

10-1930

The Physiology of Physical Condition

H. Earl Rath

Iowa State Teachers College

Follow this and additional works at: https://scholarworks.uni.edu/science_bulletin



Part of the [Health and Physical Education Commons](#), and the [Science and Mathematics Education Commons](#)

Let us know how access to this document benefits you

Copyright ©1930 by Iowa State Teachers College

Recommended Citation

Rath, H. Earl (1930) "The Physiology of Physical Condition," *Science Bulletin*: Vol. 3: No. 2, Article 3.

Available at: https://scholarworks.uni.edu/science_bulletin/vol3/iss2/3

This Contents is brought to you for free and open access by UNI ScholarWorks. It has been accepted for inclusion in Science Bulletin by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

Offensive Materials Statement: Materials located in UNI ScholarWorks come from a broad range of sources and time periods. Some of these materials may contain offensive stereotypes, ideas, visuals, or language.

SCIENCE BULLETIN

A Service Bulletin for Teachers of High School Science. Published Monthly by the Extension Division and Edited by the Department of Natural and Physical Science.

IOWA STATE TEACHERS COLLEGE

Cedar Falls, Iowa

VOLUME III

OCTOBER, 1930

NO. 2

THE PHYSIOLOGY OF PHYSICAL CONDITION

Were we in the locker room of almost any high school or college at the beginning of an athletic season, we would almost surely find the coach talking to the boys under his charge in somewhat this fashion;—

“Now boys, if we expect to have a successful season, and live up to what the community expects of us, it will be necessary that we train.” “Be careful about what you eat, avoid heavy food, do not eat between meals, get plenty of sleep with your windows open, avoid coffee and tea, and leave tobacco alone.” The coach may have a few other pet hobbies, but fundamentally these are the things he will stress as being necessary for securing and maintaining good physical condition.

Again if we were to follow the coach and the squad to the athletic field or into the gymnasium, we would see the boys being put thru a series of exercises designed to build up the muscles necessary for that particular sport, and to gain “good physical condition.” Were we to watch day after day, we would see these exercises increased in amount and intensity until after several weeks of training the boys were doing an amount of work which only a few weeks before would have been physically impossible. If the boys have responded well to the admonitions of their coach or trainer, he will smile as he sees them perform, and will comment between chuckles that they are “in the pink.” To him it means that they will be able to go thru a hard game giving

their maximum of energy all the time and still have a reserve that will carry them until the end of the contest.

Some coaches will not be so well satisfied. The boys will be listless at the start of the days practice, and will soon show signs of fatigue. They may look about the same as men who are in good physical condition, they may be able to do just as strenuous work for a short time, but there is something lacking, and no matter how hard they try or how well they are coached, if they meet teams of their own caliber, they are consistent losers.

The question is often asked, “why don’t the boys train?” “Why is it that they make a good showing the first half only to be defeated in the last half or the last quarter?” The answers may be varied. Some men willfully break training rules because they think more of their own personal pleasure than they do of the success of the team or their own success as athletes. The treatment, if any, for this sort of individual must be mental. Many boys fail to observe training rules because they do not know what good physical condition is, or because they do not see the necessity of doing certain things in order to obtain it. It is for this latter group that this article is written, with the hope that it will make easier the grind of training by a knowledge of what is accomplished by it. Incidentally, since good physical condition is essential to the best functioning of the mind and to the highest success in any kind of activity, this article may have a wider application.

First let us consider why increasingly difficult physical work is necessary to gain condition. We know that if we put an arm in a sling and keep it there for several weeks the muscles diminish in size and the arm becomes fatigued very rapidly when used. If we increase the work gradually, we finally reach the point where we can do severe work without fatigue. When any cell is used much it requires a large supply of glycogen (formed from sugar in the liver) in order not to lack in energy fuel. When a cell is used much it tends to store a larger supply of glycogen, and this with the supply which it receives from the blood stream, eliminates one of the causes of fatigue. Another thing that needs to be considered is that when only light work is performed, only a small proportion of the fibers of an individual muscle are used. Thus if strenuous exercise is not indulged in occasionally, development of the entire muscle is not possible because part of it will never be used.

A second cause of fatigue is the accumulation of waste products in the cells and in the blood stream. During very strenuous exercise it is usually impossible for the body to eliminate waste products as rapidly as they are formed, altho the development of a strong heart and vigorous circulation will aid much. These cannot be developed in a short time, nor will they be developed at all if the exercise is not vigorous enough to cause a demand for them. Another factor that requires consideration is that blood is supplied to the different parts of the body largely in proportion to the demands of that part for food or for the elimination of waste. This distribution of blood is controlled by the vaso-motor center in the medulla, and consists of two sets of nerves known as the vaso-constrictor and vaso-dilator. These nerves supply the muscles in the walls of the blood vessels and cause them to dilate or constrict according to the demand that is

made for blood supply. Like all muscles, however, the muscles in the walls of the blood vessels need development. If only a small quantity of blood is sent thru a blood vessel for a long period of time, the muscular walls become more or less permanently constricted. Thus if vigorous exercise is indulged in, the blood vessels supplying the muscles do not dilate sufficiently to allow the blood to bring glycogen fast enough, or to carry away waste products fast enough, and as a result the muscle is soon fatigued. Thus the blood vessels in a muscle require development as well as the muscle fibers themselves, and strenuous exercise is the logical means for their development.

The reason for eating only plain food and for avoidance of eating between meals, is probably less understood than any other command of the coach. Whenever food is eaten, the stomach and a short time later the intestines are called on for a large supply of digestive juices. In addition, large movements of both the stomach and intestines are required to get the food in proper condition for digestion, to mix it with the digestive enzymes, and to carry it along. All of this requires a large supply of blood, and the vaso motor center is stimulated to send a larger supply to the abdominal cavity. The blood cannot well be in two places at once, so while it is making the circuit of the abdominal cavity, the muscular system is getting a smaller supply. If foods requiring a long time for digestion have been eaten, the muscles will be deprived of their full quota of blood for just that much longer time. If food is eaten between meals, the operations carried on in the stomach are very nearly continuous. Thus the muscles can never be developed to a high state of efficiency.

Sleep to an athlete is what house cleaning is to a house. If the evening meal has been eaten at a reasonably early hour, the stomach is nearly empty by bed time. Thus during the night the

blood is largely coursing thru the muscles, carrying away accumulated waste products, and restocking the cells with a large supply of glycogen. As a result the athlete awakens in the morning feeling refreshed and full of vigor. Suppose tho, a person has retired late after a midnight lunch;—the opposite trend of events must take place with the result that morning brings only a bad taste in the mouth and a tired feeling. In the latter case the heart has had little chance to rest, waste products of the day before are still present in the muscles, and the muscle cells are not so well stocked with energy fuel for the day.

It is true that a person may accustom himself to the use of stimulants such as coffee, tea, and tobacco, so that he may not feel any very noticeable injurious effects. Space does not permit a full discussion of the matter but suppose we look at it this way for the present; a horse that is constantly goaded soon fails to respond to the goad, and should emergency arise there is no means of driving him faster. The person who uses stimulants is merely using a goad. In doing so he is taking chances that common sense would tell him to avoid.

Perfect physical condition is a thing that few persons possess not because it requires any great sacrifice to attain it, but because we thoughtlessly follow our whims or the whims of the crowd. The athlete who would attain the best of physical condition must play the game off the field as well as on it.

H. Earl Rath.

OUTLINE FOR ELEMENTARY PHYSICS

In the September number of the Science Bulletin will be found the outlines for the subjects of Mechanics and Heat. We submit in this number the remaining outlines of the principal subjects that should be presented in a high school course in Physics.

In following these outlines it would be well to provide several of each of the best high school texts for student reference. Physics teaching will be most effective when the teacher breaks away to a large extent from the habit of lesson assignments from some one text.

GROUP PROJECTS IN MAGNETISM AND STATIC ELECTRICITY

Ferro-Magnetic Phenomena

1. Natural Magnets. 2. Artificial Magnets. 3. Field of a Magnet. 4. Magnetic Induction. 5. Applications of Permanent Magnets. 6. The Earth and Its Magnetism.

Phenomena of Static Electricity

1. Nature of a Static Charge. 2. Experimental Methods of Producing a Static Charge. 3. Laws of Static Charges. 4. Static Field of Force. 5. Static Induction. 6. Difference between a Static and a Magnetic Field. 7. Constitution of Matter. 8. Earth and its Static Electricity.

APPARATUS FOR CLASS ILLUSTRATIONS IN MAGNETISM AND STATIC ELECTRICITY

Ferro-Magnetism

1. Piece of magnetic iron ore to illustrate a natural magnet.
2. Artificial magnets of tempered steel; bar and horse shoe.
3. Pieces of soft iron rod to illustrate magnetic induction.
4. Magnetic compass, declination and dipping needle to illustrate properties of earth's magnetism.
5. Miscellaneous: tacks, iron filings; card board.

Static Electricity

1. Electro-static machine of the induction type.
2. Electroscope.
3. Leyden jar; Leyden jar discharger.
4. Insulated hollow cylinder with suspended pith balls.
5. Rotating device to show the effect of charges on points.

(Continued on page 6.)