

## TESTS OF ATHLETIC ABILITY

BY

COLEMAN R. GRIFFITH  
*University of Illinois, Urbana*

If it were possible to make a description of a football player just as we find him in the midst of a game, we should end our study, no doubt, with a large and complex list of traits and skills. We would find that our football player has a certain amount of skill in running, jumping, dodging, pivoting, straight-arming, throwing, tackling, blocking, catching a ball, outguessing his opponent, keeping himself cool-headed, controlling his emotions, motivating his conduct, and the like.

This is but a suggestion of the number of items that might be listed; but our main concern is not to make a list of the whole bundle of skills and traits which any man may be at any moment. On the contrary, there are certain questions about these traits that we should like to ask. We might, for example, ask about the origin and the course of development through which each skill or trait has passed. This question would introduce us to all those problems known as the problems of learning. No man is born with any of the abilities we have named and it follows, therefore, that the games he has played, the practice periods he has used, and the experiences through which he has lived have made him what he is at the moment we find him.

In the second place, instead of asking about origins and processes of development, we might ask about the way in which a man differs in each of these various skills from the other men with or against whom he is playing. That is, some men are slower or faster, stronger or weaker, more or less alert, more or less quick, than their fellows. This would introduce us to that part of psychology known as the study of individual differences<sup>1</sup>. In the next place, we might ask whether all of the skills we could name were being used at their highest level. That is, we might ask whether, on this particular day and at this particular moment, our man was just as good as he had trained himself to be. These questions would introduce us to all of the problems that hover around the words "efficiency" or "condition."<sup>2</sup> Finally, we might ask whether it would have been possible on some previous occasion, say

<sup>1</sup> Ellis, R. S., *The Psychology of Individual Differences*, 1929.

<sup>2</sup> Poffenberger, A. T., *Applied Psychology*, 1928.

two or three years before, to predict how expert a football player a man was going to be. That is, in advance of training or in advance of the actual acquisition of a high degree of skill, is it possible to tell what the potential power of a man is?

This last question, and most of the others as well, depend upon the further question as to whether it is possible to measure either the skills of a man or the resources which he may have for gaining a skill. Several answers have been given to this question. The first says that the rate at which a man learns any given skill or a whole group of skills is the best way of finding out something about the innate qualities of a man. In other words, it is assumed that there is a high correlation between learning, on the one hand, and intelligence, on the other. It is assumed also that there is a high correlation between learning and motor intelligence.

It must be clear that this method of testing athletic ability will work only providing a coach has enough time to make it work. It is the method which is actually used in industry and in education as well as in coaching. A man is put to work or a child is given a desk in a schoolroom and we proceed to find out how fast each can learn and how proficient each can become at the end of a week, a month, a year, or a decade. The chief objection to this method of studying either the potential power of a man or his actual skill lies in the fact that it consumes too much time. To use such a method would be like building a bridge out of whatever lay at hand and then studying the sustaining power of the bridge by waiting for increasing amounts of traffic to go over it.

It is just as natural for men to seek short cuts to knowledge as it has been for them to search out short cuts to wealth, and there are, therefore, other proposals for measuring the athletic talent of a man, just as there have been other proposals for measuring his intelligence. One such method proposes that a football game, for example, is made up of a series of fundamentals such as running, throwing, catching a ball, charging, blocking, punting, tackling, and the like. If we desired, therefore, to see how talented a man was, we might ask him to run 100 yards in his football togs, throw a football at a target, tackle a tackling dummy, kick a ball, dodge, pivot, change pace, straight-arm through and around a series of obstacles, and so on. In this way, it would be possible to measure the speed at which he can run, the accuracy with which he can throw, the distance which he can kick, and his relative quickness and coördination in doing some of the other tasks we have named. This method has recommended itself to coaches and to

students of athletic sports because it is fairly quick, because the measures can be made with a fair degree of accuracy, and because it seems to bear some relation to a man's ability to play a game<sup>3</sup>.

In using this method of testing either attained or attainable skill, it is necessary to find those activities which are most prophetic. In basketball, for example, it is possible to measure the skill which a man has in shooting at the basket, record the time that it takes him to dribble the ball one hundred feet, measure his accuracy in a direct pass or a bounce pass, and so on. The argument behind measures of this kind is that each one of these feats is an activity essential to the playing of basketball and that it ought to be possible, therefore, to tell from them<sup>4</sup> something about the game-playing ability of a man.

This method of studying athletic talent can be made even more abstract by simplifying the movements to be made. It is clear, of course, that running in basketball has many elements in common with running in football. Likewise, throwing a basketball or baseball has some elements in common with throwing a football. The coordination used in shooting baskets, dribbling the length of the floor, or making a bounce pass to a team-mate has many elements in common with dodging, straight-arming, batting, and so on. Through this process, one may arrive at a group of words which seem to describe muscular ability as such. That is, they seem to describe muscular ability apart from the special uses to which this ability is to be put in the playing of any one of the games. The words at which we may arrive are agility, balance, muscular or bodily control, flexibility, strength, quickness, and the like<sup>5</sup>. Having reached this point, it now becomes possible to devise tests not for maintaining balance while being tackled or while doing a gymnastic stunt, but for sheer balance itself<sup>6</sup>. It becomes possible to devise a test of strength apart from the strength that it takes to play any one of the games<sup>7</sup>. We might, for example, ask a man to stand still with feet together and eyes closed and maintain this position for a given number of seconds without moving. We might ask him to hold his left foot in his right hand behind the right leg and hop around on one spot for as many times as we think will give a measure of his skill. We might ask him to jump into the air as high as he can or jump into the air and make a half or full turn in either direction<sup>8</sup>. In other words, we prepare a list of stunts which are exceedingly simple and

<sup>3</sup>The list of events named comes from the field test used in football at the University of Illinois.

<sup>4</sup>Brace, D. K., *Testing Basketball Technique*, Amer. Phys. Ed. Rev., 1924, 29, 159-165.

<sup>5</sup>Brace, D. K., *Measuring Motor Ability*, 1927.

<sup>6</sup>As for example, the Miles ataxiometer.

<sup>7</sup>Bovard, J. F., and Cozens, F. W., *Tests and Measurements in Physical Education*, 1930, Chap. IV.

<sup>8</sup>Brace, K. D., *op. cit.*

which we believe to be related in one way or another to such general terms as agility, sense of balance, flexibility, quickness, strength, and the like<sup>9</sup>.

Tests of the two kinds just mentioned have come into increasing favor during recent years. In the first group of tests the aim, as we have seen, is to take such fundamentals of the game as seem essential to the game, standardize them so that times, distances, or degrees of accuracy can be measured and then find the relation between these results and the actual ability of a man to play the game from which the tests were derived. In the other case, the aim is to take such phases of skill that seem to cut across all games and measure these skills in the most formal and objective way possible<sup>10</sup>.

There is still a third way to measure athletic skill, the way that takes the student of such matters into a laboratory rather than to the athletic field or to a gymnasium where stunts can be tried out and measured.

This third way may be illustrated by using the concept of quickness. One way to measure quickness would be to ask a man to run one hundred yards at his best speed. Another way would be to give him a stimulus, say a brief flash of light, and tell him to react to the light, just as quickly as he could by pressing a telegraph key. The light would have some resemblance to a pistol shot; but instead of running one hundred yards, the subject would move just a single finger. In the one case, the experimenter would have a measure of the rate of running and in the other a measure of what is called reaction time. It is obvious that the reaction time would be much simpler than rate of running, for running involves not only speed but a high degree of coördination in leg muscles as well. In a simple movement of the finger the amount of coördination is reduced almost to a minimum. We should have a test, then, for sheer quickness<sup>11</sup>.

This third way of measuring athletic skill seems to run more deeply into the heart of the problem of motor intelligence than any of the other types of measurements. We may illustrate the situation by still another example. Throwing a basketball at a basket calls for what is called eye-hand or eye-limb coördination. The same thing would appear in throwing a forward pass, in batting, or in any other form of athletic skill where it is necessary to react to an object that is being seen. Obviously, it would be difficult to make an accurate study of any one of these skills if we were to remain on the athletic field. The

<sup>9</sup> See Bovard, J. F., and Cozens, F. W., *op. cit.*

<sup>10</sup> Bovard, J. F., and Cozens, F. W., *op. cit.*, Chap. VIII.

<sup>11</sup> Reaction time studies were among the first to make a science of psychology. See Griffith, C. R. *Psychology and Coaching*, 1928, Chap. XIII.

football passer very rarely throws his pass in the same way twice in succession in the actual playing of the game. On one occasion, he may be guarded more closely than on another. He may be more fatigued at one time than at another, and so on through all of the variable conditions that would appear on the field of play. Such a study of eye-hand coördination would be then not only a study of coördination itself but a study of coördination in relation to a vast array of uncontrollable and unpredictable events.

If we are to get at the heart of the problem of coördination, all of these variable factors must be eliminated and this means that eye-hand coördination must be taken into a laboratory where practically nothing is left for study save the simple movements involved in tapping the various areas on a rotating disc, keeping track of an irregularly moving object, and the like. The subject of the experiment can always be put into approximately the same frame of mind, the task to be done can be made so simple and automatic that all measures are measures of the same thing, and thus an approach made to the study of eye-hand coördination as such, apart from all reference to definite athletic skills.

It is upon this third type of measurement that the Laboratories for Research in Athletics at the University of Illinois have spent a great deal of time. Among the pieces of apparatus used in the laboratory is an outfit for measuring rate of reaction to light, sound, and pressure, a device for measuring eye-hand coördination, a device for measuring flexibility of coördination, a device for measuring the muscular sense, a device for measuring learning ability, a device for measuring the span of attention, and so on. In every case the apparatus aims at some fundamental aspect of motor intelligence.

The great question one faces in such studies of athletic talent is, of course, the question of the relationship between the measures themselves and the actual ability of a man to play a game. The ability to play any game rests, apparently, upon three sets of factors. Other things being equal, the man who has among other traits and skills the shortest reaction time, the best muscular coördination, the most useful power of attention, and the best memory ability, will make the best athlete. But before he becomes a good athlete two other factors must be considered. In football a man must have courage; but up to the present time no way has been found of measuring courage save by watching a player during a game in order to see how far he is willing to abandon himself in making a tackle, how much he flinches when tackled, how long he can endure pain and fatigue, and the like. The third factor which enters into the makeup of any athlete is his power to use his quickness, his flexibility, and his memories in an under-

standing way. That is, an athlete must have a motor as well as a mental level of intelligence.

We have, then, three sets of conditions. There are men who are fast, well coordinated, and the like. If they lack either courage or understanding, they will not make an athlete. If they have the first items conjoined with courage, they may make a much better record. A great athlete occurs only when understanding or intelligence is combined with courage and with the motor qualities measured in the tests.