan challenging programs for gifted students, but I cannot leave here without sounding this note of warning. It is dangerous to develop in students of this age any kind of privileged character or fair-haired boy complex. Most of them are quite incapable of handling this sort of thing with a mature outlook and without developing an exaggerated notion of their own importance.[15]

Present practice supports the fact that physical education is an important aspect of college education. Studies show that a large majority of colleges require physical education.[16]

Rider made a point for requiring physical education for all students when he said:

> Regular physical activity is absolutely necessary as one contributing factor to the health and physical fitness necessary for the pursuit of exacting studies. Without a requirement the so-called "book-worm" will presumably neglect this important side of his education.[17]

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[15]Quaday, op. cit.

[16]Edward J. Shea, "The Status and Role of Physical Education as a College and University Requirement," Journal of Health, Physical Education and Recreation, 29 (December 1958), p. 31.

[17]George L. Rider, "Why Have a Physical Education Requirement?" College Physical Education Association Proceedings, 1934, p. 129.

Shea, in arguing for a two year requirement for all college students said:

> Students should be required to participate in physical education class work for at least the freshman and sophomore years. Participation in certain specific activities should also be required to ensure the development of interests in a variety of leisure-time activities; to understand, respect, and use the body as an instrument of expression; to ensure understanding of self in relation to physical needs; to motivate students to continue activity in upperclass years and following graduation; to ensure a thorough grasp of knowledge essential for understanding the activities that have become a part of our culture; to learn to accept one's own body with its limitations; to develop skills in evaluating and maintaining fitness for total living; and to develop group understandings and cooperation as preparation for participation in community life.[18]

MacKenzie[19] found in comparing the Physical Fitness Index changes in Northeastern University students in various activities, indications that wide differences in physical fitness are effected by participation in various sports and activities. The data seemed to show that general corrective program, exercises to improve abdominal conditions, cross country and hockey yielded the greatest dividends in physical development.

Vinger[20] in a study concerned with a comparison

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[18]Shea, op. cit., p. 64.

[19]Donald H. MacKenzie, "Effects of Various Activities on the Physical Fitness of University Men," Research Quarterly, Vol. 6, No. I (March, 1935), p. 137.

[20]Richard M. Vinger, "A Comparison of Physical Fitness Increases as the Result of a Selected Physical Education Program" (unpublished research paper, Department of Physical Education, University of North Dakota, 1958).

of physical fitness increases as the result of a selected physical education program concluded:

1. The required physical education curriculum which the experimental group engaged in did produce significant changes in all of the selected measures of physical fitness except the shuttle run at the criterion .01 level.

2. The control group who did not participate in any phase of the physical education program made no significant changes in any of the selected measures of physical fitness.

3. The control group did not change significantly in any of the measures of physical fitness levels, while the experimental group improved significantly in nearly all areas of physical fitness. This seems to indicate that the test-retest method of evaluating the effectiveness of a physical education program in meeting the objective of physical fitness is a satisfactory device. The data collected in this study for the control group indicated that growth and maturation have little effect on the physical development of an individual.

The physical educator who uses this method of evaluation could feel assured that any significant changes in physical fitness levels from the initial test to the retest period are due to the effectiveness of the program in attaining that objective and not to

the growth and maturation of the individual.

Summary of Review of Literature

From the review of literature, there was evidence that activity from a physical education class or from an organized sport aided in the development of physical fitness. If such were the case, then our physical education programs are justified within our schools and every individual should be encouraged to participate in a wide variety of physical activities.

CHAPTER II

METHODOLOGY

Preliminary Planning

The data used in this study were obtained from 371 male freshmen enrolled in the required Physical Education Service Program, and 27 male freshmen enrolled in the Honors Program at the University of North Dakota. All completed score cards were used. Both groups were given the American Association of Health, Physical Education and Recreation Youth Fitness Test with one modification the sixth week of school of the first semester.

Procedures

A directed group interview was conducted with 27 male freshmen honors students before they were given the fitness test. Twenty-seven male freshmen honor students answered the interview questions at the same place and time. The interview was administered by this writer. The directions for the answer sheet were as follows:

1. Do not check any of the intramural activity items unless you plan to take part.

2. Do not check any of the physical education service activities unless you really want to take part

in them.

3. To the question, "What does Physical Education mean to you?" the examiner wants your answer, not your neighbor's.

A complete example of the questions asked is presented in Appendix A, page 48.

The tests were administered according to the recommendations and instructions of the American Association for Health, Physical Education and Recreation Youth Fitness Manual.[1]

The shotput throw for distance was substituted for the softball throw for distance as a measure of arm power.

The procedures used in setting up and administering the test will be presented in this chapter.

Selection of Groups

Two groups of freshmen male students enrolled at the University of North Dakota were used.

Group I: The group included 371 male freshmen enrolled in the Physical Education Service Program, Physical Education 101.

Group II: This group included 27 volunteers of the 47 male freshmen enrolled in the Honors Program.

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[1]American Association for Health, Physical Education and Recreation, Youth Fitness Manual (Washington 6, D.C., 1961).

Test Administration

Included in the test battery were the following tests:

1. sit-ups
2. pull ups
3. standing broad jump
4. shuttle run
5. fifty yard dash
6. shot put for distance
7. six hundred-yard run-walk

All tests were administered at the University of North Dakota Fieldhouse. The sit-ups and pull ups were administered in the apparatus gym. The standing broad jump and the shuttle run were administered in the activity gym. The fifty yard dash, the six hundred-yard run-walk, and the shot put were administered on the dirt track in the Fieldhouse. The test was administered on two days. The first day sit-ups, pull ups, standing broad jump and shuttle run were given. One day elapsed between the first day of the testing and the second day of testing. The second day the fifty yard dash, the shot put for distance, and the six-hundred yard run-walk were administered. The same sequence and directions were used for both groups.

Test Assistants

The testing of both groups was under the supervision of Louis Bogan, Director of the Men's Physical

Education Service Program. Faculty members and eleven graduate assistants of the Department of Physical Education aided in the administration of the American Association of Health, Physical Education and Recreation Youth Fitness Test.

Directions for Test

A complete description of the directions for the test is presented in Appendix B.

Statistical Procedure

This investigator assumed the null hypothesis in analyzing the differences between the two groups' data. That hypothesis[2] asserts that there is no true difference between the two mean scores, and that the difference found between the sample means is a chance difference and is accidental and unimportant. Investigation of several possible tests of the null hypothesis indicated that the "t" technique for testing the significance of the difference between means derived from uncorrelated scores from large samples was suitable for use in this study. This test determines the ratio between the actual difference between the means and the standard error of the difference between the means. This ratio is expressed as "t" and is checked for significance

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[2]Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Co., 1958), p. 213.

in a table of "t".

For this study it was decided to retain the null hypothesis at .01 level of significance.

Complete data including mean differences, together with the details of the mathematical process employed in analysis for each testing area were presented in Appendix C, page 59.

CHAPTER III

ANALYSIS OF DATA

The purpose of the testing in this study was to discover whether or not there were any significant differences between fitness levels of the Honors group as compared to the Service group. The bases of comparison were results obtained through the use of the American Association for Health, Physical Education and Recreation Youth Fitness Test.

The raw scores for both groups were converted to "T" scores. The "T" scores were then punched onto computer cards. Using a 1620 I.B.M. computer, means and standard deviations for each item of the test were calculated. Further statistical calculations were made, using these data, to determine a critical ratio. It had been decided to use the critical ratio to determine the "t" ratio of the actual difference between the means and the standard error of the difference between the means. When these "t" values were determined this author checked them with a table of "t" from Garrett[1] to ascertain whether the results were statistically

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[1]Garrett, op. cit., p. 449.

significant.

Results of Comparison

Sit-Ups

The honors group had a mean T score of 62.185. The service group had a mean T score of 69.921. The actual difference between means of the two groups was 7.736. The standard error of the difference between the means of the two groups was 2.719. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 2.845. With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated a significant difference between the honors group and the service group.

Pull Ups

The honors group had a mean T score of 48.777. The service group had a mean T score of 55.579. The actual difference between means of the two groups was 6.802. The standard error of the difference between the means of the two groups was 2.142. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 3.176. With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated a significant difference between

the honors group and the service group.

Standing Broad Jump

The honors group had a mean T score of 51.888. The service group had a mean T score of 56.159. The actual difference between means of the two groups was 4.271. The standard error of the difference between the means of the two groups was 1.530. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 2.79. With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated a significant difference between the honors group and the service group.

Shuttle Run

The honors group had a mean T score of 55.777. The service group had a mean T score of 58.450. The actual difference between means of the two groups was 2.673. The standard error of the difference between the means of the two groups was 1.059. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 2.524. With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated no significant

difference between the honors group and the service group. The null hypothesis was retained.

Fifty-Yard Dash

The honors group had a mean T score of 49.259. The service group had a mean T score of 53.404. The actual difference between means of the two groups was 4.145. The standard error of the difference between the means of the two groups was 1.228. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 3.375. With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated a significant difference between the honors group and the service group.

Shot-Put

The honors group had a mean T score of 37.037. The service group had a mean T score of 43.805. The actual difference between means of the two groups was 6.768. The standard error of the difference between the means of the two groups was 1.829. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 3.70. With 398 degrees of freedom and "t" equal to 2.59 on

the "t" table, this "t" value indicated a significant difference between the honors group and the service group.

Six Hundred-Yard Run-Walk

The honors group had a mean T score of 60.666. The service group had a mean T score of 64.442. The actual difference between means of the two groups was 3.776. The standard error of the difference between the means of the two groups was 1.357. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 2.78. With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated a significant difference between the honors group and the service group.

Total Score

The honors group had a mean T score of 365.518. The service group had a mean T score of 402.064. The actual difference between means of the two groups was 35.546. The standard error of the difference between the means of the two groups was 8.003. The "t" value resulting from the relationship of the actual difference between the means of the two groups and the standard error of the difference between the means was 4.549.

With 398 degrees of freedom and "t" equal to 2.59 on the "t" table, this "t" value indicated a significant difference between the honors and the service group.

In six of the seven test items, differences between these groups were found. These actual differences were found to be statistically significant at the .01 level of confidence and in each case the null hypothesis was rejected.

TABLE 1

MEAN T SCORES OF SUBJECTS IN HONORS GROUP

Name of Test	Number	Mean T Score
Sit-ups	27	62.185
Pull ups	27	48.777
Shuttle run	27	55.777
Fifty-yard dash	27	49.259
Standing broad jump	27	51.888
Shot put	27	37.037
Six hundred-yard run-walk	27	60.442
Total Score	27	365.518

MEAN T SCORES OF SUBJECTS IN SERVICE GROUP

Name of Test	Number	Mean T Score
Sit-ups	371	69.921
Pull ups	371	55.579
Shuttle run	371	58.450
Fifty-yard dash	371	53.404
Standing broad jump	371	56.159
Shot put	371	43.805
Six hundred-yard run-walk	371	64.442
Total Score	371	402.064

TABLE 2

"t" AND SIGNIFICANCE OF DIFFERENCE

BETWEEN THE TWO GROUPS

Test Item Compared	"t" Value	.01 Level	Level of Significance
Sit-ups	2.845	2.59	Significant at .01 level
Pull ups	3.176	2.59	Significant at .01 level
Shuttle run	2.524	2.59	Not significant at .01 level
Fifty-yard dash	3.375	2.59	Significant at .01 level
Shot put	3.70	2.59	Significant at .01 level
Standing broad jump	2.79	2.59	Significant at .01 level
Six hundred-yard run-walk	2.78	2.59	Significant at .01 level
Total Score	4.549	2.59	Significant at .01 level

TABLE 3

RANK ORDER OF "t"

Area of Concentration	"t" Value
Total Score	4.549
Shot-Put	3.70
Fifty-yard dash	3.375
Pull-ups	3.176
Sit-ups	2.845
Standing broad jump	2.79
Six hundred-yard run-walk	2.78
Shuttle run	2.524

The statistical procedure used in obtaining "t" values along with the actual statistical work were presented in Appendix C, page 59.

The levels of confidence which were considered in this study were the .01 levels. From Garrett's[2] book the "t" value was taken as follows:

Degrees of Freedom	Level of Confidence
	.01
398	2.59

To explain briefly how the numbers above were used, a test item that had a "t" value greater than 2.59 was significant at the 0.01 level of confidence.

The attitudes expressed by students toward physical education were an excellent measure of the quality and success of a program in meeting the desired objectives. The interview with the male freshmen honor students produced the following data.

To the question, "What does the word physical education mean to you?" the following responses were given. The comments enclosed by quotation marks are direct quotations and are recorded as stated by the students.

"Calisthenics, volleyball, soccer."

"Doing calisthenics and learning proficiency in gymnastics."

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[2] Ibid.

"The training and development of the body."

"Blood, toil, tears, and sweat--i.e. push-ups, pull-ups, etc."

"Physical education means one-half hour out of every day wasted. I feel I get enough exercise without enrolling in a course."

"Knowing how to keep yourself in good physical condition and doing just that."

"Satisfaction in doing a physical exercise with skill and ease."

"Up to now Phy. Ed. meant working out."

"Physical enjoyment--a chance to relax and let off some unused energy."

"The developing and conditioning of the body."

"Inspirational development and conditioning of body to enable you to function with a healthy body and mind."

"Enjoyable but at times very exhausting."

"The various physical exercises needed to keep the muscles in proper tone."

"Learning and practicing sports and athletic skills."

"Mainly team and individual sports with minimal physical stress."

"It means to learn and to actively participate in various physical activities for enjoyment and for

mental and physical conditioning it provides."

"Becoming somewhat talented and familiar with certain sports, and conditioning."

"Gym--calisthenics and basketball."

"Physical education is an athletic exercise for either one's own benefit or for a team. Man develops himself physically from it."

One third of the respondents had never participated in high school sports.

Forty-seven per cent of those participating in the group interview indicated that they could not swim; however, 70 per cent of the group showed a desire to receive instruction in swimming.

One third of the group stated that they had no intentions of participating in the University of North Dakota Intramural Program.

Eighty-seven per cent of the group interviewed stated that they would like to take part in the following activities:

Activity	Number of Students Desiring Activity
Tennis	11
Beginning Diving	9
Judo	8
Golf	7
Iso-Metrics	7

Archery	5
Fencing	5
Gymnastics	5
Ice-Skating	5
Conditioning	3
Basketball	2
Trampoline	2
Handball	1
Wrestling	1
Lacrosse	1
Soccer	1
Football	1
Bowling	1
Track	1
Skiing	1

The only physical disabilities reported among the entire group were one case of diabetes, and one case of fainting spells.

CHAPTER IV

DISCUSSION

The issue of substitution of one phase of curriculum for another is becoming increasingly crucial, and consequently will require from administrators and teachers a wisdom for adequate resolution that has not always been evident. The activities most commonly substituted for physical education are varsity sports, military training, band, driver education, and special groups.

There are some less obvious reasons for proposing substitutions, and these can obscure a realistic appraisal of the problem. These reasons are sometimes considered to be the issue rather than the real question, which is whether there are aspects of the curriculum that contribute with relative value in like areas to like goals for all pupils.

In some instances in which substitution is proposed, personal bias may be the reason for the proposal. The administrator may have had an unfortunate personal experience as an adolescent; or on the other hand, the administrator may have been an "early developer" who felt adequate with his body and who achieved success

with his peers because of early maturation.

Some feel that any type of participation involving physical exertion gives sufficient evidence that the goals of physical education are fulfilled to allow it as a substitution. It is obvious that any one of these views results from a partial understanding of program purposes.

A recommendation supporting substitution of other curricular experiences for physical education may arise, too, from a lack of understanding of the purposes of the program or lack of demonstration that such purposes can and are achieved.

A proposal for substitution might arise from an inaccurate appraisal of pupil needs or an unrealistic weighing of relative values on the part of administrators. An example would be the youngster who feels highly uncomfortable in a skillful group or who is unhappy because he is inadequately prepared to participate at a level acceptable to others.

Sometimes teachers and administrators may decide that a youngster who is not progressing in keeping with their expectations may need something else more than he needs physical education without attempting to find out what kinds of experience would help the youngster achieve more satisfaction.

In final analysis, it would appear the Honors

Committee at the University of North Dakota should reconsider their policy of not requiring physical education for their honor students. The honors group scored below the mean fitness level of the male freshmen students at the University of North Dakota. It would seem that this group was being deprived of a needed experience that can be provided only by a required physical education course.

The writer believes that required physical education is a must in our society. The question is, "Is the average college freshman mature enough to know what is good for him?" To believe that all adolescents were capable of making such an important decision as this would be foolhardy indeed.

The problem can be stated in somewhat different words. People do in their leisure, if opportunities are available, what they like to do. In general, people like to do what they do well and dislike to do what they do poorly. A high degree of skill in an activity is the best single guarantee of interest in, liking for, and desire to participate in that activity. Not many people, for example, are clamoring for an opportunity to demonstrate their total ineptness on the tennis courts and golf courses of this nation.

It follows, therefore, that education for leisure is the major, unique, and continuing responsibility of

the school. In a nation where leisure constitutes more than half of the waking hours of its citizens there can be no possible justification for the failure of the schools to prepare young people for the creative use of their leisure time. If the school were to be successful in the development of leisure skills, interests, and appreciations, their acquisition must not be left to chance but must be planned for and sought as intelligently and deliberately as other goals which the school seeks. Physical education, like any other major school subject, must be placed on the required list in order that it may serve society to its fullest extent.

Education for leisure is not something extra to be tacked on to education nor does it involve telling people what they should do in their free time. It consists primarily of awakening and stimulating their creative faculties and providing opportunities for creative expression so that whenever leisure is available they will choose for themselves those activities that are eminently satisfying to the nature of man. This stimulating awakening can come only from a basic required physical education program.

Physical education represents a need of every child just as do English, social studies, and other school experiences. It became part of the school offering as a required subject to satisfy such a need and

therefore should be continued on the same basis.

All students should take physical education. No one should be excused. If a boy or girl can come to college, he or she should be required to attend physical education class. At the same time, this presupposes that a program adapted to the needs of all pupils is provided.

The student is compelled to take so many required courses that the use of electives is limited, if not entirely eliminated. Therefore, unless physical education is a required course, many students will not have the opportunity to partake of this program because of the pressures placed on them by the required courses.

The student looks upon those subjects that are required as being the most important and the most necessary for success. Therefore, unless physical education is on the required list, it becomes a subject of second-rate importance in the eyes of the students.

Various subjects in the curriculum would not be provided for unless they were required. This is probably true of physical education. Until state legislatures passed laws requiring physical education, this subject was ignored by many school administrators. If physical education were on an elective basis it might be crowded out of the college curriculum in many states. Either the subject would not be offered at all or it would have to be eliminated because of low enrollment.

Even under a required program, physical education is not fulfilling its potentialities for meeting the physical, social, and mental needs of students in most colleges. When an elective program is instituted, deficiencies and shortages increase, thus further handicapping attempts to meet the needs and provide for the welfare of the student.

Physical educators should try very hard to convince administrators, school boards, and the public in general of the place of their special subject in the curriculum of every college. Only as this is done will the subject occupy an important place in the school and become a required offering that is respected.

The duty of physical education is clear. Whatever programs are best for the development of youth, whatever facilities are necessary, the leadership of physical education is everywhere obligated to realize them. Leaders in physical education who accept the theory or principles at any point are bound to give practical expression to that intellectual agreement or appear completely foolish. Moreover, one who proposes the theory, or states the principles, or assembles the facts is no more responsible for demonstrating their practical application than he who accepts them. The test of leadership is precisely here: to help others to see what is so clear to a leader. To make prevail

that which leaders are convinced is true, is at once the challenge and the test of these convictions and leadership.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The 398 subjects selected for this study were male freshmen students at the University of North Dakota, Grand Forks, North Dakota. The Service group consisted of 371 male freshmen enrolled in required Physical Education 101 at the University of North Dakota. The Honors group consisted of 27 male freshmen enrolled in the Honors Program at the University of North Dakota. Each group was tested relative to the physical fitness level in accordance with the American Association for Health, Physical Education, and Recreation Youth Fitness Test. The test was administered to both groups the sixth week of the first semester of the 1965-1966 school term. The honors group was compared to the service group to determine whether significant differences were evident in the selected measures of physical fitness.

Comparisons were made between the honors group and the service group by testing the significance of the difference between the means found for the groups. The null hypothesis was assumed with respect to the differences between the means of both groups. This

hypothesis was tested with the "t" technique for the difference between means derived from uncorrelated scores from a combined large sample. A group interview with the 27 male freshmen honor students was conducted to determine the physical education background, and the attitude of each of the freshmen male honor students toward physical education.

Conclusions

The following conclusions seem warranted on the basis of the data collected in this study.

1. The required physical education course which the service group engaged in produced significant results in all of the selected measures of physical fitness except the shuttle run at the criterion .01 level.

2. The honors students were not required to participate in any phase of the physical education program. As measured by the prescribed test, this group achieved fitness below the levels achieved by the average university freshman of 1965-1966.

3. Some of the honors students did not seem to understand the true meaning of physical education.

4. The elective status of physical education for honors students presently in force, seems not to meet the needs of nearly 90 per cent of those students since only five enrolled voluntarily in Physical Education 101 during the first semester of 1965-1966.

5. Approximately one-half of the honors group believed that they were unable to swim well enough to save themselves in an emergency.

6. Eighty-seven per cent of the honors group stated that they would like instruction in one or more activities offered by the University of North Dakota Physical Education Service Program.

7. Physical disabilities would not prohibit any of the honors students from participating in physical education.

Recommendations

The following recommendations are made relative to this study:

1. The Honors Committee of the University of North Dakota should reconsider their policy that no student enrolled in the Honors Program should be required to take physical education.

2. A study should be conducted comparing physical fitness of the honors group at the University of North Dakota with the honors group of another university who did participate in a required physical education program.

3. It is further recommended that all honor students should be required to participate in the physical education service program at the University of North Dakota. The only exceptions to this require-

ment would be those stated in the University of North Dakota catalogue.

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QUESTIONS ASKED AT THE INTERVIEW

1. Full Name: _____

2. Hours Enrolled In: _____

3. Home Town: _____

4. What does the word "Physical Education" mean to you?

_____

_____

_____

5. Check the athletic sports which you participated in during high school:

a. Football _____ d. Track _____

b. Wrestling _____ e. Cross Country _____

c. Basketball _____ f. List any other

_____

_____

_____

6. Check highest level of swimming achievement accomplished:

_____ None

_____ Beginning

_____ Intermediate

_____ Advanced

_____ Senior Life Saving

_____ Water Safety Instructor

7. If you desire additional swimming proficiency, check level of aspiration:

_____ Beginning _____ Senior Life Saving

_____ Intermediate
_____ Advanced
_____ Water Safety Instructor
_____ Diving

8. What intramural activities do you plan to take part in:

_____ Touch Football
_____ Tennis
_____ Badminton
_____ Cross Country
_____ Archery
_____ Bowling
_____ Swimming
_____ Rifle Meet
_____ Wrestling
_____ Gymnastics
_____ Basketball
_____ Hockey
_____ Billiards
_____ Handball
_____ Free Throw
_____ Paddle Handball
_____ Indoor Track
_____ Baseball
_____ Softball
_____ Horse Shoes
_____ Golf
_____ Volleyball

9. Check any of the below activities that you might like to learn to play:

_____ Archery
_____ Volleyball
_____ Basketball
_____ Softball
_____ Fencing
_____ Gymnastics
_____ Tennis
_____ Handball
_____ Trampoline
_____ Conditioning
_____ Soccer
_____ Ice-Skating
_____ Football
_____ Bowling
_____ Golf
_____ Swimming
_____ Badminton
_____ Track
_____ Beginning Diving
_____ Iso-Metrics

_____ _____

_____ _____

10. Do you have any physical disabilities? If so explain.

_____

_____

APPENDIX B

DIRECTIONS FOR TEST

Sit-ups

Starting Positions

The pupil lies on his back with legs extended, feet about one foot apart. The hands, with fingers interlaced, are grasped behind the neck. The other pupil holds his partner's ankles and keeps his heels in contact with the floor while counting each successful sit-up.

Action

1. The pupil must sit up and turn the trunk to the left. He touches the right elbow to the left knee.
2. He returns to starting position.
3. The pupil sits up and turns the trunk to the right, touching the left elbow to the right knee.
4. He returns to the starting position.
5. The pupil should do as many sit-ups as he can, but not exceed the number shown below in the "Excellent" category for his age and sex.
6. One complete sit-up is counted each time the pupil returns to starting position.

Pull ups

Equipment

A bar, of sufficient height, comfortable to grip, is required.

Starting Position

The bar is grasped with palms facing forward; the pupil hangs with arms and legs fully extended. His feet must be free of the floor. The partner stands slightly to one side of the pupil being tested and counts each successful pull up.

Action

1. The body is pulled up with the arms until the chin is placed over the bar.
2. The body is lowered until the elbows are fully extended.
3. The exercise is repeated as many times as possible.

Rules

1. The pull must not be a snap movement.
2. The knees must not be raised.
3. Kicking the legs is not permitted.
4. The body must not swing. If the pupil starts to swing, his partner stops the motion by holding an extended arm across the front of the pupil's thighs.
5. One complete pull up is counted each time the pupil places his chin over the bar.

Standing Broad Jump

Equipment

Any level surface and tape measure comprise the equipment.

Starting Position

The pupil stands with the feet comfortably apart,

with toes just behind the take off line. Preparatory to jumping, the pupil should have his knees flexed and should swing the arms backward and forward in a rhythmical motion.

Action

The pupil jumps, swinging arms forcefully forward and upward, taking off from the balls of the feet.

Rules

1. Three trials are allowed.
2. The distance is measured from the takeoff line to the heel or any part of the body that touches the surface nearest the takeoff line.
3. The best of three trials is recorded in feet and inches to the nearest inch.

   Note:- It may be convenient to anchor the tape measure to the surface at a right angle to the takeoff line and have the pupil jump along the tape. The scorer stands to the side with a stick, touches the stick to the point where the pupil lands, and observes the mark to the nearest inch.

Shuttle Run

Equipment

Two blocks of wood, 2 x 2 x 4 inches (blackboard erasers may be used) and a stopwatch are needed. Two parallel lines 30 feet apart are marked. The blocks of wood are placed behind one of the lines.

Starting Position

The pupil stands behind the line opposite the blocks ready to run.

Action

On the signal, "Ready - Go!" the pupil runs to the blocks, picks up one, returns and places it behind the starting line. (He does not throw or drop it.) He then runs and picks up the second block and carries it back across the starting line.

Rules

1. Two trials are allowed.
2. Any trial in which the block is dropped or thrown is disqualified.
3. The better of the two trials is recorded in seconds to the nearest tenth.

Fifty-Yard Dash

Equipment

A stopwatch is needed.

Starting Position

The pupil stands behind the starting line. The starter takes a position at the finish line with a stopwatch. He raises one hand preparatory to giving the starting signal.

Action

When the starter brings his hand down quickly and hits his thigh,, the pupil leaves his mark. As the

pupil crosses the finish line, the time is noted and recorded.

Rules

1. The score is the lapsed time between the starter's signal and the instant the pupil crosses the finish line.
2. The time is recorded in seconds to the nearest tenth.

Shot Put

Equipment

One twelve-pound shot put, tape measure, one regulation size shot put circle are the equipment needed. The shot put area should be at least 100 feet x 75 feet.

Starting Position

The pupil stands near the front edge of the circle, ready to push the shot.

Action

The pupil pushes the shot from a stationary position at the shoulder.

Rules

1. Only a push from the shoulder is allowed.
2. The pupil cannot hop or take any steps before throwing the shot.
3. The pupil must stay within the circle before and after the put.
4. Two throws are allowed.
5. The point is marked where the shot put lands.

6. The best of the two puts is measured to the nearest inch and recorded.

Six Hundred-Yard Run-Walk

Equipment

A stopwatch, and running area with designated starting and finish lines are required.

Starting Position

The pupil stands behind the starting line.

Action

On the signal, "Ready? -- Go!" the pupil starts running the six hundred-yard distance (walking only if necessary).

Rules

1. Walking is permitted, but the object is to cover the distance in the shortest possible time.
2. The time is recorded in minutes and seconds.

Note:- It is possible to test several pupils at the same time. The pupils are paired off before the start of the test. One of the partners runs, while the other stands near the timer. The timer calls out the time continuously, until the runners have all crossed the finish line. Each pupil near the timer listens for, and remembers, his partner's time as the latter finishes.

Scores achieved on each test were recorded on individual fitness cards.

DATA RECEIVED FROM 1620 I.B.M. COMPUTER

HONORS GROUP

Test	Mean T Score	Standard Deviation
Sit-ups	62.185	13.800
Pull ups	48.777	10.771
Standing Broad Jump	51.888	7.602
Shuttle Run	55.777	5.130
Fifty-Yard Dash	49.259	6.161
Shot Put	37.037	8.753
Six Hundred-Yard Run-Walk	60.666	6.825
Total Score	365.518	39.726

DATA RECEIVED FROM 1620 I.B.M. COMPUTER

SERVICE GROUP

Test	Mean T Score	Standard Deviation
Sit-ups	69.921	11.329
Pull Ups	55.579	10.390
Standing Broad Jump	56.159	8.614
Shuttle Run	58.450	5.825
Fifty-Yard Dash	53.404	6.138
Shot Put	43.805	13.931
Six Hundred-Yard Run-walk	64.442	6.536
Total Score	402.064	47.447

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Sit-Ups

Standard Error of Mean in Large Samples[1]

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{13.800}{5.196}$$

$$S.E._{M_1} = 2.655$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{11.329}{19.261}$$

$$S.E._{M_2} = .588$$

Standard Error of the Difference Between Uncorrelated Means[2]

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{2.655^2 + .588^2}$$

$$S.E.\ diff = \sqrt{7.049 + .346}$$

$$S.E.\ diff = \sqrt{7.395}$$

$$S.E.\ diff = 2.719$$

---

[1] Garrett, op. cit., p. 186.

[2] Ibid., p. 214.

Actual difference between Means = 69.921 - 62.185

Actual difference between Means = 7.736

$$"t" = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$"t" = \frac{7.736}{2.719}$$

"t" = 2.845

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Pull Ups

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{10.771}{5.196}$$

$$S.E._{M_1} = 2.073$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{10.390}{19.261}$$

$$S.E._{M_2} = .539$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{2.073^2 + .539^2}$$

$$S.E.\ diff = \sqrt{4.297 + .291}$$

$$S.E.\ diff = \sqrt{4.588}$$

$$S.E.\ diff = 2.142$$

Actual difference between Means = 55.579 - 48.777

Actual difference between Means = 6.802

$$"t" = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$"t" = \frac{7.736}{2.719}$$

"t" = 2.845

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Standing Broad Jump

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{7.602}{5.196}$$

$$S.E._{M_1} = 1.463$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{8.614}{19.261}$$

$$S.E._{M_2} = .447$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{1.463^2 + .447^2}$$

$$S.E.\ diff = \sqrt{2.140 + .1998}$$

$$S.E.\ diff = \sqrt{2.3398}$$

$$S.E.\ diff = 1.530$$

Actual difference between Means = 56.159 - 51.888

Actual difference between Means = 4.271

$$"t" = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$"t" = \frac{4.271}{1.530}$$

"t" = 2.79

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Shuttle-Run

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{5.130}{5.196}$$

$$S.E._{M_1} = .987$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{5.825}{19.261}$$

$$S.E._{M_2} = .302$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{.987^2 + .302^2}$$

$$S.E.\ diff = \sqrt{.974 + .091}$$

$$S.E.\ diff = \sqrt{1.065}$$

$$S.E.\ diff = 1.059$$

Actual difference between Means = 58.450 - 55.777

Actual difference between Means = 2.673

$$\text{"t"} = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$\text{"t"} = \frac{2.673}{1.059}$$

"t" = 2.524

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Not significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Fifty-Yard Dash

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{6.161}{5.196}$$

$$S.E._{M_1} = 1.186$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{6.138}{19.261}$$

$$S.E._{M_2} = .319$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{1.186^2 + .319^2}$$

$$S.E.\ diff = \sqrt{1.407 + .102}$$

$$S.E.\ diff = \sqrt{1.509}$$

$$S.E.\ diff = 1.228$$

Actual difference between Means = 53.404 - 49.259

Actual difference between Means = 4.145

$$\text{"t"} = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$\text{"t"} = \frac{4.145}{1.228}$$

"t" = 3.375

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Shot-Put (Twelve Pounds)

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{8.753}{5.196}$$

$$S.E._{M_1} = 1.68$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{13.931}{19.261}$$

$$S.E._{M_2} = .723$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{1.68^2 + .723^2}$$

$$S.E.\ diff = \sqrt{2.822 + .523}$$

$$S.E.\ diff = \sqrt{3.345}$$

$$S.E.\ diff = 1.829$$

Actual difference between Means = 43.805 - 37.037

Actual difference between Means = 6.768

$$"t" = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$"t" = \frac{6.768}{1.829}$$

"t" = 3.70

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Six Hundred-Yard Run-Walk

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{6.825}{5.196}$$

$$S.E._{M_1} = 1.314$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{6.536}{19.261}$$

$$S.E._{M_2} = .339$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{1.314^2 + .339^2}$$

$$S.E.\ diff = \sqrt{1.727 + .115}$$

$$S.E.\ diff = \sqrt{1.842}$$

$$S.E.\ diff = 1.357$$

Actual difference between Means = 64.442 - 60.666

Actual difference between Means = 3.776

$$\text{"t"} = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$\text{"t"} = \frac{3.776}{1.357}$$

"t" = 2.78

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM LARGE SAMPLES

Total Score

Standard Error of Mean in Large Samples

Honors Group

$$S.E._{M_1} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_1} = \frac{39.726}{5.196}$$

$$S.E._{M_1} = 7.645$$

Service Group

$$S.E._{M_2} = \frac{\sigma}{\sqrt{N}}$$

$$S.E._{M_2} = \frac{47.447}{19.261}$$

$$S.E._{M_2} = 2.463$$

Standard Error of the Difference Between Uncorrelated Means

$$S.E.\ diff = \sqrt{S.E._{M_1}{}^2 + S.E._{M_2}{}^2}$$

$$S.E.\ diff = \sqrt{7.645^2 + 2.463^2}$$

$$S.E.\ diff = \sqrt{58.446 + 6.066}$$

$$S.E.\ diff = \sqrt{64.532}$$

$$S.E.\ diff = 8.033$$

Actual difference between Means = 402.064 - 365.518

Actual difference between Means = 36.546

$$"t" = \frac{\text{Actual difference between Means}}{\text{S.E. difference between Means}}$$

$$"t" = \frac{36.546}{8.033}$$

"t" = 4.549

Degrees of Freedom = N - 1

= 398 - 1

= 397

"t" at .01 level = 2.59

Significant at .01 level.