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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE REGULATION OF PHYSICAL INSTRUCTION IN SCHOOLS AND COLLEGES FROM THE STANDPOINT OF HYGIENE[1]

THE researches of modern physiologists on the growth of the brain and nervous system have done more to place the physical instruction of the young on a sound and logical basis than any other influence that can be named, for the specialization of the child's muscular system progresses with the increasing complexity of the brain, and the evolution of his physical nature is but an epitome of the evolution of the whole race.

The infant is born with but two definite voluntary movements, sucking and grasping, necessary for self preservation; all others consist of aimless waving and kicking of the arms and legs and it is not until the assumption of the upright position that the specialization begins that advances him above his four-footed fellows.

Relieved of their function of support, the arms rapidly learn movements of throwing and striking, grasping and pulling, and he familiarizes himself quickly with his surroundings and soon begins the imitation of the movements in animals and people and machines that are within his range of observation.

[1] An address delivered in a symposium on "The Regulation of Physical Instruction in Schools and Colleges, from the Standpoint of Hygiene" before Section K (Physiology and Experimental Medicine) of the American Association for the Advancement of Science, Baltimore, December 20, 1908.

This goes on with increasing freedom. He learns to handle hammers; to cut with a knife; to throw and catch and strike; to explore and hunt; to run and climb.

At the age of twelve the second great change takes place in his evolution. He finds that he is part of a community and begins to take interest in games involving organization. He becomes one of a gang or team, and this involves cooperation, self-sacrifice and discipline—qualities that he does not recognize before this stage.

A band of savages who have organized to fight under a chief instead of every man by his own hand have arrived at the same stage of evolution as Anglo-Saxon boys of twelve to fourteen, as has been so well pointed out by Gulick.

A rational system of physical instruction must follow this evolution if it is to be hygienic or successful, and this was done with preeminent success by Froebel in the kindergarten, where the games and exercises are designed to imitate the hopping of birds, the flying of bees, the circling arms of the wind-mill—objects familiar to the child and appealing to his awakening imagination.

With his increasing age the child is promoted to the lower grades of the public school where space becomes valuable and his freedom is curtailed by the limitations of the school room. The normal occupation of a child is play, but school life means periods of fixed posture and the first application of the hand of discipline to prepare him for community life.

Corrective exercises to overcome the evil tendencies of prolonged sitting when writing and reading must now be introduced, and the time for free play is curtailed.

The well-rounded course would contain these corrective exercises given at frequent intervals throughout the day; class exercises and marching for discipline; and the plays and games that children of that age have always played, modified in some cases to fit the limitations of time and space imposed by the school hours and the play ground.

At about sixteen there is a break in the youth's education. Most children finish their formal studies and go into their life's work. A few go on to college; but the freshman class of a college is also made up of young men recruited from the farm, the shop, the office, the factory and the night school, presenting all the mental and moral defects of these widely varying occupations. Many of them have uncorrected eye defects; round or crooked backs; narrow, flat chests and flabby muscles. The play instinct may have been crushed out by the hard grinding life of the factory, or office, and they may have lost the knowledge and desire to play. They are old before their time. In contrast to those are the undisciplined and self-sufficient athletic men, who do not take kindly to the discipline of college life, considering it as an unnecessary evil to be avoided as much as possible.

A careful physical examination should precede any attempt to provide physical instruction for college students.

This examination should include data on family history; habits of life; health history, obtained by leading questions which may be followed up if necessary; tests of simple maximum effort in the movements most frequently employed, extension of the back and legs, flexion and extension of the arms, the grasping power and lung capacity, with a certain number of measurements for purposes of comparison.

The students may then be divided into three classes: (1) Defective, (2) average and (3) athletes.

Defectives need personal advice and individual prescription to correct flat foot, uneven shoulders, constipation, hernia,

obesity, old heart lesions or joint injuries. These are given on cards and the student taken over each exercise in detail by an instructor who reports at frequent intervals.

The average man may be taken in classes which should begin by exercises of discipline, marching and setting-up movements to word of command. They should then be examined to find their ability to perform certain exercises of skill, and classified according to their proficiency. A course of graded exercises should follow, closing with a re-examination. This procedure may be repeated three or four times during the college year.

In designing the exercise to be given to the college student, the evolution of the race must be kept in mind and the old co-ordinations that have been responsible for its development must be used as much as possible in a natural manner.

1. *Locomotion:* in marching, running, jumping, dancing, tumbling, climbing and swimming.

2. Throwing large and small balls for distance and accuracy. Catching and dodging.

3. *Fighting:* by striking, as in boxing; by grappling, as in wrestling; by thrusting, as in fencing; and by striking, as in single stick or saber.

Some of these are best taught indoors, but where it is possible all exercises should be taken in the open air.

All the most popular athletic contests can be arranged to apply to the general mass of the students by setting a low standard, by having the whole class try a feat at once, by doing the exercise to word of command, and by stopping short of great fatigue.

After a certain time there is a tendency to specialize in those who find the general class work too easy, and this may be found on entrance to college in some whose preliminary training has been obtained in preparatory schools. They naturally drift into competitive athletics, but this involves an entirely different kind of training from that already described.

The distinction between physical training and athletic training must be sharply defined.

In physical training the object is to bring the standard of health up to its highest level, and all excessive strain or exhaustion is avoided while all the activities are exercised.

In athletic training the object is to bring the human machine to its highest point of efficiency to perform a definite feat, and everything that is useless or detrimental is sacrificed. The heart is made larger and stronger than is necessary for ordinary life if the feat to be performed is one of endurance. The nervous system is made irritable and alert if speed is required, the special muscles are developed, and the normal store of fat is lessened if agility is the necessary requirement. The object is not primarily health but superlative ability, either in strength, speed or endurance, and the undue absorption of fat leaves the constitution less able to withstand the siege of a constitutional infection like typhoid fever or pneumonia in which a moderate amount of fat is a valuable asset.

In deciding the value or harmfulness of athletic training, however, the physiologist has not always the last word to say. The ethical and social sides assume here an importance that overshadows the purely physiological consideration. The athletic class will never exceed ten or fifteen per cent. of a college community, and it is after all for the main body of students whose interests are not primarily athletic that physical instruction must be considered and its details planned so that they may be enabled to graduate stronger,

sounder, more self reliant and more efficient.

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ON THE PHYSIOLOGICAL EFFECTS OF MODERATE MUSCULAR ACTIVITY AND OF STRAIN[1]

Practical efforts, both in Europe and America, to solve the problem of physical training in schools and colleges have proceeded along two different lines, which are roughly typified in Europe by the English system, on the one hand, and the Swedish and German systems, on the other. In the former, athletic efforts may be said to play a predominant rôle; in the latter, they are strictly subordinated in the endeavor to reach the masses. Similarly, the practise in America differs considerably. In some colleges the great stress is laid upon athletics; in others athletic activities are entirely separate from instruction in physical training for the student body as a whole. But these are the extremes, for in the majority of cases the organization of the work combines, or seeks to combine, both. Perhaps it will be conducive to clearer thinking if we define at the outset the difference between the two extremes.

In those cases where athletics are under separate organization and control, it is the aim of the department of physical training to secure for each individual student the proper basis of health for his work in school or college and also to educate him in the truest sense of that word for the proper hygienic conduct of his subsequent life. Physical training is not regarded as an end in itself, but as an essential means toward the equipment of the individual for the work in which he may engage. The effort is, furthermore, made to do this economically as regards both time and effort.

The athletic ideal is entirely different. It does constitute at the time an end in itself; its primary purpose is not the cultivation of health, but of excelling some one else. It brings into play the elements of competition and championship. The athletic team of a school or college represents the best which the institution can do in that line of effort. Sacrifices of time, of convenience, and, generally, to some extent at least, of scholarship, are regarded as proper, if needed to secure the immediate end in view. Physical risks must be taken if necessary, risks which may end in permanent injury, and even in death, in order that one's college shall prove itself superior to some other college.

There are thus, these two ideals which come into practical work of physical training. It is of course not necessary that we adopt one to the exclusion of the other; but these ideals profoundly influence the practical measures adopted, and it is essential that we approach the solution of our problem from the right point of view. It should be added that, in giving each its due weight, other considerations than the strictly hygienic must enter into our decision. First, there is the question whether a given plan of action reaches the masses and is effective with them from the standpoint of physical training; and there is also the question whether we do not need to cultivate those moral qualities of group loyalty, of subordination of self to the interest of the whole, and of the willingness to make the supreme effort for a common cause, which is perhaps the very soul of modern school and college athletics. These are questions on which obviously the physiologist has not the last word,

[1] An address delivered in a symposium on "The Regulation of Physical Instruction in Schools and Colleges, from the Standpoint of Hygiene" before Section K (Physiology and Experimental Medicine) of the American Association for the Advancement of Science, Baltimore, December 20, 1908.