

5. Correct position of thorax is of utmost importance.
6. Cramped positions and straining exercises on local parts are bad.
7. Beyond the elementary grades, there may be progression in strength, skill, and courage required, as long as they do not violate the fundamentals named.

8. Nearly every boy and man ought to take part in some competitive work, the more informal the better; his interest leads him to become an active member in some club or group whose basis of activity is some wholesome play or competition, as golf, tennis, sailing, skating, athletics, gymnastics, baseball, basketball, swimming, etc.

In city life, a part of a man's spare hours must be spent in engaging with others in those activities which are known to develop power of the type he needs to produce a normal man.

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## EXERCISE AND EXERCISES.

BY

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[NOTE.—The authors of this paper and those on Diet and Stimulants and the Influence of Training, are two men who believe that the majority of mankind habitually eat too much and habitually take too much stimulating food and drink. They believe also that most people who do so do not take enough exercise, and that either an increase of exercise or a decrease of stimulant is needed. They believe that the best sorts of exercise are not those of slow pushing movements such as are made in the use of dumbbells, but full brisk extended movements, with much use of the breathing apparatus and the large muscle-areas of the body. Similarly they are in accord as regards present systems of training which tend to treat an entire crew or team as if they were identical specimens, not as widely different specimens; in everyday life also they hold that because a certain mode of diet and work suits A, it will not necessarily suit B and C, though B and C might do worse than try it. They also regard the ordinary acceptance of the word "Training" as far too narrow, and hold that to acquire a high fitness of the body is a duty which should be within the reach of everybody, since a mind housed in a fit body is far more capable of good and sustained work than when its shell is imperfect. For this end they advocate the starting of city athletic clubs, fully convinced that these clubs, with a reasonable attention to matters of diet, would secure for the ordinary city-worker a far higher measure of health than he is at present accustomed to enjoy.

Finally, they believe that air, light, and work (and here they do not mind appearing dogmatic) are three prime remedies in the pharmacy of God. And they feel sure that sensuality is bad for everybody.]

**I**T will not be necessary to go at all deeply into the physiological effects and changes wrought in the body by exercise, but at the same time for those interested in the subject it will be well to sketch in the merest outline the general effect of exercise, and give the reasons why (a rule so universal as to be considered as practically without exception) those who take exercise, especially when they take it in air, where there is a sufficiency of oxygen, are in better health than those who do not.

Now every organ in the body is either in itself a muscle or a system of muscles, or is controlled by muscles. That is to say, none

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of the infinite processes incidental not only to any movement, but to even perfectly passive life, are independent of muscular action, automatic it may be, and unconscious or subconscious, but still muscular.

The action of the heart itself, for instance, which is, in ordinary circumstances, entirely automatic and absolutely essential to life, consists in the alternate contraction and expansion of muscle, which sends the blood to all parts of the body; and the heart, like all other muscles, can be made stronger with suitable exercises, can be overtaxed by undue strain, and can lapse into feebleness and degeneration if it is not rightly and fully used. For the health of all muscles, apart from their proper nourishment by food and air, lies in their proper use.

All muscles which are within our reach, so to speak, which by an effort of will on our part are made to move some portion of the body, are controlled by nerves, which transmit the message, as through a telegraph wire, from the brain to the required place. By constant use it is possible, as in the case of walking (in itself a rather complicated movement), so to accustom the nerves to send their messages that, after a time, the action of the muscles becomes automatic, and we are conscious of no effort of will to make them work. The instinct of self-protection is another instance of this automatic use of muscles; a man will put up his arm or duck his head to avoid a blow without consciously bidding the muscles of the arm or neck to act. Not only does continued use of a proper kind give this speed to the communication between brain and muscle, but—granted proper nourishment—it gives strength and health to the muscles used; and, broadly speaking, the man who has *all* the muscles of his body in perfect working order, is physically a thoroughly healthy man.

Now the full effects of muscular movement are far too complicated to be spoken of with any completeness. Three, however, of the simplest and most obvious may be mentioned. Exercise, as every one knows, is productive first of quickened respiration, quickened circulation, and heat. Just as an engine burns coal in order to produce the steam which moves it, so the muscles consume material in their working, and this consumption of material again gives rise to waste products partly given off (in the form of carbonic acid gas) by the lungs, which therefore are called upon to supply a greater amount of oxygen. Hence the quickened respiration. Similarly, more blood is required to feed the working part, hence the heart is called upon to supply it with greater speed. And thirdly, since exercise produces heat, and heat perspiration, the pores of the skin are called upon to open for the purpose of exudation, and pass out with the sweat many waste products.\* Exercise, in short, develops not only the particular muscles used, but whatever muscle is used, the heart and the lungs as

\*Perspiration, it may also be noticed, regulates the temperature of the skin by evaporation. Thus on a hot day after we have cooled down from exercise we feel considerably less warm than before the exercise. "Text-book of Physiology," Schäfer, Part I., p. 669.

well (since they have muscles of their own, which are called upon to work), and it gets rid of waste products in the body by means immediately of the skin, and, if certain most important muscles are used, by facilitating the action of the kidneys and bowels. It also, as we have seen above, quickens the coördination of brain, nerve and muscle, until with practice many movements become automatic instead of comparatively slow. At the same time it uses up nervous force just as it does muscular force, but only temporarily, since rest and sleep automatically (and nobody yet knows how) restore both.

This brief sketch will be enough for the moment to show why proper exercise is beneficial to the body, and it will explain in a rough and ready manner why respiration and circulation are quickened, and why exercise produces (or should produce) appetite. Actual consumption of materials has taken place, and in addition waste products, which give rise to uric acid in the system, have been removed. But though in general these effects (except when from serious weakness of the heart exercise is positively dangerous) are beneficial to everybody, it does not in the least follow that any haphazard exercise is beneficial to everybody. Certain movements, which are to be highly recommended to the robust, would if they were attempted by a man whose muscles were not so developed, be either impossible to him, or, if effected, would strain rather than strengthen him. Again, the object in general of exercise is (apart from its three results mentioned above) to bricken and strengthen harmoniously, and not to cause immense development of one or two sets of muscles, leaving the others comparatively neglected. Of course, if there is special weakness in any part it may be highly desirable to strengthen that part, but as we have said above, what we call mere "Biceps-culture" is, though charming for the biceps, as long as the arm does not get muscle-bound, no better a contributor to general health than would be the cultivation of any other one muscle in the body, while there are many which it would be far more useful to cultivate than this. For by the use of the biceps, let us say, no other organ of the body (except in so far as quickened respiration and circulation is the result of muscular effort) is directly benefited, whereas by the use of the extensive muscles of the chest in a proper manner, freedom and strength are directly procured for the lungs, or by the use of the muscles of the abdomen in a proper manner, the action of certain internal organs is facilitated.

Now the main principles on which we base the system of exercise we recommend are these. Complete development of the muscular system is aimed at, and rapid obedience of the muscles to the will. The muscles should be exercised to their full extent—*i. e.*, they should make the full movement which their contraction allows, and they should also be made efficient in arrested movements; that is to say, they should be able even in the middle of a rapid full movement to stop at once, being in complete control of the will, even as a wolf—and

this is one of the seven wonders of the world—can check his spring while in mid-air. How? God knows. Mere size of muscle, we believe, is in no way a criterion either of health or of the sort of strength which we consider to be desirable, and it is infinitely better for a man to have muscles of but average size, provided they are prompt and obedient, than to be a Farnese Hercules, if the bulk of muscle which he has made for himself is but slow-moving and incapable of briskness. The Farnese Hercules no doubt could lift weights of prodigious heaviness, but if the acquisition of this power has been attained at the cost of speed and promptitude, we altogether fail to see how he is benefited. Correctness and control are the first objects of muscle-culture; by proper practice come endurance, speed, and often very great muscular power. But power—slow weight-lifting power—should be considered not as the first, still less as the only object of exercise, but as a probable result. Furthermore, though the lifting of dumbbells is exceedingly useful in bringing an exceptionally weak muscle up to the general level of the others, dumbbell work is, in itself, slow movement, and though even its continued use may not be altogether destructive of quickness, yet it cannot in any way be considered as conducive to it. It leads in fact, in the main, to efficiency in weight-lifting, which both in itself seems somewhat useless, is hardly thought of as enjoyable, even by its own enthusiasts, as are games by their thousands of votaries, and is, except under the most careful tuition and supervision, dangerous. But in these quick full movements practised either with no weights at all, or at the most with exceedingly light ones, there is no risk of strain. Again, while to judge by the letters and testimonials sent to well-known schools of physical culture (and published by them) the increase of bulk in muscle seems to be considered in itself a desirable object, the acquisition of this bulk appears even in successful cases to be a somewhat slow and laborious process, and entails more than half an hour's dumbbell practice of slow movements every day. As supplementary to brisk movements, it is more than possible that these mere bulk-acquiring movements have their uses, but to base an entire system on them is to miss the point, so it seems to us, of the culture of muscles, if not to ruin the muscles themselves. It is also most important to see that the exercise for each muscle shall be that for which the muscle is naturally adapted; and exercises designed to bring the muscles of the fingers or wrists into their utmost state of efficiency will be evidently utterly different from those by which we cultivate the muscles of the loins, the back, or the chest. For fingers and wrists are obviously designed (and are regularly used) for far more rapid movement than the muscles of the back, loins, or chest, and to attempt to make these larger muscle-areas work with the same rapidity as the fingers attain in piano playing, is to give not only an impossible task, but a most unsuitable one. Or again, to try to accustom the fingers to sustain the weight borne every moment by the muscles of the neck would,

even if it were possible, utterly unfit them for the rapid movements which are natural to them. Again, the muscles of the legs are designed to bear and to move the whole weight of the body, and it is thus obvious that exercises suitable for development of the arms may be highly unsuitable for the development of the legs, which from their greater natural bulk (designed for the continual shifting and sustaining of weight) are not able to move with the flick of the whip. And it is here also that dumbbells and indeed gymnastics generally seem to us to go wrong. It is to the arms in dumbbell exercise that all this slow weight-moving is assigned, while really the essence of gymnastics seems to be to treat the arms like legs, and let them bear the whole weight of the body either passive or in motion.

Thus it appears to us a truer and more sensible way of exercise to give each muscle, as far as may be, the kind of work for which it was intended: to give to the wrists, fingers, forearms, exercises of great speed, to give to the muscles of the legs exercises of speed certainly (but of less speed, since they are weight-carriers), of balance and of flexibility (thus enabling the body to start quickly in any required direction) and of sustaining power, to give to the big areas of muscle round the spine, abdomen, and loins exercises that will enable them to do more easily their pillar-like work, and allow the underlying organs of the body free play, to give to the muscles of the ribs and chest that power of expansion and contraction which will enable the lungs to breathe fully at all times, and in emergency quickly, so that when greater demands are made by the working body for supplies of oxygen, they may be readily supplied without a struggle for breath. And if these things are possible—as we entirely believe—we hold that the man who has attained them through exercise will be a greater debtor to exercise than he who can lift large weights with limbs required for other purposes.

One of the very best times for exercise, and also for most people the most convenient, is early in the morning before breakfast. The body is (or should be) fresh and untired, and by exercise it is given a good start for the day, and fortified against the congesting effects of the long sedentary work which must perhaps necessarily consume the greater part of the ensuing hours. On the other hand, some people habitually devote the freshness of the morning to brain-work, for the brain like the body should be fittest then, and one of the present writers always does his hardest brain-work immediately on waking, reserving his exercise for later. In any case, it is far better to take exercise on an empty stomach than after a meal, since in the latter case the energy of the body is largely occupied with the work of digestion, which will be imperfectly, or at any rate slowly, performed, if it is taxed simultaneously by other calls on it. Again, in order to give full and easy play to the muscles, as little clothing as possible should be worn, since they are thus unimpeded in the movements, and also because there is nothing more hardening and invigorating to the

body than exposure to fresh air. The exercise itself will very soon warm the body, though perhaps at first those unaccustomed to exposure will find it wiser to take their hot bath or hot and cold bath before exercise, so as to start already warmed. But all those who are accustomed to have a cold bath, and feel no chill afterwards, may safely begin with the exercises, and reserve the delightful thrill of the water for afterwards, when they are even warmer from the exercise than they would have been on getting out of bed.

Be sure also that there is plenty of air in the room, for you will use more when you are exercising by reason of the quickened respiration. Your window, it is to be hoped, has been open all night. It is really a pity to shut it. Then stand before a looking-glass, so that you may, by the sight of the reflected movement in front of you, be sure you are doing it fully and correctly, and may the more easily fix your attention wholly and entirely on what you are doing. For it is by attention that you will acquire ease and facility till, as in learning a thing by heart, the movements eventually become, if not automatic, at least extremely easy.

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#### THE VALUE AND NECESSITY OF PHYSICAL TRAINING.

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**P**HYSICAL training is preventive medicine. It is often a matter of comment why the semi-civilized peoples have such magnificent bodies. The future of the tribe depends upon the powerful arms and the tireless legs. The daily hunt for food makes the exercise necessary to life itself.

Among the civilized nations, and especially in the cities, all the necessities of life and most of the things commonly desired are to be obtained in the neighborhood or near the car line. As we are always in haste we take the quickest and least laborious way to secure it. This all means that our heads save our heels. But at what cost? The answer so often comes that it is known before it is uttered: "Yes, I know I need exercise, but I have no time for it." How near-sighted is such a view. Of what avail are scholarship and affluence if one is to be constantly interrupted by the illness that overtakes most inopportunely. Yet, what precautions are we taking to avoid illness and give our minds a strong habitation?

The body is akin to a piece of machinery operated by a boiler and engine. Our mental training is the delicate mechanism that turns out the finished goods: the nervous impulses running through the lesser or sympathetic nervous system in conjunction with our voluntary thoughts are the belts for the transmission of power; our engine