Science Bulletin

Volume 2 | Number 1 Article 6

9-1929

The Use of the Football Squad as Laboratory Material for Physiology

H. Earl Rath
Iowa State Teachers College

SCIENCE BULLETIN

Issued Monthly. Entered as second class mail matter at the post-office, Cedar Falls, Iowa, under the act of August 24, 1912.

Last year SCIENCE BULLETIN made its appearance. Your response was such that we feel encouraged to continue, and after one year's experience we should be able to make the bulletin more of a real service bulletin to the teachers in the field. We invite your suggestions and criticisms. While we all like commendations, yet we realize that unfavorable criticism is sometimes most helpful. Let us have your "brickbats" as well as your "bouquets."

We would like to have a department devoted to suggestions and contributions from the teachers in the field. Perhaps you have made some nature observations in your locality that will be valuable to the teachers of Iowa; perhaps you have some successful method or device in science teaching that you would like to share; perhaps you have a question that you would like answered. Because of our limited space the contributions should be brief, but we can make the bulletin a medium for the exchange of valuable information. You can have such a department if you desire it. Send your contributions to the editor.

THE USE OF THE FOOTBALL SQUAD AS LABORATORY MATERIAL FOR PHYSIOLOGY

Health

As school is getting under way for the new school year, the teacher of physiology or hygiene is probably busily engaged in looking over the laboratory equipment to see what can be found to demonstrate the functioning of the human body. In all probability many instructors will decide that there is not enough material on hand to justify an attempt at demonstrations, while regular laboratory work will be considered out of the question.

It is the purpose of the present article to offer a few suggestions for practical laboratory work in physiology that experience has shown to be of value as well as of interest to the students.

At this season of the year we hear the thud of the "pig skin", and along with it much talk about "training, condition, diet, heart action," etc. These things are fundamentally physiological, so why not use this fertile field of laboratory material.

One of the first things that we want to know about a football candidate is whether his heart is sufficiently strong to enable him to withstand the vigorous exercise of the football game. With a little experience the average student can soon learn to detect the characteristic heart sounds, and pick out the individuals whose hearts have abnormal sounds. If a more thorough examination is desired a stethoscope can be purchased for about two and one-half dollars which will give quite satisfactory results, or one may be borrowed from a local physician. This examination should be accompanied by a study of the heart, its function and care, and also by the dissection of an animal heart which may be secured at a local butcher shop or better still in an untrimmed form from a meat packing house. This examination, of course, is not intended to take the place of the regular physicians examination, but to supplement it and provide an interesting study for the class in physiology.

Another experiment that will be of interest to carry on for some time is to check the development of the strength of the heart as the members of the team gain in physical fitness. To do this, work out with the class a standard exercise requiring a fairly definite amount of work. Apply this exercise to a number of the team candidates early in the season taking the pulse rate before and after exercise. Continue this for the season noting when the heart has reached its maximum increase in speed with a given amount of work. This will demonstrate the need of the heart to gain in strength as well as the rest of the body if a person is to be physically fit, and with living models to work with should prove interesting to the class.

In order to demonstrate the autonomic system as well as the ac-

tion of the heart it will be interesting to find the normal pulse rate of several or all of the boys during repose and compare it with the rate just before the game when the heart is stimulated by excitement, and immediately after the game when fatigue is the exciting cause. This will illustrate the work of the adrenal glands as well as the autonomic system. Along with this it would be well to take the temperature of the players before and after a game in order to illustrate the action of the heat regulating system of the body in maintaining a uniform temperature. To check the recovery from fatigue have a number of your class count the pulse of different members of the team at regular intervals for several hours following the game. You will now have practical information which should prove of much value in a discussion of the physiology or hygiene of the circulatory system.

The beginning of the football season always brings its share of sore muscles and stiff joints. Here is an excellent opportunity to illustrate the physiology of muscle development. As the members of the football squad gain condition the labor that seemed terrific to them at the beginning of the season, is now mere child's play. A discussion of the chemistry and mechanics of muscle action will be welcomed. Along with this should come a discussion of the cause of muscle fatigue, and the reasons for its elimination with the development of better physical condition. Along with this it will be a simple matter to construct a finger ergometer by fastening a pupils forearm to a desk and having him raise a weight with one finger by means of a string through a small pulley. If the experiment is repeated at regular intervals it will not be long before the number of times that the weight can be raised will be doubled, thus illustrating the principle of physical condition in the football team.

It was not the purpose of this article to outline a complete set of laboratory experiments, nor will space permit it. The field in this line of work, however, is practically without limit.

H. Earl Rath.

MECHANICS OF SOLIDS

(Continued from page 3)

the idea of mass with that of force in analyzing a simple problem of work. The writer has often put questions like this one to beginners in the subject of physics, viz., "How much work is accomplished when a ten-pound block of wood is slid 10 feet along the top of a smooth table?" The answer is invariably 100 foot-pounds, the student not realizing that the force exerted in a case of this kind is not the weight of the block of wood but only that necessary to overcome the friction between the surface of the block of wood and the surface of the table. This frictional force might not be more than a few ounces where the constant surfaces are very smooth. A spring balance attached to the block while pulling it along would perhaps show no more than a force of one-fourth of a pound, so that the total work accomplished in sliding the ten-pound block of wood a distance of ten feet would be only two and one-half foot-pounds.

Work is measured by force times the distance through which it acts and not by the mass times the distance. A team of horses pulling a wagon loaded with two tons of coal might not be exerting a force of more than two hundred pounds although they are moving a mass of more than four thousand pounds. It takes not more than a force of 100 pounds or less to move a twelve-ton street car on a level track. In each of these cases it is the product of the force times the distance that measures the work accomplished. The ideas of mass and force can be more clearly discriminated in simple problems of work than in almost any other kind of an illustration.

The second idea to clear up before beginning a discussion of the simple machines is known as the principle of moments. This of course pertains to a force producing rotary motion of a body around an axis as illustrated by a meter stick mounted upon a fulcrum. Machines in general utilize rotary motion more than any other kind.

The measure of the moment of a force is obtained from the product