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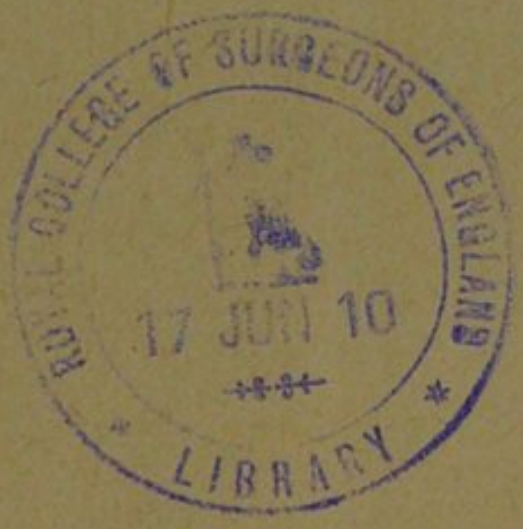

THE ATHLETIC LIFE IN ITS RELATION TO DEGENERATIVE CHANGES IN THE CARDIOVASCULAR SYSTEM.*

By ROBERT E. COUGHLIN, M.D.,
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The present time appears to be an unusual one for great interest and activity regarding athletics. No doubt the popularizing of school ahletics has contributed in a measure to this interest. A short time ago a gentleman said to me: "Doctor, I have two boys attending high school who wish to take up athletics. Would you advise against such contests?"

This is a rather difficult question to answer offhand unless one knows the boys thoroughly both in regard to their constitutions and temperament. Hereditary influences as well as idiosyncrasy also play a part. Given a boy with a certain constitution and temperament with no tendency to any organic weakness, we could decide very promptly, but a review of all the available literature may help us to a certain extent. As a rule it is impracticable to generalize respecting a subject of this character, the personal equation at all times being a very important factor.

To make it a little easy to discourse on the theme, we shall consider the subject matter from several standpoints and subdividing the same according to

*Read before the Brooklyn Pathological Society, December 9, 1909.

the age of the individuals. For obvious reasons the male sex alone will be considered, as up to the present there is really little indication of girls and women becoming athletic in the sense that it is generally considered in boys and men. We note, however, the sudden death recently of a young girl who excelled as a basket-ball player, the autopsy revealing a large heart, which the coroner's physician believed was due to her athletic life.

The four ages to consider will be early life, including infancy, boyhood, youth, and adolescence up to the twenty-first year; manhood, from the twenty-first year up to the fortieth year; middle age, from the fortieth to the fifty-fifth year; beyond middle life up to old age.

It is easy to understand that the same advice could not be given in a general way to the different persons constituting these divisions, and that indeed it would be difficult to advise the same treatment to the different persons constituting any one division, but in a general way, for convenience sake, this may be done; and so we shall consider each class or division from several standpoints: (1) from the standpoint of the same being a benefit to the individual; (2) from the same being injurious to the individual, either temporarily or permanently.

Beginning with infancy, we may observe the inclination of the child toward activity. When healthy and well he is very active during his waking moments, and he has the power which nature gives him to exercise both his voluntary and involuntary muscles. Nothing can compare quite with the grip of the infant. He likes to grip, and he grips at all times in an extraordinary manner. When he starts to walk he does so because the time has arrived for him to use his lower extremities as well as his arms

and hands. Once the art of walking is learned, he is on the way to great activity. He covers many a mile in a day, and would rather run than walk at any time. At all times he seems to have surplus energy.

Soon he reaches "the savage age when a boy abhors all regular occupation." The play problem is fairly open. It is well said, "the boy without a playground will become the father without a job."

The seventeenth is the healthiest of all years for boys, yet the eighteenth is sickly. The year of lowest death rate or greatest power to resist disease is the thirteenth. The mortality is less for girls than for boys in the period preceding puberty.

In a discussion regarding athletics in boys' schools a middle ground seems to be occupied by the Medical Officers-of-Schools Association. Says *The Hospital* (April 3, 1909) in an editorial: "These medical officers adopt the extreme position of neither side; that is, they advocate neither grandmother coddling nor the Spartan survival-of-the-fittest attitude of many athletic persons. They point out that neither age nor distance is in any way an exact criterion of the strain inflicted on any given boy by any given race. The quarter-mile is a far more exhausting race for most boys than are the long-distance races; and to this we would add the half-mile, in which schoolboys have done at various times very notable performances, but, now and then, with considerable detriment to themselves. The association lays it down that the plan of running all the boys, old and young, over the same course or distance is not to be recommended; but we are not sure that in this particular we quite agree. For if a separation is made it must be on some rough line, such as age; and that means that a compact, well-developed youth capable of any exertion may be sent into a junior

division to set the smaller boys a hot pace over a short run, while an overgrown and much less precocious boy a month older may be put to compete with the most athletic of his fellows over a longer distance. When all the boys run together, the best runners may finish a five-mile cross-country run half an hour before the worst, but at the same time this gives those who, by reason of youth or retarded development cannot excel at this exercise, a chance to complete the run and benefit by it without undue strain. Provided there is a thorough medical examination of every boy on entering school, provided that the effects of various games on the younger boys are carefully supervised, provided that certain common-sense rules, which boys themselves do not appreciate, are enforced upon them, then the risk of ordinary school exercises, including cross-country runs and flat races not exceeding one mile, is so reduced as to be quite negligible. If the masters and school medical officers do their duty in observing the limits laid down by the association, parents may safely leave their boys to follow their own inclinations and their school traditions in these matters without fear of the consequences."

Dr. Tyrrell Brooks of Oxford has said it was his experience that the most vigorous undergraduates came from the schools whose athletics were of the most strenuous type. Of the organs likely to be damaged from athletics in excess the heart was the chief. Valvular damage, due to exertion, was very rare, but it was to be remembered that slight dilatation of the heart was difficult to estimate. It was almost certain that the natural resilience of the heart was so great in boyhood that mere muscular exercise could hardly seriously damage the heart. Special care in permitting active exercise after con-

valescence from acute illness was a very important precaution. On the whole, the trend of opinion among British medical men was distinctly favorable to athletics under proper condition and supervision.

H. H. Riddle of Cambridge University, England, believes that the athlete, if he has been sensibly trained and has not noticeably overstrained his powers in his youth, has the best chance of a healthy and active old age. In reference to the difficulty experienced by British authorities in obtaining physically strong recruits for the army a writer has the following to say: "It seems to be at least generally recognized that the mind is not likely to be healthy unless the body is in sound condition."

An American writer states that New York City has more than 200,000 young aspirants for record-breaking honors in its Public School Athletic League. In the country at large are about 10,000,000 amateur athletes, a large proportion of whom are still in the growing age.

Dr. Brooks of Oxford says that in coming to any conclusion as to the precise value of athletics in causing morbidity of the heart it is necessary to know the history of the patient under examination, as excessive smoking, abuse of alcohol, gluttony, insufficient rest—any or all might enter into a young man's life and produce exactly the same symptoms as were attributed to athletics.

Dr. Moritz had a good opportunity to study the hearts of several wrestlers after severe exertion which their occupation demands. In no case was there any dilatation of the heart, and like results were noted in several bicycle riders (*Münchener med. Woch.*, June 23, 1908). Indeed, Moritz claimed to have noted even a diminution in the heart following moderate or severe exertion. The possibility

of an acute dilatation is not denied by the author, but such a phenomenon, according to him, is a sign that the heart is not free from some pathological defects.

In summing up the work of Dr. Benedict and Dr. Carpenter which was done in Wesleyan University, a medical editor has the following to say: "The human body is a machine of such a degree of efficiency that one-fifth of the energy expended by it can be utilized as work, and that this efficiency is constant in men of all types. The longest and the most thorough training does not change this ratio. The professional athlete, if he is able to do more work than the novice, does it not because his muscles are of such a quality that he can get more work out of them from the same amount of energy, but because he is able to put more energy in the shape of tissue change into the action. It would seem then that training, besides preparing the heart to stand greater strain, acts to increase the subject's power of using up his tissues and by giving him more muscle tissue to use rather than by teaching him to conserve his energies. To adopt a metaphor from the mechanical world, the professional has a more powerful engine because he is able to use more fuel, not because he wastes less steam.

Dr. Roeder of Berlin has presented an interesting report at the Union of the Berlin School of Physicians on the hygienic results of walking trips. He examined school children before and after a walking tour to see whether the favorable results of such a trip were only subjective, or whether objective benefit occurred. Fifty-six children were sent on walking trips in three groups, each under the leadership of a teacher. The children walked on an average ten to twenty miles a day. For breakfast they were

given coffee, milk and white bread, during the day bread and butter, and in the evening a warm dinner. As the result on body weight one series of well-nourished, strong children did not change weight during the six days' tour. A small number either lost weight or gained from one to three pounds. It was of interest, however, that during the following three months fifty of the fifty-six children gained weight from three to twenty-two pounds. From this it would appear that the violent muscular exercise stimulated the organism to increased metabolism and more rapid growth. Especially of interest is the comparison of nine girls who took the tour with twelve from the same school who had not been on the trip but had taken vacations at the same time. The girls who had walked gained 6.7 pounds during the next three months; those who had not walked only 4.8 pounds.

We shall now take up the unfavorable reports and statements relative to the subject, as up to the present all the testimony appears to be more or less favorable. Mr. R. H. A. Whitelocke of Oxford has explained the phenomenon of "second wind" by supposing a kind of physiological emphysema to be produced in the lungs, due to the violent exercise. The first effect of violent and sustained efforts was dilatation of the heart, the right ventricle being first affected. Those who had been subjected to or who had suffered from heart strain in youth seemed to show a distinct tendency to recurrences in later life when attempting such exercises as mountain climbing. One writer states that on numerous occasions the competitors in feats of endurance have been subjected to careful medical examination before and after the event, nearly always with the result that a warning has been uttered against indiscriminate

efforts to obtain the fame that is to be gained in this way. That while such feats of endurance may not necessarily be followed by directly injurious consequences, they involve the risk of producing districts of lessened resistance which at a later time may invite serious organic disease, and that these hazards are especially great in youthful individuals.

One medical officer of one of the National Guard has said that he did not believe that professional athletes should be recruited, as they made poor soldiers.

There appears to be any amount of evidence against Marathon races. During the past year a number of deaths have occurred. Fallen runners along a Marathon course, many in a state of exhaustion verging on collapse, while others are reported delirious, is testimony enough that such races menace athletes. In commenting on these races one writer closes the subject as follows: "Charles Kingsley's praises of 'muscular Christianity,' of the cold plunge, and the hard fought field cost England, it is said, the lives of thousands of young men whose courage and will power were stronger than their bodies—often precisely the young men who were of most value to their country. Parents, teachers, trainers in athletic clubs and others in authority are in a position now to check a similar sacrifice."

In a humorous vein one writer asks the following: "Melvin W. Sheppard's successes at the Olympian games are frankly insulting to the New York police surgeons who rejected him as physically unfit to enter the department. What business has a man whose heart is officially condemned by the second largest city in the world to win victories in international athletics?" Another asks the following question: "What is invalidism or disability to one who

has made a record, and how trivial seems the hypertrophied heart to the winner of the Olympic games?"

Dr. Warren Chapin is quoted as being very much opposed to school athletic contests. He states that school athletic competitions push the young wellnigh beyond the limit of their endurance and unfit them for their present and for their work in after life. Dr. Charles E. Quimby has said that the effect of this over-indulgence in athletics nowadays is a general breakdown. Neither Dr. Chapin nor Dr. Quimby will allow their sons to take part in competitive athletics that call for extreme exertion.

The death of Griswold early in January of this year was a blow to rowing races. It was occasioned, it is said, by typhoid fever, which was preceded by shattered health dating back to the Yale-Harvard race of last year, when Griswold, Yale's stroke, collapsed in the boat.

The conclusion that college athletics is not injurious, deduced by Dr. William G. Anderson, director of the Yale gymnasium, from mortality statistics of the graduates of the university, is declared by *American Medicine* (Sept. 1908) to be most dangerous. The picked men of the teams, the writer thinks, should show a far lower mortality than the average, and should be extra good risks. Boys need not be stimulated to develop a fatal degree of musculature; if anything, they need restraint. Numerous instances may be mentioned of record holders having been compelled to give up athletic work because of organic disease. Two examples of late are Whitney and Ewry.

From the twenty-first year to the fortieth little may be said of the evil effects of athletics as most young men have by this time passed out of athletic

life and gone into their chosen vocations. The eagerness to make a living and the desire to succeed in life compels them to be up and doing. As a rule degenerative changes are not so apparent, and though the man may be working under high pressure, no notice is taken of such changes till middle life is reached. This is the time, however, when habits of life are formed. The enlarged heart may call upon the ex-athlete for some stimulation, and instead of exercising he takes to drink or maybe opens up a saloon. Once athletically inclined, always athletically bent, would be a good rule. When Dixon, the lightweight pugilist, died last year the writer communicated with the physician in attendance for the purpose of finding out the real cause of death. The reply he received was to the effect that his patient died of myocarditis preceded by alcoholism. The fate of his successor to the title was pretty much the same except that he was attacked with a mental disorder and now resides in a sanatorium.

At a meeting of The Medical Association of the Greater City of New York in which the athlete's heart was brought up for discussion by the writer of this paper (Medical Record, February 8, 1908) Dr. William Henry Porter said that he was glad the question of the so-called athletic heart had come up for discussion, as it was very important, and, like all other affections of the heart, required a clear conception of the laws governing the nutrition of the heart muscle to be fully understood. The one thing to be remembered was that the nutrition of the heart and of all the tissues of the body depended upon a uniform expansion and contraction of the ultimate arterioles, so that the blood could be passed slowly or rapidly through the arterial capillaries, at

which point all nutritive interchange occurred and was regulated, according to the demands of the tissues. By destroying this peculiar physiological control, the varying forms of pathological lesions were brought about. In the athletic heart, in consequence of great exertion, there had been a large demand for nutritive material by the muscle fibers, and they underwent physiological hypertrophy at the expense of the intermuscular connective tissue. Stop the exercise and the muscle fibers atrophied, but without corresponding hypertrophy of the intermuscular fibers. Hence, a weak heart resulted, the cavities dilated, and sudden death often occurred without apparent reason.

In reference to the athletic heart Mr. Riddle of England has the following explanation of degenerated heart muscle: "Like every other muscle, if given more work, it increases in size. New fibers are formed, the walls become thicker, and the power of the organ is increased, so that it may supply the amount of blood the muscles demand. As day after day this demand falls on the heart during training, runs, etc., the heart, unless the athlete breaks down, becomes more and more powerful. Naturally no harm results from this condition, for the whole output of strength available is constantly being used. When, however, through force of circumstances or advance of age, the athlete gives up periodic training and its accompanying demand on his heart, there is no longer any use for the extra heart fibers. Therefore, just as any other muscle will deteriorate and may undergo fatty degeneration if not fully exercised, so the hypertrophied heart of the athlete undergoes changes which leave him below the normal in heart efficiency when once he has begun to go down the hill of old age.

We now pass on to a consideration of individuals from the fortieth to the fifty-fifth year, the so-called middle-life period. A noted athlete has lately made the following observations in regard to life in the cities: "The New Yorker wants bottled stuff to cure him; he hasn't time for exercise. Let a doctor tell a man to take exercise to cure his rheumatism or gout or neurasthenia or any of those ills that the golden drug brings on, and he'll call the doctor a fool and demand pills or bottled drugs that will cure him while he sleeps. It would take too much time away from the desk or store to exercise."

Dr. F. Gelsbock reports as the result of experiments that a low blood pressure after muscular exertion, such as climbing stairs, is often due to some affection of the muscular substance of the heart. Arteriosclerosis may result from long continued high blood pressure, or conversely, high pressure may be caused by diffuse sclerosis of the arterioles. Among persons with remarkably high blood pressure was a group of men over forty years of age, presenting the appearance of florid health. They were corpulent, prosperous, and active in business, but were under great responsibilities and mental strain.

The three things to relieve hypertonia according to Dr. L. F. Bishop are: A restricted diet, physical exercise, fatigue of the voluntary muscles will relieve or relax the involuntary muscles of the blood vessels; and the third is relief from mental strain. Kisch concludes that the pulse tension, taking into account the maximum tension when the body is at rest and comparing it with that during the performance of a certain work, furnishes a measure of the degree of resistance present in the arterial system in arteriosclerosis and of the re-

serve energy as well as the functional capacity of the heart.

The physical tests in the United States Navy for the officers show plainly the opinion regarding the ability of men in middle life to take exercise. Many believed that such tests would be a great danger, but the results have shown that the officers have kept themselves in pretty good condition.

It is reasonable to suppose that myocardial disease was responsible for the death of Edward Hanlon, the oarsman, who died at the age of fifty-two after a two-day's sickness of pneumonia. Hanlon is said to have been the most graceful oarsman who ever pulled an oar. He rowed in two hundred races, and held the record for a four-mile row. As one of his old opponents said to the writer, he actually rowed the other man blind. It was known to be a fact that he took no exercise whatsoever for ten years preceding his death.

Before concluding this division of our subject I would like to report briefly one case lately seen in consultation which illustrates our point.

Mr. C., age 52, bookkeeper, was always a man of very good habits inclined to be athletic. Said he never drank to excess. Indulged in a moderate amount of exercise up to 1896 when he took to riding the wheel. He became a very good rider, and like many others during that period, reeled off his century every once in a while. This he kept up till about two years ago, when the bicycle fad ceased. His wheel was put away, and likewise his desire to take any more exercise. He bought an exerciser which he used a little on rising in the morning. After letting up on the severe exertion he noticed that he desired a glass of beer several times through the day. This desire increased until he became to

be known for his ability to consume beer. As his weight did not increase he felt that it was not doing him any harm, for the same reason he believed he did not require much exercise. With his desire for beer the smoking habit also grew on him. One evening he was suddenly taken with great shortness of breath upon walking up a gradual incline. The next morning upon getting out of bed he was seized with his first attack of angina pectoris. Diagnosis: Myocarditis, dilated heart, arteriosclerosis, including the coronary arteries.

The lesson to be learned in a consideration of those cases is continued exercise beyond the fortieth year; once an athlete always an athlete. The penalty of early athletics is athletics all of one's life. To lay aside athletics and exercise is to invite tissue changes in the vascular system, particularly the heart and arteries.

Men beyond the fortieth year are a community's greatest asset. They are at the head of all great enterprises, they are the individuals with big ideas and who put through big schemes; they are our engineers, inventors, bankers, incorporators, professors, and successful professional men. We, as physicians, should try and study this subject so that we may prolong these valuable lives instead of allowing ordinary laymen to direct men regarding their health. Who has not heard of our great statesmen putting themselves in the hands of crude trainers and ex-trainers of prize fighters? Without medical knowledge and training the general results cannot be good, except for the fact that these men need exercise as a rule and need it badly.

We now pass on to the period beyond middle life up to old age. This is the period where one finds a good many conflicting opinions, but the evidence

appears to be in favor of regular exercise and plenty of it up to old age, especially if one has been active in early and middle life. H. Toeppen (*N. Y. Med. Jour.*, Feb. 2, 1907) mentions a man in Holland who was seventy when he won a well-contested skating race. Also a man past seventy who came in ninth in a three hundred and fifty mile race which occurred in France a couple of years ago. He sums up by stating that it is futile to try and lay down general age limits for the different kinds of athletic sports. One of the most remarkable feats for an aged man ever recorded is the great performance of Edward P. Weston, who at the age of seventy walked from New York to San Francisco in one hundred and five days. One year prior to this he walked from Portland, Maine, to Chicago, averaging nearly fifty miles a day and covering 1,200 miles. Weston has been an athlete all his life, as in an interview with a reporter he said he exercises every day excepting Sunday. His habits have always been good and he is a strict temperance man.

The recent death of Professor Lombroso at the age of seventy-three calls to our minds that he was a famous bicyclist and frequently journeyed through Europe on his wheel.

The death, a short time ago, of Joss Radcliffe recalls a wonderful feat which he performed at the age of forty-two. He backed himself to run, swim, row, ride a horse and a wheel each a quarter mile within a quarter of an hour. The times he made were: Rowing, 1:43; swimming, 5:39; fastening on shoes, 0:53; running, 1:53; cycling and riding horse together, 2:40; total time, 12:48.

Last year a pedestrian named Hughes, it is said, walked fifty miles in ten hours. His age was stated to be sixty-eight.

In commenting on the death of William Blaikie, lawyer, athlete, and author, a writer states that there was something sadly significant in his death at the age of sixty-one. Mr. Blaikie when young and in middle age was very much interested in athletics. As he grew older he devoted about all his time to his law practice, and it is said that he took no exercise the last year of his life. The strain caused by a very important law case is supposed to have paved the way for a fatal stroke of apoplexy. So interested was he in this case that he frequently worked far into the night on the papers. Here is another illustration of a man who did not keep up his heart muscle, as it is very evident that degenerative changes occurred promptly when he ceased taking his usual exercise, as he was a natural athlete up to his sixtieth year. When a young man he was a stroke oarsman in the Harvard crew which defeated Yale in the year 1866. When seventeen years of age he lifted with his hands alone 1,019 pounds. Another feat was walking from Boston to New York (225) miles, in four and one-half days.

All the best authorities appear to believe that walking is the best exercise of all provided it is done in the open air. Blake thinks walking may be prescribed as a therapeutic measure in certain conditions. Dr. Gaskell says: "A good, brisk walk in the fresh air, with free breathing and good style, is as useful a form of physical exercise as any I know."

Conclusions.—1. In summing up all the testimony for and against school athletics the evidence at hand seems to be against such athletic contests; but this may be due to the lack of precautions, as mentioned by the best authorities in England, where more attention has been given the subject. Without

those precautions the results must be disastrous.

2. Marathon races for boys and men are to be mentioned only to be condemned. There is no evidence in their favor and really no excuse for them. On witnessing a Marathon race one can hardly keep from saying, "What fools these mortals be." The death of the first Marathon runner as he announced a great victory should have been an object lesson for all time.

3. As medical men we are not particularly interested in the professional athlete, only so far as his life might become an example to the growing young, many of whom seek our advice when about to enter into athletics. There is great chance of injury being done to the heart by violent exercise in competitive games.

4. From the twenty-first to the fortieth year habits of life are apt to be formed and the athlete may give way to the temptations of the table and the glass as his heart muscle cries out for stimulation.

5. After forty degenerative changes are the most likely sequences to an early active life, especially if, as occurs often, the individual becomes sedentary in his habits. As a rule men over forty do not exercise sufficiently to keep up metabolism. One should be on the lookout for high blood-pressure at this time.

6. It is evident that more attention should be given the subject of degenerative changes in the vascular system in men who have passed the fortieth year.

7. As there does not appear to be any limitation of sports in those beyond middle life active exercise should be advised especially in those who have led the athletic life.

8. Walking in the open air with good style is the best exercise.

9. Finally, there is a close relationship between

the athletic life and degenerative changes in the vascular system, especially in the heart and arteries, when the voluntary and the involuntary muscles are not kept in tone by regular systematic exercise, particularly in middle life and beyond into old age.

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