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# PHYSICAL EDUCATION IN CHILDREN.

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BY

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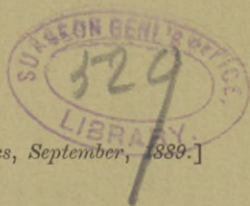
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## PHYSICAL EDUCATION IN CHILDREN.

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It is my object in this paper only to call attention to the value of physical education in children for the prevention and cure of disease. But before this is done, it is best to consider very briefly the physical constitution of children.

*Bones.*—The bones of children are imperfectly formed. Many are semi-cartilaginous, while others consist of different segments held together by intervening cartilage. They are elastic and full of blood and fat. The periosteum is thicker than in adults and richly supplied with vessels. The connective tissue of young bone is tender, and hence has not as firm a union with tendinous and ligamentous attachments as is found in adults. The cartilaginous union of the shafts of bones with their epiphyses makes violent exercise dangerous, because it is likely to cause their separation.

*Muscles.*—The muscles of children are in less of a developmental state than bone, though the muscle-elements are not as firmly bound together as in adult bodies. Their nutritive supply is very liberal, and they are generally surrounded by a liberal layer of fat. They contain a larger proportion of water than those of adults, and therefore are not firm and hard.

*Blood-vessels.*—These are all relatively large in children and liberally supplied to nearly all parts of the body. They are more susceptible to impressions at this time of life than in later years. I mean that it is easier to develop them in childhood than in adult life, for they respond more readily to increased pressure and have a relatively better nutritive supply. Oxygenation in children is also better than in adults, because the freshly aerated blood has a much shorter distance to travel from the heart to the remotest parts of the body.





*Nervous system.*—While the nervous system is undergoing considerable development in children, it presents quicker reflexes than in adults, probably largely due to shortness of the peripheral nerves, thus consuming less time in the transmission of afferent and efferent impulses. But a child's nervous centres are more sensitive to stimuli and irritations, as is shown in their common reflex convulsions and febriculæ almost always readily controlled by the administration of nervous sedatives, notably the bromides. Shortness of limb, entirely aside from the rapid transmission of nervous impulses, is very conducive to the rapidity of movement so noticeable in children.

*The viscera.*—The largeness of the liver and the relatively small lungs are prominent anatomical features in the child. The stomach and intestines are proportionally large, causing a decided abdominal bulging. The viscera of the child have a softness and vascularity in marked contrast to the same organs in the adult. All in all, they are a much more delicate organism, and require a correspondingly greater amount of care.

*Digestion.*—The imbibition, digestion, and absorption of food in the child consists of a most interesting and important series of phenomena, without a thorough understanding and appreciation of which the proper physical education of children at any time is impossible. Too much stress cannot be laid upon this point, and it must always be remembered that no fixed dietary will do for any large number of children.

*Growth and development.*—The child is undergoing constant changes of growth and development, all its processes being generally more active than those of adults. The associations of its organs are new, and more apt to be impressed by external influences than in older organisms. What would produce a moderate effect upon an older organism might be powerful in its influence upon a younger one. Adult organisms undergo but little further development, while in children many changes have yet to occur. It follows, therefore, that more care must be exercised in the direction of children's exercises than those of grown men and women.

At first sight it does not appear that exercises can have much effect upon the growth of bone, but the facts of experi-

ence teach that it is so. The explanation is simple. Young bone is but a connective-tissue framework, filled with bone-cells, or osteoblasts, and cartilage, and this blends directly with the surrounding periosteum, thus forming a continuous, direct, and intimate fibrous connection of the periosteum and the entire interior of the bone. In the same way can muscles be described as consisting of a connective-tissue framework supporting muscle-cells and their vessels and nerves. This all-pervading connective tissue begins to predominate over the muscle elements as it nears the end of the muscle to become modified into a tendon. This tendon loses itself into the periosteum and bone, to which it is attached in very much the same way as its other end is to the muscle. Thus a muscle tendon is inserted into the very heart of the bone and not into its superficial layer as is so commonly and erroneously supposed and unfortunately too often taught.

From the intimate relations that I have indicated as existing between the connective tissue of bone and muscle and intervening tendinous structures, it follows that forcible or sustained muscular contractions that pull upon a bone act upon its deeper parts as well as upon its surface. It also follows that the depth at which this strain is felt in any bone depends upon the severity and duration of the force exerted.

It is a well-known law in physiology that increased functional activity of a part causes an increased supply of blood. Suppose now that a child is doing considerable exercise, and we have at once an increased blood-supply in its acting muscle and strained bone. If this is kept up for a long enough time, the increased blood-current leads to a higher nutrition of the part,—growth,—and should the bone be in the developmental stage, it will modify its development. As a proof of this effect of exercise upon bone I will only call attention to the readiness with which anatomists usually distinguish bones of the male from those of the female because of their larger size and the more decided markings of their ridges for muscular attachment. "This must have been a powerful man" is an expression often enough heard coming from teachers when looking over a skeleton with prominent ridges and tuberosities. In my paper on base-ball pitcher's arm I had the opportunity



to first call attention to the fact that bone-growth in the adult is caused by excessive exercise.\*

My sole object in being so explicit about the effect of exercise upon bone is to show that it is a potential agent capable of doing either much good or harm according to its proper or improper application. With this example well in mind, it is hardly necessary to demonstrate the equally potential power of exercise upon all the other parts of the body, when it has been conclusively proven to have so decided an effect upon the nutrition and growth on as hard and unyielding and relatively passive a substance as bone.

Now, what are the general effects of moderate and violent exercise in health?

*Moderate exercise in health.*—When judiciously taken, moderate exercise, in ordinary health, increases the general nutrition of the body by increasing the heart's action, expanding the blood-vessels, increasing the secretions and excretions, and subsequently inducing tranquil and refreshing sleep. Besides this, it increases the vigor of the respirations, and thus the oxygenation of the blood. The body is pervaded by a healthy glow that remains for several hours and is followed by a feeling of added strength without any subsequent reaction.

*Violent exercise in health.*—By violent exercise I mean any physical work that is felt as a decided tax. All such is sure to induce local congestion at the seat of strain, and if persisted in will cause inflammation and hypertrophy. None of the organs subjected to these strains escape this inevitable result. On the young, it may even cause epiphyseal separations, tearing of the periosteum, and rupture of muscle. It follows from this that moderate exercise is better adapted for general use among children than the more active and dangerous variety. For some purposes, though, the latter is the more desirable, but it must be used with caution.

*Therapy of the exercise of children.*—Under this head I wish simply to mention some of the circumstances under which it is possible to benefit children by exercise, either instead of or in conjunction with other means. Of these condi-

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\* Medical News, July 16, 1887.

tions one of the most prominent and important are *spinal curvatures* not dependent upon osseous disease. Several plans for relief of this class of cases are now in vogue, but all seem to me more or less seriously defective. It is very generally, and I believe justly, supposed that these curvatures result from muscular weakness. Yet one plan is to treat them by a fixed plaster jacket or by metallic braces. The defect of this treatment is that while it may hold the column straight, it does not strengthen the weak muscles which should be able to hold the column in its proper position. Another method is to prescribe certain exercises that will develop certain muscles until they are strong enough to obliterate the curves by their contraction. This plan is also defective in that it develops only certain muscles while others equally as important are overlooked. Sufficient success may, and often does, result from such treatment in so far as it pleases the patient by evident improvement. But the physician's work does not stop at this point. His business is to permanently restore abnormal conditions to a normal state. Special development of certain muscles does not do this, for by following such a plan one simply replaces one deformity by another. No treatment of deformities by physical exercise is devoid of serious error that does not effect the symmetrical development of the body.

For instance, in a dextral dorsal curvature, due to muscular feebleness, the fashionable physical culture treatment now in vogue would compel the daily exercising of the muscles of the left side of the chest, for the purpose of pulling out the ribs and reducing the concavity of the spine of that side. So far the utility and correctness of this treatment cannot be assailed, but it practically stops at this point, or with a few additional exercises, causing a bending of the trunk so as to antagonize the objectionable curve. The method is defective by omission. Of what avail is it to have a straight spinal column with muscles on one side much stronger than those on the other? A muscular deformity succeeds one that was bony. This is not all, for in the course of time the stronger side predominates and the curve returns, but is the reverse of what it was in the former instance. What is absolutely requisite to a permanent cure is general exercise for both sides, and a few supplementary exercises to



help reduce the deformity without unnecessary delay. These may be of the calisthenic variety, or by means of dumb-bells, clubs, or pulley-weights. I prefer the last at all times when convenient. A suitable machine can be obtained for the moderate sum of ten dollars. I consider Reach's "O K" machine by all odds the most useful in the market, and it is the cheapest, especially when one takes into consideration the numerous exercises to which it can be adjusted.

A lady who has just left for her home was under my care for a week, receiving instructions in calisthenic and pulley-weight exercises for two purposes: one series to antagonize a dorso-lumbar curve, and the other to equally strengthen all the muscles of her back, and thus enable her to hold herself as erect as was intended by nature. She has a machine at home, and will continue her work until it is no longer needed. In her case the cure will be permanent. Had she received instructions in only those exercises which antagonize her curves, she would have made a temporary recovery only to lapse into a reversed curvature.

*Club-foot*, due to muscular weakness, as in cases due to anterior poliomyelitis, are best treated with special exercises. One plan is to have such a club-foot in leather and steel, thus forcing the foot into proper position without any direct effort to regenerate the lost muscle-power. Everything is left to time and the curative powers of nature. But this is neither scientific nor for what the physician receives his pay. The muscles actually atrophy to such an extent while braces are worn that they can never recover their functions. Another method, most ingenious, less unsightly than the former, and somewhat better, though also defective, is that which uses the artificial rubber muscle. If I am not mistaken, this was introduced a decade ago by the ingenious Dr. V. P. Gibney, of New York. But the serious objection to the rubber muscle is that it also largely destroys the functional activity of the affected muscle, by doing for it all its work. The plan of treatment which I advocate in all such cases is to use the brace when it is necessary to guard against accidental dislocation. The patient should only wear them when obliged to be on the feet, especially in locomotion. The rubber muscle should be worn when braces are



not necessary and when for æsthetic reasons it is desired to hide the deformity, but at all other times the foot should be permitted to fall into a natural position while exercises are practised to develop the affected muscle. They should also be faradized while the cord should be moderately galvanized. I, of course, only refer to those cases in which all motive power has not been lost.

It has quite aptly been said that a child is a small savage undergoing civilization. It is irregular in its habits, and tends to gormandize, as well as eat and drink without regard to the wholesomeness of what is within its reach. Regular physical exercise teaches it system, care, and discipline. Many children have a defective digestion due to many causes, common among which are defective circulation, defective nervous force, and defective muscle-power in the stomach and belly wall. These are all remedied by proper exercise. Many forms of indigestion, we all know, yield kindly to suitable exercise, and in no class of individuals is this more so than in children.

Some children are morose, some have mental torpor, some are lazy, and so I could go on through a list of ailments referable to the tone of the central nervous system. Now, a fact that is still but little appreciated is that physical exercise is a nervous stimulant and tonic of the highest order,—in fact, I believe it to have no peer; and this conviction is the result of a large unbroken series of practical clinical observations. I know of no better demonstration of this effect of exercise in sharpening the wits than that given by Dr. Hamilton D. Wey, in his reported experiments with series of dullard criminals in the New York State Reformatory, at Elmira. It has the same beneficial effect in improving the disposition. For I have seen many disagreeable children become cheerful and good-natured after becoming actively interested in a course of physical education. The exceptions are temporary and due to conceit growing out of distinctions earned by superior accomplishments in contests. As a rule this condition does not last.

Systematic physical exercise is impossible without personal cleanliness. Children who are brought up familiar with the gymnasium or track are clean and regular in their habits. To-

gether with a weak body there is nearly always associated a high degree of backwardness due to false modesty, and also considerable lack of confidence. Now these are almost invariably lost after one or two years of gymnasium and out-door athletic work. That this is a valuable change for those who in later years must fight the world's great battle cannot be gainsaid.

As physicians, we all know the objections to the customary drinking of intoxicants and the use of tobacco. Their employment is most positively conflicting with good athletic work of any kind. Any early physical training of children compels them, or at least urges them, to dispense with intoxicating drinks and any form of tobacco. This alone would be reason enough to justify a demand for the early physical training of our children if there were no other. No athlete can get along without fresh air and wholesome food. Therefore greater care in the acquirement of both these would inevitably result from proper physical exercise.

The Physical Education Society of Pennsylvania has so far directed its main efforts towards introducing into the public schools of the State a system of compulsory physical education. It now exists in some parts of the country, notably in Milwaukee, where the German Turners are doing so much good for the rising generation. It is confidently hoped that within less than another year Pennsylvania will be enrolled among those few States that have made a systematic effort at the physical as well as mental education of their children.

I can think of no better conclusion to this paper than by quoting from a former paper of mine upon this subject, and if I have interested those of the profession of this country whose special business it is to look after the welfare of the young sufficiently to obtain their aid in developing the physical remedy, physical education, I shall feel deeply gratified with the result of the labors of which this paper is the outcome.

1. The object is to develop the material body, and with it, of necessity, the mind and morals.
2. Like most potent agencies, it is much abused and far too little understood.
3. It absolutely forbids smoking.



4. It absolutely forbids the drinking of alcoholic or malt beverages.

5. It insists upon the necessity of regularity in living, especially as regards the time of sleeping, eating, exercise, and recreation.

6. It enforces a good substantial dietary that will never be forgotten.

7. It discountenances all kinds of vice.

8. It is rigid in discipline without seeming so to those disciplined, and develops implicit and willing obedience to advisers.

9. It has a marked effect upon the growth of the body and mind.

10. It develops to a high degree the valuable qualities of hope, confidence, courage, deference, obedience where proper, independence, perseverance, ambition, temperance, and determination.

11. It is, in short, the most valuable preparation of the young for the cares and trials of adult life, and aids young and old alike to ward off disease and mitigate its effects.







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