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UNIVERSAL TEST

FOR

STRENGTH, SPEED AND ENDURANCE

OF THE

HUMAN BODY

(ILLUSTRATED)

BY

DUDLEY ALLEN-SARGENT, M.D., S.D.

DIRECTOR HEMENWAY GYMNASIUM

HARVARD UNIVERSITY



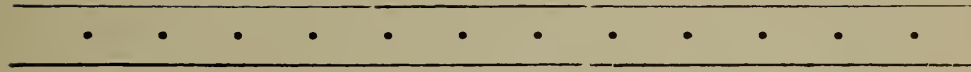
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*With Illustrations,  
D. Sargent.*



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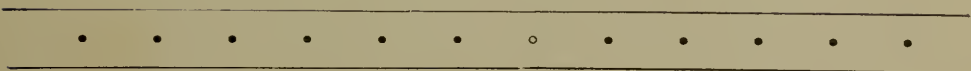
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## A Universal Test for Strength, Speed and Endurance.

ON the floor of the Hemenway Gymnasium at Harvard University there are a variety of iron weights, bar-bells and dumb-bells, used by the students in the practice of strength-giving exercises. If during the summer months, when the gymnasium is open to the public, you should watch the movements of the different groups of visitors as they pass before these weights, you would be surprised to see how universally prevalent are the instincts of imitation and emulation. If one person tries to lift a weight, another almost invariably tries to do the same thing, until man, woman and child have tested their respective abilities in this direction. The same observation in regard to the use of the dynamometers, spirometers, and other testing instruments and pieces of apparatus at the gymnasium, would be true. Most persons will readily recall other exercises or tests which easily arouse the spirit of emulation and physical rivalry. Gross says: "To lift a heavier weight, to throw further, to run faster, to jump higher, to make a top spin longer, to stay longer under water, to shoot higher, further, and with better aim than his comrades can, is the burning wish of every childish heart." In order to see the same enthusiastic rivalry in physical prowess exhibited by adults, we must turn to the half-civilized peoples to whom such acquirements are of surpassing value in the struggle of life. Although ability to run, jump, swim, and hurl weights is no longer so much a

matter of life and death as in primitive times, the organic qualities acquired by the practice of these exercises are of the greatest service in preparing young men for the struggles and trials of a business or professional career; hence the attention given to athletics in modern education. But the great defect of present-day athletics is that they are pursued too much as ends in themselves, rather than as means to an end—where that end is the invigoration and improvement of the entire organism. It is not of the slightest importance that one man is able to outrun, outrow or outjump some other man, unless he intends to engage in an occupation requiring these exercises, or unless he intends to become a professional runner, oarsman or jumper. Think of a full-grown man deliberately knocking a ball out into a field and then trying to find it; or of another hitting a ball over a net in order that some one may hit it back to him; or of a lot of men chasing a bigger ball up and down a field, and jumping all over the man who happens to get temporary possession of it. These pursuits, as ends in themselves, seem absurd; and yet, those who excel in them receive the praise and adulation of their comrades, attain a certain social prestige in the community at large, and a much-sought public reputation. Why? Because we recognize in the champions of these various sports and pastimes those virile qualities that have brought man to his present high estate. Strength, courage, skill, alertness, self-control, perseverance, endurance, and many other valuable qualities, are back of all our athletic sports and games. When we take off our hats to victorious athletes we are cheering instinctively for better blood, bones and muscles, better hearts, lungs and brains. These are possessions which

we must needs develop and perpetuate, if we would keep off disease and enhance the joy of living. Physical perfection, for its own sake, is something worthy of a struggle, and whatever helps us to the valued possession, is worthy of our careful attention. I have been so much impressed by the superior physical qualities of the student athletes who are training for the teams, or preparing for the strength contest, or trying to improve their development over their comrades who take their exercise irregularly and without any definite object in view, that I have long wished that something might be done to infuse into this kind of men the ambition and spirit of the athletes. If you ask most men why they do not exercise regularly and systematically, they say that they have not the time, or that it is too much trouble, or that they lack an incentive. If they live in the city, the gymnasium, the park or the open fields are too far away, and the athletic clubs are too expensive. If they live in the country, there is no one nearby with whom to play or compete. If they are in school or college, regular practice on the athletic teams is confined to the members or men sufficiently skilled to be candidates. In all the different phases of sedentary life the excuses for not exercising are many and various. Perhaps that which is used in most cases, is the want of an incentive.

In order to stimulate a greater interest in general exercise among college students, some five years ago an intercollegiate strength test was established. This gave an opportunity for a large number of college students to compete with each other, and has done much to raise the standard of strength and efficiency in the colleges participating.

One great objection to the present intercollegiate strength test is the expense of the dynamometers and other instruments and apparatus used in making it. The other objections are the great strain brought to bear in the lifting test upon small groups of muscles, and the increased blood pressure caused by holding the breath during the effort of lifting. The first objection restricts the use of the test to a few colleges and institutions rich enough to afford the necessary instruments and apparatus. The local strain required by the lifting and the "dipping" and "chinning," exclude most women and the youth of both sexes from the test, as well as many men who would profit greatly by being able to compare their strength and physical efficiency with others.

I think a more serious objection to the present test is, that if solely relied upon, it does not try the heart and lungs sufficiently to afford a good test of endurance. Undoubtedly, the commonest factor required in all forms of physical activity, as well as in all forms of athletics and gymnastics, is *strength*. The loss of it is the first thing we notice when we are ill; the return of it is the first thing we notice as we recover. The next most common factor is *speed*,—quickness, or the ability to accomplish the greatest amount of work in the shortest period of time. The quality which is most desired, though the least often attained, is *endurance*, or the power to continue strong efforts at the highest speed for a given period of time, so that the greatest total amount of work may be done.

In trying to meet the several objections to which I have referred, and devise a test which will at once be more economical, less straining, and, consequently, more universal in its application,



I have settled upon the following series of exercises, which, in addition to being a test for strength, will also furnish a test for speed and endurance. The result of the combined tests is termed physical efficiency.

### **Reasons for Making Tests of Strength, Endurance, etc.**

Many reasons given for measuring the human body, hold as well for tests of the capacity of the body for physical effort. All earnest teachers of physical training desire some standard or method by which to determine the effect of their instruction upon the individual pupil. Measurements, alone, do not supply the necessary information, because too many internal factors are involved. There is in every man an unknown equation which makes for power, that can only be discovered by an actual test. The pupil himself wants to know what compensation he is getting for his hard work. Learning a drill, playing a game, exercising for health or for physical development,—all have their immediate attractions, and appeal to many as sufficient inducement for putting forth effort. But after awhile all grow wearisome and monotonous, and then the spur that stimulates one's flagging energies is the consciousness of a gain in physical power,—power that may be used to further one's interests and enjoyments in other pursuits, and the ability to do and endure. Nothing is more encouraging ; nothing is more worth striving for.

Such an all-round test of muscular power, nervous force and functional activity as we herein describe, could be made applicable to various problems and conditions of life.

It could be used to determine the physical ability of different races and peoples.

It could be used to ascertain the influences of different climates and seasons, and the effects of sea, country, city or mountain life upon one's physical efficiency.

It could be used to trace the modifying influence of age, sex, occupation, habits, nurture, etc.

It could be employed to determine the effect of school, shop and factory life, and the various forms of industries.

The physical effects of all kinds of athletics, and the different systems of gymnastics, could be determined by such a uniform test of all-round ability.

The physical deficiency of persons who are in any way defective or undeveloped, may be gauged by comparing their tests with those of the same age, sex, etc., who are in a normal condition of health and strength.

The physical qualities of those best suited for the army, navy, police and fire departments, and various forms of civil service, could also be ascertained by such a test.

### **Desirability of a Uniform Test.**

In order that one person may be compared with another in height and weight, or in any other physical measurement, it is necessary that the same standard of weighing and measuring be maintained. Likewise, in order to compare one person with another in physical power and efficiency, it is necessary that the same standard of testing be constant. To-day much of the scientific interest in various forms of athletics, as far as they indicate physical ability, is lost, because there is no means of

comparing not only the modern with the ancient athlete, but the athlete of the present day with the one of twenty-five years ago. Improvement in apparatus, in the construction of boats, oars, balls, bats, hammers, shots, vaulting-poles, bicycles, and even the surface of tracks, to say nothing of the changes and improvements in rules and regulations governing contests and the different modes of training, make it very difficult to judge of the difference, if any, in the physical condition of men of the present day from those of the near or remote past by athletic performances alone.

The feats of many of the so-called strong men are robbed of half of their value when one learns "how the trick is done." A little knowledge of animal mechanics and the laws of leverage, shows the ease of many seemingly wonderful performances. Each of the representative strong men has special feats which are peculiar to himself, and it is exceedingly difficult to get any one of these men to try the specialty of another, or to take a strength test according to the intercollegiate standard. I have learned to look with doubt upon the claims and pretensions of any so-called strong man who is unwilling to be tested by a standard which is open and above-board, and common to the greatest number of people. The best criterion a person has is himself. A feat which can be performed by two men, arouses in both more interest than one which only one of the men can do. A field for comparison is afforded, whereby each man may be awakened, both to his own abilities and to an appreciation of those of the other. So it is, that a physical test which could be taken by nearly every one, would better call forth an appreciation of marked abilities than one which could be practiced and was understood by a comparatively few individuals.

## **Advantages of the New Test.**

Some of the advantages of the test which I herein describe are as follows :

The test is extremely simple, consisting of a few exercises with which nearly every one is somewhat familiar.

It requires little or no apparatus.

It brings into action all of the large groups of muscles in both trunk and limbs.

It does not subject any one group of muscles to a severe strain.

It furnishes an exercise and a test for the heart, lungs and nervous system, as well as the muscular system.

It is a test in which the effect of "knack," "trick," variations in instruments, etc., have been reduced to a minimum.

It is a test that may be tried at any time anywhere, thus determining the effect of local conditions.

As it can be easily carried on by trustworthy assistants or clerks, it is a test that does not require expert supervision.

It is a test that may be practiced by those who are well, without fear of strain or injury, as the exercises bring into action in a natural way the large groups of muscles which should be used for health's sake in the employments of everyday life.

Finally, it is a test that should appeal to the teachers of physical training and gymnastics, because it is a test of the efficiency of the exercises which they are using, and should likewise furnish an incentive to the pupils to make earnest, conscientious efforts in their daily practice.

## Exercises Selected.

The exercises selected for the universal test for strength, speed and endurance are as follows :

No. 1. Exercise for the abdominal muscles : "Elbows to knees."

No. 2. Exercise for the arms and back : "Pull up."

No. 3. Exercise for the arms and chest : "Push up."

No. 4. Exercise for the extensors of the back and hamstring muscles : "Fingers to floor."

No. 5. Exercise for the lower leg or calf muscles : "Rise on toes."

No. 6. Exercise for the muscles of the thighs : "Sit on heels."

### FIRST EXERCISE.

*Directions.*—Lie in a horizontal position upon the floor, with arms flexed and finger-points touching the top of the shoulders, as shown in Fig. I. Bring the body up to a position so that the elbows will touch the knees,



FIG. I.

keeping the legs as straight as possible, and the fingers still touching the top of the shoulders, as shown in Fig. II. In this exercise the feet may be placed under a table, lounge, chair, or any article of furniture that will assist in keeping them down during the exercise. A foot-rest or a strip of cloth or leather fastened to the floor may be used, as shown in the illustrations (Figs. I and II). Mattresses, rugs, carpets or cushions are also permissible as coverings for the floor and supports for the body,

provided they do not change the horizontal position of the body. As a matter of practice,—not a test,—this exercise may be taken mornings in bed, the feet being kept down by the weight of the bed-clothes, rolled to the foot of the bed.



FIG. II

*Caution.*—In order that the results of this exercise may be accepted in making up the total for the test, it will be necessary for the person to keep the knee-joint as close to the floor as possible; to touch the knees with the elbows in every forward movement; to keep the fingers on the shoulders, and to see that the shoulders touch the floor, mat or covering after each forward flexion of the body. The upper arms and elbows may touch the floor, also, on the downward movement, in order to relieve the constriction of the chest.

*Groups of muscles used.*—This exercise brings into action the muscles of the abdomen, the deep-seated muscles anterior to the spine, and the flexors of the thighs.

#### SECOND EXERCISE.

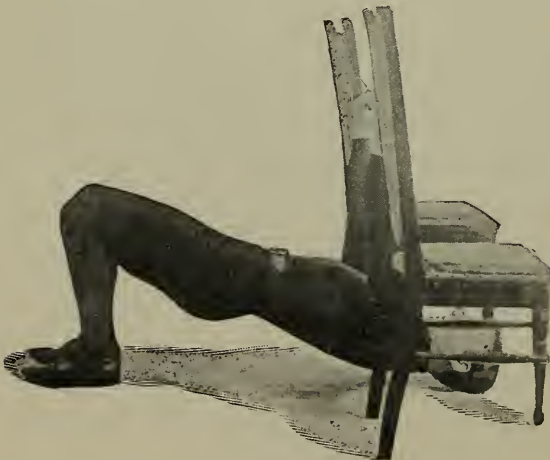


FIG. III.

Support a wooden stick, or wand, about thirty-six inches long and one inch in diameter, from the backs of two chairs placed about twenty-four inches apart, so that the wand is about thirty inches from the floor, or just high enough to allow the body

to clear the floor when supported at arms'-length, as shown in Fig. III. A bar supported on a frame between the jambs of a door, or in any other way, will be acceptable, providing it is stationary and not above the specified height.

*Directions.*—Grasp the bar with palms toward the face,\* arms fully stretched, body held horizontal on a line with the thighs, and legs bent at an angle so that the feet are directly under the knees, as shown in Fig.



FIG. IV.

III. While maintaining this position, pull with the arms until the chest touches the bar. (See Fig. IV.)

*Caution.*—Do not try to “chin yourself” or to assist yourself with the legs, but do the work with the arms and back, holding the body and thighs straight, as described above.

*Groups of muscles used.*—This exercise brings into action the flexor muscles of the fingers, wrists, fore-arms (biceps, etc.), and also the muscles on the posterior part of shoulders, shoulder-blades and upper back.

### THIRD EXERCISE.

*Directions.*—Lie on the floor face downward, body in a line with the thighs, and legs bent at right angles. Let the hands

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\*If the bar is free to turn, one hand may grasp it with palm toward the face, and the other with the back of the hand toward the face. In this way the bar may be kept from turning. In practice, however, the grasp of each hand should be frequently reversed.

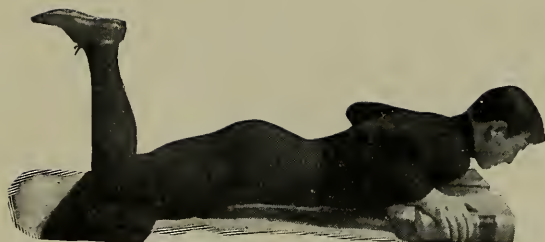


FIG. V.

rest upon two blocks of wood, or two books, about four inches thick, as shown in Fig. V. The hands should be placed from sixteen to twenty-six inches

apart, according to the size of the person. Maintaining this same relative position of body and legs, push the weight up by the arms until they are straight or fully extended, as shown in Fig. VI; then lower the body until the chin is on a level with the top surface of the wooden blocks or books, and continue the exercise.

*Caution.* — Do not straighten the arms by hollowing the back and raising the weight of the head and shoulders only, and do not try to assist yourself by elevating the lower part of the back so as to throw more weight on to the knees, but keep the body stiff and in line with the thighs, pivoting at the knees only. In this exer-



FIG. VI.

cise a padded carpet, mattress, pillow or cushion may be placed under the knees, and it is advisable to spread a piece of cloth or newspaper on the floor in front of the face, so that no dust or dirt may be inhaled during the downward movement.

*Groups of muscles used.* — This exercise brings into action the extensor muscles of the fore-arm (triceps, etc.), and the muscles of anterior shoulders, chest and abdomen.



## FOURTH EXERCISE.

*Directions.* — Stand with feet about twelve inches apart, trunk bent well forward, legs straight as possible, and arms extended so that the backs of the fingers touch the floor just back of a real or imaginary line drawn between the heels. (See Fig. VII.)



FIG. VII.

From this position swing the arms directly forward until they are in line with the body; then bend at the hips, bringing the body through the vertical position, finishing the exercise with the body bent backward and fingers clenched well above the head, as shown in Fig. VIII.

*Caution.* — In taking this exercise care should be taken to see that the legs are kept as straight as possible, and that the arms are straightened rigidly overhead and kept on a line with the body. The back may be bent as far forward as necessary, to enable the fingers to touch the line behind the heels.

*Groups of muscles used.* — This exercise brings into powerful action the extensor muscles of the back, the gluteal muscles, and the ham-string muscles on the back of the thighs.



FIG. VIII.

## FIFTH EXERCISE.

*Directions.* — Stand upon the heels with the toes raised from the floor, as in Fig. IX. Now rise on the toes until the

heels are about three inches from the floor (see Fig. X),



FIG. IX.

and return to the starting position with toes off the floor. It is permissible to maintain one's balance by touching a wall, chair, or any other object that allows the hand to be held about waist high and renders no other assistance in the exercise.

*Caution.* — During this exercise the knees must be kept rigidly straight, and the body must not be allowed to sway backward and forward. All

movement must be confined to the ankle joint.

*Groups of muscles used.* — “Rising on the toes” and flexing the feet exercises principally the calf muscles, and also those on the anterior part of the leg near the large shin-bone.

#### SIXTH EXERCISE.

*Directions.* — Flex the legs and thighs and sit on the heels, holding the trunk and head in an upright position, with arms and fingers extended forward, as



FIG. X.

shown in Fig. XI. Now rise to a straight standing position, as in Fig. XII, with arms bent at a right angle, shoulders thrown back, and fingers clenched. In this exercise the arms are to be thrust forward and the fingers extended as the body sinks, and returned to the sides again with fingers clenched as the body rises.



FIG. XI.

*Caution.*—It is not permissible to grasp any object or to assist in maintaining a balance. The accomplishment of this feat is a part of the test. The heels may be kept on the floor to assist in balancing,

provided the body is not bent forward of the perpendicular. The body must be held in an upright position throughout the exercise.

*Groups of muscles used.*—This exercise brings into powerful action the large extensor muscles of the legs, which are on the front of the thighs; and to a lesser extent, many muscles of the trunk, arms and feet, which are used in maintaining one's balance.

#### DIRECTIONS FOR MAKING THE TEST.

Take the exercises in the order in which they are given, doing each exercise as many times as possible, but remembering that it is an all-round test, and that each exercise must represent at least a certain minimum per cent of the total work done in the allotted time. On the other hand, the amount of work done in any single exercise should not exceed a certain maximum amount of the whole. The minimal amount required and the maximal amount



FIG. XII.

allowed for the different exercises, as well as the average amount usually attained, may be represented as follows:

	Minimal	Average	Maximal
First Exercise	7 per cent	14 per cent	21 per cent
Second “	4 “ “	8 “ “	12 “ “
Third “	4 “ “	8 “ “	12 “ “
Fourth “	12 “ “	24 “ “	36 “ “
Fifth “	5 “ “	10 “ “	15 “ “
Sixth “	18 “ “	36 “ “	54 “ “
	50	100	150

By reference to the above table it will be seen that if the contestant does only a minimal amount of work in one exercise, he must do a larger amount in the others in order to qualify. On the other hand, if the contestant does a maximal amount of work in one of the exercises, he will necessarily have a less amount to do in some of the other exercises. The aim should be to distribute one's efforts over the several exercises in about the same proportion as indicated in the center column in the table.

Note the number of times each exercise is taken, also the number of minutes occupied by all the exercises. Where it is desirable to take the rate and rhythm of the different movements, the time of each exercise may be noted. The amount of rest between exercises, and the manner of taking it, are left to the option of the person taking the test, but the time taken out for rest will be counted towards the total time allowed for the completion of the test.

*Time allotted for the test.*—The total test of the six exercises must be completed within thirty minutes from the time the first exercise is started. As it is only by adhering strictly to this rule, that speed as well as endurance may be cultivated,

no exception will be made to it. In practice, a certain time must be allowed for each exercise, and the exercises must be so conducted that all may be performed within the thirty-minute limit; otherwise, the person tested will be disqualified.

### **How to Compute the Results of the Tests.**

1. In the first test multiply one-half of the total weight in pounds by one-half of the total height in inches, and this product by the number of times the body was lifted, as described in the exercise. Divide this product by twelve, to reduce it to foot-pounds, and enter the result in the column under the heading opposite the abdominal exercise.

2. In the second test multiply one-half of the total weight in pounds by the length of arm in inches. (Measure the arm extended forward, from the front of the shoulder when it is drawn back, to the large knuckles of the firmly closed hand.) Multiply this product by the number of times the body is pulled up, as described, and divide this amount by twelve, placing the result in the column under foot-pounds opposite the arms and back exercise.

3. The third exercise is computed in the same way as the second; *i.e.*, multiply one-half the body weight in pounds by the length of the arm measured as above. Multiply this product by the number of times the weight is lifted, and divide this amount by twelve, to reduce it to foot-pounds. Enter the result in the column under foot-pounds opposite the exercise for the arms and chest.

4. In the fourth test multiply one-half the total weight in

pounds by one-half the total height in inches, and the product by the number of times this exercise is accomplished. Divide the result by twelve, and enter the quotient in the column under foot-pounds opposite the back exercise.

5. In the fifth test multiply the total weight in pounds by three inches, and this product by the number of times the weight is raised on the toes and heels as one exercise. Divide the product by twelve, and place the result in the column under foot-pounds opposite the exercise for legs.

6. In the sixth test multiply the total weight in pounds by one-half the height in inches into the number of times the weight is lifted. Divide the product by twelve, and place the result in the column under foot-pounds opposite the exercise for thighs.

Add the number of foot-pounds for each exercise. The total sum is the number which determines your speed, strength and endurance, combined. This may be termed your *physical efficiency*, and is the number which gives you your standing when compared with others, or your rating, should you enter the contest.

Divide the total number of foot-pounds by the time in minutes consumed in making the test, and the result will be the *speed in foot-pounds per minute*.

The numerical equivalent for strength and endurance alone is not so easily shown. No one will question that the lifting of a great weight is a matter of strength, and that the lifting of a smaller weight a greater height, or a greater number of times, is more a matter of endurance. But can we not say that the ability to continue making great efforts in lifting weights or

maintaining great speed, with sudden changes in the direction of movement, is also a matter of strength as well as endurance?

If we add the sums of the weights and heights and times lifted, we shall see the relations which these factors bear to one another, — relations which, strictly speaking, are not accurate, but which, nevertheless, afford us some sort of numerical equivalent of these important qualities, — strength and endurance.

### **Directions for Filling Out the Test Blank.**

In filling out the test blank (see sample test card, page 29), give the age in years and months. Give the name or initials, for identification, with name of school or number of street and place to be addressed. Give the sex, nationality and occupation, to aid in classification. Give the date in years, month and day. Give the height in inches and the weight in pounds, stating whether clothes are included. Measure the length of the arm extended forward, from the front of the shoulder when drawn back, to the largest knuckles of the hand when the fingers are clenched. Take the rate of the pulse and breathing immediately before and immediately after the test. If you can arrange to do so, have the pulse and breathing taken simultaneously for the first quarter of a minute; then multiply the number in each case by four, and enter the result, as shown, in the sample test blank. Have the blank filled out with the figures, giving the results of your test according to the directions given. Have the report signed by a witness or an official examiner, if you desire to enter the contest.

## Preparation for the Test.

A test is a means of trial by which the presence or genuineness of certain qualities is shown. In the test which has been described, the aim is to test the strength, speed and endurance of the average man, woman or child. The total result indicates the physical efficiency of the individual tested. As we have seen, the test consists of a series of simple exercises which bring into action all of the principal muscles of the body. These muscles have been developed in man through past ages by pushing, pulling, lifting, running, rowing; in short, by flexing and extending body and limbs in very much the same way as is required by the exercises described. In a natural condition of life the muscles would all be capable of responding to the demands made upon them, to the full extent of their power; but under such conditions as most of us live at the present time, the muscles become weak and incapacitated from disuse; consequently, when they are called upon to work to their full capacity, they are made lame and sore for a few days, or until they can become accustomed to the increased demands made upon them. Under ordinary circumstances this muscle soreness, though sometimes a little painful and unpleasant, is perfectly harmless, and soon passes away under the influences of the same exercises that caused it. If the person tested has not been accustomed to take any kind of exercise, or if the exercises of the test are done too rapidly at first, or are too much prolonged, or if the person perspires freely and then fails to rub down or take a cool bath immediately after the exercise, the results that follow may be rather unpleasant.



the weight lifted by the height lifted in each exercise, as described in the method of computing the test, and divide the product by twelve. This will give one's *personal factor* for each exercise, which will vary very little from day to day, and which therefore may be entered as a constant for daily use. Keep account of the number of times you do each exercise from day to day, and multiply this number into your *personal factor* for each exercise. The result will be the number of foot-pounds of work done, as previously described. If you do not care to watch your progress too closely, a monthly account may be kept another way, as shown on page 30. This may be computed at the first of each month, after giving yourself a trial test. In this way your progress may be noted from month to month, and your substantial gains in physical efficiency recorded. The monotony of the test exercises may be varied by doing many other exercises which tend to develop the same muscles in a little different way. By beginning such a course cautiously, progressing slowly, and keeping at it persistently for six months, the progress that may be made in physical vigor and efficiency is simply surprising. As it is the intention of the author to supplement this pamphlet by a handbook of developing exercises, no attempt will be made at this time to give detailed instruction upon that important subject.

### **The Use of the Test in Schools and Colleges.**

In order to make the test applicable to the needs of schools and colleges, some such scheme as the following is advisable: Every applicant for a position on a school or college athletic

A cold, lameness in the back and limbs, stiffness in the joints, etc., are likely to be the uncomfortable reminders of the lack of a little precaution in beginning a course of otherwise healthful exercises. Nearly all the muscle soreness that usually accompanies a new exercise may be avoided if in starting one will but take the precaution to begin slowly, doing only a few exercises at one time, and gradually increasing the number from day to day, or from week to week, as the condition may require. A course of preliminary exercising or training for a few weeks or months should always be taken when a test of one's full powers of speed, strength and endurance is anticipated, and a hard test should always be followed by a warm tub bath the evening of the day it is taken.

### **The Test as an Exercise.**

One of the most attractive features about the Universal test is that it consists of a series of exercises that may be practiced themselves as a method of physical training or as a means of physical development. Where one desires to pursue such a course, it is advisable, after taking a little preparatory exercise, to give oneself a preliminary test, according to the method described. The result of this test will form a basis, or serve as a starting-point from which to measure one's gain in speed, strength and physical efficiency. After making a note of the first test, as reckoned in foot-pounds, a very good way to maintain the interest is to keep a daily account of the work actually done and the time taken to do it. This may easily be done by first determining one's *personal factor* for each of the six exercises described. To do this, multiply

team should have a careful physical examination or inspection. This is necessary, not only to protect the weak against injury from athletics, but also to protect athletics from injury through the feebleness of the weak. Athletics are intended to give added strength to the strong, not to increase the debility of the weak and infirm. In order that a schoolboy or student may be permitted to engage in athletic contests, he should not only show an absence of all negative signs why he should not be allowed to compete, but he should also be expected to show certain positive signs why he should. The prohibitive signs should be organic disease, or physical or constitutional defects. The positive signs should be perfection of structure and harmony of function, supplemented by such an exhibition of nerve force and physical ability as may be brought out in the test for strength, speed and endurance. As the results of the test may be expressed quantitatively or numerically, as has been shown, it can be graded to meet the requirements of the different classes of athletes. For instance, those who aspire to row in a University boat race, or to play on the University football team, or to throw weights, or to engage in a boxing or wrestling contest, must be expected to make a higher test numerically than the aspirants for positions on a school or class team, or than those who desire to compete in baseball, cricket, tennis, and the various forms of running events in track athletics.

The requirements of the new test at Harvard University are as follows:

All students of Harvard University desiring to enter as competitors in athletic contests, are required to give evidence of their physical efficiency by making the following tests of speed,

strength and endurance, in addition to the regular physical examinations:

Candidates for the University crew and football team, and weight throwers, are expected to make a total test of 80,000 foot-pounds.

Candidates for the University baseball nine, class crews and football teams, gymnastic, wrestling and sparring contests, 70,000 foot-pounds.

Candidates for the class baseball nines, Lacrosse, cricket, hockey, basket-ball and fencing teams, track and field events, 60,000 foot-pounds.

Holders of scholarships are expected to make a total test of 50,000 foot-pounds.

Distribution of Groups in Thousands of Foot-pounds.

* = 140 to 150	E = 90 to 100	J = 40 to 50
A = 130 to 140	F = 80 to 90	K = 30 to 40
B = 120 to 130	G = 70 to 80	L = 20 to 30
C = 110 to 120	H = 60 to 70	M = 10 to 20
D = 100 to 110	I = 50 to 60	N = 0 to 10

By reference to the above table of groups it will be seen that candidates for the University crews and football teams must get into or above group F. Candidates for class crews, football teams, etc., must get into or above group G.

The average student's test will entitle him to a place in group I, whereas strong men and those of exceptional athletic ability will range upward in their classification through the groups D, C, B, A, etc. To get a place in the star group, one must make a total of at least 140,000 foot-pounds. This is equivalent to the amount of work required to row an oar in an

or cases such as are used for card catalogues. These cases should be kept at the office of the director of the gymnasium, or of the principal of the school, or in some room where they may be open to inspection by the pupils of the school or college. The test cards should be arranged after every examination, and kept strictly up to date. As a stimulus to greater interest, prizes might be offered annually to the first, second and third pupils on the list, and honorable mention might be made of the first ten, twenty-five or fifty, according to the size of the school or college.

In some thirty years I have not found a better way of supplementing the work of the gymnasium and athletic field, and of awakening a broad, general interest in physical training among all classes of students, than the scheme just described. I am pleased to recommend it to the attention of the authorities of schools and colleges for both sexes, who are interested in the physical welfare of the young.

eight-oared racing shell at the rate of thirty-two strokes a minute for half an hour.

This method of grouping the results of the tests will furnish a ready means of classifying other pupils who are not athletes, according to their *physical efficiency*. As the number of athletic teams is necessarily limited, and the number, therefore, who can engage in athletic contests is very small in proportion to the whole student population, the opportunity to compare one's strength, speed, endurance, etc., by the same tests as the athletes have been required to make, is readily appreciated. If one who has not been fortunate enough to make an athletic team through lack of ability in some other direction does equal the required test in *physical efficiency*, the knowledge of this fact often serves as a balm for his disappointment. In fact, it may be considered, with a good deal of assurance, as an excellent means of making the athletic attainments of the few contribute to the physical welfare of the many. From the arrangement of men in groups according to the results of their tests, a man is able not only to compete with his own record from week to week and from month to month, but also to compete with his group. In this way a man who is able to make only a fairly good test, recognizes that he is not thoroughly outclassed; he may even be at the head of his group. In order to create and keep up a personal interest, each pupil examined should be furnished with a test card, on which there is a copy of his record and an indication of the group to which the results of his tests assign him. A record of each pupil's test should also be copied on tabulating cards, which should be arranged in groups in order of superiority and placed in drawers

F. P. No.   
 Age Sex   
 Name Nationality Occupation   
 School Place Date   
 Height Weight Length of Arm Cir. Res.

UNIVERSAL TEST   
 FOR   
 STRENGTH, SPEED AND ENDURANCE.

No.	Exercises.	Weight Lifted.	Height Lifted.	Times Lifted.	Time for Each Exercise.		Foot-pounds.	Time of Beginning.
					Min.	Sec.		
1	Abdomen, "Elbows to Knees."							Thirty minutes allowed in which to complete test.
2	Arms and Back, "Pull up."							
3	Arms and Chest, "Push up."							
4	Back, "Fingers to Floor."							
5	Legs, "Rise on Toes."							
6	Thighs, "Sit on Heels."							
Totals.								
Time of Exercise.		Strength and Endurance		Speed F. P. per Minute.		Physical Efficiency.		Time of Ending
Time of Test.								

Order of Exercises.   
 Witness.   
 Examiner.

### Record of Trial Test for First of Each Month.

Months.	Abdomen.	Pull.	Push.	Back.	Legs.	Thighs.	Physical Efficiency.
<b>Totals.</b>							
<b>Average.</b>							

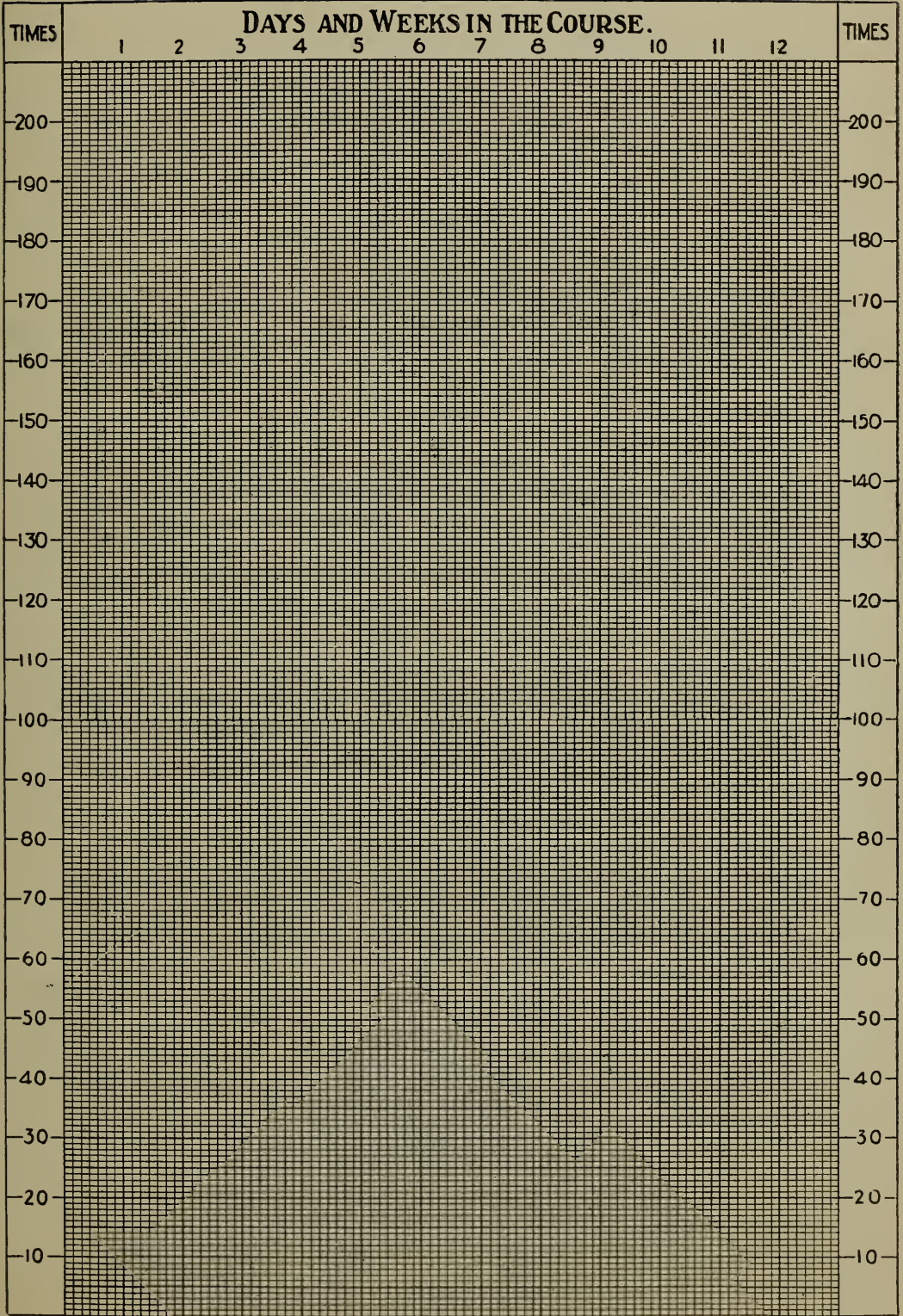
  

No.	Exercises.	Personal Factor.	Times.	Foot-pounds.	Time.
1	Abdomen.				
2	Pull up.				
3	Push up.				
4	Back.				
5	Legs.				
6	Thighs.				
		Speed.			
					Physical Efficiency.

On cards similar to this, the best trial test may be recorded for each month, and the personal factor for each exercise may be recorded for ready use in reckoning up the result of daily practice.



**DAYS AND WEEKS IN THE COURSE.**



**TIME TABLE FOR TESTS AND EXERCISES.**

## **Explanation of Timetable Chart.**

In keeping account of the work done and progress made in a schedule of exercises, the Timetable for Tests and Exercises may be used with great interest and convenience.

The figures at the top of the table refer to the number of weeks in the course, and the intervening lines indicate the days of the week.

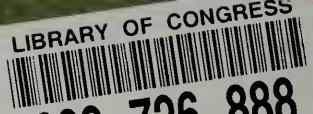
The figures at the right and left of the table may be used to indicate the number of times each exercise is done from day to day, the number of thousand foot-pounds attained in the test for physical efficiency, or the rate per minute of doing the different exercises.

In using the table, follow the rate and times for each of the prescribed exercises, as indicated by the curved lines on the table, or chart.

To indicate the gain in physical efficiency, make a dot on the chart the first day the test is taken, at the number of thousand foot-pounds attained; then make another dot, a week later, of the number of foot-pounds attained, and so on, from week to week or month to month. Connect the dots with a line, which will plainly indicate the progress made.



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