A COMPARATIVE STUDY OF HEALTH KNOWLEDGE AND HEALTH PRACTICES OF ATHLETES AND NON-ATHLETES IN SELECTED CLASS A TEXAS HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

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A COMPARATIVE STUDY OF HEALTH KNOWLEDGE AND HEALTH PRACTICES OF ATHLETES AND NON-ATHLETES IN SELECTED CLASS A TEXAS HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

THESIS

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BY

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CHAPTER I

ORIENTATION TO THE STUDY

Modern educators set the obtainment of good health as one goal of education. The Educational Policies Commission includes health knowledge and health habits as two objectives for self-realization of an educated person.[1] The school should be implemented to make it possible for the students to reach these objectives.

One phase of the school is the athletic program. Under the old traditional concept that the curriculum was composed of subject matter, athletics was considered as extracurricular activities. The modern concept of the curriculum is that it consists of all of the experiences of the students under the influence of the school.[2] The former concept placed athletics outside of the curriculum. The present concept makes athletics an intrinsic part of the school curriculum. In this status, athletics should contribute to the attainment of the goals of education.

There are many inherent opportunities in the experiences centering in athletics for the development of health knowledge

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[1] Educational Policies Commission, The Purposes of Education in American Democracy, p. 50.

[2] H. L. Caswell and D. Campbell, Curriculum Development, New York, American Book Company, 1935.

and the establishment of desirable health practices. The question arises: Are the health knowledge and the health practices on the part of the students increased through participation in athletics? One way of answering the question is to compare the health knowledge and the health practices of high school athletes with those of non-athletes. Interest in this question led the investigator to undertake the present study.

Statement of the Problem

The investigator made a comparative study of the health knowledge and health practices of participants in inter-scholastic athletics for boys and non-participants in a selected number of class A Texas high schools during the school session of 1948-1949.

Definition of Terms

In the study, the term, athletes, referred to those students who were members of the squad of interscholastic football, or basketball, or track of the given schools of the study during the school session of 1948-1949.

In the study, the term, non-athletes, referred to those students of the given schools of the study who were not participants in interscholastic athletics during the school session of 1948-1949.

Purposes of the Study

The investigator had the following purposes in undertaking the study:

1. To determine the health knowledge of athletes of the selected schools of the study as indicated by the standardized test results.

2. To determine the health knowledge of non-athletes of the selected schools of the study as indicated by the standardized test results.

3. To determine the health practices of athletes of the selected schools of the study as indicated by a standardized inventory.

4. To determine the health practices of non-athletes of the selected schools of the study as indicated by a standardized inventory.

5. To determine if there is a difference in the health knowledge and in the health practices of the two groups.

6. To determine if there is a relation between the health knowledge and the health practices of each group.

Limitations of the Study

The present study was limited to the determination of the health knowledge and of the health practices of a group of boys participating in athletics and a group of non-participants in a selected number of Texas high schools for the school year of 1948-1949.

Survey of Previous Studies

The investigator made an extensive search for previous researches related to the present study. Jackson made a study in 1944 to evaluate the existing health practices in interscholastic athletics for boys in Illinois and to develop policies or procedures for use in the schools.[3] The purposes of the study were to obtain authoritative information concerning existing health practices in athletics and to develop standards by which to evaluate those health practices. Standards to be used in measuring present health practices were obtained by submitting questions to professional teachers, coaches and doctors, and by substantiating their judgment by that of a jury of fifteen experts who determined the final list of standards to be used. The jury consisted of five doctors of medicine, five doctors of public health, and five health education experts who met specific criteria as to experience in their respective fields as well as to interest and knowledge of health problems in athletics. A check list, then, was developed with the standards as the basis. The check list was used to secure information from administrators, coaches, and custodians relative to health practices in athletics. Six hundred and seventy-two schools were sent copies of the check list of which four hundred and twenty-eight, or 63.6 per cent, replied.

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[3] C. O. Jackson, "An Evaluation of Health Practices in Interscholastic Athletics for Boys in Illinois," Research Quarterly of the American Association of Health and Physical Education, XV (December, 1944), 303-309.

Jackson found that the first important health element in athletics is embodied in the training, experience, and attitude of the coach. The findings of the study showed that he is responsible for evaluating the day-by-day status of the participants; he administers first aid, cares for minor injuries, and inspects the athletic equipment for correct fit and use. Where systematic provisions for teaching certain health facts to athletes is made in addition to the required course in health, the coach was listed by three-fourths as the instructor. In schools where individual diets are recommended for athletes, such recommendations were made by the coach in two-hundred and twelve (seventy-five per cent) of the schools. The study shows further that the coach plans every scrimmage, arranges schedules in all sports, and has a closer, more intimate contact with the athletes than any other person. It is apparent that he is one of the most important individuals in the school system, especially, with regard to his influence on the participants, directly, and on all other pupils, indirectly.

Selection of participants, and the amount of practice and scrimmage were other elements studied. Ability, condition, experience, size, strength, age, grade in school, and attitude were the main criteria used in selecting members of the varsity teams. Practice periods before the first scrimmage varied from none to thirty in basketball, and from two to twenty in football. Eight or nine practices were the average in both sports and fourteen practices were the

average before scheduled contests in each one. Football practices averaged two hours and three minutes, including showers and dressing, and basketball practices averaged one hour and forty-one minutes.

The number of games scheduled for each sport is another element which affects health. Two hundred and thirteen (seventy per cent) indicated fewer games in basketball during 1942-43, but forty stated "more". Other sports were as follows:

	Less	More
Track and Field	101 schools	16 schools
Baseball	75 schools	13 schools
Football	66 schools	17 schools
Wrestling	18 schools	3 schools

There were two hundred and sixty schools (eighty-four per cent) that indicated less games scheduled in sports other than basketball, and forty-nine schools (sixteen per cent) that scheduled more games in 1942-43. The average number of games or meets scheduled in varsity sports is as follows: basketball, nineteen; baseball, eight; football, seven; track and field, six.

The data revealed that the school-team physician gave the health examination in sixty per cent of the schools responding, while the family physician assumed the responsibility in the remaining schools. One-fourth of the schools required an annual examination. While sixty per cent of the schools indicated that they had a formulated policy regarding financial responsibility for injuries incurred in athletics,

only half of this group made a systematic effort to inform the parents concerning such a plan.

One hundred and forty-eight schools (thirty-seven per cent) provided clean towels daily for the individual participants. Such an arrangement was financed by a fee in one third of the schools, and by the Board of Education or by the Athletic Association in the remaining institutions.

Another element studied was equipment. Personal equipment was provided by the participant in the small schools of the study, and by the Athletic Association or the Board of Education in the larger schools. The balance of items of the uniform and all protective equipment were provided by the Athletic Association or by the Board of Education, with the possible exception of shoes in many small schools. The participants had the responsibility of cleaning their personal equipment, except in the larger schools, where the Board of Education or the Athletic Association assumed the responsibility. The method of cleaning personal equipment was not satisfactory except in the large schools where the cleaning was done either by the school laundry, or by a commercial establishment. The method of cleaning practice equipment was satisfactory for the most part, but the frequency was not in eighty per cent of the schools.

The all-around picture of the janitorial controls was poor in all but fifteen per cent of the schools. Both the methods of cleaning and the frequency did not meet approved standards.

Administrators evaluated their own situation in terms of inadequacy, as shown by the presence or absence of certain controls. Fifty-five per cent of the schools placed inadequate medical controls first, and twenty-six per cent mentioned inadequate facility controls.

When the health practices in athletics, which were studied in the survey, were measured by the standards previously established, it was found that three-fourths of the schools responding met fifteen (twenty-one per cent) of the seventy-one standards.

The study indicated that the situation with respect to health practices in interscholastic athletics in Illinois was poor. This was especially true in many small schools, and in some very large, over-crowded institutions. The following specific conclusions concerning a majority of the schools responding to the survey were made.

1. Medical controls were inadequate.

2. Safe and adequate personal, practice, and game equipment were not provided for all participants.

3. Training and conditioning programs were not adjusted or modified to meet the needs of the individual participant.

4. The gymnasium, shower, and locker rooms were not cleaned frequently enough, nor with adequate methods and approved materials to eliminate hazards to health.

5. Other aids to cleanliness and health, such as warm water, liquid soap, and paper and individual towels were not provided.

6. The cleaning of personal equipment was so infrequent and haphazard as to constitute another health hazard.

7. The training of coaches, particularly in health practices as related to athletics, was inadequate.

8. Adequate facilities for instilling or encouraging good health practices in a comprehensive program of athletics and a modern curriculum in physical education were lacking. Other conclusions indicate, by inference, that the coaches were not selected with the care that their position merits; functional courses in health were lacking and inadequate supplementary instruction was not given participants in athletics; school and community facilities for athletics were not used as fully or as efficiently as they should be used; administrators were not alert to their responsibilities in connection with improving the health situation by securing capable, well-trained coaches; Boards of Education were not sufficiently aware of the objectives of athletics.

Implications and recommendations were made to school board members and administrators.

The present study varies from Jackson's in that it is a comparative study of the health knowledge and health practices of athletes and non-athletes in a selected number of Texas high schools for the school year of 1948-1949. It, also, differs in that standardized tests were used for gathering data. The present study was confined to selected class A high schools in and around Denton, Texas.

Southworth, Latimer, and Turner in 1941-1942 made a study of the health practices, knowledge, attitudes ~~and~~ interests of senior high school pupils.[4] The purposes of the study were to survey the health activities in operation, to discover the factors which are directly related to the present physical status of youth, and to use such information for the building of a more effective health program for high schools. Subjects of the study were 15,480 tenth, eleventh, and twelfth grade pupils from a state-wide sample of twenty-seven Massachusetts high schools.

Data were obtained by four objective, paper-and-pencil health tests, especially designed and constructed for use in the study. The investigators treated the data statistically to determine averages, range of scores, and standard deviations.

On each of the four tests constructed, the highest possible score was one hundred points. A total of 9,647 students took the test. Southworth, Latimer, and Turner found that the range of scores of the health practice test was from seventeen points to ninety-seven points. The average for the boys was 53.34 points and the average for the girls was 60.84 points. The standard deviation for both groups

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[4] Warren H. Southworth, Jean V. Latimer, Clair E. Turner, "A Study of the Health Practices, Knowledge, Attitudes and Interests of Senior High School Pupils," Research Quarterly of the American Association of Health and Physical Education, XV (May, 1944), 118-136.

was 12.37. The investigators concluded that the result of the health practice test was an accurate reflection of health practices of the students. The investigators, also, concluded that it appears that the quality of the health practices remains constant throughout the high school period with no improvement from grade to grade.

A total of 9,768 subjects participated in the health knowledge test. The range of scores was from thirty-six points to ninety-five points. The average for both boys and girls was 73.10 points and the standard deviation was 8.78 points. The average score for both boys and girls in grade ten was approximately 70.7; in grade eleven, 75.4; and in grade twelve, 74.8. The test grades show that there was very little difference between types of communities. There was, however, a slight improvement from grade to grade.

The scores of the health attitude test showed very little difference in the averages, with the exception that the averages for the boys in rural communities were consistently a point or so above those in any other type of community. However, it was not a statistically significant difference. The averages on the attitude test rise slightly from grade to grade, the average in grade ten being approximately 73.4; for grade eleven, 74.2; and for grade twelve, 75.2.

The present study is related to Southworth, Latimer, and Turner's study in that health knowledge and health practice tests were administered to high school students to obtain data

for the study. It varies, however, in that both boys and girls were used as subjects from a state-wide sample of twenty-seven Massachusetts high schools, whereas the present study takes into consideration only boys of selected high schools within a one hundred mile radius of Denton, Texas.

A study was made in 1937 by Kilander of the health of high school and college students.[5] Specifically, the purposes of the survey were (1) to determine the relative scores (norms) of high school and college classes; (2) to determine in which fields of health education students are the best and least informed; (3) to determine what factors contribute to greater health knowledge or a lack of health knowledge; and (4) to offer certain suggestions based upon the findings of the investigator.

The 2300 subjects used in the study were selected from five colleges and seven high schools, located in northern New Jersey. Kilander made a preliminary survey in the spring of 1936 in which 2000 subjects were used. On the basis of the survey, Kilander constructed a multiple-choice type test consisting of one hundred questions, to obtain data for the study. He treated the data statistically to determine the range of scores, the average (mean), and the percentile scores.

The following important findings were made in Kilander's study:

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[5]H. F. Kilander, "Health Knowledge of High School and College Students," Research Quarterly of the American Association of Health and Physical Education, VIII (October, 1937), 3-33.

1. Individual scores vary a great deal within a given class.

2. The mean rises in general for each successive year within a given school both on the high school and college level. Such a rise is most rapid for the first two to three years in high school.

3. The rise in the mean in the high school is related to the amount of health instruction received in special health education classes or in related subject fields such as sciences.

4. High scores in a given class with approximately the same educational background have the following characteristics: a higher intelligence, a more favorable home environment as judged by the occupations of the fathers, and membership in certain racial groups. The latter point is partly explainable by the fact that the choice of occupations is frequently determined along racial or national lines.

5. The average scores for all classes within a given grouping do not differ much, but the class averages of individual schools vary considerably. Some classes score very high, sometimes higher than the best of the college freshmen, and others very low.

6. A college education, per se, does not necessarily add to the health knowledge of students. College students of the same intelligence as high school seniors ordinarily do not score higher unless they have had specific health instruction.

The present study is related to Hilander's study in that it tests the health knowledge of the subjects, but it differs in that it makes no differentiation of sex or of participants in athletics, whereas the present study deals only with boy athletes and non-athletes on the high school level. The present study, also, differs in that it tests the health practices of the athletes and non-athletes of the selected schools of the study.

In 1935, a study was made by Patty and Van Horn to determine the health of high school athletes.[6] The purpose of the study was to secure data that would answer the following questions: How healthy are athletes? What portion of the great group of high school boys who wish to try out for interscholastic athletic teams each year are physically fit? What kinds of illness most often cause high school athletes to miss participation in contests or be absent from school? How many boys are permanently injured by athletic participation?

The cooperation of officials in three hundred and seventy-five Indiana high schools was secured. The study included 19,823 participants in basketball, baseball, track and field, and football. Many boys participated in two or more sports so that the data really represent approximately 12,000 different individuals.

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[6]Willard Walter Patty and Paris John Van Horn, "The Health of High School Athletes," The Journal of Health and Physical Education, VI (December, 1935), 26-51.

The investigators presented their data by use of tables and original figures drawn to represent the number of cases and the per cent of cases in each table.

The survey showed that two and one-half per cent or three hundred and three boys were physically unfit for athletic participation. Of these three hundred and three boys, one hundred and ninety-three, or 65.7 per cent, had defective hearts; twenty-nine, or 9.87 per cent, had deformities; twenty-one, or 6.9 per cent, were underweight; eleven, or 3.63 per cent, had ruptures; nine, or 2.97 per cent had tuberculosis; 8, or 2.64 per cent, were overweight; 6, or 1.98 per cent, had hernia; and 4, or one hundred and thirty-two per cent, had varicosity. A total 1,092 cases of colds were reported. This ailment was responsible for the absence of students of the study from 2,027 days of school and from six hundred and fifty-eight contests. Of the permanent injuries derived from athletic competition, four were received in football and three in basketball. The coacheswere asked if they held the opinion that it was injurious to a boy's health to play three basketball games in one day, as required in the state tournament. Of the total number, one hundred and fifty-one of them, or forty-six per cent, were of the opinion that this practice was injurious to the boy's health, and one hundred and sixty-six, or fifty-four per cent, of the coaches thought the practice was not injurious to the boy's health. The investigators made the following summary of the findings:

1. In 143 schools, 203 cases of physical unfitness were found in participants in athletics according to the results of the state-required medical examination. Of the causes of physical unfitness, heart ailments ranked first; deformities, second; underweight conditions, third; rupture, fourth; tuberculosis, fifth; overweight conditions, sixth; hernia, seventh; and varicocity, eighth. There were 242 schools which reported that no boys were found to be unfit.

2. Colds ranked first in illness causing 62 per cent of all cases of illness; measles ranked second, with 74 cases; influenza ranked third, with 17 cases.

3. Eighteen boys were thought to have received permanent ailments from inter-scholastic athletics. Among the ailments recorded were heart trouble, six cases; knee thrown out of place, four cases; tooth knocked out, two cases; broken bone in foot, one case; hernia, one case; broken shoulder, one case; dislocated shoulder, one case; wrenched ankle, one case; and twisted knee, one case.

4. Coaches were divided in their opinion as to whether a team should play three games in one day in basketball tournaments. There were 151 who said that it was injurious and 170 who said that it was not injurious; 42 offered no opinions.

5. The coaches offered many valuable health suggestions, such as, better showers, a school physician, and better sanitation.

The present study is related to Patty and Van Horn's study in that it deals with the health of athletes on the high school level. It varies, however, in that non-athletes were not taken into consideration and no form of tests were given to individuals in the former study, whereas the present study dealt with the data obtained by administering standardized tests to both athletes and non-athletes relative to the health knowledge and health practices.

Sources of Data

Both documentary and human sources were used in the study. Documentary sources included professional literature, professional periodicals, and previous researches in the field. Human sources included experts in the field of health and physical education and the boys of the selected Texas class A high schools used as subjects in the study.

CHAPTER II

PROCEDURES FOR THE DEVELOPMENT OF THE STUDY

The procedures followed in the development of the present investigation concerning the health knowledge and health practices of athletes and non-athletes in a selected number of class A Texas high schools are presented in this chapter.

Preliminary Procedures

In order to gain a sound basis for the development of the study, the investigator made an intensive study of professional literature related to the study from the fields of education, physical education, and tests and measurements in health and physical education.

A survey was made of previous studies which were similar or related to the present study.

Selection of the Instrument for the Collection of Data

The investigator conferred with the writings of experts in the field of tests and measurements before selecting the instruments to be used in the study. McCloy states that an adequate and useful test may be distinguished by the following criteria:

1. Validity
2. Reliability

3. Objectivity

4. Simplicity

   a. Conservation of time

   b. Cost

   c. Ease of understanding

5. Standardization of procedure

6. Meaningfulness and worth-whileness of the tests.[1]

A thorough examination was made by the investigator of all available tests in the field of health and physical education that were related to health knowledge and health practices. The following tests were selected on the basis of the criteria listed above:

1. Gates-Strang Health Knowledge Test, Form D.--The Gates-Strang Health Knowledge test, Form D, was used as a means of measuring the health knowledge of high school athletes and non-athletes. The test is standardized. To determine its validity, Gates and Strang administered three forms of advanced tests to pupils in grades seven to twelve in a large city system and in the suburb. Validity was established by correlating one form with another. The coefficients of correlation based on 888 cases are for form D and E, .74; form D and F, .76; form E and F, .86.[2]

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[1] C. H. McCloy, Tests and Measurements in Health and Physical Education, pp. 7-9.

[2] Arthur I. Gates and Ruth Strang, Manual of Directions Gates-Strang Health Knowledge Test, (New York: Bureau of Publications, Teachers College, Columbia University, 1936), p. 1.

The reliability coefficients, (corrected by Spearman attenuation formula) based on 150 cases, 25 in each grade, are for form A, .83; form B, .89; form C, .74; form D, .82; form E, .76; and form F, .74.[3]

By objectivity in a measuring instrument is meant the degree to which equally competent users get the same results. For this reason the investigator used the answer key for scoring the tests. McCloy states that in order for a test to have a high objectivity it must have a high reliability.[4] Since the reliability coefficients tend to be high, the criterion of objectivity is met.

Any number of subjects may take the test at the same time, the maximum time limit being thirty minutes for the advanced tests. The test is standardized. The directions are simple and easily understood. The resulting scores can be interrupted and are in such a form that they can be easily treated statistically. The cost of the test is reasonable.

2. Johns Health Practice Inventory.--The Health Practice Inventory was used as a means of measuring the health practices of athletes and non-athletes in selected class A Texas high schools of the study. The test met certain criteria for an adequate test set forth by McCloy[5] and accepted by the investigator.

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[3] Ibid., p. 1.

[4] McCloy, op. cit., p. 9.

[5] Ibid., pp. 7-9.

The Health Practice Inventory is a standardized test. The inventory, composed of 36 health-practice statements, was reduced from an original list of 159 health-practice items. A trial run on 200 students and three experimentations involving 1,700 high-school, junior college, and college students made possible the selection of items included in the Health Practice Inventory.

Validity of the Health Practice Inventory was established in the following ways:

a. By careful selection of items from standard health-education references.

b. By student-roommate study in which the student rated himself, and his roommate, also, rated the student's practices, followed by a statistical comparison of the ratings.

c. By analysis of each item on the second experimentation in the field of health education by experts in the field, including teachers, professors, physicians, school physicians, public health officers, and state directors of health, physical education, and recreation.

d. By a study in which the author observed the health practices of fifteen fraternity men over a two and one-half months period and compared the students' own ratings with those of the author.

e. By an objective study of a high-school hygiene class in which objective measures were applied to student responses on the Inventory.

f. By determining two sets of discrimination values for each statement used in the Inventory.[6]

A reliability coefficient was calculated in each of the three experiments. A consistent coefficient resulted in both long and short forms. The following reliability coefficients for the three experimentations were obtained: first experimentation, .87 - .013; second experimentation, .88 - .015; third experimentation, .86 - .018.[7]

The methods of scoring, as indicated by the Manual of Directions, was used by the investigator to score the tests used in this study. Since the reliability coefficients tend to be consistently high, the test is considered to have a high objectivity.[8]

The maximum time for completing the test is twenty minutes. The directions are easy to comprehend. The resulting scores are easily interpreted and can be treated statistically. The cost is nominal.

Selection of the Schools and Subjects for the Study

The investigator formulated the following criteria as a guide in the selection of schools and subjects for the study:

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[6]Ned B. Johns, Information Manual Health Practice Inventory, (Standard University Press, Publishers, Stanford University, California, 1943), p. 1.

[7]Ibid., p. 3.

[8]McCloy, op. cit., p. 9.

1. The schools must be class A Texas high schools.

2. The schools must be easily accessible to the investigator.

3. The schools must be within a radius of one hundred miles of Denton, Texas.

The investigator obtained names of all class A Texas high schools within a radius of one hundred miles of Denton, Texas from the North Texas State College Placement Service and wrote a formal letter to the administrator of each of the schools within this area, requesting permission to select the subjects for the study from the student body of the school. Each letter contained a check list concerning the date and the desirable time of day preferred by the school administration for the administration of the tests in the school, and the number of available athletes. The administrators were asked to give the information requested on the check list and to return the information to the investigator. Those schools whose administrators completed the check list and returned it to the investigator were selected for the study. A copy of the letter and check list is found in Appendix I.

From the check lists the investigator obtained information relative to the number of athletes available for the study. Upon arrival of the investigator at each school, a general effort was made to obtain an equal number of non-athletes. With the cooperation of the administration, coaches, and teachers, non-athletes were assembled from

physical education classes, study halls, and regular class rooms. This procedure tended to give a random sampling of the non-athletes.

Administration of the Test

The tests used in this study were administered at the seven schools of the study during the 1940-1960 school session at the regular class period in the gymnasium, study hall, or auditorium, designated by the administration. The investigator prepared the copies of the two tests for distribution to the students of the study by placing corresponding numbers on both sets of tests from 1 to 464, since no names of individuals were to be used in the study.

1. Administration of the Gates-Strang Health Knowledge Test.--As the students came into the room for the test, they were assigned to their proper group, namely, athletes or non-athletes, and seated accordingly in the room. A complete explanation of the purposes of the study was given. The investigator explained that no names would be used in the study, and stressed the importance of each individual doing his own work. Standardized procedures as set forth in the Manual of Directions for the Gates-Strang Health Knowledge Tests, were followed by the investigator in the administration of this test.[9] The examiner carefully explained the directions for taking the test. The test sheets, then, were distributed

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[9]Arthur I. Gates and Ruth Strang, op. cit., pp. 1-2.

to the subjects. To insure a thorough understanding on the part of the students, the investigator read the directions aloud while the students read them silently. Upon completion, the students were given an opportunity to ask questions concerning the directions since no questions were to be answered during the test period. The students were directed to fill in during a three-minute period four information blanks on the first page of the test sheet which included a statement of age, grade, date, and classification as an athlete or as a non-athlete. After this procedure the students were told to begin the test. At the end of the thirty-minute time limit, the students were instructed to stop.

2. Administration of the Health Practice Inventory.--When the Health Practice Inventory tests were distributed, the Health Knowledge Tests were taken up and the examiner was positive that for each student the number on test two corresponded to the number on test one. This precaution assured accurate results in the computation of the coefficients of correlation. The Health Practice Inventory was administered according to directions set forth in the Manual of Directions.[10] The investigator emphasized that the student should state his answers in accordance with what he does, his practices, not what he knows or thinks. He assured the students that the answers would be kept confidential, and in no way would

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[10] Johns, op. cit., pp. 1-2.

affect his grade or his reputation. The investigator instructed the students to begin the test. After the twenty-minute time limit was ended, the students were authorized to stop and the tests were taken up.

Treatment and Interpretation of the Data

The two tests used in the present study were scored and tabulated. Statistical computations were made for each test to determine for both athletes and non-athletes the following measures:

1. The range
2. The mean
3. The standard deviation
4. The standard error of the mean
5. The standard error of the standard deviation
6. The difference between the means of the scores made by the athletes and by the non-athletes on the Gates-Strang Health Knowledge Test and, again, on the Health Practice Inventory.
7. The standard error of the difference of the means of the scores made by the athletes and by the non-athletes on the Gates-Strang Health Knowledge Test and on the Health Practice Inventory.
8. The difference between the standard deviation of the scores made by the athletes and by the non-athletes on the Gates-Strang Health Knowledge Test and, again, on the Health Practice Inventory.

9. The standard error of the difference of the standard deviations of the scores made by the athletes and by the non-athletes on the Gates-Strang Health Knowledge Test and on the Health Practice Inventory.

10. The coefficients of correlation of the scores made by the athletes and by the non-athletes on the Gates-Strang Health Knowledge Test and on the Health Practice Inventory.

In order to judge the significance of the size of the standard error of the means, of the difference of the means, of the standard error of the standard deviations, and of the difference of the standard deviations, the investigator chose the .05 level of accuracy as proposed by Fisher[11] and reported by Garrett to be acceptable as the standard for most experimental work.[12] The .05 level of accuracy for each measure was obtained by finding $\pm 1.96\sigma_m$ of the standard error for each measure. The results of the computation mark the limits between which are found ninety-five per cent of the cases in a normal distribution.

In order to judge the significance of the difference between the means of the scores of the athletes and of the non-athletes and the significance of the difference between the standard deviations of the scores of the athletes and of the

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[11] R. A. Fisher, The Design of Experiments, pp. 15-16; 38-43.

[12] Henry E. Garrett, Statistics in Psychology and Education, pp. 187-203.

non-athletes in the two tests used in the study, the standard error of the difference of the means and the standard error of the difference of the standard deviations were computed. A critical ratio was computed by dividing the difference of the means by the standard error of the difference of the means. Likewise, a critical ratio was computed by dividing the difference of the standard deviations by the standard error of the difference of the standard deviations. In each case the critical ratio of the given measure was compared with the $\frac{.05}{.01}$ value of 1.96 which is the positive and negative directions marks off the limits within which are ninety-five per cent of the cases in a normal distribution.

The findings of the study were interpreted.

Formulation of the Summary, Conclusions, and Recommendations for Future Studies

A summary of the study and of the findings was made, conclusions were drawn from the findings, and recommendations for future studies were made.

CHAPTER III

FINDINGS AND INTERPRETATIONS OF THE STUDY

The findings and interpretations of the study are presented in this chapter.

The subjects selected for use in this study are enrolled in the following class A Texas high schools:

1. Birdville high school
2. Bowie high school
3. Farmersville high school
4. Handley high school
5. Jacksboro high school
6. Nocona high school
7. Plano high school

The distribution of athletes and non-athletes of the study according to school and grade in a selected number of Texas class A high schools for the school year of 1948-1949 is shown in Table 1.

Of the 249 athletes that participated in the study, 43 were enrolled in the ninth grade; 54 were enrolled in the tenth grade; 89 were enrolled in the eleventh grade; and 63 were enrolled in the twelfth grade.

TABLE 1

DISTRIBUTION OF ATHLETES AND NON-ATHLETES OF THE STUDY ACCORDING TO SCHOOL AND GRADE IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

	Athletes					Non-Athletes				
School	Grade				Total	Grade				Total
	9	10	11	12		9	10	11	12	
A	13	7	14	5	39	10	8	8	5	31
B		16	11	14	41		9	3	19	31
C	6	3	11	10	30	21	7			28
D	7	13	11	16	47	12	11	3	4	30
E	3	7	15	8	33	6	10	14	4	34
F	4	6	9	7	26	7	4	11	6	28
G	10	2	18	3	33	7	5	7	14	33
Total	43	54	89	63	249	63	54	46	52	215

From a total of 215 non-athletes that participated in the study, 63 were enrolled in the ninth grade; 54 were enrolled in the tenth grade; 46 were enrolled in the eleventh grade; and 52 were enrolled in the twelfth grade.

The athletes and non-athletes tend to be well distributed in the seven schools of the study, the athletes averaging 35 per school and the non-athletes averaging 30 per school.

In Table 2 is presented the distribution of athletes and non-athletes according to age and grade in the selected schools of the study. Ages range from 13 years to 21 years for the athletes. The mean age of the athletes in the ninth grade is 14.7 years; in the tenth grade, 15.2 years; in the eleventh grade, 16.2 years; and in the twelfth grade, 17.1

years. The mean age for the 249 athletes that participated in the study is 15.9 years.

TABLE 2

DISTRIBUTION OF ATHLETES AND NON-ATHLETES OF THE STUDY ACCORDING TO AGE AND GRADE IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Age	Athletes					Non-Athletes				
	Grade				Total	Grade				Total
	9	10	11	12		9	10	11	12	
22	0	0	0	0	0	0	0	0	0	1
21	0	0	1	0	1	0	0	0	0	0
20	0	0	0	0	0	0	0	0	1	1
19	0	0	0	0	0	0	0	2	1	3
18	0	1	7	20	28	0	1	2	10	13
17	1	4	23	28	56	4	4	8	25	41
16	3	16	40	15	74	5	7	22	14	48
15	21	21	15	0	57	23	25	12	0	60
14	17	12	3	0	32	28	17	0	0	45
13	1	0	0	0	1	3	0	0	0	3
Total	43	54	89	63	249	63	54	46	52	215

The range of ages for the non-athletes is from 13 years to 22 years. The mean age for non-athletes in the ninth grade is 14.7 years; in the tenth grade, 14.8 years; in the eleventh grade, 16.1 years; and in the twelfth grade, 17.1 years. The mean age for the 215 non-athletes that participated in the study is 15.6 years.

In Table 3 is presented the distribution of scores of the Gates-Strang Health Knowledge Test for athletes and non-athletes according to grades of the selected schools of the study. The

scores range from 15 to 53 for the athletes and from 14 to 52 for the non-athletes. No individual in either the athlete or non-athlete group attained the highest possible score of 60. The athletes surpass the non-athletes in that more scores tend to fall in the higher intervals. The athletes made 3 scores in the highest interval of 51-53, whereas, only one non-athlete made a score that falls in the highest interval. One athlete made a low score of 14.

TABLE 3

DISTRIBUTION OF SCORES FOR THE GATES-STRANG HEALTH KNOWLEDGE TEST FOR ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

	Athletes					Non-Athletes				
Scores	Grade				Total	Grade				Total
	9	10	11	12		9	10	11	12	
51-53	0	0	2	1	3	0	1	0	0	1
48-50	3	0	3	5	11	3	1	0	2	6
45-47	1	6	7	13	27	1	6	3	2	12
42-44	3	10	13	10	36	3	10	5	9	27
39-41	6	9	12	11	38	8	5	9	11	33
36-38	5	11	20	8	44	14	6	12	12	44
33-35	9	9	16	7	41	10	10	5	8	33
30-32	7	5	9	3	24	9	7	4	3	23
27-29	4	4	4	3	15	6	1	4	3	14
24-26	3	0	2	1	6	1	1	3	1	6
21-23	2	0	1	0	3	5	4	0	0	9
18-20	0	0	0	0	0	2	1	0	1	4
15-17	0	0	0	1	1	1	0	0	0	1
12-14	0	0	0	0	0	0	1	1	0	2
Total	43	54	89	63	249	63	54	46	52	215

In Table 4 measures of central tendency are presented for the Gates-Strang Health Knowledge Test for athletes and non-athletes according to grades in the selected schools of the study.

TABLE 4

COMPARISON OF MEASURES OF CENTRAL TENDENCY OF THE GATES-STRANG HEALTH KNOWLEDGE TEST ADMINISTERED TO ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Grades	Athletes		Non-Athletes		$\frac{D_{M_1 - M_2}}{\sigma_{D_M}}$
	Me	σ_M	Me	σ_M	
9	34.9	1.06	33.9	.918	.71
10	37.9	.710	36.2	1.11	1.23
11	37.7	.643	35.9	.975	1.58
12	39.9	.854	37.6	.807	2.01
All Grades	37.8	.409	35.7	.485	3.42

The mean score for the athletes in the ninth grade is 34.9. The reliability of the mean for the athletes in the ninth grade was determined by computing the standard error of the mean, σ_M, which is 1.06. The significance of the standard error of the mean for athletes in the ninth grade a t the .05 level of accuracy is 2.08. At this level, the probability is ninety-five chances out of one hundred that

the mean of 34.9 does not vary from the true mean by more than ± 2.08; that is, the true mean falls between 32.83 and 36.98. According to Garrett,

> The sampling error allowable in the mean depends upon the purpose of the experiment; the standards of accuracy set up, the units in terms of which measurement is made and other factors.[1]

The mean score of the ninth grade athletes on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The mean score for the non-athletes in the ninth grade on the Gates-Strang Health Knowledge Test is 33.9. The reliability of the mean for the non-athletes in the ninth grade was determined by computing the standard error of the mean which is .918. The significance of the standard error of the mean for the non-athletes at the .05 level of accuracy is 1.80. At this level, the probability is ninety-five chances out of one hundred that the mean of 33.9 obtained for the non-athletes on the Gates-Strang Health Knowledge Test does not vary from the true mean by more than ± 1.80; that is, the true mean falls between 32.10 and 35.70. The obtained mean of 33.9 for the non-athletes in the ninth grade has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in the ninth grade on the Gates-Streng Health Knowledge Test is 1.01. The standard error of the difference of the means is 1.403. The critical ratio for the difference

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[1] H. E. Garrett, Statistics in Psychology and Education, p. 197.

in the means for the two groups is .71. To be significant at the .05 level of accuracy, the critical ratio should be at least 1.96. Since the critical ratio of .71 falls below 1.96, the difference between the means is not large enough to be considered significant at the .05 level of accuracy. Therefore, this difference is not considered significant to distinguish the athletes and non-athletes of the ninth grade of the present study on the Gates-Strang Health Knowledge Test.

The mean score for the athletes in the tenth grade on the Gates-Strang Health Knowledge Test is 37.9. The reliability of the mean for the athletes in the tenth grade was determined by computing the standard error of the mean, which is .710. The significance of the standard error of the mean for the athletes in the tenth grade at the .05 level of accuracy is 1.39. At this level, the probability is ninety-five chances out of one hundred that the mean of 37.9 does not vary from the true mean by more than $\pm$ 1.39; that is, the true mean falls between 36.51 and 39.29. The obtained mean of 37.9 for the tenth grade athletes on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The mean score for the non-athletes of the tenth grade on the Gates-Strang Health Knowledge Test is 36.2. The reliability of the mean for the non-athletes in the tenth grade was determined by computing the standard error of the mean, which is 1.11. The significance of the standard error

of the mean for the non-athletes in the tenth grade at the .05 level of accuracy is 2.18. At this level, the probability is ninety-five chances out of one hundred that the mean of 36.2 obtained for the non-athletes in the tenth grade on the Gates-Strang Health Knowledge Test does not vary from the true mean by more than ± 2.18; that is, the true mean falls between 34.02 and 38.38. The obtained mean of 36.2 for non-athletes in the tenth grade has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in the tenth grade on the Gates-Strang Health Knowledge Test is 1.67. The standard error of the difference of the means for the two groups is 1.35. The critical ratio for the difference of the means for the two groups is 1.23. The critical ratio is only .63 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, this difference is not considered significant to distinguish the athletes and non-athletes of the tenth grade of the present study on the Gates-Strang Health Knowledge Test.

The mean score for the athletes in the eleventh grade is 37.7. The reliability of the mean for athletes in the eleventh grade was determined by computing the standard error of the mean, which is .643. The significance of the standard error of the mean for athletes in the eleventh grade at the .05 level of accuracy is 1.26. At this level, the probability is ninety-five chances out of one hundred that the mean of 37.7, for the athletes of the eleventh grade, does not vary

from the true mean by more than ± 1.26; that is, the true mean falls between 56.44 and 58.96. The obtained mean of 57.7 for the eleventh grade athletes on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The mean score for the non-athletes of the eleventh grade on the Gates-Strang Health Knowledge Test is 35.9. The reliability of the mean for the non-athletes in the eleventh grade was determined by computing the standard error of the mean, which is .957. The significance of the standard error of the mean for the non-athletes in the eleventh grade at the .05 level of accuracy is 1.88. At this level, the probability is ninety-five chances out of one hundred that the mean of 35.9 obtained for the non-athletes in the eleventh grade on the Gates-Strang Health Knowledge Test does not vary from the true mean by more than 1.88; that is, the true mean falls between 34.02 and 37.78. The obtained mean of 35.9 for the non-athletes in the eleventh grade has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in the eleventh grade on the Gates-Strang Health Knowledge Test is 1.85. The standard error of the difference of the means for the two groups is 1.17. The critical ratio for the difference of the means for the two groups is 1.58. Since the critical ratio of 1.58 falls below 1.96, the difference between the means is not large enough to be considered significant at the .05 level of accuracy to distinguish the athletes and non-athletes of the eleventh grade on the Gates-Strang Health Knowledge Test in the present study.

The mean score for the athletes in the twelfth grade on the Gates-Strang Health Knowledge Test is 39.9. The reliability of the mean for the athletes in the twelfth grade was determined by computing the standard error of the mean, which is .854. The significance of the standard error of the mean for the athletes in the twelfth grade at the .05 level of accuracy is 1.67. At this level, the probability is ninety-five chances out of one hundred that the mean of 39.9 does not vary from the true mean by more than ± 1.67; that is, the true mean falls between 38.23 and 41.67. The obtained mean of 39.9 for the twelfth grade athletes on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The mean score for the non-athletes in the twelfth grade on the Gates-Strang Health Knowledge Test is 37.6. The reliability of the mean for the non-athletes in the twelfth grade was determined by computing the standard error of the mean, which is .807. The significance of the standard error of the mean for non-athletes at the .05 level of accuracy is 1.58. At this level, the probability is ninety-five chances out of one hundred that the mean of 37.6 obtained for the non-athletes of the twelfth grade on the Gates-Strang Health Knowledge Test does not vary from the true mean by more than ± 1.58; that is, the true mean falls between 36.02 and 39.18. The obtained mean of 37.6 for the non-athletes in the twelfth grade on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The difference between the means of the athletes and of the non-athletes in the twelfth grade on the Gates-Strang Health Knowledge Test is 3.38. The standard error of the difference of the means is 1.18. The critical ratio for the difference of the means for the two groups is 2.01. This ratio is 1.002 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference in the mean scores is considered significant to distinguish the athletes and the non-athletes of the twelfth grade of the present study on the Gates-Strang Health Knowledge Test.

The mean score for athletes in all of the grades of the present study on the Gates-Strang Health Knowledge Test is 37.8. The reliability of the mean score for the athletes in all of the grades was determined by computing the standard error of the mean, which is .409. The significance of the standard error of the mean for athletes in all of the grades at the .05 level of accuracy is .80. At this level, the probability is ninety-five chances out of one hundred that the mean of 37.8 does not vary from the true mean by more than $\pm$ .80; that is, the true mean falls between 37 and 38.60. The mean score of the athletes in all grades on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The mean score for the non-athletes of the entire group on the Gates-Strang Health Knowledge Test is 35.7. The reliability of the mean for the non-athletes in all of the

grades in the present study on the Gates-Strang Health Knowledge Test was determined by computing the standard error of the mean, which is .495. The significance of the standard error of the mean for the non-athletes of all of the grades at the .05 level of accuracy is .95. At this level, the probability is ninety-five chances out of one hundred that the mean of 35.7 obtained for the non-athletes of all of the grades on the Gates-Strang Health Knowledge Test does not vary from the true mean by more than $\pm$ .95; that is, the true mean falls between 34.75 and 36.65. The obtained mean of 35.7 for the non-athletes in all of the grades has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in all of the grades on the Gates-Strang Health Knowledge Test is 2.17. The standard error of the difference of the means is .634. The critical ratio for the difference of the means for the two groups is 3.42. This ratio is 1.74 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference in mean scores is considered significant to distinguish the athletes and non-athletes of all the grades of the present study on the Gates-Strang Health Knowledge Test.

In Table 5 measures of variability are presented for the Gates-Strang Health Knowledge Test for athletes and non-athletes according to grades in the selected schools of the study.

TABLE 5

COMPARISON OF MEASURES OF VARIABILITY OF THE GATES-STRANG HEALTH KNOWLEDGE TEST ADMINISTERED TO ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Grade	Athletes		Non-Athletes		$D_{\sigma_1 - \sigma_2}$
	S.D.	$\sigma_{S.D.}$	S.D.	$\sigma_{S.D.}$	σ_{D_σ}
9	6.87	.741	7.29	.649	.43
10	5.22	.502	8.16	.785	3.60
11	6.06	.454	6.54	.682	.59
12	6.78	.604	5.82	.571	1.14
All Grades	6.45	.289	7.11	.343	1.51

The standard deviation for the athletes in the ninth grade is 6.87. The reliability of the standard deviation for the athletes in the ninth grade was determined by computing the standard error of the standard deviation, which is .741. The significance of the standard error of the standard deviation for the athletes in the ninth grade at the .05 level of accuracy is 1.45. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 6.87 obtained for the athletes in the ninth grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than $\pm$ 1.45; that is, the true standard deviation falls between 5.42 and 8.32. The

investigator concludes that the obtained standard deviation of 6.87 for the athletes in the ninth grade has a fair degree of reliability.

The standard deviation for the non-athletes of the ninth grade on the Gates-Strang Health Knowledge Test is 7.29. The reliability of the standard deviation for the non-athletes in the ninth grade was determined by computing the standard error of the standard deviation, which is .649. The significance of the standard error of the standard deviation for the non-athletes in the ninth grade at the .05 level of accuracy is 1.27. At this level the probability is ninety-five chances out of one hundred that the standard deviation of 7.29 obtained for the non-athletes in the ninth grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than $\pm$ 1.27; that is, the true standard deviation falls between 6.02 and 8.56. The obtained standard deviation of 7.29 for the non-athletes in the ninth grade has a fair degree of reliability.

The difference between the standard deviations for the athletes and non-athletes in the ninth grade on the Gates-Strang Health Knowledge Test is .42. The standard error of the difference of the standard deviations is .905. The critical ratio for the difference is .43. This ratio is only .22 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the

athletes and the non-athletes of the present study for the variability of scores made on the Gates-Strang Health Knowledge Test.

The standard deviation for the athletes in the tenth grade on the Gates-Strang Health Knowledge Test is 5.22. The reliability of the standard deviation for the athletes in the tenth grade was determined by computing the standard error of the standard deviation, which is .502. The significance of the standard error of the standard deviation for the athletes in the tenth grade at the .05 level of accuracy is .98. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 5.22 obtained for the athletes in the tenth grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than $\pm$ .98; that is, the true standard deviation falls between 4.24 and 6.20. The investigator concludes that the obtained standard deviation of 5.22 for the athletes in the tenth grade has a desirable degree of reliability.

The standard deviation for the non-athletes of the tenth grade on the Gates-Strang Health Knowledge Test is 8.16. The reliability of the standard deviation for the non-athletes in the tenth grade was determined by computing the standard error of the standard deviation, which is .785. The significance of the standard error of the standard deviation for the non-athletes in the tenth grade at the .05 level of accuracy is 1.54; that is, the true standard deviation falls between 6.62

and 9.70. The obtained standard deviation of 8.16 for the non-athletes in the tenth grade has a fair degree of reliability.

The difference between the standard deviations for the athletes and non-athletes in the tenth grade on the Gates-Strang Health Knowledge Test is 2.04. The standard error of the difference of the standard deviations is .317. The critical ratio for the difference is 5.60. This ratio is 1.64 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is considered significant to distinguish the athletes and non-athletes of the tenth grade of the present study on the Gates-Strang Health Knowledge Test.

The standard deviation for the athletes in the eleventh grade on the Gates-Strang Health Knowledge Test is 6.06. The reliability of the standard deviation for the athletes in the eleventh grade was determined by computing the standard error of the standard deviation, which is .454. The significance of the standard error of the standard deviation for the athletes in the eleventh grade at the .05 level of accuracy is .37. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 6.06 obtained for the athletes in the eleventh grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than $\pm$ .37; that is, the true standard deviation falls between 5.19 and 6.93. The investigator concludes that the obtained standard deviation of 6.06

for the athletes in the eleventh grade on the Gates-Strang Health Knowledge Test has a desirable degree of reliability.

The standard deviation for non-athletes of the eleventh grade on the Gates-Strang Health Knowledge Test is 6.54. The reliability of the standard deviation for the non-athletes in the eleventh grade was determined by computing the standard error of the standard deviation, which is .682. The significance of the standard deviation for the non-athletes in the eleventh grade at the .05 level of accuracy is 1.34. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 6.54 obtained for the non-athletes in the eleventh grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than $\pm$ 1.34; that is, the true standard deviation falls between 5.20 and 7.88. The investigator concludes that the obtained standard deviation of 6.54 for the non-athletes in the eleventh grade on the Gates-Strang Health Knowledge Test has a fair degree of reliability.

The difference between the standard deviations for the athletes and the non-athletes in the eleventh grade on the Gates-Strang Health Knowledge Test is .48. The standard error of the difference of the standard deviations is .813. The critical ratio for the difference is .59. This ratio is only .30 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the athletes and the non-athletes of the present study for the

the variability of scores made on the Gates-Strang Health Knowledge Test.

The standard deviation for athletes in the twelfth grade on the Gates-Strang Health Knowledge Test is 6.78. The reliability of the standard deviation for the athletes in the twelfth grade was determined by computing the standard error of the standard deviation, which is .604. The significance of the standard error of the standard deviation for the athletes in the twelfth grade at the .05 level of accuracy is 1.18. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 6.78 obtained for the athletes in the twelfth grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than $\pm$ 1.18; that is, the true standard deviations falls between 5.60 and 7.96. The investigator concludes that the obtained standard deviation of 6.78 for the athletes in the twelfth grade of the present study has a desirable degree of reliability.

The standard deviation for the non-athletes in the twelfth grade on the Gates-Strang Health Knowledge Test is 5.62. The reliability of the standard deviation for the non-athletes in the twelfth grade was determined by computing the standard error of the standard deviation, which is .571. The significance of the standard error of the standard deviation for the non-athletes in the twelfth grade at the .05 level of accuracy is 1.12. At this level, the probability is ninety-five

chances out of one hundred that the standard deviation of 5.82 obtained for the non-athletes in the twelfth grade on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than ± 1.12; that is, the true standard deviation falls between 4.70 and 6.94. The obtained standard deviation of 5.82 for the non-athletes in the twelfth grade has a fair degree of reliability.

The difference between the standard deviations for the athletes and the non-athletes in the twelfth grade on the Gates-Strang Health Knowledge Test is .96. The standard error of the difference of the standard deviations is .831. The critical ratio for the difference is 1.14. This ratio is only .58 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the athletes and the non-athletes of the present study for the variability of scores made on the Gates-Strang Health Knowledge Test.

The standard deviation for athletes in all of the grades of the present study on the Gates-Strang Health Knowledge Test is 6.45. The reliability of the standard deviation for the athletes in all of the grades was determined by computing the standard error of the standard deviation, which is .289. The significance of the standard error of the standard deviation for the athletes in all of the grades at the .05 level of accuracy is .57. At this level the probability is ninety-five

chances out of one hundred that the standard deviation of 6.45 obtained for the athletes in all of the grades on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than ± .57; that is, the true standard deviation falls between 5.88 and 7.02. The investigator concludes that the obtained standard deviation of 6.45 for the athletes in all of the grades of the present study has a desirable degree of reliability.

The standard deviation for non-athletes of all grades on the Gates-Strang Health Knowledge Test is 7.11. The reliability of the standard deviation for the non-athletes in all of the grades was determined by computing the standard error of the standard deviation, which is .345. The significance of the standard error of the standard deviation for the non-athletes in all of the grades at the .05 level of accuracy is .67. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 7.11 obtained for the non-athletes in all of the grades on the Gates-Strang Health Knowledge Test does not vary from the true standard deviation by more than ± .67; that is, the true standard deviation falls between 6.44 and 7.78. The investigator concludes that the obtained standard deviation of 7.11 for the non-athletes in all of the grades of the present study has a desirable degree of reliability.

The difference between the standard deviations for the athletes and the non-athletes in all of the grades of the

present study on the Gates-Strang Health Knowledge Test is .66. The standard error of the difference of the standard deviations is .437. The critical ratio for the difference is 1.51. This ratio is only .77 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the athletes and the non-athletes of the present study for the variability of scores made on the Gates-Strang Health Knowledge Test.

A summary of the findings of the Gates-Strang Health Knowledge Test discloses important points. An analysis shows that there is a predominating progression in the mean scores made by the athletes and non-athletes on the Gates-Strang Health Knowledge Test, from the ninth grade to the twelfth grade, with the exception of the eleventh grade for both groups of the study. In the eleventh grade, the mean score of the athletes fall below the mean score of the athletes in the tenth grade by .2 of a point. The non-athletes of the eleventh grade fall .3 of a point below the mean score of the non-athletes of the tenth grade. The athletes in the twelfth grade attained the highest mean score of both groups of athletes and non-athletes. The increase in mean scores for the athletes from the ninth grade to the twelfth grade is 2.9 points, whereas the increase in mean scores for the non-athletes from the ninth grade to the twelfth grade is 1.8 points. The greater increase in mean scores for the athletes

from the ninth grade to the twelfth grade is significant. By the time the athletes of the study have reached the twelfth grade, they have had a greater increase in health knowledge than the non-athletes. The mean of the combined scores of all grades for the athletes surpass the mean of the combined scores for the non-athletes in the corresponding grades. The mean of the combined scores of all grades for both athletes and non-athletes have a desirable degree of reliability. The difference between the mean scores of the athletes and non-athletes in the ninth, tenth, and eleventh grades was not significant at the .05 level of accuracy. Therefore, it is not possible to distinguish athletes and non-athletes in the ninth, tenth, and eleventh grades in regard to health knowledge, as measured by the Gates-Strang Health Knowledge Test. The difference between the mean scores for the athletes and non-athletes in the twelfth grade is 1.002 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the athletes and non-athletes in the twelfth grade can be distinguished in regard to health knowledge as measured by the Gates-Strang Health Knowledge Test. The difference between the mean of combined scores of athletes and non-athletes in all of the grades is 1.74 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the athletes and non-athletes in all of the grades can be distinguished in regard to health knowledge as measured by the Gates-Strang Health Knowledge Test.

When a comparison is made of the measures of variability of scores on the Gates-Strang Health Knowledge Test of athletes and non-athletes of the study, it is found that the athletes in the tenth grade show less variability than any other group, whereas, the non-athletes in the tenth grade show a greater variability than do any other group of the study. The critical ratio of the difference of the standard deviations for the athletes and non-athletes of all grades is only .77 as large as necessary to be considered significant. Therefore, the difference between the standard deviations is not significant to distinguish athletes and non-athletes of the present study for the variability of scores made on the Gates-Strang Health Knowledge Test.

In Table 6, is presented the distribution of scores of the Health Practice Inventory for athletes and non-athletes according to grades of the selected schools of the study. The scores range from 85 to 164 for the athletes and from 77 to 177 for the non-athletes. No individual in either the athlete or non-athlete group attained the highest possible score of 180. Two non-athletes made scores that fell in the highest interval. No athlete made a score that fell in the highest interval. Two non-athletes made scores that fall in the interval of 76-80, whereas, no athlete made a score that fell in the interval of 76-80. The athletes surpass the non-athletes in that more scores fell in higher intervals.

TABLE 6

DISTRIBUTION OF SCORES FOR THE HEALTH PRACTICE INVENTORY FOR ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Scores	Athletes					Non-Athletes				
	Grades				Total	Grades				Total
	9	10	11	12		9	10	11	12	
176-180	0	0	0	0	0	1	0	0	1	2
171-175	0	0	0	0	0	0	0	0	0	0
166-170	0	0	0	0	0	0	0	0	0	0
161-165	1	3	7	1	12	3	0	0	0	3
156-160	0	3	3	3	9	5	2	4	4	15
151-155	2	4	8	7	21	4	4	4	3	15
146-150	3	6	11	10	30	7	4	6	5	22
141-145	8	5	8	10	31	1	5	3	4	13
136-140	7	12	6	11	36	7	7	6	5	25
131-135	4	7	10	3	24	4	5	7	6	22
126-130	3	5	13	7	28	7	10	3	5	25
121-125	4	2	6	3	15	7	4	4	5	20
116-120	2	1	5	4	12	2	3	1	3	9
111-115	4	1	6	3	14	5	3	3	3	14
106-110	2	2	3	0	7	3	1	1	1	6
96-100	0	0	1	0	1	0	1	0	2	3
91-95	1	0	0	0	1	1	1	0	2	4
86-90	0	0	0	0	0	1	0	0	0	1
81-85	1	0	0	1	2	2	1	1	0	4
76-80	0	0	0	0	0	0	2	0	0	2
Total	43	54	89	63	249	63	54	46	52	215

In Table 7, measures of central tendency are presented for the Health Practice Inventory for athletes and non-athletes according to grades of the selected schools of the study.

The mean score for the athletes in the ninth grade is 130.56. The reliability of the mean for the athletes in the ninth grade was determined by computing the standard error

TABLE 7

COMPARISON OF MEASURES OF CENTRAL TENDENCY OF THE HEALTH PRACTICE INVENTORY ADMINISTERED TO ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Grade	Athletes		Non-Athletes		$\frac{D_{M_1} - M_2}{\sigma_{D_M}}$
	Me	σ_M	Me	σ_M	
9	130.56	2.56	131.49	2.63	.25
10	137.17	2.05	129.11	2.56	2.4
11	135.70	1.72	133.66	2.59	.66
12	138.00	1.78	131.08	2.63	2.2
All Grades	135.67	1.001	131.28	1.31	2.7

of the mean, M, which is 2.56. The significance of the standard error of the mean for athletes in the ninth grade at the .05 level of accuracy is 5.01. At this level, the probability is ninety-five chances out of one hundred that the mean of 130.56 does not vary from the true mean by more than ± 5.01; that is, the true mean falls between 125.55 and 135.56. According to Garrett,

> . . . the sampling error allowable in the mean depends upon the purpose of the experiment, the standards of accuracy set up, the units in terms of which measurement is made and other factors.[2]

The mean score of the ninth grade athletes on the Health Practice Inventory has a desirable degree of reliability.

[2]Garrett, op. cit., p. 187.

The mean score for non-athletes in the ninth grade is 131.49. The reliability of the mean for the non-athletes in the ninth grade was determined by computing the standard error of the mean, which is 2.65. The significance of the standard error of the mean for the non-athletes at the .05 level of accuracy is 5.15. At this level, the probability is ninety-five chances out of one hundred that the mean of 131.49 obtained for the non-athletes on the Health Practice Inventory does not vary from the true mean by more than ± 5.15; that is, the true mean falls between 126.34 and 136.64. The obtained mean of 131.49 for the non-athletes in the ninth grade has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in the ninth grade on the Health Practice Inventory is .934. The standard error of the difference of the means is 5.67. The critical ratio for the difference of the means for the athletes and non-athletes is .25. This ratio is .13 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the mean score is not significant to distinguish the athletes and the non-athletes of the present study, in regard to health practices as measured by the Health Practice Inventory.

The mean score for the athletes in the tenth grade on the Health Practice Inventory is 137.17. The reliability of the mean for athletes in the tenth grade was determined by computing the standard error of the mean, which is 2.05. The

significance of the standard error of the mean for the athletes in the tenth grade at the .05 level of accuracy is 4.02. At this level, the probability is ninety-five chances out of one hundred that the mean of 137.17 does not vary from the true mean by more than ± 4.02; that is, the true mean falls between 133.15 and 141.19. The obtained mean of 137.17 for the athletes in the tenth grade on the Health Practice Inventory has a desirable degree of reliability.

The mean score for the non-athletes in the tenth grade on the Health Practice Inventory is 129.11. The reliability of the mean for the non-athletes in the tenth grade was determined by computing the standard error of the mean, which is 2.56. The significance of the standard error of the mean for the non-athletes in the tenth grade at the .05 level of accuracy is 5.02. At this level, the probability is ninety-five chances out of one hundred that the mean of 129.11 obtained for the non-athletes in the tenth grade on the Health Practice Inventory does not vary from the true mean by more than ± 5.02; that is, the true mean falls between 124.09 and 134.13. The obtained mean of 129.11 for non-athletes in the tenth grade has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in the tenth grade on the Health Practice Inventory is 8.06. The standard error of the difference of the means for the two groups is 3.28. The critical ratio for the difference of the means for the two groups is 2.4. This ratio is 1.2 times as large as necessary to be considered

significant at the .05 level of accuracy. Therefore, the difference in mean scores is considered significant to distinguish the athletes and the non-athletes of the present study in regard to health practices, as measured by the Health Practice Inventory.

The mean score for the athletes in the eleventh grade is 135.70. The reliability of the mean for athletes in the eleventh grade was determined by computing the standard error of the mean, which is 1.72. The significance of the standard error of the mean for athletes in the eleventh grade at the .05 level of accuracy is 3.37. At this level, the probability is ninety-five chances out of one hundred that the mean of 135.70, for the athletes in the eleventh grade, does not vary from the true mean by more than $\pm$ 3.37; that is, the true mean falls between 132.33 and 139.07. The obtained mean of 135.70 for the athletes in the eleventh grade on the Health Practice Inventory has a deisrable degree of reliability.

The mean score for the non-athletes in the eleventh grade is 133.66. The reliability of the mean for the non-athletes in the eleventh grade was determined by computing the standard error of the mean which is 2.59. The significance of the standard error of the mean for the non-athletes in the eleventh grade at the .05 level of accuracy is 5.08. At this level, the probability is ninety-five chances out of one hundred that the mean of 133.66 obtained for the non-athletes in the eleventh grade on the Health Practice Inventory does not vary from the

true mean by more than ± 5.08; that is, the true mean falls between 128.58 and 138.74. The obtained mean of 133.66 for the non-athletes in the eleventh grade has a desirable degree of reliability.

The difference between the mean scores of the athletes and non-athletes in the eleventh grade on the Health Practice Inventory is 2.05. The standard error of the difference of the means for the two groups is 3.11. The critical ratio for the difference of the means for the two groups is .66. This ratio is only .34 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the mean scores is not significant to distinguish the athletes and the non-athletes of the present study in regard to health practices, as measured by the Health Practice Inventory.

The mean score for the athletes in the twelfth grade on the Health Practice Inventory is 138.00. The reliability of the mean for the athletes in the twelfth grade was determined by computing the standard error of the mean, which is 1.78. The significance of the standard error of the mean for the athletes in the twelfth grade at the .05 level of accuracy is 3.49. At this level, the probability is ninety-five chances out of one hundred that the mean of 138.00 does not vary from the true mean by more than ± 3.49; that is, the true mean falls between 134.51 and 141.49. The mean score of 138.00 obtained

for the athletes in the twelfth grade on the Health Practice Inventory has a desirable degree of reliability.

The mean score for the non-athletes in the twelfth grade is 131.08. The reliability of the mean for the non-athletes in the twelfth grade was determined by computing the standard error of the mean, which is 2.63. The significance of the standard error of the mean for non-athletes at the .05 level of accuracy is 5.15. At this level, the probability is ninety-five chances out of one hundred that the mean of 131.08 obtained for the non-athletes in the twelfth grade on the Health Practice Inventory does not vary from the true mean by more than $\pm$ 5.15; that is, the true mean falls between 125.93 and 136.23. The obtained mean of 131.08 for the non-athletes in the twelfth grade on the Health Practice Inventory has a desirable degree of reliability.

The difference between the means of the athletes and of the non-athletes in the twelfth grade on the Health Practice Inventory is 6.92. The standard error of the difference of the means for the two groups is 3.13. The critical ratio for the difference of the means for the two groups is 2.2. This ratio is 1.1 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference in mean scores is considered significant to distinguish the athletes and non-athletes of the twelfth grade of the present study in regard to health practices, as measured by the Health Practice Inventory.

The mean score for the athletes in all of the grades of the present study on the Health Practice Inventory is 135.67. The reliability of the mean score for the athletes in all of the grades was determined by computing the standard error of the mean, which is 1.001. The significance of the standard error of the mean for athletes in all of the grades at the .05 level of accuracy is 1.96. At this level, the probability is ninety-five chances out of one hundred that the mean of 135.67 does not vary from the true mean by more than ± 1.96; that is, the true mean falls between 133.71 and 137.63. The mean score of the athletes in all grades on the Health Practice Inventory has a desirable degree of reliability.

The mean score for the non-athletes in all of the grades is 131.28. The reliability of the mean for the non-athletes in all of the grades in the present study on the Health Practice Inventory was determined by computing the standard error of the mean, which is 1.31. The significance of the standard error of the mean for the non-athletes of all of the grades at the .05 level of accuracy is 2.57. At this level, the probability is ninety-five chances out of one hundred that the obtained mean of 131.28 for the non-athletes of all of the grades does not vary from the true mean by more than ± 2.57; that is, the true mean falls between 128.71 and 133.85. The obtained mean for the non-athletes in all of the grades has a desirable degree of reliability.

The difference between the means of the athletes and non-athletes in all of the grades on the Health Practice Inventory is 4.39. The standard error of the difference of the means is 1.65. The critical ratio for the difference of the mean score for the two groups is 2.7. This ratio is 1.4 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference in mean scores is considered significant to distinguish the athletes and non-athletes of all the grades of the present study in regard to health practices, as measured by the Health Practice Inventory.

TABLE 8

COMPARISON OF MEASURES OF VARIABILITY OF THE HEALTH PRACTICE INVENTORY ADMINISTERED TO ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Grade	Athletes		Non-Athletes		$\frac{D}{\sigma_1, \sigma_2}$
	S.D.	σS.D.	S.D.	σS.D.	σ_D
9	16.60	1.79	20.85	1.86	1.64
10	15.10	1.45	18.80	1.81	1.60
11	16.25	1.22	17.40	1.81	.53
12	14.15	1.26	18.95	1.86	2.13
All Grades	15.80	.708	19.20	.926	2.90

In Table 8, measures of variability are presented for the Health Practice Inventory for athletes and non-athletes, according to grades in the selected schools of the study.

The standard deviation for the athletes in the ninth grade is 16.60. The reliability of the standard deviation for the athletes in the ninth grade was determined by computing the standard error of the standard deviation, S.D., which is 1.79. The significance of the standard error of the standard deviation for the athletes in the ninth grade at the .05 level of accuracy is 3.51. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 16.60 obtained for the athletes in the ninth grade on the Health Practice Inventory does not vary from the true standard deviation by more than $\pm$ 3.51; that is, the true standard deviation falls between 13.09 and 20.11. The investigator concludes that the obtained standard deviation of 16.60 for the athletes in the ninth grade has a desirable degree of reliability.

The standard deviation for the non-athletes in the ninth grade is 20.85. The reliability of the standard deviation for the non-athletes in the ninth grade was determined by computing the standard error of the standard deviation, which is 1.86. The significance of the standard error of the standard deviation for the non-athletes in the ninth grade at the .05 level of accuracy is 3.65. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 20.85 obtained for the non-athletes in the ninth grade on the

Health Practice Inventory does not vary from the true standard deviation by more than ± 3.65; that is, the true standard deviation falls between 17.20 and 24.50. The obtained standard deviation of 20.85 for the non-athletes in the ninth grade has a desirable degree of reliability.

The difference between the standard deviations for the athletes and non-athletes in the ninth grade on the Health Practice Inventory is 4.25. The standard error of the difference of the standard deviations is 2.58. The critical ratio for the difference is 1.64. This ratio is only .84 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the athletes and non-athletes of the ninth grade of the study for variability of scores in regard to health practices as measured by the Health Practice Inventory.

The standard deviation for the athletes in the tenth grade on the Health Practice Inventory is 15.10. The reliability of the standard deviation for the athletes in the tenth grade was determined by computing the standard error of the standard deviation, which is 1.45. The significance of the standard error of the standard deviation for the athletes in the tenth grade at the .05 level of accuracy is 2.84. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 15.10 obtained for the athletes in the tenth grade on the Health Practice Inventory does not vary from the true standard deviation by more than

± 2.84; that is, the true standard deviation falls between 12.26 and 17.94. The investigator concludes that the obtained standard deviation of 15.10 for the athletes in the tenth grade has a desirable degree of reliability.

The standard deviation for the non-athletes in the tenth grade is 18.80. The reliability of the standard deviation for the non-athletes in the tenth grade was determined by computing the standard error of the standard deviation, which is 1.31. The significance of the standard error of the standard deviation for the non-athletes in the tenth grade at the .05 level of accuracy is 3.55. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 18.80 obtained for the non-athletes in the tenth grade does not vary from the true standard deviation by more than ± 3.55; that is, the true standard deviation falls between 12.26 and 17.94. The obtained standard deviation of 18.80 for the non-athletes in the tenth grade has a desirable degree of reliability.

The difference between the standard deviations for the athletes and non-athletes in the tenth grade on the Health Practice Inventory is 3.70. The standard error of the difference is 2.32. The critical ratio for the difference is 1.60. This ratio is only .31 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the athletes and non-athletes of the tenth grade of the study for variability of scores in regard to

health practices as measured by the Health Practice Inventory.

The standard deviation for the athletes in the eleventh grade on the Health Practice Inventory is 16.25. The reliability of the standard deviation for the athletes in the eleventh grade was determined by computing the standard error of the standard deviation, which is 1.22. The significance of the standard error of the standard deviation for the athletes in the eleventh grade at the .05 level of accuracy is 2.39. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 16.25 obtained for the athletes in the eleventh grade on the Health Practice Inventory does not vary from the true standard deviation by more than $\pm$ 2.39; that is, the true standard deviation falls between 13.86 and 18.64. The obtained standard deviation of 16.25 for the athletes in the eleventh grade of the present study on the Health Practice Inventory has a desirable degree of reliability.

The standard deviation for non-athletes in the eleventh grade is 17.40. The reliability of the standard deviation for the non-athletes in the eleventh grade was determined by computing the standard error of the standard deviation, which is 1.61. The significance of the standard error of the standard deviation for the non-athletes in the eleventh grade at the .05 level of accuracy is 3.54. At this level, the probability is ninety-five chances out of one hundred that the standard

deviation of 17.40 obtained for the non-athletes in the eleventh grade on the Health Practice Inventory does not vary from the true standard deviation by more than ± 3.54; that is, the true standard deviation falls between 13.86 and 20.94. The obtained standard deviation of 17.40 for the non-athletes in the eleventh grade of the present study on the Health Practice Inventory has a desirable degree of reliability.

The difference between the standard deviations for the athletes and the non-athletes in the eleventh grade on the Health Practice Inventory is 1.15. The standard error of the difference of the standard deviations is 3.18. The critical ratio for the difference is .53. This ratio is only .27 as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is not significant to distinguish the athletes and the non-athletes of the eleventh grade of the present study for the variability of scores in regard to health practices as measured by the Health Practice Inventory.

The standard deviation for the athletes in the twelfth grade on the Health Practice Inventory is 14.15. The reliability of the standard deviation for the athletes in the twelfth grade was determined by computing the standard error of the standard deviation, which is 1.36. The significance of the standard error of the standard deviation for the athletes in the twelfth grade at the .05 level of accuracy is 2.47. At this level, the probability is ninety-five chances out of

one hundred that the standard deviation of 14.15 obtained for the athletes in the twelfth grade on the Health Practice Inventory does not vary from the true standard deviation by more than ± 2.47; that is, the true standard deviation falls between 11.68 and 16.62. The obtained standard deviation of 14.15 for the athletes in the twelfth grade of the present study has a desirable degree of reliability.

The standard deviation for the non-athletes in the twelfth grade is 18.05. The reliability of the standard deviation for the non-athletes in the twelfth grade was determined by computing the standard error of the standard deviation, which is 1.06. The significance of the standard error of the standard deviation for the non-athletes in the twelfth grade at the .05 level of accuracy is 3.65. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 18.95 obtained for the non-athletes in the twelfth grade on the Health Practice Inventory does not vary from the true standard deviation by more than ± 3.65; that is, the true standard deviation falls between 15.30 and 22.60. The obtained standard deviation of 18.95 for the non-athletes in the twelfth grade has a desirable degree of reliability.

The difference between the standard deviations for the athletes and non-athletes in the twelfth grade of the present study on the Health Practice Inventory is 4.80. The standard error of the difference of the standard deviations is 2.25.

The critical ratio for the difference is 2.13. This ratio is 1.09 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is considered significant to distinguish the athletes and non-athletes of the twelfth grade of the present study for the variability of scores in regard to health practices as measured by the Health Practice Inventory.

The standard deviation for athletes in all of the grades of the present study on the Health Practice Inventory is 15.80. The reliability of the standard deviation for the athletes in all of the grades was determined by computing the standard error of the standard deviation, which is .703. The significance of the standard error of the standard deviation for the athletes in all of the grades at the .05 level of accuracy is 1.30. At this level the probability is ninety-five chances out of one hundred that the standard deviation of 15.80 obtained for the athletes in all of the grades on the Health Practice Inventory does not vary from the true standard by more than $\pm$ 1.30; that is, the true standard deviation falls between 14.41 and 17.19. The obtained standard deviation of 15.80 for the athletes in all of the grades of the present study has a desirable degree of reliability.

The standard deviation for the non-athletes in all of the grades is 19.30. The reliability of the standard deviation for the non-athletes in all of the grades was determined by

computing the standard error of the standard deviation, which is .926. The significance of the standard error of the standard deviation for the non-athletes in all of the grades at the .05 level of accuracy is 1.81. At this level, the probability is ninety-five chances out of one hundred that the standard deviation of 19.20 obtained for the non-athletes in all of the grades on the Health Practice Inventory does not vary from the true standard deviation by more than ± 1.81; that is, the true standard deviation falls between 17.39 and 21.01. The obtained standard deviation of 19.20 for the non-athletes of all of the grades of the present study has a desirable degree of reliability.

The difference between the standard deviations for the athletes and the non-athletes in all of the grades of the present study on the Health Practice Inventory is 3.40. The standard error of the difference of the standard deviations is 1.17. The critical ratio for the difference is 2.90. This ratio is 1.47 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is considered significant to distinguish the athletes and non-athletes of all of the grades of the present study for the variability of scores in regard to health practices as measured by the Health Practice Inventory.

An anlysis of the central tendency of scores made on the Health Practice Inventory of athletes and non-athletes of the study shows that there is a slight progression in

the mean scores of the athletes from the ninth grade to the twelfth grade with the exception of the eleventh grade. The mean score for the athletes in the eleventh grade falls 1.47 points below the mean score of the athletes in the tenth grade. The athletes in the twelfth grade attained the highest mean score by surpassing the athletes in the ninth grade by 7.44 points. Mean scores of the athletes in the tenth, eleventh, and twelfth grades surpass the mean scores of the non-athletes in the tenth, eleventh, and twelfth grades. The mean score for the athletes in the ninth grade fall .93 of a point below the mean score for the non-athletes in the ninth grade. The mean scores for the non-athletes in the ninth, tenth, eleventh, and twelfth grades tend to be rather consistent, the largest difference of scores being 4.55 points. The highest mean score for both groups was attained by the athletes in the twelfth grade and the lowest score for both groups was made by the non-athletes in the tenth grade. Since the athletes in high school have had more opportunities for better development of health knowledge, this knowledge should in turn enable the athlete to acquire and put into use, better health practices. The mean score for all grades for both athletes and non-athletes of the present study has a desirable degree of reliability. The difference between the mean score for the athletes and non-athletes of the present study in the ninth and eleventh grades, was not significant at the .05 level of accuracy. Therefore, it is not possible to distinguish athletes and non-athletes of the present study in the ninth

and eleventh grades in regard to health practices as measured by the Health Practice Inventory. The difference between the mean scores for athletes and non-athletes of the study in the tenth and twelfth grades are 1.2 and 1.1 times as large, respectively, as necessary to be considered significant at the .05 level of accuracy. Therefore, the athletes and non-athletes of the study in the tenth and twelfth grades can be distinguished in regards to health practices as measured by the Health Practice Inventory. The difference between the mean score of athletes and non-athletes for all of the grades of the study is 1.4 times as large as necessary to be considered significant at the .05 level. Therefore, the athletes and non-athletes of the study in all of the grades can be distinguished in regard to health practices as measured by the Health Practice Inventory.

An analysis of the measures of variability of scores made on the Health Practice Inventory of athletes and non-athletes of the study show that athletes in the twelfth grade show less variability than any other group. Whereas, the non-athletes in the ninth grade show a greater variability than do any other group of the study. The critical ratio of the difference of the standard deviations for the athletes and non-athletes of the study in the ninth, tenth, and eleventh grades is not significant at the .05 level of accuracy. Therefore, the difference is not significant to distinguish the athletes and non-athletes of the study in the ninth, tenth, and eleventh grades, for the variability of

scores as measured by the Health Practice Inventory. The difference between the standard deviations for the athletes and non-athletes of the study in the twelfth grade is 1.09 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is considered significant to distinguish the athletes and non-athletes of the study in the twelfth grade for variability of scores as measured by the Health Practice Inventory. Likewise, the difference between the standard deviations for the athletes and non-athletes in all of the grades is 1.47 times as large as necessary to be considered significant at the .05 level of accuracy. Therefore, the difference between the standard deviations is considered significant to distinguish the athletes and non-athletes of the present study in all of the grades for variability of scores as measured by the Health Practice Inventory.

In Table 9, the relationship between the health knowledge of students of the study and their health practices is shown. The investigator determined the relationship by computing the coefficient of correlation for the scores on the Gates-Strang Health Knowledge Test and the Health Practice Inventory. The reliability of the coefficients of correlation was determined by computing the standard error of the coefficients of correlation. The non-athletes in the eleventh grade show the greatest degree of relation between health knowledge and health practices with a correlation of .46

± 1.12. Of the two groups, the athletes in the tenth grade show the smallest degree of relationship between health knowledge and health practices as measured by the Gates-Strang Health Knowledge Test and the Health Practice Inventory, with a correlation of .22 ± .13. The non-athletes in all of

TABLE 9

COMPARISON OF THE COEFFICIENTS OF CORRELATION OF THE TWO SETS OF SCORES FOR THE GATES-STRANG HEALTH KNOWLEDGE TEST AND THE HEALTH PRACTICE INVENTORY ADMINISTERED TO ATHLETES AND NON-ATHLETES ACCORDING TO GRADES IN A SELECTED NUMBER OF TEXAS CLASS A HIGH SCHOOLS FOR THE SCHOOL YEAR OF 1948-1949

Grade	Athletes		Non-Athletes	
	r	σ_r	r	σ_r
9	.37	± .13	.45	± .10
10	.22	± .13	.27	± .11
11	.39	± .09	.46	± .12
12	.28	± .12	.27	± .13
All Grades	.20	± .06	.28	± .06

the grades showed a greater correlation between health knowledge and health practices than the athletes of all grades. The size of the coefficients of the correlation for scores of the two tests, namely, the Gates-Strang Health Knowledge Test and the Health Practice Inventory, made by the athletes and non-athletes in all grades of the study show

that there is a relationship between health knowledge and health practice of the students, but it is slight.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

The investigator made a comparative study of the health knowledge and health practices of participants in interscholastic athletics for boys and non-participants in a selected number of class A Texas high schools during the school session of 1948-1949. The term, Athletes, as applied to the present study, referred to those students who were members of the squad of interscholastic football, or basketball, or track of the given schools of the study during the school session of 1948-1949. The term, non-athletes, as applied to the present study, referred to those students of the given schools of the study who were not participants in interscholastic athletics during the school session of 1948-1949. The present study was undertaken to determine:

1. The health knowledge of athletes of the selected schools of the study as indicated by the standardized test results.

2. The health knowledge of non-athletes of the selected schools of the study as indicated by the standardized test results.

3. The health practices of athletes of the selected schools of the study as indicated by a standardized inventory.

4. The health practices of non-athletes of the selected schools of the study as indicated by a standardized inventory.

5. The difference in the health knowledge and in the health practices of the students of the two groups.

6. The relation between the health knowledge and the health practices of the students of each group.

The investigator formulated criteria as a guide in the selection of the schools and subjects for use in the present study. The investigator obtained names of all class A Texas high schools within a radius of one hundred miles of Denton, Texas from the North Texas State College Placement Service and wrote a formal letter to the administrator of each of the schools within this area, requesting permission to select the subjects for the study from the student body of the school. Each letter contained a check list concerning the date and the desirable time of day preferred by the school administration for the administration of the tests in the school, and the number of available athletes. The administrators were asked to give the information requested on the check list and to return the information to the investigator. Those schools whose administrators completed the check list and returned it to the investigator were selected for the study.

From the check lists the investigator obtained information relative to number of athletes available for the study. Upon arrival of the investigator at each school, a general effort was made to obtain an equal number of non-athletes. With the cooperation of the administration, coaches, and teachers, non-athletes were assembled from physical education classes, study halls, and regular class rooms. This procedure tended to give a random sampling of the non-athletes.

The instruments used to collect the data for the study were the Gates-Strang Health Knowledge Test and the Johns Health Practice Inventory. The data were treated statistically to determine the range, mean, standard deviation, standard error of the mean, standard error of the standard deviation, difference between the means of the athletes and non-athletes, difference between the standard deviations of the athletes and non-athletes, standard error of the difference between the means of the athletes and non-athletes, standard error of the difference between the standard deviations of the athletes and non-athletes, critical ratio of the means and the critical ratio of the standard deviations, the coefficients of correlation of the scores made by the athletes and by the non-athletes on the Gates-Strang Health Knowledge Test and on the Health Practice Inventory. The data were analyzed and interpreted and conclusions of the study were drawn.

Summary of the Findings

Important findings of the study are:

1. The athletes in all of the grades surpass the non-athletes in regard to health knowledge as measured by the Gates-Strang Health Knowledge Test. There is a predominant progression of the mean scores from the ninth grade to the twelfth grade, with the exception of the eleventh grade, for both athletes and non-athletes. The athletes in the twelfth grade attained the highest mean score of both groups. The non-athletes in the ninth grade has the lowest mean score of both groups. The mean score for athletes and non-athletes in all of the grades has a desirable degree of reliability. The difference in the mean of the combined scores for all grades for the athletes and non-athletes is significant at the .05 level of accuracy. The non-athletes show greater variability as indicated by the standard deviation. The standard deviation for each group has a desirable degree of reliability. The difference in standard deviations of the two groups is not significant at the .05 level of accuracy to distinguish the athletes from the non-athletes.

2. The athletes in all of the grades, with the exception of the ninth grade, surpass the non-athletes in regard to health practices as measured by the Health Practice Inventory. There is a slight progression in the mean scores of the athletes from the ninth grade to the twelfth grade with the exception of the eleventh grade. The mean scores of the non-athletes on the Health Practice Inventory tend

to be consistent from grade to grade. The athletes in the twelfth grade have the highest mean score of the two groups. The non-athletes in the tenth grade have the lowest mean score of the two groups. The mean of the combined scores for all grades for the athletes and non-athletes has a desirable degree of reliability. The difference in the mean of the combined score for all grades for the athletes and non-athletes is significant at the .05 level of accuracy. The standard deviation for athletes and non-athletes in all of the grades has a desirable degree of reliability. The athletes in the twelfth grade show less variability. The non-athletes in the tenth grade show more variability than do any other group of the study. The difference in standard deviations of the combined scores for all grades for the athletes and non-athletes is considered significant to distinguish the athletes and non-athletes of the present study.

5. The relation between health knowledge and health practices of athletes and non-athletes tends to be present but slight. The coefficients of correlation for both the athletes and non-athletes has a desirable degree of reliability. The non-athletes tend to have a higher correlation between health knowledge and health practices.

Conclusions of the Study

In light of the findings of the study, the investigator drew the following conclusions:

1. Boys of the secondary schools of the study, as represented by the athletes and non-athletes, show a progression in the attainment of health knowledge during their high school experiences as indicated by the increase in mean scores of the Gates-Strang Health Knowledge Test. The athletes of the study tend to show a greater increase than the non-athletes.

2. Boys of the secondary schools of the study, as represented by the athletes and non-athletes, do not show such a consistent progression in health practices from grade to grade as in health knowledge. The athletes of the study tend to surpass the non-athletes in health practices, as indicated by the mean scores of the Health Practice Inventory.

3. The students of the study show a very low degree of relationship in their health knowledge and health practices. The non-athletes of the study surpass the athletes to a slight degree in the correlation of health knowledge and health practices.

On the basis of the conclusions of the study, the investigator makes the following recommendations:

1. That administrators and teachers put forth continuous effort to bring about a progressive increase in health knowledge on the part of the students during the secondary school years.

2. That greater stress be placed on the development of desirable health practices on the part of the students through all of the experiences of the school.

3. That the coaches continue to make conscious effort to guide the students in their experiences in athletics so that full advantage is taken of the opportunity to increase health knowledge and health practice.

Recommendations for Future Studies

1. A study similar to the present one conducted on the college level.

2. A study similar to the present one comparing the health knowledge and health practice of high school boys and high school girls.

3. An evaluation of practices in Interscholastic athletics that are related to health.

Appendix I

Denton, Texas
April 5, 1949

Mr. _____
_____ High School
_____, Texas

Dear Mr. _____:

As a graduate student at North Texas State College, I am undertaking for my thesis a study entitled, " A Comparative Study of Health Knowledge and Health Practices of Athletes and Non-Athletes in Selected Class A Texas High Schools for the School Year of 1948-1949." The study will involve approximately 500 secondary school boys of Texas.

I would like very much to have your school participate in the study as a representative Texas High School. Therefore, I am writing to ask your permission to use groups of your students as subjects for the study.

The study requires the administration of two standardized tests, a Health Knowledge test and an Inventory of Health Practices, to two groups of students:

1. All of the boys of the given school who are participating in interscholastic football, basketball, and track.

2. An equal number of boys, picked at random, who are not participating in interscholastic football, basketball, and track.

Both tests are the type that is commonly known as a paper and pencil test, the two requiring no more than one hour to complete. There will be no signing of names to test papers by the student as no mention will be made of the identity of individuals or of schools in treating the tests results.

My plan is to personally administer the tests at each school selected for the study. The most convenient time for me to give the tests is on Tuesday or Thursday afternoon. However, if this is not possible with the

Appendix 1 --continued

school, I can make other arrangements. I desire to finish collection of the data by April 14, 1949.

If you find it possible for your school to take part in the study, please give information concerning the possible arrangements for the administration of the tests by checking the enclosed sheet and mailing it to me in the stamped envelope.

Your interest and cooperation in my study will be greatly appreciated as I feel that the results will be of professional significance to the field of Health and Physical Education.

Sincerely,

Blake E. Yager, Jr.
Box 5005 T. C. Station
Denton, Texas

BEY:aw
enc.

Appendix II

Please give information concerning possible arrangements for administering the tests at your school by checking one or more possibilities under I, II, III.

I. Desirable date for administering tests:
April 12, 1949 ___
April 14, 1949 ___
Other date_____

II. Desirable time for administering the tests:

1:00___	2:30___
1:15___	2:45___
1:30___	3:00___
1:45___	3:15___
2:00___	3:30___
2:15___	Other Time___

III. Check approximate number of boys participating in interscholastic football, basketball, and track in your school:

15___	55___
20___	60___
25___	65___
30___	70___
35___	75___
40___	80___
45___	Other Number___
50___	

Signed:_____
Principal
_____ High School
_____, Texas

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