A CRITICAL ANALYSIS OF THE EXPERIMENTS PERTAINING TO THE PSYCHOLOGY OF PHYSICAL EDUCATION FROM 1930 TO 1942 INCLUSIVE

by

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TABLE OF CONTENTS

CHAPTER PAGE

LIST OF TABLES

CHAPTER I

INTRODUCTION

During the earlier part of the writer's life, popular opinion among school men and women seemed to be that the mind and body were distinctly separate. Even today it seems that many are still holding to that belief. For example, such opinions as these are to be found: athletes, as a group, are dumb; physical education does not contribute anything to one's education; most forms of extra-curricular activities are social evils and have no merits when compared to the academic subjects; vocational work which requires motor skill is a place to dispose of the incorrigibles.

In contrast to the foregoing line of thought much has been claimed in defense of those activities which have been frowned upon. It has been claimed that such traits as honesty, fair play, courtesy, etc., could best be taught and learned in the fields of motor activity.

Whenever two contrasting lines of thought are presented, it is almost certain that both cannot be right. Both could be wrong. In connection with this particular problem the writer has sought to satisfy himself as to the validity of the arguments given pro

and con. Many opinions along this line have been gained by experience and observation. These will at no time be presented in this thesis. In order to confirm or deny those opinions gained by observation and experience, much time has been spent in learning of the experimental contributions that have been made.

I. THE PROBLEM

Statement of the problem. The purpose of this study was to review and interpret a group of research studies of various problems in the psychology of physical education.

Importance of the study. Compared to many other educational problems, very little scientific study has been made of this problem. So far as the writer has been able to learn, no one has ever before made an attempt to assimilate this information under one cover. Hence it was felt that this thesis would be quite valuable to those interested in this field.

Procedure of the study. This particular study did not attempt to quote from authorities pro and con but rather to study those experiments which were conducted from 1930 to 1942 inclusive and to present the findings in a concise form.

The criteria used in selecting these experiments consisted of three parts: first, the dates of 1930 to 1942 inclusive were taken; second, only material of an experimental nature was used; and third, only those experiments which had a direct bearing upon the problem were used.

All experiments were selected from periodicals, since those found in text-books are already in published form. Any experiments that may have been published in periodicals other than those found in the college library will not be included in this presentation owing to inaccessibility.

In presenting these findings, highly technical statistics have purposely been avoided in order to render the content as understandable as possible and still present the true interpretation. Thus it was hoped that anyone else who might wish information of this nature would find this thesis practical.

CHAPTER II

REVIEW OF THE STUDIES

Study 1.

This article[1] does not confine itself to one experiment alone but includes a discussion of four.

Baseball. The problem in the first one was to determine the relative amount of time consumed by a baseball batter in covering the first fifteen feet toward first base, after hitting the ball, and the time used in going the last seventy-five feet.

The procedure consisted of using a delicate timing device and recording when the ball was hit, when the batter reached the fifteen foot line, and when he reached first base.

The results showed that the average batter consumed as much time in getting out of the batter's box and covering the first fifteen feet as was required to travel the last seventy-five feet.

It was found, moreover, that this relatively long time was consumed in recovering from the completion of the batting stance and getting into the

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[1]Coleman R. Griffith, "Studies in the Psychology of Athletics," Journal of Health and Physical Education, 1:9-12, 60, March, 1930.

proper running stance.

The total performance of hitting and getting out of the box toward first base is the essential psychological fundamental of the whole situation, and it is just this fundamental which is practiced least.

Basketball. The problem of this experiment was to learn the main cause of missed free throws.

Nine members of the freshmen basketball squad of the University of Illinois were each asked to make ten free throw attempts before practice and ten attempts after practice during an interval of four weeks and a half. The shots were charted as to hits and the reasons why they were missed, i. e., a distance or direction error.

The results showed that in all cases the direction errors were reduced during the experimental period but that distance errors remained the same.

Here is a case, then, where the psychological factor of vision in relation to throwing makes a big difference in the rate at which skill is gained, and these results lay emphasis upon what the coach should do to change methods of practice so that distance errors are eliminated along with direction errors.

Sleep. This is a study of the way athletes sleep.

Six Simmons beds were equipped with electrical

recording devices which recorded any movement, together with an indication of its magnitude, and also the time the movement occurred. The subjects in these experiments were six men from the basketball squad of 1927-1928, six men from the football squad of 1928-1929, six men from the basketball squad of 1928-1929, and such other men, principally from the track squad, as were available between the basketball and football seasons.

The findings in this experiment showed that,

1. The average sleeper goes to bed and moves some portion of his body once every ten or fifteen minutes during the night.
2. A man is just as likely to move frequently during the first or second hour of sleep as he is during the seventh or eighth.
3. His movements are likely to be just as vigorous at one time as any other.
4. Two types of change in the normal sleep curve appear:
   a. In one case a man goes to bed after a hard game and sleeps as long as forty or fifty minutes without making a movement. He will then turn restlessly for five or ten minutes, only to fall into another forty- or fifty-minute period of

motionlessness. The rest of the sleep period will be spent more or less normally.

b. There are other cases where the amount of restlessness during the night is abnormally increased after a heavy game. The intervals between movements may be as short as four or five minutes on these nights.

5. The individual who gets the normal amount of movement during the night is the one that awakens refreshed as contrasted to the one who sleeps "like a log" and is not refreshed the next morning.

Physical Fitness. This experiment was an effort to work out more in detail Sargent's test of physical fitness.

The test rests on the assumption that the more fit a man is, the higher he ought to be able to jump. A device was provided by means of which the full upward jump of a man is recorded on a sheet of paper. The subjects were the basketball players on the 1928-1929 squad. Each man on the squad jumped five successive times before and after scrimmage and before and after certain games.

The measures of individual differences in fitness or in reserve strength were surprisingly reliable when compared with the independent judgment of the

coaches and with the actual performances of the men during the games.

The picture of changing fitness or condition, as the season wore on, is not quite so clear.

Study 2.

Problem. After reviewing the conflicting reports relative to the efficiency of the whole method of learning and the progressive-part method as it applied to mazes, mirror drawing, typewriting, piano scores, and card sorting, Mr. Shay decided to conduct an experiment[2] in gymnastics.

Procedure. For the experiment, Mr. Shay used two groups of sixteen each and selected the upstart or kip on the horizontal bar as the skill to be learned. Equating the groups was done by means of the Brace Scale of Motor Ability Tests, which are supposed to measure native motor ability rather than acquired, and the Rogers Physical Capacity Tests, which are supposed to be tests of general athletic ability.

He used the whole method with one group and the progressive-part method with the other group. The

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[2] Clayton T. Shay, "The Progressive-part vs. the Whole Method of Learning Motor Skills," Research Quarterly, 5:62-67, December, 1934.

criterion used for the learning of the upstart was three consecutive successes.

Results. The results of the experiment in tabular form are given in the following table.

TABLE I

RESULTS OF PROGRESSIVE-PART VS. WHOLE METHOD OF LEARNING MOTOR SKILLS

Group A (Whole Method)		Group B (Progressive-part Method)	
Total number of trials	616	Total number of trials	781
Mean	38.5	Mean	48.8
Standard Deviation	9.80	Standard Deviation	8.04

To check the reliability of the difference of the two means, the Critical Ratio was computed and found to be 3.3.

At the end of the experiment he drew the following conclusions concerning the relative merits of the two methods of learning this particular skill:

1. Attention was not distracted from the whole by the necessity for perfecting each part before preceding to the next as was the case in the progressive-part method.

2. Meaning or 'satisfyingness' was never violated by forced pauses.

3. Timing, an essential factor in learning gymnastics, favors the whole method.[3]

Mr. Shay believes this experiment

> suggests means of improving correct methods of instruction in gymnastics, to say nothing of such skills as swimming, track, golf, and tennis, each of which needs special experimental investigation.[4]

Study 3.

Problem. The problem in this study[5] was just what the title indicates, i. e., to determine which method of teaching basketball is most efficient.

Procedure. This experiment was carried on in the Junior High School of Jefferson City, Missouri, during the school year 1932-33. At the beginning of the term the principal divided the ninth-grade physical education classes into three groups, each group meeting two times per week. Each group was assigned a method of learning: the first hour class, the

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[3]Ibid., p. 66-67.

[4]Ibid., p. 67.

[5]Thomas J. Cross, "A Comparison of the Whole Method, the Minor Game Method, and the Whole Part Method of Teaching Basketball to Ninth-grade Boys," Research Quarterly, 8:49-54, December, 1937.

whole method; the second hour class, the minor game method; the third hour class, the whole part method.

In teaching by the whole method, a basketball was given to the group, and they actually played the game. In the second group the minor game method was used by playing games such as indoor baseball, dodge-ball, volleyball, and relay games in the gymnasium classes. These games were used to build up certain fundamental skills which it was believed would be carried over into basketball. In the third group the whole-part method was used by dividing basket-ball into the fundamental skills.

Results. The results obtained in this experiment show that one method was not superior in all of the tests, or even in a great enough number of them to warrant any general conclusions.

The whole method was best for fast, accurate passing and speed in starting and stopping.

The minor game method was best for shooting baskets, side shift footwork, and ability to jump and reach.

The whole part method proved best for dribbling and shooting, pivot and shooting, opposition shooting, and getting the ball and shooting.

The value of each method was interpreted as follows:

1. The simpler unitary skills (visual and hand coordination of catching the ball, muscle coordination of passing the ball, and changing from catching to throwing) are best taught by the whole method.

2. The most complex skills and those that are intellectually complex as well as complex from a motor point of view (muscular coordination of handling ball, stopping and grasping ball, skill in shooting, visual and hand coordination of dribble, muscular coordination of feet, and ability to start and stop) are best taught by the whole-part method.

3. Skills of intermediate degree of complexity and ones which are easily carried over from simpler games in identical form (such as pivoting, change from catch to throw, ability to start and stop, and ability to jump) are best taught by the minor game method.[6]

Study 4.

Purpose. The purpose of this study[7] was to note peculiarities in improvement made under a variety of conditions and to keep such records as would enable one to plot learning curves in several events.

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[6] Ibid., p. 54.

[7] Frederick W. Cozens, "The Determination of the Efficiency of Group Learning Under Different Incentive Conditions and Modes of Activity," Research Quarterly, 4:50-62, May, 1933.

The groups studied were organized in six track and field classes of the writer during the fall semester of 1931 as follows:

(1) Dash--Practiced dash only, 17 cases.

(2) Dash--Practiced dash only, three minutes of distance running at the end of each period, 11 cases.

(3) Low Hurdles--Practiced low hurdles only, 10 cases.

(4) Low Hurdles--Practiced low hurdles only, three minutes of distance running at the end of each period, 15 cases.

(5) Distance Group--Practiced distance only, 23 cases.

(6) Broad Jump--Practiced broad jump only, 5 cases. This group dwindled out so that there is little reason for giving it consideration.

(7) Shot Put--Practiced 12 pound shot only, 16 cases.

(8) Shot Put--Practiced 12 pound shot only, 12 cases; three minutes distance work at the end of each period.

(9) Discus--Practiced discus only, 9 cases.

(10) Discus--Practiced discus only, 20 cases; three minutes distance at the end of each period.

At the start of the semester the groups were equated as to numbers, beginning track ability, spread of ability in the particular event practiced and general athletic ability score, but there were so many changes owing to uncontrolled conditions and to 'drop-outs' that it was impossible to keep the groups equated. A spread of ability, however, was maintained in each group.[8]

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[8] Ibid., p. 50-51.

Results. Mr. Cozens, after experimenting with track athletes in six events, arrived at some significant conclusions. Some which might be considered of especial importance in connection with this analysis are as follows:

1. Learning curves in 'big-muscle' events follow the same general tendencies as many other curves involving mental reactions and small muscle groups.

2. A rather extended vacation period does not, as a rule, cause a 'setback' in improvement. Men come back with increased enthusiasm. A change in program will probably help to relieve staleness and after an extended vacation we can expect men to pick up where they left off, with few exceptions.

3. In any activity program, a careful study of skill improvement should be made to see what skills can most profitably be emphasized.[9]

4. Improvement in some skills progresses faster and farther than in others.

5. There is no evidence to show that possible observation is of assistance in acquiring technique. Apparently we learn only by doing.

6. Twenty-eight to thirty periods of practice and instruction were not sufficient to cause any plateaus in the learning curves. This indicates that instruction and practice might very

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[9] Ibid., p. 62.

profitably go on for some time.

7. Distance running seemed to add to the improvement of those practicing the half mile; but hurdlers, shot putters, and discus throwers who did not include three minutes of distance running improved slightly more than those who did. Dash men seemed to be benefited some by adding three minutes of distance running.

Study 5.

Problem. Mr. Jackson in his experiment[10] with gymnasts at the University of Illinois hoped to find the answer to these questions:

1. What factors are responsible for the development of fear in certain athletic situations?
2. Under what conditions, or during what gymnastic activities, is fear most likely to be present?
3. What correlation is there between a subject's mental and physical state, his performance in gymnastic activities, and his susceptibility to fear?
4. What definite procedures can be followed

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[10] C. O. Jackson, "An Experimental Study of the Effect of Fear on Muscular Coordination," Research Quarterly, 4:71-80, December, 1933.

for overcoming fear and securing better performance in gymnastic events?

5. Will it be possible to predict from laboratory studies the degree of skill which may be displayed in the actual performance of a gymnastic stunt when the stunt itself may be fear exciting?

6. What differences are there, in actual movements of different parts of the body, as shown by graphs drawn from motion pictures, between skilled and unskilled performance?[11]

Procedure. Fourteen university students from the aerial gymnastic group of the Student Circus were used in the study. These subjects ranged in ability and experience from individuals who were beginners to experts who had spent many hours in practice.

Several reels of film were taken to record the movements as they occurred under a variety of conditions which produced or allayed the element of fear.

As a source of further information, the questionnaire method was used. Two types were adopted. It was the aim of the first to learn what the subjects and others in the gymnasium thought about fear, its causes, its effects, and its possible means of cure. The second had as its objective a description of what the subjects themselves thought of their own performance at each practice, of their successes or failures, of fear or any other factors that might influence their performance. Forty-six individuals, including the fourteen subjects studied in more detail, filled out the first question-

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[11] Ibid., p. 71-72.

naire of fear, while the subjects themselves, and a few others in the same activity, returned 389 copies of the second questionnaire on performance, over a period of three years.[12]

Results. In answer to the foregoing questions Mr. Jackson gives the following summary and conclusions:

The fear questionnaire indicated that fear was present in most cases, and was due to height, inadequate support, and imagination. Fear was most likely to be present in the beginner. New stunts were likely to cause various degrees of fear, especially the first few times they were tried. Previous experience, i. e., dangerous falls in the activity or elsewhere, previous injuries, and observation of accidents or near-accidents were likely to induce fear when the subject tried other, or similar stunts. Perhaps the most important conclusion reached was the all-important part the topman played, not only in performance itself, but in the presence or absence of fear. The questionnaires, as well as observation and discussion with the subjects themselves, indicated that a new topman inspired little confidence. Likewise, a topman who, because of carelessness of lack of ability, had caused a flyman

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[12] Ibid., p. 75.

to miss a stunt or receive a hard fall was avoided whenever another topman in whom the individual had confidence could be secured. Fear seemed to be most prevalent in those stunts where, if the stunt was missed, possibilities of injury might be greatest. These were stunts where the feet were higher than the head, dives, and those in which the performer turned over.

> Fear tends to be eliminated with successful experience, and this may be brought about by the help of experienced topmen in whom the subject has confidence. In addition, the stunt should be learned by stages, i. e., by observation, explanation, demonstration, and preliminary trials in the safety belt. Later when the 'feel' of the stunt has been secured, and the stunt has been successfully performed a number of times, it may be tried without artificial support.
>
> There seemed to be some correlation between the mental and the physical state of the performer, his performance, and his susceptibility to fear. A subject who is depressed, or who is tired or ill, can seldom perform as well as he will under more ideal conditions. Likewise, fear is more apt to be present under these circumstances. Fear developed in this way not infrequently results in hard falls to the net, with the possibility of injury, and, nearly always, a loss of confidence. Likewise, lack of proper rest, particularly sleep, coupled with excessive effort expended in school work, may place most of the subjects below normal in their performance.
>
> The tests given in the laboratory apparantly cannot be fully accepted as a true indication of ability in gymnastics.[13]

[13] Ibid., p. 79.

The moving pictures and the graphs of the various angles of the body drawn from them show a distinct difference between the skillful, well-coordinated performance of some of the experienced men as opposed to the awkward, poorly coordinated attempts of some of the beginners.

> Without question, the emotion of fear tends to make the individual give a performance similar to that of the beginner. Moreover, there is a jerky, ill-coordinated quality to such movements which nearly always end in a miss and an unexpected fall to the net. The subject 'breaks his swing,' 'hangs on too long to the topman's hands,' or 'fails to start and carry through his turn properly,' and, in general, gives definite evidence of his inability to make up his mind.[14]

Study 6.

Whoever has been associated with physical education or athletics has frequently found individuals who have every characteristic that makes an ideal player except that mental quality which so outstandingly characterizes the competitor. These non-competitive individuals usually outshine their teammates during practice periods, but they fail when placed in situations that demand superior performance.

[14] Ibid., p. 80.

Problem.

> Specifically, the problem [of this study] was to 'analyze the effect of competition by measuring performance under three sets of conditions.' Set one, alone, without knowledge of the results; set two, alone, with knowledge of the results; set three, in the company of other performers with the results known and announced so all could hear.[16] 15

Procedure. A Kellogg back and leg dynamometer was used to obtain all of the data of this experiment.

The groups used were four classes of physical education students taking wrestling for their required work. No varsity, or any candidate for varsity, or any intramural wrestler was used. No student was included who had ever been a member of any college athletic team. The majority of the students were taking wrestling for the first time. No attempt was made to equalize the groups by predetermining their strength. Sixty-one individuals were tested.

The four classes were divided into different groups called A, B , C, and D. The tests were listed

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[15]Harold L. Berridge, "An Experiment in the Psychology of Competition," Research Quarterly, Vol. 6, Supp. 1:37-42, March, 1935.

[16]Ibid., p. 37.

as set one, set two, and set three. The order of taking each set of tests was different for each group in order to cancel practice effects.

Results. In mean scores, set three scored the highest with set two next and set one scoring the lowest. The mean of set one was 536 pounds; set two, 568 pounds; and set three, 616.5 pounds.

The results show that the arrangement of the series or previous practice had practically no influence on the results.

Most individuals are definitely stimulated by competition, but some are less efficient. Of the 61 tested,

1. Five individuals made their best lifts in set one.
2. Nine individuals made their best lifts in set two.
3. Forty-four individuals made their best lifts in set three.
4. One individual made equal lifts in sets one and two.
5. One person made equal lifts in sets one and three.
6. Two individuals made equal lifts in sets two and three.[17]

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[17] Ibid., p. 40.

The author recognizes the fact that this experiment is open to criticism both in technique and validity of findings but does feel that it probably is a contribution of value and that better procedures are forthcoming which will be of inestimable value to the athletic coach, particularly in measuring the temperament of athletes.

Study 7.

Most of the studies on learning and skill have taken it for granted that a skill is a pattern of bodily movement notable either for its absolute perfection or for the maximal speed at which it may be executed.

Problem. It was the purpose of this study[18] to suggest that some so-called maximal speeds, whether at the practical limit or not, may not be maximal at all, that instead they represent nothing more than a timing or pace habit that has been set as an artificial barrier against further progress. It was also an attempt to point out that many skills cannot be

[18] Coleman R. Griffith, "Timing as a Phase of Skill," Journal of Educational Psychology, 23:204-213, March, 1932.

judged at all in terms of speed or even in terms of accuracy because the pace or the timing of the skill stands as the significant feature of it.

Procedure. The Carr maze was modified in the following way. Along the bottoms of the runways in a maze 60 x 120 centimeters, there was placed, at intervals of ten centimeters, a series of brass contact points over which a stylus could slide with no perceptible halting or jolting. These contact points find a common ground in a large brass plate upon which the whole maze rests. The stylus furnishes the other pole of a circuit which is connected through a Renshaw polygraph to the brass plate upon which the maze rests. The contact points in the alleys of the maze are so arranged that the stylus can never traverse more than ten centimeters without making a contact. As the learner goes through the maze, a record is kept, not only of the pathway pursued but of the rate at which any path has been traversed.

One group of individuals was instructed to learn the maze at a rate of their own choosing. A second group was asked to learn the maze and in so doing to move as quickly but as accurately as they could. A third group was shown the correct pathway, and a few trials were allowed to assure their knowing it. When

the pattern of movement necessary to pass through the maze was fully learned, they were asked to go through the series, some to cover each unit distance (ten centimeters) in two seconds, some to cover it in one second, and some to cover it in a half second.

The degree of attained skill was measured (1) by the number of trials it took to learn the form or the pattern of the maze, that is, the correct pathway; (2) by the number of trials necessary to learn the rate at which the maze should be run; and (3) by the degree to which the records, gained after a four weeks' interval, paralleled those gained at the end of the initial learning period.

Results.

1. Fast paces were much more difficult to acquire than slower paces.
2. In acquiring a new pace, one's problem is not to increase the old pace but to forget the old pace habit and to learn a new one.
3. Early in the learning period this new problem introduces a plateau in the learning curve.
4. Late in the learning period it occasions the practical limit and the removal of further incentive to learning.

Study 8.

Problem. The purpose of this study[19] was to determine just what the true relationship between chronological age and motor performance might be.

Procedure. These studies are divided into two groups. One group has to do with strength tests, and the other with track and field athletics.

Strength Tests. The data from which these studies on strength have been made are records of the Rogers' Physical Capacity Test made by the pupils of the public schools of Schenectady, New York, and supplied through the kindness of the supervisor of physical education for Schenectady, Mr. E. T. Grant. They were records of 2,300 boys and 1,800 girls.

To determine the relative effect of age at each level, the records were sorted by age groups, and a correlation was computed between weight and strength. The regression equation for predicting strength from weight was then derived. From these equations the predicted strength value was computed for the age following and the age before. For example, if the regression equation for the twelve-year-old group

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[19] C. H. McCloy, "The Influence of Chronological Age on Motor Performance," Research Quarterly, 6:61-64, May, 1935.

was under consideration, this equation was used to compute the predicted strength for the eleven-year-old group from the average weight for the eleven-year-olds, and was also used to compute the predicted strength for the thirteen-year-olds from the mean weight of the thirteen-year-old group. The average difference of strength as computed by the formulae from the age below and from the age above was adopted. These obtained averages were then plotted and smoothed; the results for the strength tests for both boys and girls are seen in Table II. (See page 27.)

It will be noted that in the boys' strength test there is a rapid increase in the amount of added strength for each year from thirteen to seventeen. After eighteen there is no further increase. This period corresponds to the period of active pubescent changes in the male.

In the girls' records, this rapid increase comes from twelve to fourteen years of age and corresponds to the earlier onset of puberty in the female; it declines abruptly at fifteen. It should be noted that this increase and decrease are in the age increment of strength, not in the strength itself.

TABLE II

AVERAGE ANNUAL INCREMENT OF STRENGTH

DUE TO CHRONOLOGICAL AGE ALONE[20]

(Rogers' Test, Without Lung Capacity, and with Pull-ups and Push-ups Scored by the Author's Formulae.)

Records are in pounds.

AGES	BOYS		GIRLS	
	Raw Values	Smoothed Values	Raw Values	Smoothed Values
11-12	20	20	15	15
12-13	29	30	34	34
13-14	52	55	109	109
14-15	98	100	77	77
15-16	108	105	-3	0
16-17	39	70	-10	0
17-18	59	50	-7	0
18-19	-16	0	----------	

[20] Ibid., p. 62.

Track and Field Athletics.

> The data from which the studies on track and field athletics were made were as follows: (1) 1,000 elementary school boys from the Detroit, Michigan, public schools; (2) 1,300 public school girls from the elementary schools of Detroit (obtained through the courtesy of Mr. V. S. Blanchard, Supervisor of Health Education); (3) 320 cases from the Gorton High School, Yonkers, New York, (data secured from Mr. H. L. McCurdy); (4) 130 cases from Oberlin College (data secured from Mr. Dan Kinsey); (5) 319 Chinese girls, ages ranging from 8 to 23, from the public schools of Nanking, China.[21]

In this study the same procedure was used as described in the strength test above.

Results. These results are somewhat more conflicting than are those of strength. The results of the studies on the boys and girls of the elementary schools are given in Table III. (See page 29.)

> When to these elementary school results are added the smoothed values from the high school group, it will be seen that approximately the same phenomena are observed as in the strength test. Namely, there is an increase in the average point value around the ages of puberty, which later decreases and in the case of the boys ceases at seventeen. The Oberlin data mentioned above show no age differences whatsoever from seventeen on.
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> In the girls' data the maximum increase is at the period from twelve to thirteen, one year earlier than was the case with strength. Again this increase ceases at

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[21] Ibid., p. 63.

TABLE III

AVERAGE ANNUAL IMPROVEMENT IN POINTS IN TRACK AND FIELD ATHLETICS DUE TO CHRONOLOGICAL AGE ALONE[22]

(Boys, Four Events; Girls, Three Events, Scored by the Author's Scoring Tables.[23])

AGES	BOYS				GIRLS	
	Elementary[a]		High School[b]		Elementary[c]	
	Raw Values	Smoothed Values	Raw Values	Smoothed Values	Raw Values	Smoothed Values
10-11	34	34			50	50
11-12	41	41			56	56
12-13	44	53			59	59
13-14	65	65	71	73	-23	33
14-15	67	67	94	77	63	7
15-16	--	--	19	71	0	0
16-17	--	--	159	64	--	--
17-18	--	--	4	38	--	--
18-19	--	--	0	0	--	--

[a]Computed from weight.

[b]Computed from height.

[c]Computed from both height and weight.

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[22]Ibid., p. 64.

[23]C. H. McCloy, Measurement of Athletic Power (New York: A. S. Barnes and Company, 1932).

fifteen. In the Chinese data a somewhat different method of analysis was used, but there was a definite increase up to the age of fifteen. Beyond this there is no further increase. This corresponds exactly to the facts found in the American data.

The facts presented above would lead us to think that there is a high probability not only that the relationship between age and athletic or other motor performances is not a linear one, but that the relationships between height and performance, and weight and performance, are also non-linear.[24]

Study 9.

Problem. It was the purpose of this investigation[25] to study the relation of intramural participation to the academic grades not only of freshmen but also of sophomore, junior, and senior university students.

Procedure.

The data for the investigation were obtained from the academic records at the Office of the Registrar, the intelligence test records of the Department of Psychology,

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[24]C. H. McCloy, "The Influence of Chronological Age on Motor Performance," Research Quarterly, 6:61-64, May, 1935.

[25]C. W. Hackensmith and L. Miller, "A Comparison of the Academic Grades and Intelligence Scores of Participants and Nonparticipants in Intramural Athletics at the University of Kentucky," Research Quarterly, 9:94-99, March, 1938.

and the intramural participation record of the 1935-36 school year of the Intramural Division of the Department of Physical Education, University of Kentucky.

The average academic standings and intelligence test scores of 322 students were used in this study. These students were classified as participants and nonparticipants in intramural athletics and numbered 161 in each group.

In the above groups, participants and nonparticipants, an equal number of students was used in each class: 48 freshmen, 41 sophomores, 38 juniors, and 34 seniors. The names of students in the participant group were taken directly from the intramural records, including only those who engaged in team sports and who participated in more than three activities. The 161 participants in intramural athletics engaged in an average of six different activities including team sports. The students used in the nonparticipant group were secured by random sampling from the registrar's records.

The method employed by the University of Kentucky for computing grade letters into grade points was used in this study. The following table will explain this method.

Grade	Credits	Points per Credit	Grade Points
A	3	3	9
B	3	2	6
C	3	1	3
D	3	0	0
E	3	0	0

The average grade or standing is computed by dividing the total number of credits into the total number of grade points. In this investigation the average grades or standings of participants and nonparticipants were determined for the school year 1935-1936.

The mean average academic grades of the participants and nonparticipants in intramural athletics and the standard error of the means were calculated for the freshmen, sophomore, junior, and senior groups.

The mean average of the intelligence test scores of the participants and nonparticipants in intramural athletics and the standard error of the means were determined for the freshmen, sophomore, junior, and senior groups.[26]

Results and Conclusions.

TABLE IV*

MEAN ACADEMIC GRADE AND SIGMA RANKING IN INTELLIGENCE OF PARTICIPANTS AND NONPARTICIPANTS IN INTRAMURAL ATHLETICS[27]

CLASS	Mean Academic Standing		Mean Sigma Ranking	
	Nonpar-ticipants	Participants	Nonpar-ticipants	Participants
Freshmen	1.06	1.19	.035	.095
Sophomore	1.20	1.23	-.265	.120
Junior	1.11	1.33	.050	.110
Senior	1.27	1.52	.215	.465

* The scores of each year's intelligence tests at the University of Kentucky are placed in a sigma range of ±3 with zero as the mean average of the freshman class.

The results of the study suggest:

1. That freshmen participation in intramural athletics does not have a marked effect upon the student's academic grade.

[26] Ibid., p. 95-96.

[27] Ibid., p. 96.

2. That participants in intramural athletics as a whole have a higher mean intelligence sigma ranking than those who do not participate.

3. That sophomore participants show a slightly higher mean academic grade and that junior and senior intramural participants demonstrate a definitely higher mean academic grade than do nonparticipants of the same classes.[28]

Study 10.

Purpose. It was the purpose of this study[29] to try to determine whether there is any way in which we may weigh the evidence, apart from mere personal prejudice, and discover from objective data what, if any, are the values of physical activity, and which students are most likely to be benefited by exercise.

Procedure. This study was based upon a compilation of the records of 432 boys of a specific high school, the records covering from one to four years of high school attendance. This study was made in the Palo Alto, California, High School during the school year 1935-1936.

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[28] Ibid., p. 99.

[29] Howard C. Ray, "Inter-relationships of Physical and Mental Abilities and Achievements of High School Boys," Research Quarterly, 11:129-141, March, 1940.

After the records were compiled and correlations computed, the following tables were made as a means of interpreting the results. (See Tables V and VI, pages 35 and 36.)

Conclusions. Athletic participation seemed to be beneficial to the student in a number of different respects. The athlete grew faster and was less subject to extreme variations in weight. Contrary to general opinion, athletics seemed to have a greater effect in correcting the underweight than the overweight condition.

An unexpected result of this study was that aspect related to the boy who works, as he seemed to be handicapped to some extent academically and to a great extent physically. Play activity of a physical nature, no longer a part of the life of the average family at home, was evidently still a necessity for normal development of boys of high school age, and that need was not met by the physical activities of a work life. Work, however, was by no means so great a handicap to a boy's academic success as was a deliberate choosing not to participate in competitive activity.

The greatest contrast in the entire study was that between students who resisted physical educa-

TABLE V

CORRELATIONS OF TRAITS BY I. Q. GROUPS*[30]

	I. Q. 121-147	I. Q. 106-120	I. Q. 96-105	I. Q. 81-85
Mental Ability and Mental Achievement	+.24	+.06	-.12	-.09
Mental Ability and Physical Ability	-.19	-.11	+.16	+.27
Mental Ability and Physical Achievement	+.03	+.17	+.08	+.12
Mental Ability and Citizenship Service	+.59	+.33	+.11	+.54
Mental Achievement and Physical Ability	+.24	+.09	+.16	+.26
Mental Achievement and Physical Achievement	+.07	+.25	+.12	+.76
Physical Ability and Physical Achievement	-.08	-.28	+.03	+.03
Physical Ability and Citizenship Service	+.21	+.18	+.18	+.54
Physical Achievement and Citizenship Service	+.23	+.14	+.30	-.08

* Four groups only are used in this tabulation because the senior class contained no members with I. Q. below 80.

[30] Ibid., p. 135.

TABLE VI

COMPARISON BASED ON ATHLETIC PARTICIPATION[31]

	Senior Class	All Athletes	Team Athletes	Indiv. Athletes	Out by Choice	Out for Work
Age	17.11	17.10	17.11	17.10	18.3	18.4
I. Q.	109.2	111	107	116	111	102.2
Weight	138	140	141	138	138	129
Height	67.8	68.6	69	68	68	67
No. overweight	11	3	3	0	3	1
Percent overweight	8	3.5	6		15*	6
No. underweight	23	12	7	5	6	6
Percent underweight	16	14	13	15	30*	36*
Annual growth	1.6	1.7	1.55	1.92	1.51	1.3
Phys. Ed. grade	73.92	83.32	81.36	86.4	50.68	74.16
Physical ability	469	513	546	458	438	415
Physical achievement	58.7	62	60	65	56	49.5
Academic grade	61.95 (B-)	65.35 (B+)	62.15 (B)	70.4 (A-)	54.25 (C-)	57.7 (C)
Average No. of failures	.8	.5	.67	.3	1.7	1
Leadership record	30.8	41	26	65	2.7	4
Citizenship record	70	100.4	93	112	19.8	14

*Apparent discrepancies in percentages in relation to the total number of the group are caused by the fact that only a part of these two groups have had school physical examinations.

Senior records only were used in this table because of the greater reliability of the four-year record.

[31] Ibid., p. 137.

tion and those who requested special permission to participate. The inferiority of the group who resisted physical activity was characteristic in every respect except native mental capacity, and the superiority of the handicapped was also persistent in every trait except I. Q., which was lower than the general average.

Within the limits of an I. Q. group, this study showed physical ability a more reliable predictor of academic standing than I. Q. At the low I. Q. levels, some unmeasured quality seemed to influence achievement of all sorts in the individual who persisted in school attendance.

It may also be said that the values indicated by this study are attainable only in case the program is arranged to meet all degrees of physical need and in case the athletic program is administered with properly conceived educational objectives and the participation of an entire student group in mind. Although this is true, no school should ever have a physical activity or athletic program conceived or administered in any other way. The values of a program are measured by its potential power. Failure to attain those values or corruption of the force to produce negative results is a criticism of the administration of the program.

Study 11.

Purpose. This study[32] was made in an effort to find an answer to the following questions:

1. What effect does the athletic program have upon academic progress?
2. Does the time and effort required to produce finished athletic teams compare favorably with the benefits derived, either by the participants or by the institution involved?
3. Are athletes as a group inferior in both scholastic ability and interest?
4. Does the athletic program detract from the academic progress of the institution?

Procedure. The data used include the percentile rank in the University of Iowa qualifying and placement examination, the grade point rank, the grade point average, by semester, of each man, and the athletic success of each athletic team as measured by its conference standing. The period from September, 1935, to June, 1940, was used for the study. The study involved 577 athletes and included 432 major and 145 minor letter winners. They were distributed among the sports

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[32] W. W. Tuttle and F. S. Beebee, "A Study of the Scholastic Attainments of Letter Winners at the State University of Iowa," Research Quarterly, 12:174-180, May, 1941.

as follows:

Football	145	Golf	37
Basketball	69	Wrestling	36
Baseball	73	Gymnastics	35
Track and field	91	Cross Country	16
Swimming	70	Tennis	15

Results. By the analysis of the data the authors found this study to show--

1. During three of the years studied, the letter winners were slightly below the Liberal Arts and Commerce mens' averages in scholarship, while for one year they were slightly above.
2. Gymnastics and golf letter winners stood at the top of the athletic group scholastically, while baseball, basketball, and football stood at the bottom.
3. The athlete definitely suffered scholastically during the semester in which he was competing.
4. In general, the scholastic attainments of letter winners at the University of Iowa were on the upgrade. This was especially true in football, basketball, and wrestling.
5. Scholastic attainments and athletic success were directly related. This was shown by the fact that for the most part the scholastic attainments of letter winners during championship

years either were the highest or well above the average of the group for the period studied.

Study 12.

Problem. "The specific purpose of this investigation[33] was to study experimentally the relationship existing between intelligence and athletic achievement."[34]

Sources of Data and Procedure.

1. Two hundred and ninety-five men between the ages of 18 and 21 of the required physical education classes of the Southern Illinois State Teachers' College acted as subjects for this experiment.

2. Intelligence quotients were determined through the medium of the Otis Self-Administrating Tests of Mental Ability, Higher Examination (Form B).

3. The 295 cases were divided into 'classes' for fairness in athletic competition by means of the McCloy method of classification.

4. Athletic achievement scores were secured by obtaining individual records in eight events, namely, the standing broad jump, running broad jump, 100-yard dash, 440-yard dash, 12-pound shot-put, javelin throw,

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[33]Vincent G. DiGiovanna, "A Comparison of the Intelligence and Athletic Ability of College Men," Research Quarterly, 8:96-104, October, 1937.

[34]Ibid., p. 97.

baseball throw for distance, and push-ups, and by transposing them into a single percentage score through the use of a specially devised scoring chart.

5. Motor ability ratings were attained by using Brace's Motor Ability Tests and by the further application of the McCall T-Scale technique for scaling tests in physical education.

6. The rank method and foot-rule formula were employed to secure the coefficient of correlation between Intelligence Quotient, Athletic Achievement, and Motor Ability within the various athletic classes, and conclusions are derived from the findings.[35]

The following correlation table is of particular interest.

TABLE VII

CORRELATIONS OF VARIOUS MEASURES OF COLLEGE MEN[36]

Factors Correlated	No. of Cases	Correlation r
Age and Athletic Achievement	295	.03
Height and Athletic Achievement	295	.04
Weight and Athletic Achievement	295	.28
Motor Ability and Athletic Achievement	278	.31
Height and Weight	295	.55
Motor Ability and I.Q.	275	.07

[35] Ibid., p. 97.

[36] Ibid., p. 101.

Conclusions.

1. There is no definite correlation between intelligence and athletic ability, and intelligence and motor ability in college men. This may be interpreted to mean that regardless of a college man's I.Q., he may be a 'good, bad, or indifferent' athlete. Vice versa, regardless of a college man's athletic attainments, he may fall anywhere in an I.Q. rating scale. One cannot be determined by the other.

2. There is a small but definite correlation (.31) between motor ability and athletic achievement which substantiates the findings of others.

3. Between the years 18-21, age and height have no definite bearing on general athletic achievement, but weight has a definite, although low, correlation (.28).[37]

Study 13.

Purpose.

The purpose of this study[38] was two-fold: (1) to discover to what extent intelligence is related to height and weight among a group of college freshmen of both sexes; (2) to determine in what way the dominance-submission aspect of personality of these subjects is correlated with height and weight measurements.[39]

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[37] Ibid., p. 101-102.

[38] Warren C. Middleton and Donovan C. Moffett, "The Relation of Height and Weight Measurements to Intelligence and to Dominance-Submission Among a Group of College Freshmen," Research Quarterly, 11:53-59, December, 1940.

[39] Ibid., p. 53.

Method. Measurements of 490 DePauw University freshmen were included in the study. Age was not considered a factor since 81 per cent were either seventeen or eighteen years old.

Height was measured in centimeters with the students' shoes removed. Weight was measured in kilograms with all the students' clothing removed. The Bernreuter Personality Inventory was given, and only the scores on dominance-submission (the B_4-D Scale) were used for this study. Intelligence scores on the American Council on Education Psychological Examination (1939 edition) were used.

Results. The first table (see Table VIII, page 44) shows the means and standard deviations of the 490 measurements of height, weight, intelligence, and dominance-submission.

In reading this table, one should keep in mind the fact that the dominance percentiles are derived from separate sex norms.

The next table (Table IX, page 45) shows the product-moment correlations between height and intelligence, weight and intelligence, height and dominance-submission, and weight and dominance-submission for the men and women subjects and for the total group.

TABLE VIII

MEANS AND S.D.'s OF 490 COLLEGE FRESHMEN WITH RESPECT TO MEASUREMENTS OF HEIGHT, WEIGHT, INTELLIGENCE, AND DOMINANCE-SUBMISSION[40]

TYPES OF MEASUREMENT	MEAN			STANDARD DEVIATION		
	Men (N=235)	Women (N=255)	Total (490)	Men (N=235)	Women (N=255)	Total (N=490)
Height[a]	176.0	164.6	170.0	7.1	4.5	5.7
Weight[b]	66.5	55.0	60.6	9.4	6.8	9.5
Intelligence[c]	111.9	96.4	104.1	31.2	27.8	28.6
Dominance-Submission[d]	58.5	50.4	54.8	29.3	26.6	28.3

[a] In terms of centimeters.

[b] In terms of kilograms.

[c] In terms of raw scores as measured by the American Council on Education Psychological Examination (1939 Edition).

[d] In terms of percentiles for men and women from the Bernreuter Personality Inventory.

[40] Ibid., p. 57.

TABLE IX

CORRELATIONS BETWEEN HEIGHT AND INTELLIGENCE, WEIGHT AND INTELLIGENCE, HEIGHT AND DOMINANCE-SUBMISSION, AND WEIGHT AND DOMINANCE-SUBMISSION [IN CASE OF MEN AND WOMEN] [41]

Measurements Correlated	Men N=235		Women N=255		Total N=490	
	r	PEr	r	PEr	r	PEr
Height and Intelligence	.25	.04	.29	.03	.22	.03
Weight and Intelligence	.18	.04	.19	.04	.15	.03
Height and Dominance-Submission	.04	.05	.58	.04	.30	.03
Weight and Dominance-Submission	.08	.05	-.24	.05	-.10	.03

Here height showed a low positive correlation to intelligence; sex differences in size of correlation were negligible.

Weight did not correlate with intelligence as highly as did height.

Whereas there was no relationship between height and dominance for the men, tall women seem to be definitely dominant.

There was no relationship between weight and dominance among men, but there is a slight tendency for heavy women to be submissive.

[41] Ibid., p. 58.

Study 14.

Problem. The problem of this study[42] was to determine some of the fundamental differentials in the case of those junior high school boys who enter whole-heartedly into the common social big-muscle play activities of the physical education program and those who tend to be "fringers" or who have to be unduly encouraged to "get into the game." In other words, it was a study of the "actives" versus "fringers."

Procedure. The male teachers of physical education in four junior high schools of Springfield, Ohio, and in one in Ludlow, Massachussetts, were asked to provide a list of ten or a dozen white boys who, from their class behavior, seemed disinclined to enter whole-heartedly into the activities of the program. In this study these are henceforth called the "fringers." Instructions to teachers eliminated boys with obvious physical or mental handicaps.

Out of the resulting sixty boys, fifty were chosen at random for this study.

About a month later the same teachers were asked

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[42]Charles C. Cowell, "A Study of Differentials in Junior High School Boys Based on the Observation of Physical Education Activities," Research Quarterly, 6:129-136, December, 1935.

to provide a list of ten or a dozen white boys who did enter whole-heartedly and spontaneously into the activities of the physical education program. These boys will henceforth be referred to as "actives." This provided for each fringer subject an active control.

The data in this study resulted from the use of three devices: the "Boys' Citizenship Ballot," the observation charts, and the trait-cards.

Results.

Junior high school boys who were disinclined to enter whole-heartedly into the social big-muscle play activities of the physical education program tended to answer the following description as determined by the techniques employed in this study:

1. They were less socially acceptable to other boys and girls.

2. They tended to regard others as socially more acceptable than they are regarded by other boys and girls.

3. They were considered much less able by other boys and girls to fulfill school positions demanding qualities of virtue than were actives.

4. They showed a marked tendency to exhibit those negative behavior trends which psychiatrists, mental hygienists, and clinicians indicate are symptoms of great clinical value.

Statistical handling of the data in this study gave this additional indication:

1. From the standpoint of social adjustment and happiness fringer boys, in general, are against tremendous odds when one considers the apparent presence of personality differentials which have negative social stimulus value.[43]

Study 15.

Much has been claimed for physical education in the past. In addition to the development of muscles, such traits as obedience, self-sacrifice, honesty, and friendliness were said to be improved.

Various tests have been given to check upon the improvement in motor skills, but little has been done to measure objectively the mental and character changes which may occur from such participation.

Purpose. The central purpose of this experiment[44] conducted by Mr. Clevett, a Y. M. C. A. instructor, was to ascertain whether such forms of behavior as honesty can be developed in a program of physical education activities, and whether there would be less improvement in motor skills as a re-

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[43] Ibid., p. 136.

[44] Melvin A. Clevett, "An Experiment in Physical Education Activities Related to the Teaching of Honesty and Motor Skill," Research Quarterly, 3:121-127, January, 1932.

sult of such participation.

Procedure. The members of a boys' gymnasium class in the Y. M. C. A. of Chicago were the subjects of this experiment.

Twenty boys were in the experimental group and twenty-two in the control group.

They were pre-tested for chronological age, intelligence, socio-economic status, physical ability, and honesty. With the experimental group the teaching always followed a definite sequence which started the individual with the simpler movements, going progressively to the more complex.

In the program relating to honesty the incidental method was followed, utilizing the behavior situations which arose as an opportunity to present honesty as a more desirable form of behavior than cheating.

With the control group no emphasis was placed upon the teaching of fundamental skills in games, gymnastics, or swimming; and no emphasis was placed upon character education.

Results. The findings in this experiment indicated that the following statements are true:

I. Behavior

1. The form of behavior called honesty can be influenced in a program of physical education activities over a period of three months.

2. Definite attempts to develop honest behavior seem to be about three times as effective as where dependence is placed on honesty as a by-product of an activity.

3. Skills are not sacrificed when a definite attempt is made to develop honest behavior.[45]

II. Development of Motor Skills

1. Skills in gymnastics, athletics, and aquatics can be increased during a three months' period, and in measurable amounts.

2. Definitely planned teaching is much more effective in developing motor skills than mere practice of the activity without instruction. The ratio is between two and three to one.[46]

Study 16.

Problem.

Briefly stated, the problems of this study[47] were as follows:

1. What specific physical education activities

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[45] Ibid., p. 127.

[46] Loc. cit.

[47] Melvin A. Clevett, "The Interests and Participation of Boys in Voluntary Physical Education Activities," Research Quarterly, 5:27-42, October, 1934.

do Y. M. C. A. boys ten to seventeen years of age like or prefer and in which do they participate?

2. What specific physical education activities and what types of activities do prepubescent, pubescent, and postpubescent boys prefer and in which do they participate most frequently?

3. Do strong and heavy boys prefer more vigorous activities than do boys who are not so strong or who are of a more slender body build?

4. Do boys like the activities which physical educators consider to be the most valuable for the all-round development of boys of specific ages?

5. What is the relationship, if any, between the activities which boys say they like or prefer and the activities in which they say they participate?[48]

Procedure. Mr. Clevett conducted an experiment with boys in Y. M. C. A. work. Twenty-three associations located in seven central states were used for the study. Two hundred and fifty-eight boys made up the experimental group, and 537 boys constituted the control group. These boys were divided into three groups based upon maturity as follows: prepubescent, no pubic or axillary hair observed; pubescent, a few long, straight pubic hairs observed; postpubescent, the pubic hair bunchy or curled, and axillary hair present.

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[48] Ibid., p. 28.

Questionnaires were distributed on September 10, 1932, December 12, 1932, and March 25, 1933.

Results. Analysis of the data received on the questionnaires revealed the following answers to the problems in question.

With slight exceptions, the following activities were liked and preferred by all three groups of Y. M. C. A. boys, ages ten to seventeen: basketball, hard baseball, swimming, football, volleyball, tennis, soft baseball, running races, skating, and soccer.

From 61 to 65 per cent of all preferences and participation of the three physical maturity groups were accounted for in four activities--basketball, hard baseball, swimming, and football.

The percentages of the total preferences which were for team games are as follows: prepubescent, 64 per cent; pubescent, 82 per cent; postpubescent, 73 per cent. The percentages of total participation which were for team games are 68, 70, and 73 per cent respectively.

Moderately vigorous activities were selected about equally by all levels of strength and body build.

The findings of this study indicated that boys like the activities which leaders in physical education think are most valuable for the all-round de-

velopment of the boys.

One of the significant findings of this study was that interest far exceeds participation, although a part of the study showed participation to exceed preferences in a few instances.

Study 17.

Insofar as interest may be considered symtomatic of ability, participation may be considered an indicator of mechanical ability and skill.

Problem. This was a study[49] to learn the extent to which unselected children engage in certain activities usually alleged to require motor ability or mechanical skill.

Method. Over five thousand children were asked to check from a comprehensive and catholic list of two hundred play activities only those activities in which they had voluntarily engaged during the preceding week. In order that seasonal differences might be allowed for, the list was checked by the above groups

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[49]Harvey C. Lehman and Paul A. Witty, "Sex Differences: Interest in Tasks Requiring Mechanical Ability and Motor Skill," Journal of Educational Psychology, 21:239-245, April, 1930.

on each of three different dates: November 7, 1923, February 20, 1924, and April 30, 1924. The same list of activities was checked on each of these dates and the same procedure in administering the test was used in each testing.

Results and Conclusions. The writers were concerned only with showing the differences in the mechanical background of the sexes. The data they collected gave clear evidence that boys participated in certain motor activities more frequently than girls. The data suggest that marked sex differences in voluntary participation in various activities may be assumed logically to be indicative of interest in these activities. The nature of the motor activities suggests that the varying experiences of the sexes are potent forces in effecting the differences. These experiences may be due to social customs, attitudes, and values. The latter fact seems so conspicuous as to suggest that alleged innate differences in motor ability previously reported may be due to differences in attitude and experience, the product almost solely of environmental factors.

Study 18.

Purpose. The main problem of this investigation[50] was to determine the nature of the relationship between "quickness of bodily movement" and success in athletics.

Procedure. First of all, it was necessary to select movements of a general nature that were rather common to all sports. Movements forward and to the side which involved the use of arms, legs, and body were decided upon.

A special instrument[51] had to be devised for measuring the timing of these movements.

Reliability of the instrument and technique was checked and found to be satisfactory.

The students used in this study consisted of 359 athletes and 227 non-athletes from three institutions--the University of Minnesota, the Columbia Heights (Minnesota) High School, and the University of Minnesota High School. An athlete was defined as a person who had been retained as a member of a freshman or varsity athletic squad, while the non-athlete was an

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[50] Louis F. Keller, "The Relation of 'Quickness of Bodily Movement' to Success in Athletics," Research Quarterly, 13:146-154, May, 1942.

[51] Ibid., p. 147.

able-bodied boy or man who had not been a member of any organized athletic squad in his institution.

Athletic success was determined by two methods of rating, one of which was based upon performance and the other upon estimates by coaches and physical education teachers.

For performance each subject was given a rating according to the schedule below.

A -- Any person who was awarded a letter or similar award for athletic competition.

B -- Any person who played in regular games but did not participate enough to receive a letter or similar award.

C -- Any person who was retained on a squad but did not play in regularly scheduled games.

D -- Any person who tried out for a team but was not included in the squad roster.

E -- Those individuals who did not try out for a team or were not out for a varsity sport.

For the rating based upon the estimates of coaches and physical education teachers, the schedule below was used. Those making the ratings were asked to give each subject on their list a letter rating based on the individual's ability in comparison with all athletes they had had under their direction in the given sport. The standards for rating were:

A -- Excellent -- approximately the upper 10%

B -- Very good -- approximately the next 20%

C -- Medium -- approximately the next 40%

D -- Fair -- approximately the next 20%

E -- Poor -- approximately the next 10%.[52]

A total of thirty-six measurements was taken of each subject.

Conclusions. The results established or indicated the following conclusions:

1. There is a positive relationship between the ability to move the body quickly and success in athletic activities.

2. The requirements in quickness of bodily movement are not the same for all sports. A person with relatively slow total body reaction time has a better chance of attaining success in the more individual activities such as gymnastics, swimming, and wrestling than in those sports in which he is required to react to rapidly changing conditions and to the movements of several team mates and opponents, such as is found in baseball, basketball, football, and the like.

Men who are not quick enough to achieve proficiency and success in these highly competitive team games might be guided into the more individual type of sport and possibly become outstanding performers.[53]

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[52] Ibid., p. 149.

[53] Ibid., p. 154.

CHAPTER III

SUMMARY AND CONCLUSIONS

Summary.

Distribution of Practice

Cozens (5) found that

> twenty-eight to thirty periods of practice and instruction were not sufficient to cause any plateaus in the learning curves of motor skills. This indicates that instruction and practice might very profitably go on for some time.[54]

Whole vs. Part Method

Shay (17) found the whole method of learning to be superior to the progressive-part method as they applied to motor skills in gymnastics. He believes this suggests means of improving correct methods of instruction in such skills as swimming, track, golf, and tennis.

Cross (6) in his experiment with ninth-grade boys did not find any one method to be superior as a means of teaching all of the game of basketball. His evidence showed the whole method to be superior in teaching the simpler unitary skills, the whole-part method was superior in teaching those skills that are intellectually complex as well as complex from a motor

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[54]All quotations found in Chapter III have been properly footnoted in Chapter II.

point of view, and the minor game method was superior in teaching skills of intermediate degree of complexity which are easily carried over from simpler games in identical form.

Guidance Through Observation

Cozens (5) in his experiment found no evidence to show that possible observation is of assistance in acquiring technique. He concluded that apparently we learn only by doing. He also found the learning curves of "big-muscle" events to follow the same general tendencies as many other curves involving mental reactions and small muscle groups. Furthermore, retention of learned physical skills exceeds mental retention as is evidenced by the fact that efficiency, as a rule, is not lowered by vacation periods.

Effect of Fear on Skillful Performance

Jackson (11) in his study with aerial gymnasts found that any situation which established the element of fear in the mind of the performer was detrimental to the efficiency of that performer. This he found to be true with the expert, the beginner, and all degrees between.

Fear tended to be eliminated with successful experience.

> There seemed to be some correlation between the mental and the physical state of the performer, his performance, and his susceptibility to fear. A subject who was depressed, or who was tired or ill, could seldom perform as well as he would under more normal conditions. Likewise, fear was more apt to be present under these circumstances. Fear developed in this way not infrequently resulted in hard falls to the net, with the possibility of injury, and nearly always a loss of confidence. Likewise, lack of proper rest, particularly sleep, coupled with excessive effort expended in school work, placed most of the subjects below normal in their performance.

Effect of Competition on Performance

Berridge (1) collected data to show that most individuals are definitely stimulated by competition, but that some are less efficient. About three out of four are more efficient.

Griffith (9) concluded from his experiment that whenever the tempo of an activity is increased it is necessary for the performer to learn a new pace. The slower pace is not gradually stepped up, but a new habit with the desired pace must be substituted for the old one. Fast paces are much more difficult to acquire than slower paces.

Growth Curve

McCloy (14) found evidence to the effect that there is an increase in the age increment of strength of both boys and girls up to their respective ages of

puberty. The increment of strength was greatest during the pubescent period, and there was no further increment after this period. In the case of girls there was a sharp decrease at fifteen years of age. (Note: This increase and decrease is in the age increment of strength and not in the strength itself.)

His data indicated

> that there is a high probability not only that the relationship between age and athletic or other motor performance is not a linear one, but that the relationships between height and performance, and weight and performance, are also non-linear.

DiGiovanna (7) found that "between the years 18-21 age and height have no definite bearing on general athletic achievement, but weight has a definite, although low, correlation (.28)."

Comparison of Scholarship of Athletes and Non-Athletes

Hackensmith and Miller (10) in a study conducted at the University of Kentucky, comparing the academic grades and intelligence scores of participants and non-participants in intramural athletics, found

> that (1) freshmen participation does not have a marked effect upon the students' acedemic grade; (2) participants in intramural athletics, as a whole, have a higher mean intelligence sigma ranking than those who do not participate; (3) sophomore participants show a slightly higher mean academic grade, and junior and senior intramural participants demonstrate a definitely higher mean academic grade than

do non-participants of the same classes.

Ray's (16) study of high school boys showed a great contrast between students who resist physical education and those who request special permission to participate.

> The inferiority of the group who resisted physical activity was characteristic in every respect except native mental capacity, and the superiority of the handicapped was also persistent in every trait except I. Q., which was lower than the general average.

Within the limits of an I. Q. group, this study found physical ability a more reliable predictor of academic standing than is relative I. Q. At the low I. Q. levels, some unmeasured quality seemed to influence achievement of all sorts in the individuals who continued in school. Tuttle and Beebee (18) found that during the five-year period covered by their study at the University of Iowa, letter winners were slightly below the liberal arts and commerce men's averages in scholarship for three of the years and for one year they were slightly above.

Relation of Scholastic Attainment to Athletic Achievement

The data collected by Tuttle and Beebee (18) indicated that scholastic attainments and athletic success are directly related.

> This was shown by the fact that for the most part the scholastic attainments of letter winners during championship years were either the highest or well above the average of the group for the period studied. Gymnastics and golf-letter winners stood at the top of the athletic group scholastically while baseball, basketball, and football stood at the bottom. The data also clearly showed that the athlete suffers scholastically during the semester in which he is competing.

Relation of Intelligence to Athletic Achievement

DiGiovanna (7) as a result of his study found that "there is no definite correlation between intelligence and motor ability, and intelligence and athletic ability in college men." He interpreted this to mean that regardless of a college man's I. Q. he may be a "good, bad, or indifferent" athlete. Vice versa, regardless of a college man's athletic attainments, he may fall anywhere in an I. Q. rating scale. One cannot be predicted by the other.

Relation of Height and Weight to Intelligence

Middleton and Moffett (15) found in their study of college freshmen that there was a slight positive correlation between height and intelligence (.25 for men and .29 for women). Weight and intelligence showed a lower correlation than height and intelligence (.18 for men and .19 for women).

Relation of Height and Weight to Personality

The study of Middleton and Moffett (15) revealed no relationship between height and dominance for the men, but tall women seemed to be definitely dominant. There was no relationship between weight and dominance among men, but there was a slight tendency for heavy women to be submissive.

Relation of Physical Activity to Personality

Cowell's study (4) found that those high school boys who are disinclined to enter whole-heartedly into the social big-muscle play activities of the physical education program are less socially acceptable to other boys and girls. They tend to regard others as socially more acceptable than they are. They are considered much less able by other boys and girls to fulfill school positions demanding qualities of virtue than are those boys who participate whole-heartedly. The inactives show a marked tendency to exhibit those negative behavior trends which psychiatrists, mental hygienists, and clinicians indicate are symptoms of great clinical significance. Cowell also found indications that, from the standpoint of social adjustment and happiness, these boys who do not enter whole-heartedly into the big-muscle play activities are for

the most part against tremendous odds because of the apparent presence of personality differentials which have negative social stimulus value.

Character Teaching Through Physical Activity

A study of a Y. M. C. A. class of Chicago by Clevett (2) revealed that the form of behavior called honesty can be influenced in a program of physical education activities over a period of three months. It also showed that a definite plan to develop honest behavior was about three times as effective as where dependence is placed on honesty's being developed as a by-product of play activity.

Interests of Boys in the Field of Physical Activity

Clevett (3) found that boys did not participate most in those activities in which they held the greatest interests. This was probably due to environment, facilities, etc. A boy cannot swim if there is no swimming pool available. For the boys ten to seventeen of the Y. M. C. A.'s studied by Clevett, interests were greatest in basketball, hard baseball, swimming, football, volleyball, tennis, softball, running races, skating, and soccer.

From 61 to 65 per cent of all preferences and participation can be accounted for in four activities--

basketball, hard baseball, swimming, and football.

Team games were preferred by 64 per cent of the prepubescent group, 82 per cent of the pubescent group, and 73 per cent of the postpubescent group.

One of the significant findings of this study was that interest far exceeds participation although a part of the study showed participation to exceed preferences in a few instances.

Sex Differences

The data collected by Lehman and Witty (13) gave clear evidence that boys participate in certain motor activities more frequently than girls. The nature of the motor activities suggests that the varying experiences of the sexes are potent forces in affecting the differences. These experiences may be due to social customs, attitudes, and values. This fact seems so conspicuous as to suggest that alleged innate differences in motor ability previously reported may be due to differences in attitude and experience, the product almost solely of environmental factors.

Reaction Time

Keller (12) found a positive relationship between the ability to move the body quickly and success in athletics. Some sports require more speed than others.

Hence, an individual may not move fast enough to be successful in a team game where he is required to react to rapidly changing conditions and to the movements of several team mates and opponents, such as are found in baseball, basketball, and football, and yet may move fast enough to be outstanding in an individual activity such as swimming and wrestling.

Miscellaneous

DiGiovanna (7) found "a small but definite correlation (.31) between motor ability and athletic achievement which substantiates the findings of others."

Ray (16) found that the athlete grew faster and was less subject to extreme variations in weight. Contrary to general opinion, athletics seemed to have a greater effect in correcting the underweight than the overweight condition.

> An unexpected result of this study was that aspect related to the boy who works. As he seems to be handicapped to some extent acadmically and to a great extent physically, play activity of a physical nature, no longer a part of the life of the average family at home, is evidently still a necessity for normal development of boys of high school age, and that need is not met by the physical activities of a work life. Work, however, is by no means so great a handicap to a boy's academic success as is a deliberate choosing not to participate in competitive activity.

Griffith (8) found that, in baseball, the total performance of hitting and getting out of the box toward first base is the essential psychological fundamental of the whole situation, and it is just this fundamental which is practiced least. The results showed that the average batter consumed as much time in getting out of the batter's box and covering the first fifteen feet as was required to travel the last seventy-five feet. It was found, moreover, that this relatively long time was consumed in recovering from the completion of the batting stance and getting into the proper running stance.

In basketball Griffith (8) found that the causes of missed free throws, at first, were both errors of distance and direction. However, the usual procedure of practice resulted in a very marked improvement in the direction errors with practically no improvement in the distance errors. Shooting free throws blindfolded resulted in a marked improvement of the distance errors. Here is a case, then, where the psychological factor of vision in relation to throwing makes a big difference in the rate at which skill is gained, and these results lay emphasis upon what the coach should do to change methods of practice so that distance errors may be eliminated along with direc-

tion errors.

In a study on the way athletes sleep, Griffith (8) found that the average sleeper goes to bed and moves some portion of his body once every ten or fifteen minutes during the night. Movements are just as likely to occur during any given hour as at any other and are likely to be just as vigorous at one time as anyother. The individual who gets the normal amount of movement during the night is the one who awakens refreshed as contrasted to the one who "sleeps like a log" and is not refreshed in the morning.

In another study Griffith (8) found that measuring the full upward jump of men gave him a measure of individual differences in fitness or in reserve strength which was surprisingly reliable when compared with the independent judgment of the coaches and with the actual performances of the men during games.

Conclusions.

1. Up to the time of the present writing the surface has hardly been scratched in the field of psychology as it relates to physical activity.
2. Reliable methods of testing and measuring such factors as attitude, character, personality, emotions, etc., must be devised before investigations can accomplish dependable results.
3. Unquestionably, mental and physical activity are interrelated. Hiking has been found to be one of the best tonics for the mind, and certainly the performance of motor skills is affected by attitudes, emotions, and the like.
4. At the present, there is conflicting evidence about certain phases, e.g., the relationship of intelligence and success in athletics.
5. Many of the investigations are open to criticism regarding the technique used although in most instances they are as good as present methods of measuring and testing seem to permit. All pioneer movements must pass through the elementary stage.
6. Many more investigations are needed. Anything which has so much to contribute to the well being, satisfaction, and success of the human body is worthy of more effort to arrive at a true solution. Per-

sonal opinions are unreliable.

7. Industry has probably been quicker to recognize the possibilities of a physical-mental relationship than have the schools. The employment of efficiency experts who have demonstrated the effects of fatigue, the value of short rest periods, the importance of recreation, etc., has certainly gone a long way toward establishing a true relationship. Schools have not been as able to show the value in terms of dollars which fact no doubt accounts largely for the leadership of industry along this line.
8. Much more information of a definite nature is needed and is certain to prove very valuable if and when it is forthcoming.

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