Original Articles

THE EFFECTS OF MILITARY DRILL ON BOYS.¹

BY PROF. D. A. SARGENT, M.D., OF HARVARD UNIVERSITY.

LONG before the Civil War the majority of the Southern States were pursuing the European plan of having State Academies devoted to military science.

At the outbreak of the Rebellion, while the North was obliged to look to the small nucleus graduated from West Point for its officers, the South had, in addition, the well-trained students of the State colleges to command its regiments. In the opinion of military men, the early successes of the Southern army were largely due to this fact.

Many of our Northern citizens were so much impressed with the utter lack of military training on the part of our educated young men at the beginning of the war, that efforts were made as early as December, 1861, to introduce infantry drills in the public schools. The matter was acted upon by the New York and other City Boards of Education, and referred by them to special committees. In the January following, Governors Andrew and Morgan recommended legislative action on the subject.

In 1863, military drill was established in the Boston schools. At the termination of the war, it was considered desirable by the general government that some of the army officers not otherwise employed should be detailed to teach the students of such colleges as desired it, so that educated men might have a better knowledge of military discipline and drill than they have hitherto had in these institutions.

Many of our schools and colleges applied to the government for officers, and entered upon the experiment of making military drill a part of the regular curriculum. How far this experiment has succeeded from the military point of view, I must leave those who are interested in our volunteer militia to answer.

I simply wish to call your attention to the fact that the primary object of establishing the drill in our schools and colleges was a professional one—that is, to give instruction in military tactics to educated young men, in order that they might be of service to the country or community in case of an emergency. The war gave an incentive not only to the practice of military drill, but it also furnished a great stimulus to all forms of physical exercise, and especially to athletic contests and games.

Within the past few years, physical training has received a new impetus. A large number of school, college, and city gymnasia have been built, and athletic games have obtained a strong hold on public attention.

As the occasion which gave rise to a call to arms grows more remote, and the real object of the drill loses its significance, the advocates for its maintenance in the schools claim for it superior advantages as a physical exercise. In the city of Boston, the committees to whom the subject of military drill in schools has been referred have placed considerable stress upon this point.

Allow me to quote a few lines from their published reports, as compiled by the Principals of the public Latin and High Schools for boys. In 1873 the Committee reported as follows:

¹ Read before the Section for Clinical Medicine, Pathology, and Hygiene of the Massachusetts Medical Society, Suffolk District, June 8, 1886.

"Your Committee believe that the drill, as now carried on, proves to be not only the *best* for physical exercise for these schools, but that, at the same time, it inculcates a more manly spirit in the boys, invigorates their intellects, and makes them more graceful and gentlemanly in their bearing."

In the report for 1874 there is a similar statement. In 1875 the Committee state:

"We trust that the drills will be kept up, believing that committees having them in charge will see that no form of gymnastics could be substituted from which the boys would derive such benefit."

In 1880 the Committee say:

"The establishment of the military drill is one of the few provisions made by the School Board for the physical training of the pupils under its charge, and no one who has observed the soldierly bearing of the members of our school battalions can have any doubt of its value as a means of securing a full and symmetrical development of the physique."

Notwithstanding the fact that half of the members of these committees were physicians, I shall beg to differ with them absolutely as to their conclusions concerning the physical effect of the military drill upon boys.

In order that we may approach the discussion of this subject more intelligently, let us inquire briefly into the physiology of exercise, and consider some of the facts which observation and experience have determined.

Exercise in its simplest sense may be defined as muscular movement produced by muscular contraction. According to the physiologists, "the property of contractility is inherent in the muscular substance, but in normal life the manifestation of this property is immediately determined through the influence of the nervous system. . . .

"A nervous impulse originating at the brain or spinal column travels along the nerves to their terminal expansions in the muscular fibres; on its arrival at the muscular fibre, the nervous impulse is converted into a muscle-impulse. . . . Between the reception of the nervous impulse and the initiation of the visible contractile movement an interval elapses, known as the 'latent period,' which (according to Helmholtz) is probably occupied by molecular changes in the fibre preparatory to its alteration in form. At the close of the latent period the muscle-impulse is succeeded by a wave of contraction. . . . The contraction of the individual fibres produces changes in form of the entire muscle, shortening the distance between its two extremities by increasing its thickness, and slightly reducing its bulk.

"In the voluntary muscles (according to Weber), each contraction is compound in character, being composed of a series of rapid contractions, due to an equally rapid succession of nerve-impulses."

During muscular contractions certain chemical changes take place in the muscle substance, although the exact nature of the metamorphosis is not known. It is known, however, that the blood escaping from muscles in action is much darker than the venous blood of muscles in repose, and that it contains a much greater proportion of carbonic acid.

It is also known that a greater amount of oxygen is absorbed by the muscle during the period of contraction, and Gaskell's experiments have demonstrated that the flow of blood through muscle is increased at the time of its shortening.

Thus we see that the simplest muscular movements involve a molecular change at the nerve-centre in which the movement originates, in the nerve-fibre that transmits the impulse, in the muscle-fibres that contract, and in the bloodvessels that dilate in response to the stimulation. The experimental researches in the physiological laboratory on a single muscle have given us an epitome of what should take place throughout the system at large, in order to realize the best results from exercise.

The consecutive action and harmonious relation of the nervous, muscular, and vascular systems must accompany every effort to improve the physique and render the individual energetic, healthy, and strong. How to attain this three-fold result is the problem that the instructor of physical training has before him.

If you lift your arm in this manner (flexing the arm at the elbow), it is because the biceps muscle contracts, but the fibres are not hard and tense, and there is little evidence of an increased circulation. This would be termed a movement — almost a passive movement — and is what might be first advised to restore efficiency to the arm of a paralytic, or to preserve a single group of muscles from atrophy. This is the basis of the Movement Cure as founded by Ling, of Sweden.

If you should contract the muscles of the arm rapidly and energetically, you would give exercise to nerve-centres and nerve-fibres, but the muscles would not be efficiently used, and the blood-supply would not be much augmented.

By pursuing this method, the nervous system can sometimes be improved and the muscles made responsive, but activity will be attained at the expense of endurance. This is the basis of the Delsart system of physical culture now so popular in the schools of elocution.

Now grasp a heavy dumb-bell or weight in the hand, and elevate it slowly to the shoulder. In so doing you bring about an energetic action of the flexor muscles, but the nervous system is not especially active, and though the bloodvessels of the arm are gorged with blood, the circulation is not much improved. By pursuing this method the muscles can be increased in size and strength, but the individual, though strong, will lack heart and lung power, and be constitutionally weak. This is the result of the Heavy Weight System as formerly practised and advocated by Dr. Winship.

Now if the arm is alternately contracted and relaxed while using a lighter weight, the blood in the arteries is pushed forward into the veins, and through the veins into the heart. When it arrives at the heart, that organ is stimulated to contract with greater energy, and a proportionally greater amount of blood is sent back to the arm. In following this course, the bloodvessels in the parts used would be greatly increased in size and capacity, but in case many muscles were called into play at the same time, the brain and central nerve system would lack their due share of blood, and power to continue the effort for any length of time would be wanting. This, in a word, is the chief defect in the system of Light Gymnastics, advocated so fervently some twenty years ago by the late Dr. Dio Lewis.

These four methods of exercise, when elaborated and applied to the whole body, represent, I say, the fundamental principles of four great systems of physical training, each method being admirably adapted to

meet the special wants of certain individuals, but wholly unreliable, and in many cases followed by fatal consequences when applied indiscriminately to all classes in the community.

To select at once a system of exercise that will do no harm to any one, and yet be beneficial to all, is a difficult task, yet we shall come nearer doing the greatest good to the greatest number if we follow what may be termed the physiological method. As near as I have been able to ascertain them, the essential requisites of a good exercise may be summed up in the following suggestions:

(1) The person should be sufficiently interested in the exercise to give it his attention in order to secure the necessary volitional power to start the movement. Any exercise executed in a lifeless way is of little benefit to nerve or muscle in a healthy condition.

(2) There should be a weight or resistance to overcome in order to bring out the working force of the muscle, the theory being that the muscles were not created merely to move the parts to which they are attached, but to do service and help man bear his burdens. In using a weight, the muscle gradually acquires the force with which it tries to contract.

(3) The exercise must be performed with sufficient vigor and rapidity to engage the energetic contraction of the muscles employed. When this is done, old tissue is broken down, and its place is supplied with new material in increased quantity, thus augmenting the size and strength of the muscles. The rapidity of the movement puts a limit to the weight used, and the alternate contraction and relaxation of the muscles assists the circulation of the blood in the parts employed.

(4) As many muscles as possible must be brought into action in order to secure a full-orbed and harmonious development of the whole body. One-sided development is usually attained by robbing some other part of its just share of the body's nutriment. It is apt to be accompanied by a functional disturbance of one or more of the vital organs, by inducing malformations of the thorax, or it is likely to lead to the straining of parts that are weak, by gauging their strength by parts that are strong.

(5) A sufficient number of muscles should be called into action at one time to stimulate the action of the heart and lungs and increase the circulation and respiration. This is one of the most important considerations to bear in mind in regard to exercise. The more muscles a person can use at one time, and the more rapid and extensive the movement, the greater the muscular consumption of oxygen and elimination of carbonic acid. In order to sustain this activity in the muscles, a greater amount of oxygen must be taken in, and a greater amount of carbon-di-oxide must be given off from the system. This is accomplished through the respiration. "If a man walks one mile an hour, he breathes twice as much air as when lying down; if he walks four miles an hour, he breathes four times as much, and if six miles an hour, seven times as much." He takes out of this inspired air an increased ratio of oxygen, and eliminates nearly the same proportion of carbonic di-oxide during expiration. To keep up this increased respiratory activity and to aid the heart in removing the waste material and hastening forward the new, the limbs and walls of the chest must be absolutely free from any ligatures or constrictions. The slightest interference with the

action of the respiratory muscles at this time embarrasses the functions of the lungs and heart. The chief advantage of exercises that give employment to many muscles at one time is that by increasing the respiration and quickening the circulation, they improve the health and strength of all parts of the body.

(6) As a "latent period" precedes the contraction of a muscle, so a momentary period of rest should, as far as possible, precede movement in exercise. This is best secured where there is an alternation in the movements, as in walking, running, rowing, etc. All tetanized movements, such as holding weights, standing in a constricted position, etc., tend to impair the tone of the muscles by interfering with the nutrition of both muscles and nerves.

(7) The exercises of the young should be of such a composite nature as to bring about the co-operation and co-ordination of the muscles. This involves principally the training of the central nerve system. All gymnastic sports and athletic games that require skill, dexterity, coolness, courage, and presence of mind, are included in this list, and are exceedingly valuable to any system of physical training, as adjuncts in the development of character.

My principal objection to military drill as a physical exercise is that it does not to any extent meet the physiological demands of the body as set forth in the seven observations just referred to. In other words: It is not of sufficient interest as a means of physical development to arouse any moral earnestness and enthusiasm on the part of the boys. The exercise of the manual is not performed with sufficient force and rapidity to engage the energetic contraction of the muscles employed. It is essentially a one-sided exercise, bringing into excessive action the elevators of the right scapula, the deltoid, biceps, flexors of the fore-arm, wrist and fingers of the right side, while the other muscles, excepting the legs on parade days, do not get sufficient employment to keep them in good condition. It does not increase the respiration and quicken the circulation to a sufficient extent to secure the constitutional benefits that should accrue from exercise.

During the drill the clothing is buttoned close around the chest, and natural respiration is hindered. The muscles are not alternately contracted and relaxed, but are tetanized or kept in a state of prolonged tension. This, as we have seen, not only impairs the tone of the muscles used, but it also puts an additional strain upon the brain and nervous system at a time when both should be as much relieved as possible. Finally, the mere exercise of the manual of arms does not give sufficient breadth and scope of movement to secure the co-operation of the muscles, and as a training for the central nerve system, it is of little or no value.

Coolness, courage, presence of mind, and that rapid and responsible exercise of judgment in emergencies, so valuable to the man of business, as well as to the soldier, are not developed by the drill itself, though I will admit that other moral attributes, such as obedience, patience, fortitude, and forbearance, may be brought to a high degree of perfection. The community at large have long entertained the idea that there was something about military drill that made young men erect, or, as the committee have been pleased to term it, giving them a graceful and manly bearing.

I dislike to take from the drill one of the strongest

attributes that has commended it to parents and teachers, but unless I have been misled in my observations, there is nothing in the drill itself that tends to make one erect or graceful. On the other hand, I am prepared to maintain that it tends to make him stiff and angular in his movements, as well as to droop and round his shoulders.

This fact was long since brought to the attention of military authorities, and a set of calisthenic exercises or free gymnastics have been incorporated into all of the treatises on military tactics, to correct this tendency. I refer to what is familiarly known as the "setting-up" drill. Upton says, in his manual of "United States Army Infantry Tactics": "As the importance of 'setting up' cannot be over-estimated, the exercises must be often recurred to, and all soldiers will be frequently practised therein."

Notwithstanding this recommendation, I have yet to learn of a single military school in this country, the National School at West Point excepted, where these exercises are practised assiduously. They are irksome and unpopular, like all corrective measures, and are consequently never insisted upon.

There is another method, commonly known as "tailorizing," by which youthful soldiers may easily acquire a full chest, square shoulders, and a straight back. The results may not be as enduring, but they help out on parade day, and undoubtedly contribute something to the "manly bearing" that is so often spoken of. The moral is: Do not waste your admiration over the military figure until you see it with its coat off.

In reference to the gracefulness that is thought to characterize the movements of young cadets, I can only say it is not the outcome of drilling and marching. The soldier is trained to square corners, straight platoons, and angular movements. Curves and embellishments are not encouraged in speech or in action. If you would account for the graceful poise of our National cadets, you must visit West Point in summer, and see them from one to two hours a day in charge of the dancing master.

Having considered at some length what the drill does *not* do for boys, let me invite your attention to a brief consideration of some of the things that it does do. Here let me forestall any impression that my previous remarks on this subject may have left, and state that I do not think that military drill, as conducted in the Boston schools, is injurious to a strong, full-grown, healthy boy, except in a negative way. That is, it does not furnish him the physical training he needs for the maintenance of vigorous health, and the acquisition of a complete or symmetrical development. But those of you who have had the pleasure of examining school boys, or of looking over their measurements or photographs, will bear me out in saying that the strong and well-developed boys are largely in the minority.

The pupils attending our public and private schools represent nearly every phase and condition in life. Some are well nurtured, others are not. Some have favorable hygienic surroundings at home, others are subjected to unhealthy influences. All bear the stamp of a good or bad inheritance, and the strong and weak points of the parents show themselves in the physique as readily as they do in mental characteristics.

As no two minds are alike, so no two bodies are

alike. But growing out of this great diversity of shapes and sizes, there is a figure around which nature tends to range those of a certain age, height, or weight (according as either is taken for the standard). This is termed the mean or typical boy for a given age, height, etc. Any marked divergence from this standard is readily detected by a casual observer. My attention was long since called to what I think may be termed the prevailing weaknesses or defects in the school boy's and student's physique.

These are a drooping of the head, flatness of the chest, narrowness of the waist, and an exaggeration of the normal or physiological curves of the spine, and I might add to this number, though it is not quite so common in boys as in girls, lateral curvature of the spine. These defects, I say, are so apparent, that it does not take a practised eye to detect them. They attract the attention at once of any one who cares to examine the figures.

The drooping of the head and flatness of the chest may be accounted for by the increased prevalence of myopia, tightness of clothing, and the pressure of the school desk or table on the lower ribs and sternum. The hollowness in the back is partly due to the fact that it is a compensating curve, but more probably attributable to the weakness of the trapezii, rhomboidii, serati, and latissimus dorsi muscles.

The smallness of the waist is undoubtedly largely due to inheritance, and to the fact that the youth of the present day make very little use of the muscles of the waist and loins. Lateral curvature of the spine may be caused in many ways; by defective seats, bad positions in writing and drawing, standing for a long time on one leg, carrying weights, or using one arm more than another, etc.

Personally, I do not put particular stress upon these malformations, if they can be discovered in time. Nearly all of them can be corrected by judicious exercise. If allowed to increase, however, they invariably lead to spinal disease, or to some functional disturbance of the heart, stomach, or lungs, followed sooner or later by structural changes in these important organs.

Whatever the original cause of these physical defects may be, the immediate cause is a weakness of the supporting muscles.

After the body has once acquired a bias in the wrong direction many exercises otherwise beneficial are likely to be injurious. Among this number are horseback riding, rowing, lawn tennis and military drill. In order that you may see how the last named exercise can prove injurious to imperfectly developed boys I wish to call your attention to the elastic nature of muscular tissue.

In order to be as brief as possible I shall simply quote extracts from the experimental researches described by Rosenthal on this subject, in his admirable treatise on "Muscles and Nerves."

"A muscle dissected from the body is easily extended by a weight, and is extended in proportion as the weight attached is heavier. . . . The law of elasticity for inorganic bodies is: 'The tension is directly proportionate to the length of the body extended and to the amount of the extending weights; and that it is also proportionate in inverse ratio to the diameter of the extended body.'"

"It has been found, however, that soft organic bodies, like muscles, are capable of far greater extension than

are rigid, inorganic bodies of equal length and diameter and under the application of equal weight. But the organic body also exhibits another peculiarity."

"If a weight is attached to a steel wire or some other similar body, the latter extends and retains its new length so long as the weight acts upon it; but as soon as the weight is removed the steel resumes its original length. It is not so in the case of organic bodies. When the weight is removed from an organic body it immediately becomes shorter, but does not entirely revert to its original length; it attains the latter very gradually and in the course of many hours. This phenomenon is known as the gradual extension of organic bodies." . . .

"Muscle, in common with all soft bodies, exhibits another variation from the bearing of rigid bodies. That is, muscles are comparatively more extensible by light than by heavy weights. For instance, if the extension of a muscle when carrying ten grammes is five millimetres, when carrying a weight of twenty grammes it is not ten millimetres but only eight; when carrying thirty grammes it is only ten millimetres, and so on."

Another striking fact in connection with the physiology of the muscles has been brought out by the experiments of Weber. He has proven conclusively that muscle is further extended by the same weight when it is in a state of activity than when it is quiescent. Here again we have the experiments of the physiological laboratory confirming the facts that have been brought under frequent observation in the gymnasium. We can now readily understand, how carrying the head forward would soon extend the muscles of the neck, how carrying a gun, though a light one, with the same arm for any length of time would gradually extend the muscles, and elongate the arm, droop the shoulder and crook the spine. This is, in fact, what military drill tends to do in all cases, and what it invariably does do when there is a bias in that direction, when the boy is tall and slender, or the muscles weak and flabby, and there is no effort made to correct the evil tendency.

If it is deemed advisable to make military drill a department of school instruction, I see no reason why a system of corrective exercises cannot be introduced as an accompaniment. If, on the other hand, military discipline alone is required, this can easily be applied to a system of class gymnastics or free exercises, as shown in the schools of Germany.

After taking the most favorable view possible of military drill as a physical exercise, we are led to conclude that its constrained positions, and closely localized movements do not afford the essential requisites for developing the muscles, and improving the respiration and circulation, and thereby improving the general health and condition of the system. We must further conclude that in case of any malformation, local weakness or constitutional debility, the drill tends, by its strain upon the nerves and prolonged tension on the muscles to increase the defects rather than to relieve them.

Finally, if the ultimate object of the drill was to prepare young men for the life and duties of a soldier, we should be forced to conclude that the drill itself would still be defective as a means of developing the chief requisites for men in that profession.

This defect, we are pleased to state, is recognized by the great military nations of Europe, and measures

are taken to give all the recruits from three to twelve months' gymnastic training to develop them as *men*, before they are expected to conform to the requirements of the soldier.

MILITARY DRILL AND GYMNASTIC TRAINING IN PHYSICAL CULTURE.¹

BY E. M. HARTWELL, PH.D., M.D. OF JOHNS HOPKINS UNIVERSITY.

I FEEL some embarrassment in standing here as an advocate of the superiority of gymnastics over military drill as a means of physical training for school-boys, since, in so doing, I am obliged to dissent from the views of General Moore, who was formerly my commanding officer. I suppose that as one of his orderly-sergeants in the Latin School Battalion, I passed the climax of my self-importance. I thought then that the drill was a very good thing. I think now that it did the other boys good, and that it did me good, but I am compelled to think, as the result of my reading, observation and experience, that while much good may be accomplished through military drill in boys' schools, very much more good can be attained through a well-devised and intelligently-managed system of gymnastics.

It is a noteworthy fact that physical training has always owed much to lessons learned in war. Under the sting of defeat, or the stimulus of victory, the most enlightened and the rudest nations have alike been impelled to give to bodily training a place in their schemes for the education of their youth. It was in the half century following the victories gained by the Greeks over the Persians, that Greek gymnastics saw their palmy days. It was then that the gymnasium furnished the finest models for the noblest specimens of the sculptor's art. Although the Greek training was chiefly general and educational in its aims, it embraced certain exercises of a martial character. The Norman archers made such an impression upon the English at Hastings, that centuries elapsed before English law-givers ceased to legislate for the training of the people in "Shooting."

An English law passed in 1388 required servants and laborers "to have Bows and Arrows and use the same the Sundays and Holydays, and leave all playing at Tennis or Football and other Games called Coits, Dice, Casting of the Stone, Kailes, and other such importune Games." Henry VIII caused Parliament to enact, in 1511, that "every man being the King's subject, not lame, decrepit or maimed; being within the age of sixty years, except spiritual men, justices of the one bench and of the other, justices of the assize, and barons of the exchequer, do use and exercise shooting in long bows, and also do have a bow and arrows ready continually in his house, to use himself in shooting; and that every man having a man child or men children in his house shall provide for all such, being of the age of seven years and above, a bow and two shafts, to learn them and bring them up in shooting." Each village was, in 1541, required to maintain a pair of archery butts. It would seem that this statute was held to apply to school-boys and collegians. It is noteworthy that certain playgrounds at Eton and Harrow respectively, are still termed "the Shooting

Fields" and "the Butts." The English took the lessons of the Crimean War so deeply to heart that, great as is their aversion to gymnastics, they introduced gymnastic drill into the army in imitation of their neighbors on the Continent.

The quickening and shaping influences of the Napoleonic Wars, of the War of Liberation, and of the wars with Austria and France, are clearly discernible as potent factors in the development and organization of the German system of physical training. France has, since 1871, organized an elaborate system of physical training, embracing both gymnastic exercises and military drill in connection with all its public schools for boys.

We in America occupy no exceptional position in this matter, unless it be that we are preternaturally slow to profit by the experience of other nations. The first attempts in America to promote physical training were of a military character. On January 21, 1790, President Washington transmitted to the first Senate of the United States a comprehensive report from General H. Knox, the Secretary of War, on a plan for "a national defense system adequate to the probable exigencies of the United States, whether arising from internal or external causes." The plan called for the enrollment of those liable to bear arms into three classes: the first comprehending the youth of eighteen, nineteen and twenty years of age, to be denominated the advanced corps; the second class including the men from twenty-one to forty-five years of age, to be denominated the main corps; the third class comprehending, inclusively, the men from forty-six to sixty years of age, to be denominated the reserved corps. It failed, however, of adoption, although the need of a well-trained militia had been sharply and abundantly emphasized by the events of the Revolutionary War. The failure was attributed to the great expense and the administrative difficulties which it was believed it would entail.

In 1792, a United States law was passed, which is still in force, I believe, requiring the enrollment of "all able-bodied male citizens of the respective States" between the ages of eighteen and forty-five years. All enrolled citizens are required to be "constantly provided with a good musket or fire locket . . . a sufficient bayonet and belt, two spare flints, and a knapsack, a pouch therein to contain not less than twenty-four cartridges . . . or with a good rifle, knapsack, shot-pouch, and powder-horn, twenty balls suited to the bore of his rifle, and one-fourth of a pound of powder." So far as I know, neither the Boston School Regiment, nor any other regiment, complies with the requirements of this law.

In 1817, in a report on the reorganization of the militia, made to the House of Representatives by Mr. Harrison, it was recommended that "military instruction should not be given in distant schools, but that it should form a branch of education in every school within the United States; that a corps of military instructors should be formed to attend to the gymnastic and elementary part of education in every school in the United States, whilst the more scientific part of the art of war should be communicated by professors of tactics, to be established in all the higher seminaries." It does not appear that this scheme, or anything like it, ever received the sanction of law, although it was again brought forward for adoption in 1819.

Meanwhile, the United States Military Academy at

¹ Remarks made at the meeting of the Section in Clinical Medicine, Pathology and Hygiene of the Massachusetts Medical Society, Suffolk District, June, 1886.