

Muscles, then, are the agents for all the movements of our body, and this in the larger movements by acting on the bones; the growth of bones goes on with that of muscles; muscles are very numerous, have nerves communicating with the brain running into them, and can be made to associate with each other in what is called co-ordination; besides nerve stimulus they require a large blood supply, the character of which is altered as it passes through the contracting muscle. These latter will much help us as we pass now to consider the effects of muscular exercise on the various functions of the body.

Let us take first of all the changes in the respiration during muscular exercise. We are all familiar enough with the fact that exercise not only makes our heart beat quicker, but causes us to breathe more rapidly and fully at the same time, while the amount of carbonic acid and watery vapour exhaled are much increased. These phenomena have been carefully examined by experiment, and accurate results can be given. In the first place, as to the amount of air expired, Dr. Edward Smith has prepared a table showing the relative amounts of air breathed under varying amounts of exercise; taking the lying position as unity, it runs as follows:—

Lying position	1
Sitting	1.78
Standing	1.33
Walking 2 miles per hour	2.76
" 3 "	3.22
" 3 " and carrying 34 lbs	3.5
" 3 " " 62 lbs	3.84
" 3 " " 118 lbs	4.75
" 4 "	5
" 6 "	7

and a few more which need not be given here. Or, as Dr. Parkes puts it, "Under ordinary circumstances a man draws in 480 cubic inches per minute; if he walks 4 miles an hour he draws in (480 x 5 =) 2400 cubic inches; if 6 miles an hour (480 x 7 =) 3360 cubic inches."

But it has been found also that the amount of carbonic acid exhaled during exercise is much increased, and although for a time after the exertion is over the amount as during rest is somewhat below the average, still the total amount is increased, as will be seen from the following table prepared by Messrs. Pettenkofer and Voit. I may mention that work here means enough labour to give moderate fatigue, while rest means quiet occupation with the fingers:—

	Average Elimination of Carbonic Acid in Grains.		Average Absorption of Oxygen in Grains.	
	Day.	Night.	Day.	Night.
Rest	8825.25	6100.73	5771.56	7062.60
Work	13217.50	5447.49	8410.44	6720.63
Work	4392.25	653.24	2638.88	341.97

These figures no doubt look dry and uninteresting, but we may now associate what is thus proved to take place in the air which is breathed, with what is found to happen in the blood circulating through a muscle during its contraction. The muscle uses more oxygen and gives out more carbonic acid, consequently a greater demand is made on the lungs. More air is required, and the blood must be driven the faster through them, and this accounts for the shortness of breath and beating of the heart which we all know by experience to accompany any muscular exertion.

If we reflect on these carefully ascertained facts, it will be clear that in cases where the lungs are in danger of suffering from insufficient

expansion, and where carbonic acid is thus apt to accumulate in them, and the circulation of the blood to be impaired, great benefit will result from active exertion, more especially if it is such as to call into play the muscles of the shoulder and chest. This is now so well recognised by medical men that the systematic practice of full and deep breathing and the regular exercise of the chest muscles is considered an important element in the treatment of those with weak lungs, or who are already in the early stages of consumption. But surely if this is so well known it becomes every reasonable person in charge of the young to see to it that no such important preventive measure has been neglected as that afforded by healthy, free, and natural exercise. But again if we look at the demands made upon the air while a person is taking exercise, we will see how very important it is that the air should be not only large in amount, but also exceedingly pure in quality. Let us take as an example what generally takes place at an ordinary dancing party. A room is filled with people, certainly more than the number which, in ordinary circumstances, it was intended for, or what science would allow, supposing they were all to continue at rest. Presently dance music is played, and the whole company exert themselves violently, certainly as much as would be equal to walking at the rate of four miles an hour. And what is the consequence? Not only do they now require five times as much air as they did before, but they are using up the oxygen and giving out the carbonic acid at a relatively much increased proportion, while people are afraid to open the windows in case of draughts. This is bad enough in itself, but when we remember that this condition of affairs is often carried on so as to encroach on many hours of the time for needful rest, and almost always in a blaze of gaslight, every burner of which, as Dr. Wilson told us last year, uses as much air as four or five men, we can see that those entertainments require serious attention and careful management if they are to be conducted on sound principles of health, as I must say I think they might be. Last Saturday we had the advantage of hearing Professor MacLagan on the subject of ventilation; let me impress on you the increased necessity of it when active exercise is being taken.

The late George Henry Lewes, in his "Physiology of Common Life," draws attention to the experiments of Herbet, which show that "the same man who when naked was capable of inspiring 196 cubic inches at a breath, could only inspire 130 when dressed," and the late Dr. Parkes, in his work on Hygiene, points out as deduction from this and the above physiological facts, that during exercise, whether directly involving the use of the shoulders or not, the lungs should have the freest possible play; therefore there should be no tightly contracting garments round the chest which would interfere with its expansion, and thus tend to neutralise the very benefit it is destined to bestow; and it follows further from this, that where exercise has to be taken in such ill-designed garments, the amount of work done must be in proportion diminished. Dr. Parkes having pointed out that the clothing and accoutrements for a soldier should be made as loose and free as possible over the chest, goes on to say: "And yet till a very recent date (and

in our service unfortunately even now) the modern armies of Europe were dressed and accoutred in a fashion which took from the soldier, in a great degree, that power of exertion for which, and for which alone, he is selected and trained." This was written in 1864; let me give you an example from the late Egyptian war. I have received it from good authority, and it will show the importance of the subject, and give you one illustration of the effects of eighteen years longer continuance of custom *versus* humanity and sense. A body of soldiers and a body of sailors had to make a march of three miles in the scorching sun on two consecutive days, and over the same ground. They were both able-bodied healthy men under orders for the war; the soldiers had their tight-fitting jackets, the sailors their loose and free costume. Before the march was ended no less than 130 of the soldiers had fallen out, while every single man of the blue jackets continued in his place. I know of no other difference between the two sets of men, and whether the costume had anything to do with it or not, after all that we have seen I must leave you to judge.

NOTE AND COMMENT.

We learn that a number of Montreal sportsmen have organized a new club for the purpose of carrying on a Fencer's and Club room. For this purpose they have engaged Prof. R. F. Reid, who has held the position of instructor to the Philadelphia, Toronto and Montreal Fencing Clubs. He will act as room manager and instructor, the club having arranged for lessons at an exceedingly low rate. The entertainments will be limited to members of the club and invited friends, each member having the privilege of introducing a friend.

The Montreal Racquet Club are prospecting for a new Court. A plan is under consideration for building in a better and more central locality. The new premises will contain a plunge bath and other suitable accommodation, and in addition, a bowling alley will probably be attached.

The office bearers for the ensuing year are:—Honorary President, Sir Donald A. Smith; Committee, E. S. Clouston, H. Abbott, F. M. David, John Atkin, L. S. Macdonnell, W. R. Millar, Henry J. Joseph.

The Association Regatta Committee are hard at work getting things ready, and organizing for the Regatta to be held 7th August. Subscription lists have been issued by the Hon. Secretary, and so far, the canvass has been very successful, nearly one half of the amount required has been subscribed, and there ought to be no difficulty collecting the remainder. The object is a most worthy one, and the Lachine Boating Club, who, wishing to encourage aquatics in this Province, have pluckily taken hold of the enterprise, are deserving of all the encouragement which they no doubt will receive.

It is a great pity that the Winnipeg Club will be unable to send crews to Lachine this summer. Their Juniors' and Seniors' fours are probably composed of the best amateurs rowing this year, and would give a good account of themselves. They will row in the Regatta of the St. Paul and Winnipeg rowing association, to be held on the 26th of July, on Lake Mametouka, and we venture to predict that they will have no difficulty in defeating their confreres from the Western States. Perhaps they may yet be inclined to come as far as Lachine, they would be sure of a hearty welcome and would meet many old friends, among them, Mr. J. G. Monk, Captain of the Lachine Rowing Club who was in the Winnipeg crew in 1883-84.