



THE JOURNAL OF EDUCATION

Devoted to Education, Literature, Science, and the Arts.

Volume XVIII.

Quebec, Province of Quebec, December, 1874.

No. 12.

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On Physical Education : Its Neglect, Effects and Promotion. (1)

(Continued.)

III. Effects of physical training on physical, intellectual, and moral development.

I purpose now to examine more in detail the effects of systematic training on physical, and thus on intellectual and moral, development.

1. Influence of gymnastics on physical development.

"A perfect state of health," says Dr. Parkes, in his *Manual of Hygiene*, "implies that every organ has its due share of exercise. If this is deficient, nutrition suffers, the organ lessens in size, and more, degenerates. If it be excessive, nutrition, at first apparently vigorous, becomes at last abnormal, and also causes degeneration. Every organ has its special stimulus, which excites its action; and if this stimulus is perfectly normal as to quantity and quality, perfect health is necessarily the result..... The action of the voluntary muscles is necessary for the perfect exercise of all organs. For circulation of the blood, its formation and destruction, are profoundly influenced by the movement of the voluntary muscles.

(1) A paper read by Professor D. Schaible, F. C. P., before the Royal College of Preceptors, London.

Without this muscular movement, health must inevitably be lost."

The voluntary muscles.—The local effect is the growth of the muscles; they become firmer, and respond more readily to volition. When we exercise the arm, *e. g.*, by handling a club, or by striking with a hammer, or rapidly turning a wheel, the limb becomes the seat of a considerable activity: its bulk increases; heat is developed; and, if the skin be sensitive, and the capillary system vigorous, a ruddy glow is diffused over it, and a more or less abundant perspiration succeeds. If the limb is not accustomed to muscular exertion, lassitude presently sets in. An effort of the will may overcome this first feeling of fatigue, until one more imperious demands rest. Then, at a longer or shorter interval, everything returns to its normal state. Fatigue or stiffness disappears last. By the habitual practice of the same movements, the limb becomes the seat of a continued activity, of a more active circulation and nutrition; in a word, it becomes bigger. The growth of the muscles, however, has a limit. If the limb is gradually accustomed to the exercise, it becomes able to resist, to a considerable extent, the feeling of fatigue. But the too frequent repetition of one particular exercise, or the excessive exercise of a single muscle or group of muscles, results in a diminution, wasting. It appears that this is less the case when *all* the muscles of the body are equally exercised. But in any case, prolonged or too great exertion, without due intervals of rest, injures the nutrition of the muscles, and they become flaccid.

Thus moderate and gradual exercise leads to the progressive development of the muscular system, while abuse of it induces atrophy. Look at the thin legs of a man who walks to excess—the lean arms of certain workmen or labourers, exhausted by fatigue. But exercise must not only be moderate and gradual, it ought also to be general; *i. e.*, *all* muscles, and not single groups, should be brought into play. One side exercise of certain muscles causes atrophy of the others. Smiths, fencing masters, and others, often have right arms of extraordinary bulk, the legs of dancers are extravagantly developed, the shoulders of porters are like those of Atlas, while the muscles of the other parts of the body are shrivelled.