

# THE CANADIAN ATHLETIC NEWS.

"Better to hunt in fields for health unbought  
Than fee the doctor for a nauseous draught.  
The wise for cure on exercise depend,  
God never made His work for man to mend."

—Dryden.

Registered.

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## PHYSICAL EXERCISE: ITS FUNCTION.

LECTURE BY CHARLES W. GATHCART, M.D., F.R.C.S.

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### FIRST PART.

There are many different and distinct muscles in the body. Each has its own particular action, according to the joints over which it passes, and the part of the bone to which it is attached; and it is by the delicate interposition of one muscle, or part of a muscle, with another that we get all that marvellous variety and delicacy of movement with which we are all familiar, and which is technically called co-ordination. No muscle ever contracts by itself; there may be one or two muscles which have most to do with a particular action, but many other muscles in distant parts of the body must contract along with it, and help it to produce its special result. For instance, if I raise my arm up and hold it fully out from my side, not only are the muscles passing from the shoulder blade to the arm bone contracting, but in addition those fixing the shoulder blade itself to the trunk; and now I must in turn contract some of the muscles of the trunk, and involuntarily alter the grip of my legs on the floor to meet the unsteadiness which the extended arm tends to produce on my previously well balanced body. Now, although in the simple illustration which I have taken, the necessary contraction of distant muscles was produced, not only with-

out my being aware of it, but also without effort, it was not so the first time I tried it, for each new combination requires practice to enable us to train the other muscles to come in at the proper time and in the proper order. This practical result of co-ordination is called knack, and as its regulation depends on the proper succession of nervous impulses, it shews us another particular in which the nervous system is of the greatest importance to the proper and efficient contraction of the muscles. In passing let us learn a lesson from some of these theoretical considerations. We can see that the exercise of one part of the body indirectly tells upon many others which we would not suspect. Hence the value of vigorous walking, for instance, with the swing of the arms, the balance of the body, and the action of the legs, but hence also the danger of movements which are one-sided and often repeated producing the constant and associated action of certain groups of muscles which may produce changes in the bones and alterations in form which no one would suspect, because apparently not concerned immediately in the movements in question. Who would imagine, for instance, that when you write a letter quietly at a table you require not only muscles in your hand and forearm, but also in your upper arm and shoulder as well; this, however, is an important fact and should not be forgotten, because some of our practical rules for exercise will depend upon it. Another point as to muscular contraction before we leave it, and that is as to the blood supply of muscle. Every contraction uses up so much material derived from the food which acts as fuel, and is, as it were, burnt up in the muscle. The blood parts with its nutrient material which is stored up within the muscular fibre during the

period of rest, then when the nerve stimulus comes, the stored material is broken up again, oxygen is absorbed from the blood, and certain waste products, especially carbonic acid gas, are discharged into it, so that it has to be purified in the lungs and kidneys before it is again fit for use. Thus a contracting muscle which in virtue of its life required some blood before, requires not only more blood to give it new material and to carry off its waste products, but it requires also leisure and rest to build up new fuel for future contractions. Mr Gaskell of Cambridge, has seen under the microscope that the arteries going to a muscle and the veins coming from it are much distended with blood during its contraction, and thus we see how the demand is fully met by the supply; and, as to the requisite for leisure, we all of us know that the greatest trial is an even steady strain, since nothing is more tiring than a continuous cramped position, much more so than a more violent but intermittent effort. All these apparently dry details on the changes going on in muscle during contraction and the resulting alteration in the blood, the increased quantity of blood passing through exercise muscle, and the requisite for alteration in muscular contraction, have an important bearing on physical science as we shall afterwards see, so I must ask you to note them carefully now. At the same time, too, I may point out that similar conditions hold good for all the other tissues of the body in their condition of vital activity, whether it be the brain in thought or mental excitement, or the various glands such as the liver and kidneys, all requiring or using more blood during the period of their activity, and calling for times of leisure to build up new material against a repetition of the same.