

THE USE OF MEASUREMENT
IN
ADAPTING PHYSICAL EDUCATION
TO
INDIVIDUAL NEEDS

by

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TABLE OF CONTENTS

	Page
I. INTRODUCTION TO STUDY.	1
A. Purpose for study	1
B. Procedure in Analyzing Army Testing Program	2
II. THE ARMY SPECIALIZED TRAINING PROGRAM.	4
A. Physical Efficiency Test.	4
1. Groups A, B, and C	5
2. Conclusions of Survey	6
C. Improving Testing Program	7
1. Define and Confine Goals	8
2. Progressive Activities	8
D. Objective of Program.	8
E. Definition of Physical Fitness.	9
F. Areas of Physical Training.	10
III. THE NEED FOR CLASSIFICATION.	12
A. Individual Differences.	12
B. Mental Age and Intelligence Quotient.	12
C. Applying Measurement to Desired Outcomes.	13
D. Ideals, Achievement, and Measurement.	14
E. Measurement to Precede Training	15
F. Criteria of Tests	15
1. Validity, Reliability, and Objectivity	15
2. Norms and Forms.	16
G. Motor Achievement	16

	Page
1. Definition	17
2. Individual Achievement Versus Muscle Development.	17
3. Brace Scale of Motor Ability Tests	17
IV. PHYSICAL EFFICIENCY TESTS FOR ARMY SPECIALIZED TRAINING PROGRAM	18
A. Battery of Events and Objectives.	19
B. Utilization of Test Scores.	20
C. Individual Instruction.	21
D. Individual Differences.	22
E. Qualified Instructors	22
F. Mass Education vs. Individualism.	23
G. The Need for Heart Tests.	23
1. Michigan Pulse Rate of Recovery Test	23
2. California Group Functional Tests.	23
3. Dr. Schneider's Test	23
H. The Need for Testing Athletic Ability	24
1. Cozen's Test for Athletic Ability.	24
V. TESTING AND TRAINING	26
A. Army Specialized Training Program Failures.	26
B. Organization of Material.	27
1. Fundamentals and Learning	27
C. Method of Presentation.	27
D. Attitude of Student	27
1. Techniques Must Fit Student.	27

	Page
E. Summary of Testing and Training	27
1. Infallibility of Tests.	28
2. Functional Tests.	29
3. Knowledge of Anatomy, Kinesiology and Physiology.	29
4. Program of Health and Physical Education.	30
VI. BIBLIOGRAPHY	31

CHAPTER I

INTRODUCTION

It is impossible to dismiss the significance of Physical Training when we analyze the health and physical statistics that were accumulated in an effort to muster a sufficient number of able-bodied men to defend and protect our inalienable rights against the aggressive nations. The war has greatly expanded the emphasis upon national physical training but only when our national strength was tested in terms of manpower. The widely neglected aims of health and physical training should receive increased attention, for when these factors were put to a test in the crisis it was discovered that the standards attainable by a large percentage of the men tested were far below the required standards. The Army Specialized Training Program recommended certain instructional material that had possibilities of attaining definite aims. These aims and instructional material will be discussed in the following study and alterations will be recommended with the ultimate intention of developing a more perfect Training Program.

In making a survey of the scores that were achieved in the physical efficiency test that was given to the Army Specialized Training Program trainees, the writer arrived at certain conclusions by analyzing and averaging the various scores yielded in the different events. In order that the reader may fully understand the terminology it will be necessary to explain how the survey was made and why certain conclusions were drawn. This survey and conclusions will be

the basis for many recommendations in testing and instructional material presented in this paper.

As the men enrolled in the Army Specialized Training Program at Oregon State College, they were tested and put into groups according to the term in which they enrolled. The groups studied in this survey ranged from small groups of 25 men to larger groups of 130 men. In referring to various groups during this survey, letters A, B, and C will be utilized to designate a certain group of trainees. Whenever the term "raw score" is being considered, it refers to the number of times an event is correctly completed or the time it took an individual to complete an event. The first four events of the tests were composed of push-ups, squat-jumps, sit-ups, and pull-ups. There was no time element involved in these events and the raw score was computed in the number of times the events were completed satisfactorily. The fifth and seventh events recorded the raw score in the number of seconds it took to complete the 100-yard-pick-a-back and 300-yard-shuttle-run. The sixth event, squat-thrust, recorded the raw score in the number of times the activity could be completed in a time limit of 20 seconds. Scoring tables are provided to determine the point score for each event. The tables are so constructed that a running point score is established for the raw scores. These raw scores and point scores are mentioned frequently in the following study. The height, weight, and age statistics mentioned in the study are averages taken from the various groups. There were no provisions made to have like characteristics in separate groups.

These facts are mentioned in the introduction because the writer deems individual characteristics and needs necessary prerequisites to instruction.

Various measuring and testing methods are introduced during the study with the ultimate intention of improving the Army Specialized Training Program. Many types of tests are discussed to emphasize the need for a wide testing program to reach the individual needs of the trainees. The instructional material should be fitted to the trainees or students after the tests discover the weaknesses and levels of performance. It is not the purpose of this study to single out any one specific test as the answer to a physical education program.

CHAPTER II

THE ARMY SPECIALIZED TRAINING PROGRAM

To arrive at the averages of the raw scores and point scores, it was necessary to find the gain or loss between the succeeding tests. Each event was averaged and the gains or losses recorded. In analyzing the first group of 39 men who participated in the program for three terms and designated as Group A, the following averages were yielded:

Group A made an unusually low gain percentage in the raw and point scores of the first event, push-ups. This group was in the program for three terms and made a maximum gain of one point in the raw score and five points in the point score. After the second test this group did not make any gain in this event. This same group of 39 men did not make a single point gain after the first test in either the fourth or fifth events. This immediately brings up the fact of instructional material utilized. To improve the score of the pull-ups, emphasis should have been given to strengthening the arm and shoulder flexor muscles. The instructional material should have included various body supporting activities. Running activities as well as leg-testing exercises may have enabled the trainees to improve the fifth event. The average age of Group A was 24 years and the weight averaged 161 pounds, presenting a group that should have made at least minor improvements if the material had been conducive to muscle development.

In examining Group B, composed of one hundred men who

were in session for four terms, a total gain of ten in the raw score of the push-ups was produced. This group produced an unusual situation when the largest increase came between the first and second tests. The gain was six in the raw score during the second test but yielded a decrease of one in the third test. This fact leads one to believe that progression was lacking. It is surmised that Group B would have yielded more uniform scores and the improvement may have been more graded had the men been classified more carefully. The writer recommends an extensive measuring program to provide classification according to age, weight, height, and motor and physical ability. Such classification would provide like characteristics in similar groups and enable the instructional material to be chosen to fit the needs of the group.

In further averaging the scores of Group B, noticeable features were uncovered in the fourth event, pull-ups. This group of 100 men, after being in the program for four terms decreased an average of two pull-ups from the first test until they took their final and fifth test. There was a decrease of two pull-ups from their first test to the second, an increase of one pull-up from the second to the third test and also an increase of one from the third to the fourth test, but again a decrease of two pull-ups in the fifth test. These men lost on the average of two pounds in weight during this period of training and gained a few months in age, emphasizing that the instructional material did not improve their muscle strength. Progression must be so graded to insure muscle development, but to accomplish this fact the instructor must

know the capacity and limitations of the trainees. To insure constant improvement, the material cannot be spasmodic. In a training program plateaus may be experienced by large decreases should not be frequent unless illness intervenes.

Group B also had a noticeable feature in the second event, squat-jumps. From the time that this group took the first test until they took it the second time, there was a total increase of twelve squat-jumps. During the third and fourth tests, these men made an improvement of four sit-ups in each of the applications, but had an average decrease of six sit-ups in the fifth testing period. The instructional material must be lacking in progression and graded intensity to produce such inconsistency in results. The writer believes that if the conditioning material was graded in its degree of intensity and difficulty that it would have been more likely to assure a steadier progress. In many cases it is probable that the progress and scores could have been influenced by the method of presentation and attitude of student. The nation being in a state of war could have had a psychological affects upon the scores. If the exercise is performed with any deviation from proper form, the muscles will not receive the correct degree of activity and hence development of muscles will be retarded. The instructor has full control as to how vigorous the activity should be and the length of time the pupils should participate to receive muscle development without injury.

The conclusions drawn from these averages and surveys seem to converge at the same point. The two groups mentioned previously in this study had a remarkable beginning as the scores

indicated from the second tests. Both A and B Group had unpredictable and unsatisfactory resulting scores in the remaining tests. The point of conclusion singles out the lack of progression in intensity which in turn was influenced by the instructional material chosen for the program. Some of the scores indicated that some of the material attained improvement. In analyzing the scores of Group C the following satisfactory results were noticed: The fifth event, 100-yard pick-a-back, yielded a decrease of two seconds in the time required to run the distance. The second test did not show any improvement but the third test produced an average gain of 20 points in the point score. This same group had a remarkable degree of improvement in the 300-yard shuttle-run. From the time of the first test until the final test was administered, the entire group had decreased the group average by three seconds and increased the point score by 30 points. Without doubt the running activities and exercises that this group participated in had produced an improvement in general muscular endurance and stamina.

The writer believes that spotty improvement is not indicative of good planning. To improve the techniques utilized in the Army Specialized Training Program it may be necessary to confine and define the various objectives in physical education. It is not possible to accomplish all the objectives in one year or numerous years. It is recommended that a few focal points be established each year and all effort be centered on attaining partial accomplishment of these few before new focal points are chosen. For example,

endurance of abdominal muscles and endurance of leg muscles may be the two focal points of the program during the winter term. This would necessitate an extensive testing program because the focal points would determine the measurement techniques utilized. If we test the criterion that we wish to develop with selected events, it will be easier to intelligently organize the instructional material. The various testing techniques mentioned in the following study will enable an instructor to choose and define focal points.

If ever a defined goal of physical training is to be reached, there must be a way established that will enable educators to set up progressive activities that will insure positive attainment. There also must be methods of measurement parallel to the activities that may be employed as a ruler of progress and success. An ideal measuring program is an indispensable technique in a physical training program because it will enable educators to determine the desired direction, focal points to be set up, and the ultimate goal which is improvement in physical performance.

When the Physical Training Program for the Army Specialized Training Program was organized it had one main objective. That objective was to prepare the trainees for the vigorous military duties that were to face them when they were assigned to combat zones. An ordinary physical education program that would be established under conditions would not be as intensive because more time could be allotted for progression. However, the activities that were utilized in the instruction periods of the Army Specialized Training Program can be used in an

extensive program that is planned for a longer period of time.

As it was in the Army Specialized Training Program, the men were subjected to a short period of training before being sent into action. Some of the men were in the program for a year or more, while many were transferred to duty after only twelve weeks of training. Whenever humans are subjected to an intensive training program, individual capacities and limitations must be given consideration. Every program should endeavor to reach the peak of physical efficiency but at the same time the program must be governed by individual limitations. The maturity of each individual as well as his basic skills must be considered before standards can be established as to the type of material that can be established that can be used for any one group. The type of measurement for judging the progress can be standardized only after the purpose of an activity and skill is defined. The ultimate attainment of any measurement of progress should be the goal as defined by the program. It is important that we plan for the future of each individual so that we can show him where he can improve himself through participation in certain activities. By utilizing the necessary measurement, it will be possible to show the individual the progress that he is making.

Physical training involves both activity and development, these two elements being inseparable when working with individuals. Through activity we develop the organic and neuromuscular systems which in turn permit certain skills

to develop. The Army Specialized Training Program had these elements divided into various objectives. The physical examination was to discover any physiological defects or disease. Once these were uncovered special treatment and care was necessary. The definition of physical fitness included such objectives as strength, muscular endurance and stamina, cardiovascular-respiratory endurance, speed, agility, coordination, balance, and flexibility. There was a great need of reserve strength to meet daily routine as well as emergencies that may develop unexpectedly. To insure survival of the fittest, the Army Specialized Training Program subjected the men to a strenuous training program that invariably presented activities beyond the individual's mastery and capacity. Very often the soldier was confronted with an individual situation and problem that no one could solve but himself through maneuverability that called for speed, agility, coordination, balance, and flexibility in movement. It is true that many of the elements mentioned are controlled by reflex but can be developed and perfected through practice. Once the Army was able to develop a man who was physically fit for combat, certain skills could be acquired that assured effective performance.

The Army Specialized Training Program has recommended activities for developing the physical fitness of a man and the criteria that constitutes physical fitness. These activities were divided among four areas of physical training that included swimming, conditioning, combatives, and competitive sports. It is the writer's belief that to reach higher

perfection in these four areas, it is necessary to devote more attention to individual needs. Through the utilization of different tests, and not just the one used by the Army Specialized Training Program, it may be possible to achieve a higher degree of progression in the development of individual differences. The instructional material utilized is not being condemned due to the conditions that existed while the program was in progress. Many objectives were achieved, proving that the program had accomplished its purpose in many respects.

CHAPTER III

THE NEED FOR CLASSIFICATION

With a constant fluctuation in the men enrolled in the program due to separation and enrollment, it was difficult to group the men by age, weight, and height. To have an intensive standardized conditioning program and still adhere to all health measures, it is advisable to group the men by age levels as well as physical capabilities, taking into consideration the weight and height in scoring. In order to properly develop individual differences in the academic departments, the educators may group the students according to mental age in given classes, intelligence quotient, educational age or status as shown by scores taken from prognostic or aptitude tests, socio-economic status of parents, or even study habits and skills. If we are to reach the outcomes desired from physical training there should be grouping in this area also.

Through a thorough medical examination we can discover all physical defects that can be either corrected, retarded, or at least put under special supervision that will guard against serious developments. There have been too many cases where mass conditioning has resulted in permanent injury to the individual with physical limitations that were not discovered and properly handled. This same physical examination will designate the physical ability of an individual or at least the degree to which he can exert himself without harmful effects and results. Some individuals seem to expend their energy faster than others, there-

fore careful consideration must be given to the results produced by medical examinations. Medical examinations aid in the classification of students because the results from these examinations can be utilized in organizing the instructional material for the program. Students needing special attention can be placed in corrective classes.

There is one more emphatic and determining feature that stands a close second to physical capacity. That is physical skills. Once the students are classified, their individual skills should be measured and utilized in the physical training program. Many of the individuals may have natural abilities while others need time to discover their innate qualities. If we try to train students without classifying and homogeneous grouping, the ones who are advanced will be denied the opportunity of improvement while the beginners will not be presented with the opportunities of practicing fundamentals. There is a tendency to strike a happy medium in such mixed groups, depriving both groups of essential training and splitting two focal points of education to attain one. The focal point is better performance for the advanced group, while the beginner's focal point is to learn fundamentals.

The University of California at Los Angeles constructed achievement scales for skills and grouped the men tested in nine height-weight divisions. The groups were as follows: tall slender, tall heavy, short slender, short heavy, tall medium, medium slender, medium heavy, short medium, and

medium medium.¹ Weight alone does not meet the criteria for fair competition because it is difficult to judge how much of the weight is fat or bone, and how much is muscle. Height is an important factor because the mechanical advantage increases and decreases depending on the events. Each individual instructor in the field of physical education should apply measurements to best evaluate his desired outcomes. If at all possible, each instructor should try to classify his students in some height-weight division. This will enable him to organize his instruction to best fit each division. It may sound too idealistic, but some educators believe that ideals are the only means of achieving perfection in the future.

Dr. E. L. Thorndike has been quoted as saying: "Our ideals may be as lofty and as subtle as you please, but if they are real ideals, they are ideals for achieving something, and if anything real is ever achieved it can be measured. Not perhaps now; but in fifty years from now; but if a thing exists, it exists in some amount; and if it exists in some amount, it can be measured."² This statement has been considered the corner-stone upon which the structure of educational measurement has been built. Measurement is no recent educational tool. In order to determine individual differences the measurement of achieve-

¹Cozens, F. W., Achievement Scales and Physical Education Activities for College Men, Philadelphia, Lea & Febiger, 1936, p. 33.

²Palmer, I., Tests and Measurements, A. S. Barnes & Co., 1932, p. 3.

ment should precede the teaching method as well as after a period of instruction. This will be a great aid for the instructor in selecting material. The writer would have the instructional material selected and organized after the students are grouped according to height, weight, age, physical abilities and capabilities, and skills. This may require an extensive measuring program but instructors in health and physical education should not deny a possibility and opportunity for a more ideal program to be set up in our special field.

It is advisable at this time to consider certain criteria of tests whose merits are being judged. A test should be selected only after these criteria have been considered and evaluated by the person who is going to administer the test. The validity of a test is judged by its accomplishment. A test is said to be valid if it accomplishes the purpose it is stated or intended to perform.³ The same test is never valid in general because each test has a specific function. This means that a test may fulfill all requirements for one focal point alone and another test must be selected to achieve results when working toward another objective. To insure accuracy in measurement of individual accomplishments, the degree of reliability should range at least .50 to .60. The reliability of a test is judged by the degree to which a second application of the test yields scores equivalent to

³Douglas, H. R., and Boardman, C. W., Supervision in Secondary Schools, New York, Houghton Mifflin Co., 1934, Chapter XVI.

√ Those obtained in the first application. A test should not be subjective in nature when more than one individual is doing the scoring. The objectivity of a test is said to be high when no disagreement is possible in scoring. Norms should be established for every test so that the results can be properly utilized. Such norms would include groups from which these norms were derived, state or city norms, school systems of different sizes and possible different races and nations.

In selecting a test it is advisable to choose one with duplicate and equivalent forms. This duplicate form must be exactly similar to the original form in type and numbers of exercises or activities. It must be exactly of the same difficulty and content. The test can be weighed or scaled according to the degree of difficulty that is presented by each separate activity. Before a test can be worthwhile it must have explicit directions pertaining to administering and scoring. There are such other criteria of tests as reputation, ease of interpretation and demonstration, author, cost, test service, time required for administering, purpose, and applicable results, that must be considered when an instructor is organizing his measuring program.

A program of physical education should include and provide for motor achievements, using the term motor to designate those muscular reactions resulting in manipulating the body. Too many programs are concerned with physical structure rather than individual performance by increasing physical

capacities, developing large muscles, increasing strength, and still not devoting enough time and emphasis to individual achievement. In performing physical activities, motor ability is tested unconsciously. David Brace has challenged the problem of developing a test for testing motor ability. He has produced and developed what is known as the Brace Scale of Motor Ability Tests, in an attempt to standardize a method of testing fundamental motor ability which individuals must use in learning and performing physical activities. This Scale of Motor Ability Tests can be utilized by instructors in physical education when classifying their pupils and evaluating achievement. By integrating such an ability test with the Army Specialized Training Program, the trainees motor ability could have been tested and they could have received instruction that would have contributed towards attaining the desired outcomes. Individual needs must always be considered before a training schedule is organized and such a test would have assisted the Army Specialized Training Program improve agility and coordination. Utilizing the events of the battery in the Brace Test as activities would have aided improving two focal points, agility and coordination.

CHAPTER IV
PHYSICAL EFFICIENCY TESTS FOR
ARMY SPECIALIZED TRAINING PROGRAM

The Army Specialized Training Program recommended specific areas of activity as supplementary to, and a part of, the general conditioning program. They were as follows: aquatics, gymnastics, military track, combatives, and team sports. All Army Specialized Training Program trainees, except those who required special work, were assigned to two of these areas of activity for the last eight weeks of the first term. Under a more ideal set-up, the students could have been tested for motor achievement and assigned to the activities that would present opportunities for the development of innate qualities. There are two conflicting reasons why it is difficult to judge motor ability even though we know it exists. Subjective defining of motor ability is very difficult. An instructor in physical education can observe a group of participants in a variety of activities and conclude that certain individuals are above, some average, and others below average ability. The average group, however, has a tendency to overlap both the lowest and highest extremes. Frequently, we hear such remarks as, with ease, or, graceful form, but do we realize that it is difficult to measure such criteria. A group of seventy-five educators listed the following criteria of general motor ability: learning new activities easily, skill in a variety of activities, easy and graceful

form in performance, and great ability in some special line.⁴

The physical efficiency test that was designated for the Army Specialized Training Program had a battery of seven events and each event was to measure the principle factors of general motor fitness. The battery of events composing the test is as follows:

1. Push-ups. -- To measure strength and endurance of arms and shoulder extensor muscles.
2. Squat-jumps. -- To measure strength and endurance of leg muscles.
3. Sit-ups. -- To measure strength and endurance of abdominal muscles.
4. Pull-ups. -- To measure strength and endurance of arm and shoulder flexor muscles.
5. 100-yard pick-a-back. -- To measure general muscular endurance and stamina.
6. Squat-thrust, 20 seconds (Burpee test). -- To measure agility, coordination, and speed.
7. 300-yard shuttle-run. -- To measure cardiovascular-respiratory endurance, speed, and stamina.⁵

The test was administered in two separate parts. The first part consisted of the first three events and had to be completed during the first time the test was given to a certain group. During the second day of testing, the remaining four

⁴Brace, D. K., Measuring Motor Ability, New York, A. S. Barnes & Co., 1927, p. 14.

⁵Army Service Forces Manual, M106, Physical Training Program for Army Specialized Training Program, Headquarters, Army Service Forces, May, 1944, p. 5.

events were completed in the order that they were listed. This test was administered during the fourth week of their initial term of training. If these scores could have been utilized as the basis for the program of training, more desirable outcomes would have been achieved. The men with the lowest scores should have been grouped so that their weaknesses would have received special attention through an appropriate battery of exercises. The average group of men should have been put into another division to receive careful guidance in mastering the skills already achieved and for the purpose of improving their general physical efficiency. The highest or extreme group which was more proficient in special lines should have received instruction in athletic skills and been permitted to progress. The Army Specialized Training Program failed in this aspect of training because one battery of exercises and activities was utilized to train the lowest and extreme groups. In some respects it may have been impossible to prepare three sets of instructional material, but in the specific areas of activity, which covered aquatics, gymnastics, track, combatives, and team sports, it would have been advisable as well as possible. The swimming program was well graded to offer proper instruction to all classes of swimmers. The swimmers were classified into three groups: Beginners, intermediates, and advanced swimmers. The beginners were physically and mentally adjusted to the water through information pertaining to pressure and breathing. While standing in shallow water the beginners were given a water

polo ball to encourage the feeling of relaxation. The intermediate swimmers' instructional material covered primarily leg and arm strokes. Emphasis was placed on coordination of arm and leg strokes in a style adapted to the learner. The advanced swimmers' course was primarily concerned with the mastery of swimming and rescue work. Methods of life saving were demonstrated and practiced.

Classification should not have taken place in swimming alone because the areas of track, gymnastics, combatives, and team sports had elements conducive to different levels of instruction. It has been observed that when a mixed group is taught in boxing or wrestling, someone is being neglected. It has been found necessary to start with fundamentals as well as orthodox techniques in boxing whenever a beginners group receives instruction. The Army Specialized Training Program had these men in divisions without any consideration for individual needs and abilities. Through classification the more individualized the instruction can be in a program. By having classification into at least two groups in wrestling, the instructional material will be more encouraging and interest will be cultivated through understandable activities. To a group of beginners in wrestling, a half-nelson means little more than its name because the body mechanics involved in the application of this hold have not been mastered. The trainees attending the Army Specialized Training Program and receiving instructions in wrestling and boxing should have been classified by the instructor after he had time to observe them in a

combatives class. The advanced trainees could have devoted their time to learning new methods and techniques under actual competitive conditions. This advanced group would not need as much attention because the instructor could demonstrate a phase of combatives and then permit the trainees to learn through participation. Through such a modification of instructional material, the instructor would have more time to demonstrate and coach the beginners. The same techniques may have been utilized in the instruction of gymnastics and track.

Recognition of individual differences has been recognized as an essential factor in all fields of education, and therefore individual differences must receive recognition in the field of health and physical education whenever methods in procedure and techniques of instruction are being formulated. Therefore it is highly important that an instructor of physical education knows the skills which a pupil has mastered, his capabilities, along with all his strengths and his weaknesses. As previously mentioned in this study, a professionally trained physical educator could properly and satisfactorily evaluate a pupil if he had been able to observe each pupil participate for a period of a few weeks. Through such a procedure a pupil could be placed in the proper physical education section, but such a project is impossible under our present arrangement of mass education. Visual evaluation would consume too much time and therefore it is necessary to utilize an extensive measuring program to classify the pupils. There is no one test that can measure everything to the degree

that proper classification is assured. Certain diagnostic tests may assist an instructor in classifying his pupils if he has no other method. These tests may discover individual differences that must receive recognition in a health and physical education program. No physical educator can afford to neglect the significance of the medical and physical examination that should be given periodically to consider the action and condition of the heart and lungs. These two physiological factors have a close correlation with physical fitness and must receive attention when the instructional material is organized.

There have been numerous attempts made to formulate tests of heart condition that could be administered by the pupil. Among these are the following: The Michigan Pulse Rate of Recovery Test, and the California Group Functional Tests. These tests help to separate the efficient heart from the less efficient one, but the need of a test that can rate the fitness of an individual with a high degree of accuracy must yet be formulated. "When the pulse rate slows down after exercise irregularly, or when it is slower after exercise than normal, general weakness or some disorder is to be suspected."⁶ In 1920 Dr. Schneider published an article entitled, "A Cardiovascular Rating As A Measure of Physical Fatigue and Efficiency." His test took into consideration a wider account of elements. These elements considered the heart rate reclining, increase

⁶ Journal of the American Medical Association. Vol. 74, May, 1920, p. 1507.

on standing, standing rate, increase after exercise, return rate after exercise, and systolic blood pressure standing and reclining.⁷ The reason for making these comments on the relationship of the heart rate to physical fitness is to impress the fact that physical training can be administered only after it is determined whether an individual pupil can accept developments through participation in physical activities without incurring permanent injury. The only accurate way these determining factors can be revealed is through an extensive and an all-inclusive measuring procedure. In all instances, it will not be possible to group the students according to similar scores but the testing and measuring techniques will greatly assist the individual physical instructor to emphasize the revealed weaknesses and take special notice of superior students.

To analyze general athletic ability, Cozens has decided to use the following elements:

1. Arms and shoulder-girdle strength.
2. Arms and shoulder-girdle coordination.
3. Hand-eye, foot-eye, arm-eye coordination.
4. Jumping or leg strength and flexibility.
5. Endurance (sustained effort).
6. Body coordination, agility and control.
7. Speed of legs.

These various elements are measured separately by three

⁷Bovard, J. F., and Cozens, F. W., Tests and Measurements in Physical Education, Philadelphia, W. B. Saunders Co., 1930, p. 77.

to eight individual tests, and Cozens has chosen the following as the best single measure of the elements:

1. Dip on parallels
2. Baseball throw for distance
3. Football punt for distance
4. Standing broad jump
5. Quarter mile run
6. Dive for distance (long dive)
7. Dodging.⁸

⁸ Ibid., Pp. 283-4.

CHAPTER V

TESTING AND TRAINING

There is no one test that would apply to every situation and therefore the group to be tested and the desired outcomes should decide the test that is utilized for testing a certain group. To test just general ability, one type of test may be utilized; if we desire to classify the students as to their athletic skills, it would be necessary to apply a test with different objectives. Regardless of what criterion of physical fitness is being put to a test, once it is defined and measured it must be developed by proper instructional material. If the criterion happens to be the development of fundamental physical skills it should be confined to such activities as running, jumping, climbing, striking, throwing and dodging. Individual tests can be set up to measure the elements mentioned. Once they are measured, the instructional material must be built to insure development through progressive activities.

Physical education has been defined as "the contribution made to the complete education of the child through fundamental psycho-motor activities."⁹ These activities must be selected and based on the interests and developmental needs of the child. The activities should have meaning and significance to the child and be satisfying. The individual differences and needs should have been recognized when the Army

⁹ Wood, T. D., New Physical Education, New York, The MacMillan Company, 1927, p. 86.

Specialized Training Program was organized and instructional material selected. The instructional material must be progressive but allow sufficient time for normal muscle development and technical mastery of skills through emphasis on fundamentals. It is a common law of learning that fundamentals, if learning is to take place, must be acquired before skills can be mastered. The individual who is assigned the study and organization of the instructional material must bear in mind that lesson plans for daily activities must be very flexible.

The Instructional material utilized by an instructor who attempts to improve agility, coordination, and speed, must be presented in such a manner that the unsatisfactory and useless habits are replaced by proper procedures. It is impossible to improve a miler without correcting such things as the position of his arms, the movement of his legs, and many other factors that are fundamental in running a mile. In other words, before we can try to improve a performance or a score, it is essential that we emphasize the best possible techniques in teaching of fundamentals. Since size, weight, and age are influencing factors in speed and coordination, the instructor may find it necessary to adjust his methods of instruction to individual characteristics. Not every high jumper or 100-yard dash runner uses the same method, so it will be necessary to consider the individual student before a style is established for him. Once a suitable group of techniques is established,

the student must practice under the guidance of his instructor and attempt to learn the methods that are selected for him. Some broad jumpers can attain good distance because the momentum gotten as their forward speed carries them forward will attain distance before the body weight overcomes the forward momentum. Still other broad jumpers must rely on the elevation of the body as they leave the take-off board to get distance. It is the duty of the instructor to discover these facts and adopt suitable instructional material. Sometimes it will be necessary to combine various activities to arrive at the desired outcome. It may be necessary to combine a jumping activity in order to achieve correct performance when attempting to make a basketball player leave his feet on follow-ups. The writer has seen successful coaches place a bench or hurdle in front of the basket and make the players jump the obstacle in following up a rebounding basketball. It all refers back to the fact that fundamentals are essential if we are to attain maximum results. As health and physical instructors, we cannot assume that every student has all basic training that is essential for good performance.

No single test is infallible nor any one battery of activities satisfactory to the extent that the same test and same activities can be applied in every situation. In most schools an immediate complete physical examination of all the children is impossible and to overcome this difficulty and to group the seemingly unfit, certain tests have been

devised that will aid an instructor in rating a large group in a short time. At the present time there is a need for a battery of functional tests that an instructor can apply to a small group of students so that he can divide them into one of two groups. These groups would be (1) those who need an immediate physical examination by a physician, and (2) those who can participate in physical education until a regular physical examination is given.

The instructional material that is utilized during a physical training program must be constructed with these two questions in mind. What outcomes are desired and what muscles are used in achieving this outcome? This necessitates a thorough knowledge of anatomy, kinesiology, and physiology. The outcomes desired will determine the type of a test used and the scores from the test will help the instructor determine the instructional material utilized.

It was the purpose of this study to reach higher perfection in health and physical training of the individual student and to set up a more ideal course of study that would correlate highly with individual differences. To achieve these two objectives and focal points of education, the writer has placed emphasis on these three factors:

1. Testing before training.
2. Instructional material organized around outcomes desired and scores achieved from the tests that were applied.
3. Tests for measuring progress to learn if material is achieving results.

It was the writer's intention to point out that tests should be chosen only if they are designed to test and to meet the objective of the program. The accomplishment of any activity in the field of physical education is governed largely by age, weight, and muscle size involved in the performance. Tests should be administered to determine needs, to classify pupils according to needs, and to measure the results produced by the instructional material. No matter what the testing program may be it is only the preliminary step in the program of physical education. The main part of the program should be concerned with the instructional material that the instructor formulates and organizes to improve physical fitness, social efficiency, and culture of every individual.

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