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Relliability of The Tests of Maximal Kicking Performance in Youth Croatian Soccer Players

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ABSTRACT

The basic aim of this research was to analyse the reliability of 8 tests for evaluation of kicked soccer ball velocity. The research was conducted on the sample of 42 (15.7±1.5 years) youth soccer players who kicked the ball without and after dribbling. All the kicks were performed with dominant and non-dominant leg. The kick speed was evaluated by pocket radar. The values of the Cronbach alpha (CA) and Spearman-Brown (SB) reliability coefficients were higher than 0.80 in all the tests. Somewhat lower values of Inter-item correlation (IIC) were reported in tests performed with a dominant leg. The variance analysis showed a systematic error (the learning effect) only in first test, indicating a need of performing a greater number of trials before the real test. It can be concluded that kicked soccer ball velocity tests in which the pocket radar was applied had good metric characteristics.

KEYWORDS: soccer, ball velocity, pocket radar, metric characteristics

INTRODUCTION

Reliability could be considered as the amount of measurement error that has been deemed acceptable for the effective practical use of a measurement tool. Since measurement error can seriously affect statistical analysis and interpretation it is important to assess the amount of such error. Logically, it is reliability that should be tested for first in a new measurement tool, since it will never be valid if it is not adequately consistent in whatever value it indicates from repeated measurements (Atkinson and Nevill, 1998). Measurement errors may be systematic or random (Bruton et al., 2000). Systematic errors are predictable errors, occurring in one direction only, constant and biased (learning effect, fatigue effect, level of motivation changes etc.). Random errors are due to chance and unpredictable, thus they are the basic concern of reliability. While evaluating the reliability of the measuring, it is important to take into consideration random and the systematic measurement errors.

Kicking is a very important skill in soccer, and one of the ways to score that leads to team and individual success (Wong et al., 2010). Maximum ball speed has been widely accepted to be important indicator of kicking success (Marković et al., 2006; Sedano Campo et al., 2009; Berjan Bacvarevic et al., 2012). While testing the soccer kick speed it is important to measure the ability to kick with both feet (McLean and Tumilty, 1993). Also, majority of passing and kicking actions take place with the ball not being stationary (Sterzing, 2010). Due to these facts, this research will measure the stationary and rolling ball kick velocity (after the dribbling) with the instep kick and side-foot kick.

In soccer, kick speed is usually measured by radar. Pocket radar (Pocket Radar, Inc. Santa Rosa, California) measures the speed ranging from 11 to 600 km/h, with ±2 km/h deviation. Due to its relatively low price, dimensions and long lasting batteries, this device could be appropriate for evaluation of kicked soccer ball velocity. High degree of concordance between the results obtained by this device and those obtained by the speedster radar has been ascertained in the research conducted on young female volleyball players (Grgantov et al., 2012), while the authors could not find any accessible work in which pocket radar was used in soccer. It is therefore necessary to analyse the metric characteristics of the kicked soccer ball maximum velocity evaluation tests.

METHODS

The basic aim of this research was to analyse the reliability of eight kicked soccer ball velocity tests. The research was conducted on the sample of 42 youth soccer players (15.7±1.5 years), with 24 players of FC „Adriatic" and 18 players of FC „Krilnik" from Split. Both teams train four times a week and have competitive matches once a week.

The teams were tested at the end of the competition season 2012/2013, in July. The tests took place two days in a row, beginning at 8 A.M. Prior to tests, the examinees warmed up and stretched for 20 minutes (running with different tasks with and without the ball – 13 minutes, dynamic stretching – 7 minutes). All tests were conducted on a natural grass surface in dry, consistent weather conditions. Subjects wore their own soccer boots during the test. In all the tests the examinees would, after performing the first test item, stand at the end of the row and performed the next test item only when all the remaining examinees performed the test item. This procedure provided enough recovery time and prevented possible fatigue. The same order for each subject was kept constant across all the tests. Three successful trials were used per test for each subject. The maximum ball velocity was estimated using the pocket radar.

In all the tests the examiner was standing behind the goal, in the centre position opposite to the examinee, and was reading the kick velocity, in km/h.

In the tests without dribbling (IKDL – instep kick dominant leg, IKNDL – instep kick non-dominant leg, SFKDL – side-foot kick dominant leg, SFKNDL – side-foot kick non-dominant leg), the ball was placed at the centre part of the goal, at the distance of 16 meters. The players would, after an arbitrary run up, kick the ball in the direction of the radar.

In the same tests with dribbling, the ball was placed between two cones situated 25 m from the goal. At the sign from the examiner the examinees would dribble the ball using an arbitrary technique, touching it at least 3 times until reaching the 16 m line, from where they

would kick the ball with all their strength, in the direction of the examiner with the radar.

Cronbach alpha (CA), Spearman-Brown (SB) and Inter-item correlation (IIC) coefficients were calculated in order to determine the random measurement errors. Repeated measure ANOVA was applied to check for systematic differences between trials (items). After that, maximum value was taken for each test and normality of the data distribution was checked using the Kolmogorov-Smirnov test ($p \leq 0.05$), as well as asymmetry measures (Skew) and curvature distribution (Kurt). Also, the basic descriptive variables indicators were calculated (arithmetic mean, standard deviation, minimum and maximum values).

A statistical program Statistica for Windows, ver. 10.0 was used in entering and processing the data.

RESULTS AND DISCUSSION

Table 1 Reliability coefficients of the applied tests

Variables	CA	SB	IIC
IKDL	0.873	0.872	0.70
IKNDL	0.866	0.869	0.69
SFKDL	0.807	0.810	0.59
SFKNDL	0.893	0.901	0.75
DIKDL	0.813	0.817	0.60
DIKNDL	0.911	0.913	0.78
DSFKDL	0.830	0.832	0.62
DSFKNDL	0.933	0.934	0.83

Legend: IKDL – instep kick dominant leg, IKNDL – instep kick non-dominant leg, SFKDL – side-foot kick dominant leg, SFKNDL – side-foot kick non-dominant leg, DIKDL – instep kick dominant leg (dribbling), DIKNDL – instep kick non-dominant leg (dribbling), DSFKDL – side-foot kick dominant leg (dribbling), DSFKNDL – side-foot kick non-dominant leg (dribbling), CA-Cronbach alpha coefficient, SB-Spearman-Brown coefficient, IIC-Inter-item correlation coefficient

Table 1 shows the reliability of the maximum soccer kick velocity evaluation test. It can be observed that CA and SB values in all the tests were bigger than 0.80, supporting the high internal consistency of all tests. Squaring the values and subtracting it from 1.00 produces the indices of measurement (random) errors, which were lower than 0.35 in all the tests. Somewhat lower IIC values were noted in the tests performed with a stronger leg.

Table 2 Repeated measure ANOVA

	$Mean_1$	$Mean_2$	$Mean_3$	F	p
IKDL	96.30	99.15	100.33	6.13	0.003
IKNDL	82.73	80.90	83.14	0.87	0.42
SFKDL	91.71	92.69	91.59	0.57	0.56
SFKNDL	78.40	77.71	78.04	0.10	0.89
DIKDL	92.80	94.59	93.85	0.99	0.37
DIKNDL	79.76	79.50	79.02	0.14	0.86
DSFKDL	86.71	87.23	86.90	0.10	0.90
DSFKNDL	75.04	75.11	76.38	0.90	0.40

Legend: IKDL – instep kick dominant leg, IKNDL – instep kick non-dominant leg, SFKDL – side-foot kick dominant leg, SFKNDL – side-foot kick non-dominant leg, DIKDL – instep kick dominant leg (dribbling), DIKNDL – instep kick non-dominant leg (dribbling), DSFKDL – side-foot kick dominant leg (dribbling), DSFKNDL – side-foot kick non-dominant leg (dribbling), Mean - arithmetic mean, F – F test value, p – significant level

Table 2 shows the results of the variance analysis, aimed at determining the possible systematic errors caused by the learning effect, fatigue etc. It is noticeable that 7 out of 9 tests had no statistically significant differences in the results of certain items. The exception was the IK test (instep kick at a stationary ball) performed first, which also showed a result increase trend. This fact shows that the examinees were not adequately prepared for the performance of the test. Although they practice this skill at every training session, the presence of the examiner with radar presented a novelty that one should adapt to. Besides this, a maximum kicking speed was demanded, so it can be concluded that they needed more trials to be completely ready for the test.

Table 3 Deskriptive statistics and sensitivity of the applied tests

Variables	Mean	Min	Max	SD	Skew	Kurt	KS
IKDL	103.00	80.00	121.00	9.60	-0.60	-0.08	0.13
IKNDL	95.00	84.00	111.00	7.00	-0.00	-0.65	0.09
SFKDL	98.00	79.00	116.00	8.20	-0.40	0.15	0.10
SFKNDL	91.00	76.00	109.00	7.60	0.20	0.22	0.10
DIKDL	88.00	58.00	106.00	11.90	-0.80	-0.00	0.13
DIKNDL	83.00	43.00	103.00	11.50	-1.20	2.60	0.11
DSFKDL	85.00	56.00	98.00	11.10	-0.80	-0.07	0.14
DSFKNDL	79.00	45.00	98.00	11.00	-1.30	1.75	0.21

Legend: IKDL – instep kick dominant leg, IKNDL – instep kick non-dominant leg, SFKDL – side-foot kick dominant leg, SFKNDL – side-foot kick non-dominant leg, DIKDL – instep kick dominant leg (dribbling), DIKNDL – instep kick non-dominant leg (dribbling), DSFKDL – side-foot kick dominant leg (dribbling), DSFKNDL – side-foot kick non-dominant leg (dribbling), Mean - arithmetic mean, Min – minimum results, Max – maximum results, SD – standard deviation, Skew – skewness, Kurt – kurtosis, KS – coefficient of the Kolmogorov-Smirnov test

Table 3 shows that the KS test results were lower than the critical values, meaning that the result distribution was good and the sensitivity of the newly constructed specific kicked ball velocity evaluation tests was good. The analysis of the skewness and kurtosis showed that all the tests (except for the SFKNDL tests with and without dribbling) had those values ranging from 0 to 1, indicating the symmetry and mesokurtic distribution. The remaining tests showed negatively asymmetric and platykurtic distribution, showing that the lower number of examinees achieved significantly lower kicking velocities than the others. This is additionally confirmed by the comparison of the minimum kick velocity values, which were much lower in comparison to the other tests, while these differences were less expressed in the average values.

It is obvious that the technique of the side-foot kick with non-dominant leg was not well adopted by certain examinees, causing a significant difference in ball kicking velocity.

CONCLUSIONS

The obtained results show that all applied ball kicking velocity evaluation tests had good metric characteristics.

Pocket radar was a reliable and sensitive measuring instrument in evaluation of maximum soccer ball kicking velocity

Prior to testing, it is important to ensure the examinees had enough trial attempts, so they can perform the kicks with their maximum strength from the first item test

Certain examinees should perfect the side-foot (non-dominant leg) ball kicking technique.

KS test=0.21 (N=42)

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