

function, that keystone of our life—Respiration. What is its principal end and aim? To provide a due supply of oxygen for the use of the tissues, and to cast forth from the body the carbonic acid thrown off by those tissues, and brought to the lungs by the venous blood. Now how is this interchange of gases effected? The blood arrives at the lungs charged with carbonic acid and in passing through them by means of the capillaries, is exposed to the air contained in the pulmonary cells, and as the blood in the capillaries contains a larger quantity of carbonic acid than the air in the vesicles;—and oxygen being more abundant in the air of the vesicles than in the circulating fluid; a transudation of these gases takes place through the membranes of the lungs; the carbonic acid being given forth to the external air, and the oxygen condensed by the blood.

Now this exhalation and absorption is an actual necessity, for if the supply of oxygen carried to the tissues by the blood be cut off, their functional activity ceases, and if, on the other hand, the regular elimination of carbonic acid be in any manner impeded or suspended, it accumulates in the blood and tissues, and death rapidly ensues by a deterioration of the blood, and more particularly by the poisonous effects on the nervous system.

The foregoing statement will show the paramount importance of securing a perfect supply of fresh air, for as soon as the air we breathe becomes charged with carbonic acid, it follows as a matter of course that when it is taken into the lungs, being already charged with the poisonous gas, the escape of that contained in the blood is prevented, to which is added the further evil of a diminished supply of oxygen, thereby to use a vulgar phrase: "Lighting the candle at both ends."

Having said thus much on the necessity of pure air, I would proceed to shew why it is that daily regulated exercise is so important an agent in sustaining health.

The muscular system forming as it does fully one half of the weight of our body, and being more or less under our control, is a mighty lever by which to lift ourselves from a state of weakness to one of strength and vigour.

The tissues of the body require for their support food, conveyed from the stomach by the blood, and oxygen without which the transformation by which that food becomes a constituent element of the tissues, cannot take place; this vivifying oxygen being brought by the blood from the lungs.

Now we know that there is a constant process of waste and repair going on in our bodies, that old matter is being continually replaced by new; but it is not so generally known that every time a muscle is contracted this process is quickened—that waste of the part is instantly increased—but this act of waste is actually an act of increase also, for by pressure of the contracted muscle on the adjacent capillaries, the flow of blood is pressed on towards the veins, from which it is prevented returning by valves, and is consequently pushed forward in the direction of the heart; as soon as the contraction ceases the arteries instantly pour in an increased supply of blood, thereby distending the vessels, by which means the effusion of the vital plasma of the blood containing nutritive elements for the part is rendered more forcible, and not only this but the circulation being by this means quickened, a greater supply of blood is furnished to the whole body, and what is a matter of no less consequence, the affinity of the blood for oxygen is thereby increased, thus ensuring a fuller supply of that indispensable element of a high degree of vital action.

Such is the immediate effect of muscular action, but do the muscles act in a selfish manner, having only regard to their individual interest? By no means, they have a tender regard for their neighbours' welfare, they are in very deed and truth, real philanthropists, working for the benefit of the whole community; for this alternate contraction and relaxation of the muscles sends an increased supply of blood to every part of the body, the importance of which will be fully estimated when we consider that the blood bears with it all the ingredients necessary to repair the waste continually going on in the minutest parts of our organization.

And yet how lightly we regard the powerful means thus placed literally in our very hands, of securing that greatest of earthly blessings—sound health—not that I would for one moment mean to say that muscular movements would of themselves suffice to this important end, for we must enlist in our service the whole resources of hygiene, good, plain, wholesome food, regular meals, fresh air, proper clothing, rational hours for rising and retiring, and last but not least, a properly adapted system of bathing.

And now having spoken of the importance of exercise, let me go into details as to the kind and amount required:—and when I come to this part of my subject I am aware of how many discordant ideas I shall find myself amongst—one man believes in *walking*—another in *riding*—a third in *boating*—one pins his faith to heavy *dumb bells*—another to lifting *kegs of nails*—whilst those of an extra enthusiastic turn of mind are for running through all the apparatus of a

gymnasium; each one of course firmly believing that *this is the idea*; but all agreeing with wonderful unanimity that it is not of any *very great* consequence what kind of exercise is taken so long as it is taken, which amounts very much to this: as if a person suffering from sickness and having heard that medicine would relieve him, were to rush into a druggist's shop, and call for the contents of the first labelled jar his eyes lighted upon; and it is in this way that a vast amount of unmerited obloquy has been heaped upon gymnastic exercises—but it is not in the *rational and scientific application* of exercise there is any possibility of harm, but in its abuse, exercise being a most powerful agent for good or evil, and if not used in accordance with some regulated plan, will be productive of more injury than benefit.

To commence at childhood, that period when the plastic form is most amenable, to influences of every kind: what should be our mode of action? to shut children up in a close room for several hours, and cram their poor little heads with all kinds of knowledge?—or to engage them out for a limited time in purely *mental* exercises, interspersed with *bodily* movements; varied from time to time, in order to engage the interest of the pupils? Surely the latter is more in consonance with sound philosophy—and for these little ones I would during the first period of their training most emphatically protest against any exercises, other than such as can be performed unaided by apparatus of *any kind*, all the exercise they need can be taken in this way, and with much greater advantage to their healthy muscular development.

After a time I would introduce light wooden Dumb Bells, and if space permitted—wauds—after a certain amount of dexterity had been attained with these, the *Ring* exercises might be taught; which latter are of the highest value in strengthening the muscles of the Trunk, particularly those in the region of the abdomen and loins, indeed *all* the exercises I have mentioned (when *rightly* arranged) have a special tendency to this most important safeguard against the dreadful evils which flow from a weakness of these—too often—grossly neglected regions—in all these courses I would insist much upon a proper alternation of marching exercises of which the varying may be extended indefinitely; and now there is one more item which is of the highest importance, and that is—when practicable, all these exercises should be performed with the accompaniment of music; not only because it is more pleasant, making the exercises partake of the character of a recreation, rather than of a task, serves in fact as the sugar coating to the pill, but for another and much more important reason, viz: that the actual strain on the nervous system is so immensely lessened by the as it were mechanical effort of keeping time to the music in every movement, that an amount of work is gone through—without any injurious fatigue—which would be impossible were the mind concentrated on the art itself during each movement; who has not witnessed this effect in dancing—is it to be supposed that persons could endure such an amount of work (all to one set of muscles, and in an impure, heated atmosphere) were it not that the music serves not only as a stimulus, but also by relieving the mind from *thinking too much*, lessens the nervous strain and thereby enables the action to be prolonged to what would otherwise be an impossible length of time.

After boys have gone through these exercises and their frames have become well developed, it will be proper to proceed to exercises on the fixed apparatus of the Gymnasium, not so much as a means of strengthening them, as of allowing them to put in practice that agility, elasticity—and perfect control over their limbs which they will have acquired by their previous training; when once they have commenced this course, progress must be made very cautiously—nothing allowed to be slurred over—one of the greatest aids in sustaining the interest will be by insisting that every exercise should be executed in as perfect a manner as possible, and not permitting the pupils to move into more advanced classes until they are *really fit* to do so.

As soon as the ordinary exercises of strength and agility are mastered, those requiring dash and courage may be entered on.—I am aware that I am now treading on ticklish ground, and shall have many whose opinion is entitled to the highest respect, opposed to me, but as I believe in cultivating *every* faculty, I can see no good reason why *nerve* and *coolness* should be left out, and that these *can* be cultivated I think no one will deny. When a boy has been so trained that every part of his body is brought into a healthful vigorous condition, the *nerves* as part of his organisation of course come in for their share of this vigour; and when he has been accustomed to execute with ease and certainty, various feats which to the untrained would not only *appear*, but actually *be* unsafe, it could not be but that in any position of danger in which he might be placed, his early training would stand him in good stead.

At an exhibition where some of my pupils appeared a short time since, a few of those present expressed an opinion that the Double