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VALIDITY OF THE SOCCER SPECIFIC SKILL TESTS AND THEIR APPLICATIONS IN EVALUATION AND CONTROL OF TRAINING

Abstract

The aim of this study was to determine the validity of soccer specific skill tests. The sample consisted of 80 male players aged 13-16 (M = 15.1, SD = 1.1, range = 3.83, min = 13, max = 16.83). The validity of 12 tests of soccer skills from the SoccerTutor Skill Tester battery was determined. First, the criterion validity of the tests, the concurrent validity as a particular type of criterion, was established. The coefficient of concurrent validity covered the correlations of the test results and subjective coach assessment. A statistically significant correlation with the criterion has shown 8 out of 13 variables. These were tests of ball control, specific soccer agility, test of specific ball control and test for long passing accuracy assessment. The construct validity of the tests was established by applying the known groups difference method. The participants are grouped into three groups (dominant, good, weak) based on subjective training evaluation. Based on the results of the variance analysis, a statistically significant difference between the groups based on the results of 6 tests was established. These were dribbling slalom, agility eights, dribbling eights, passing long, running with the ball-return and juggling-both feet.

Keywords: validity, football, skills, tests, measurement

1. INTRODUCTION

The validity of measurements can be defined as the ability of a measuring instrument or test to reflect what it is designed to measure (Atkinson and Nevill, 1998). The measurement results are used for different purposes in accordance with the objectives of the evaluation process. There are therefore different types of measurement validity. The validity of measurements is usually determined according to a certain criterion. This type of validity is called criterion validity. Concurrent validity is a type of criterion that involves establishing correlation among a test results and a certain criterion that is determined at about the same time. The most frequently used criteria are subjective assessment and laboratory test results. For the validation of sports skills tests, the results of the subjective assessment are often used as criterion measures. Tests of sports skills evaluate the progress of athletes in learning and developing specific skills. A special type of measurement validity is construct validity. To

determine construct validity, the known group difference method is often used. The sports skills test shows constructive validity if it is sensitive to make the difference between the groups of children with different levels of skill.Tests of specific skills in football are often used by coaches and researchers in football because of their ease of use and the fact that no expensive equipment is required for their implementation. In a relatively short period of time, it is possible to test the number of athletes and to obtain the necessary information. Based on the results of the skill tests, it can be evaluated a particular learning program, determined changes in performance between young players of different ages and compared the skills of young and professional players depending on the level of competition and links the results of skill tests and statistical performance indicators. There are a number of studies where the strengths and flexibility test results are compared between the players of different levels of soccer skills (Oberg et al., 1984; Poulmedis, 1985; Tagari et al., 1988; Rosch et al., 2000); as well as differences in physical fitness and soccer skills of young players and non-athletes (Seabra et al., 2001). Tests of specific skills were applied to evaluate the effects of specific training programs on skill level changes (De Proft et al., 1988; Gauffin et al., 1989). A large number of tests have been developed to assess the development of specific football skills such as ball control, passing, shooting, heading, agility etc. (Caicedo et al., 1993, Van Rossum and Wijbenga, 1993, Soares et al, 1994; Rosch et al., 2000; Kirkendal et al., 1997). Malina et al. (2005) used six tests of technical skills to research the influence of variability associated with growth on the specific skills of young soccer players aged 13-15 years. Tests are suggested by the Portuguese Football Association and are traditionally used in Portugal. The following tests are used: body ball control, head ball control, dribbling with passing, dribbling (speed), passing and shooting. The reliability and validity of these tests were evaluated.The authors did not give statistical indicators of the validity of the tests. They concluded that the validity of the tests is logical, as tests evaluate all the important elements of the game (ball control, passing, shooting, etc.). The results of the study (Coelho e Silva et al., 2004) are used as evidence of the validity of the tests, in which the results of the six tests of Federacao Portuguesa de Futebol (1986) and the test of slalom dribbling and the test of the ball passing on the wall were correlated. Average correlation values were obtained. Kirkendall et al. (1997) found coefficients of correlation ranging from 0.53 to 0.94 between the performance of dribbling slalom tests and the passing on the one hand, and the subjective assessment of playing ability on the other. Ali A. et al (2007) examined the reliability and validity of two Loughborough Soccer Passing Test-LSPT and Loughborough Soccer Shooting Test-LSST. LSPT requires players to make 16 passes as fast as possible. LSST includes the passing, ball control and the shooting to the goal of regular dimensions. The participants conducted two trials each separated for at least one day. The aim of the research was to determine the difference between elite and amateur players on two skill tests. In this way, the validity of tests was determined by the known group difference method, the ability of tests to discriminate between two groups of athletes expected to have a different level of skills in accordance with the quality of the competition they participate. Differences were determined by t-test for independent samples ($p < 0.01$). The results of the study show that both tests provide valid measurements to assess differences in the performance of specific skills. Mirkov et al. (2008) investigated the quality of specific field tests on a sample of 20 professional male football players. The tests consisted of anaerobic performances with and without the ball (throwing in, standing kick performance-measured distance, 10m-sprint, flying 20m sprint, running 10x5 m, zig-zag running with and without the ball and zig-zag running ratio with and without the ball). The participants performed 3 consecutive trials on each test. Reliability of measurement was tested by intraclass correlation (ICC) and coefficient of variation (CV).The used tests showed high correlation coefficients (> 0.80) and low variability in repeated trials (CV <4%). The authors have recommended that ball throwing tests and shooting tests are not measured by distance rather than ball flight speed

(eg, standard radar). Wrag CB at al (2000) investigated the reliability and validity of repeated sprint ability tests. The sample consisted of 7 players who performed 6 repeated trials. To determine the difference between the measurements, ANOVA with repeated measurements and a CV was used to detect the variability of test results between repeated measurements. A CV of 1.8% (95% CI, 1.5-2.4) was found in the repeated sprint test among all 6 trials as a high reliability indicator. The CV between 2. and 4. trial was 1.9% (95% CI, 1.3-3.1%), while between 4. and 6. trial was 1.4% (95% CI, 1.0-2.3%). The variance analysis has shown that there is a statistically significant difference between repetition. Tuckey's post-hoc test showed that significant differences exist between trial 1 and trials 3-6 and between trial 2 and trial 5. Learning effect is completed with third trial. The performance of repeated sprint tests is compared with total running time calculated as the average of two repeated tests of maximum anaerobic running in laboratory conditions. The coefficient of correlation between these two tests was -0.298 and was not statistically significant p = 0.516. This result suggests that the energy mechanisms of these two tests are not related. Generally, in the scientific literature there is a lack of information related to the measurement and testing of asoccer specific skills. There are few published studies dealing with the issue of reliability and validity. Scientific effort is needed to carry out and publish a number of validity and reliability studies to verify tests that can be used both for scientific and practical purposes. The situation is much better in the area of measurement of the physical capacity of soccer players.

The aim of this study was to determine the validity of soccer specific skill tests. The research should demonstrate to what extent the tests show relevance to the criterion (performance of players in game playing conditions) and whether these tests can determine the differences between different levels of competition and whether these tests are justified for scientific and practical use.

2. METHODS

Participants

In this study, 80 male soccer players (M=15.1 years; s=1.1; range=3.83; min=13; max=16.83) participated. The participants were members of U14 and U16 teams from2nd League. The participants were tested with the approval of clubs and parents. Before the start of the competition season, all participants had passed medical examinations and received the medical certificate of the verified medical service. No serious health problems were identified that would endanger the health of the participants and prevent them from undergoing various training and competition charges. During the period of testing, the subjects were healthy without any signs of injury and illness that would affect the test results.

Measurement instruments and test procedures

A set of measuring instruments consisted of 12 tests of soccer skills from SoccerTutor Skill Tester. Tests are designed to evaluate basic soccer skills such as ball control, passing, specific soccer agility, dribbling, specific ball control (juggling) etc.

1. dribbling eights
2. dribbling slalom
3. dribbling straight
4. agility eights

5. agility slalom
6. passing short
7. passing long
8. passing weight
9. running with the ball-straight
10. running with the ball-return
11. juggling-both feet
12. juggling-headers

The description and the method of performing the tests can be found on the website https://www.soccertutor.com/.
To determine the validity of the measurement, it was necessary to associate test results with a particular criterion. In this research, as a criterion, a subjective coaching assessment of the level of skills was used. The evaluation was carried out by 4 coaches with "A" and "B" UEFA licenses for a coaching job. The used scoring form was a general form for a holistic assessment of sports skills (Morrow Jr. et al., 2005). The scale was a five-point type scale with scores from 1 to 5. Objectivity of coach assessment was established using the internal correlation coefficient (ICC). The value of this coefficient was 0.88, which indicates that there is a high match between coaches in the assessment of a soccer skills.
In addition to this form, another method of subjective assessment has been used in the research. The coaches had the task to classify players in one of three categories depending of their offensive and defensive contribution to the team's success. The coaches were evaluating the player's performance at matches and training sessions. The categories of players were used to determine the constructive validity of the tests by the method of the known groups difference as independent variables in the ANOVA. They are classified into three categories (dominant, good, weak) based on the criteria given by Nadeau et al. (2008).

Statistical analysis

The results were processed using software for statistical analysis SPSS 16 (SPSS Inc., Chicago IL). Descriptive statistics included arithmetic means and standard deviations for each test. Prior to the application of the statistical analysis, the estimate of the distribution of results and the homogeneity of the variance was performed. Whether the results were normally distributed was determined by the K-S test. The probability values $p < 0.05$ were taken as statistically significant. After preliminary data analysis, the coefficients of the validity are calculated. First, the criterion validity of the tests, the concurrent validity as a particular type of criterion, was established. The coefficient of concurrent validity covered the correlations of the test results and subjective coach assessments. The construct validity was determined using the known group difference method. The known group difference method involved determining the differences between the group of participants formed on the basis of subjective coaching evaluation of the player performance quality. For this purpose, the analysis of variance with Tuckey's post-hoc procedure was applied.

3. RESULTS AND DISCUSSION

The first step in the analysis of the obtained results is the calculation of descriptive statistical parameters. Arithmetic mean, standard deviation, minimum and maximum score for each test were calculated. Determination of individual measurement validation indicators requires the use of conventional parametric statistical methods. The prerequisite for their application is

the normal distribution of measurement results. For the purpose of estimating the form of data distribution and to determine whether the measured results differ significantly from the normal distribution, the K-S test was used. The obtained values confirm that there are no statistically significant deviations of results from the normal distribution and the data can be analyzed by parametric statistics.

- *Criterion validity of measurement*

Determining the criterion validity required the linking the test results with the results of a subjective coaching assessment of the player's skills. For this purpose, Pearson's correlation coefficient was used. A subjective assessment is set as a criterion because the ability of a player to adequately apply certain skills in terms of the game considers the essential quality of the player. Statistically significant correlation with the criterion showed eight variables of a total of thirteen. The results are shown in Table 1.

Table 1. Correlation of test results and subjective coach assessment

tests	subjective assessment
dribbling slalom	**-0.505****
agility slalom	**-0.339***
dribling eights	**-0.691****
agility eights	**-0.465***
dribbling straight	-0.178
passing short	-0.225
passing long	**0.526****
passing weight	-0.211
running with the ball-return	**-0.568****
running with the ball-straight	**-0.420***
juggling-both feet	**0.368***
juggling-headers	0.176
	R^2=0.65adj. R^2=0.46 ** P≤0.01, * P≤0.05

R^2-coefficient of determination, adj. R^2-adjusted coefficient of determination

The values of significant correlation coefficients ranged from -0.339 to -0.691. The values obtained are slightly lower than the values obtained in some earlier studies. However, it is generally confirmed that it is very difficult to construct a test for assessment of sports skills that will correlate with the criterion (subjective assessment) above 0.80. A significant correlation with the coach assessment had the dribbling slalom (-0.505), the dribbling eights (0.691), the passing long (0.526) and the running with the ball-return (-0.568) with the level of significance p <0.01 and agility slalom (-0.339), agility eights (-0.465), running with a ball-straight (-0.420) and juggling-both feet (0.368) with a level of significance p <0.05. It can be concluded that the criteria are the most closely related with tests for assessing the control of ball in motion. This is consistent with the fact that the ability to control the ball, especially in the movement, is one of the fundamental skills that determine the success in the game. Fast movement of players with the ball in the game and rapid change of direction give players the opportunity to quickly conquer space and the possibility to correct the position on the field to create the preconditions for better performance. Good control of the ball allows players to safely protect the ball against the defensive pressure of the players in the offensive game.A significant correlation with the criterion has shown the passing long test to estimate the elevation precision of the ball. The ability of the player to accurately pass the ball to a

greater distance is essential in a modern football. Fast and accurate shifting of the focus from one side of the field is important in attacking actions, because they bring the defense to a state of imbalance due to the inability to quickly move the defense to the direction of the attack. This creates unprotected defense spaces where attacking team focus actions with the goal to the attack last third of the pitch. Passing on larger distances is important in counter-attack situations when a large part of the field is conquered through one or two passes. Football is a game that demands a number of movements that consists of a large number of short sprints, turns, jumps, rapid changes in direction and a lot of explosive movements. For this reason, the correlation of test results of specific football agility with a subjective coaching assessment of skills was expected. The analysis showed the correlation of the criteria with the ball juggling test. These two variables account for about 14% of the total variance, indicating a weak relation between these two variables. Juggling is used extensively in the process of learning and training and it implies the specific control of the ball that is associated with the ability to coordinate movement, force control, motor timing, etc. This skill is not derived from a particular football technique, but is very important precisely for developing the abilities mentioned above and are important for the performance of most of the skills in football.

- *Construct validity of measurement*

In this study, three groups were formed, and the differences between them were analyzed using a variance analysis with the Tuckey post-hoc procedure (Table 2). The results confirmed the conclusions derived from the results of the correlation analysis. Statistically significant differences were found between groups of dominant, good and week players on the same variables that showed a statistically significant correlation with the criterion. Taking into account the logic of the applied statistical analyzes, the obtained relationship is expected. This can mean that the subjective coaching assessment coincides in both cases, although the criteria and method of forming variables are different, they can in essence be interpreted in a similar way.

Table 2. Results of ANOVA with the comparison of groups formed on the basis of a training and match performance

	dominant		good		weak			
	M	SD	M	SD	M	SD	F	p
dribbling slalom	13.48	0.75	13.96	0.47	14.51	0.83	6.098	**0.005******A-C**
agility slalom	10.99	0.54	11.07	0.31	11.43	0.46	3.935	**0.028*****A-C**
dribbling eights	17.30	0.69	17.83	0.53	18.57	0.73	10.392	**0.000******A-C,B-C**
agility eights	13.65	0.60	13.91	0.49	14.14	0.70	1.580	0.220

dribbling straight	5.81	0.56	5.58	0.44	5.92	0.47	2.191	0.126
passing short	14.08	1.91	15.17	1.63	15.17	1.52	1.263	0.295
passing long	15.00	3.95	11.80	2.70	9.97	1.90	7.713	**0.002******A-B,A-C**
passing weight	10.61	1.48	11.95	1.53	11.76	0.94	2.609	0.087
running straight	5.21	0.26	5.36	0.22	5.57	0.31	4.957	0.127
running return	8.80	0.35	8.97	0.35	9.38	0.37	7.859	**0.001******A-B,B-C**
juggling both feet	50.95	10.01	49.03	8.90	40.48	12.36	3.458	**0.042*****A-C**
juggling headers	40.90	9.99	38.13	10.33	35.92	14.14	0.423	0.658

M-arithmetic mean, SD-standard deviation, F-F statistic, p-significance level, A-dominant, B-good, C-weak, ** $P\leq0.01$, * $P\leq0.05$

A statistically significant difference was found between the groups of dominant and weak players on following tests: dribbling slalom, dribbling eights, passing long and running with the ball-return with the achieved level of significance $p<0.01$. The difference was also found on agility slalom test and juggling with both feet with the achieved significance level of $p<0.05$. A significant difference was found between the dominant and good players on the passing long test and running with the ball-return. On the dribbling eights test and running with the ball-return test difference was also found between the groups consisting of good and weak players. The difference in some tests is conditioned by differences in the age of the participants, which is confirmed by the correlation of the test results and the chronological age of the players. Using the covariance analysis, the results of the tests were corrected for the variance that is common with age. In this way, the influence of the covariance of the results is eliminated in order to carry out the analyzes on the real score of the participants.

The value of the coefficient of determination in the Table 1. shows that only half of the variance of the criteria is explained by a set of variables of specific skill tests. This data can be explained by the fact that these tests measure a basic level of soccer skill that does not include complex game conditions. These conditions apply to complex spatial and time constraints and to the presence of an opponent, which requires a player to quickly analyze the informationand quickly to make adequate decisions in the game. This proportion of the explained variance criteria is in line with the characteristics of these tests because they do not contain a cognitive-perceptual aspect that is crucial to success in the game. The ability to perceive, anticipate, decide in the game, think creative and other forms of football intelligence would largely explain the remaining part of the variance of the criteria. This certainly does not mean that coaches do not need to use skill tests in this form, because the basic soccer skill derived from the elements of the technique is the prerequisite for moving to a higher level of skill where the cognitive-perceptual aspect is decisive.

CONCLUSION

- the basic problem that relates to skill tests relates to their criterion validity. The lack of these tests is the inability to assess the perceptual-cognitive aspect of the soccer skill. Therefore, these tests explain only a portion of the variance of the criteria. The information provided by these tests can only be used to evaluate the player's skill without the constraints imposed by the environment or the game. Possession of these skills is only the basis for further development of a more complex skill in which the cognitive mechanism of correct decision-making in the game is dominant.

- the known group difference method showed similar results probably due to a similar interpretation of the criteria for determining the categorical variable and subjective

assessment. Giving more precise criteria for the formation of groups of players according to the level of skill can contribute to obtaining better information. All the conclusions about the validity of the skill tests should be made using the results of the reliability study, because it is important to know to what extent the obtained results are loaded with error.

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