INFLUENCE OF COORDINATION AND PSYCHOLOGICAL FACTOR ON THE KICK PRECISION IN FOOTBALL

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Summary
The main components which influence the precision of the kick by leg onto a ball in the sport of football were extracted by only one factor analysis. Since this was a pilot research performed at a smaller size sample which did not meet conditions referring to relation between the number of variables and number of entities, the extracted factors were not statistically reliable. On the basis of such a kind of results, the author of this study decided to examine efficacity in trying to hit the aim with ball at the sample of young professional footballers, but this time trying to meet research conditions. According to the tables for determination of difference significance between two series of data, for the degree of freedom (number of frequencies) 18 (20-2) at the level of 0.01, and in order to have the existence of a significant difference between the two series, it is necessary that it amounts 2.88. Having the value of T-test of this research slightly higher (-2.92), it can be concluded that there exist a significant difference in favor of the variable between the results obtained by kicks performed by favored leg in the state of fatigue in relation to the kick performed by unfavored leg in the state of rest.

Key words: *football, ball kick, coordination*

Introduction
The main components which influence the precision of the kick by leg onto a ball in the sport of football were extracted by only one factor analysis. Since this was a pilot research performed at a smaller size sample which did not meet conditions referring to relation between the number of variables and number of entities, the extracted factors were not statistically reliable. On the basis of such a kind of results, the author of this study decided to examine efficacity in trying to hit the aim with ball at the sample of young professional footballers, but this time trying to meet research conditions and compare the following variables and measure their mutual realtions: a) Precision of a kick performed by the internal side of instep by unfavored leg in the state of rest and in an even-tempered intensity (VAR.3), b) Precision of a kick performed by the internal side of instep by favored leg in the state of fatigue and in an even-tempered intensity (VAR.5)

Terms and definitions
Only three terms were picked out for the purpose of this research:
PRECISION, in football and according to the general convention, is presented in the form of a number of kicks as nearer to a certain aim, which is usually located in the center of the field exposed to shooting , as possible.

FAVOURED LEG is the leg which is better in shooting motion and for that reason it is often called a better leg. In most cases it is represented by the right leg. It is called a favoured leg because shots are mostly performed (favored) using that leg.
UNFAVORED LEG is the other leg, in most cases it is the left leg, which is more rarely used if the aim is a high degree of efficacity.

The Aim and Methods
The aim of research. Already on the basis of the chosen variables, it can be concluded that the main aim of this study will be mental and physiology fields. The problem of how kicks performed by inner part of instep influence on the kick precision will be studied in order to form an appropriate and adequate hypothetical scope. Hypothesis - Only two following factors were examined in this research: Is the precision of a kick performed by the inner side of instep influenced more by asymettrically acquired coordination or by the state of organism fatigue. The appropriate hypothesis were set in relation to it: The acquired coordiantion by favored leg (H1) has a bigger influence on precision of a kick performed by the inner side of instep. The degree of organism fatigue (H2) has a bigger influence on precision of a kick performed by the inner side of instep.

There is a significant correlation (H3) between the precision of a kick performed by the inner side of

instep of the unfavored leg in the state of rest and with an even-tempered intensity and the precision of a kick performed by the inner side instep of the favored leg in the state of fatigue with an even-tempered intensity. There is no significant correlation (H4) between the precision of a kick performed by the inner side of instep of the unfavored leg in the state of rest and with an even-tempered intensity and the precision of a kick performed by the inner side instep of the favored leg in the state of fatigue with an even-tempered intensity. The group of samples included the sample of the young representatives from the football clubs of federal rank represented this partial sample. All of them entered a regular medical examination and they had a status of healthy people. Not one among the testees had some physical handicap or mental disorder. Each of the testees was engaged in systematic training in a club under leadership by a qualified coach at least for seven years. After elimination of the individuals who were not able to take part in the test due to a number of objective and subjective reasons, the sample was reduced on an entity consisting of twenty testees.

Testing conditions: This sample included two models of shooting the aim by a kick onto the ball, which could be efficently used in situational conditions in football game: Leg: Unfavored. State: Rest. Intensity: optimal. (VAR3). Leg: Favored. State: Fatigue. Intensity: Optimal. (VAR5). The weather there was good: warm, sunny and without wind. Humidity and pressure were normal. The setting was placed in an open air space with grass field, cut grass and dry field. The distance from the goal was 20 meters. The distance line was marked. The places where the balls were positioned were also marked. The testees were dressed in standard sport clothes: sport shorts and sport shirt and on their legs they had football boots; the size of balls that were used during the experimet was pursuant to the regulation of Football association.

For the purpose of this experiment, the goal lines were outlined on a steady vertical surface in standard dimensions (7,32 x 3,44 m). The whole goal surface was divided into two mutually vertical lines which were divided in four quadrants of the sime size. The two mentioned lines were intersected exactly in the center of goal. From that center of intesection, that is, from the center of vertical goal projection, concentrated circles were outlined. The first circle was of a prescribed diameter size of a football ball (22,1 cm).

All other circles were outlined with their mutual space between of a size of a football ball diameter. Both on the left and right, 16 interspaces, sized as a football ball diameter each, were outlined from the central circle as big as football ball projection. Looking from the central circle up and down, the number of 11 same kind interspaces were outlined.The central circle brought 17 points, which was a maximal number of points for one hit, whereas peripheral circles on the left and right brought one point. The closer center hits, the larger number of points they brought. Each goal miss hit was identified by zero points.

Results

Twenty testees performed ten kicks each using the inner side of instep onto the ball in two relevant ways in order to shoot the surface of goal, that is the first (central) concentrated circle, which had the same diameter with the one of a football ball. The Table 1. shows the raw results for the whole sample consisting of twenty testees. The results obtained by all of the testees were recorded and each of the testees performed ten kicks onto the ball using the inner side of instep by unfavored leg in the state of rest and with even-tempered intensity. The Table 2. shows the raw results for the whole sample consisting of twenty testees. The results obtained by all of the testees were recorded and each of the testees performed ten kicks onto the ball using the inner side of instep by favored leg in the state of fatigue and with even-tempered intensity.

Table 1. First horizontal line : Frequencies. First vertical line : Entity

	1	2	3	4	5	6	7	8	9	10
P.V.	13,00	10,00	12,00	17,00	13,00	12,00	8,00	12,00	9,00	9,00
G.I.	16,00	9,00	9,00	10,00	5,00	,00	11,00	,00	2,00	12,00
K.M.	11,00	13,00	14,00	13,00	17,00	15,00	13,00	7,00	10,00	12,00
N.S.	12,00	15,00	9,00	14,00	,00	11,00	13,00	4,00	12,00	3,00
D.Đ.	8,00	12,00	10,00	14,00	,00	12,00	10,00	8,00	8,00	15,00
M.M	12,00	10,00	12,00	2,00	10,00	10,00	11,00	9,00	9,00	13,00
Đ.I.	13,00	8,00	7,00	,00	12,00	14,00	,00	12,00	4,00	13,00
D.G.	12,00	10,00	13,00	14,00	6,00	12,00	13,00	12,00	4,00	11,00
S.P.	10,00	13,00	8,00	5,00	10,00	12,00	9,00	,00	7,00	,00
J.S.	10,00	,00	11,00	5,00	,00	11,00	12,00	10,00	11,00	12,00
I.S.	13,00	10,00	12,00	17,00	13,00	12,00	8,00	12,00	9,00	9,00
V.P.	16,00	9,00	9,00	10,00	5,00	,00	11,00	,00	2,00	12,00
I.G.	11,00	13,00	14,00	13,00	17,00	15,00	13,00	7,00	10,00	12,00
M.K.	12,00	15,00	9,00	14,00	,00	11,00	13,00	4,00	12,00	3,00
S.N.	8,00	12,00	10,00	14,00	,00	12,00	10,00	8,00	8,00	15,00
D.D.	12,00	10,00	12,00	2,00	10,00	10,00	11,00	9,00	9,00	13,00
S.M.	13,00	8,00	7,00	,00	12,00	14,00	,00	12,00	4,00	13,00
I.D.	12,00	10,00	13,00	14,00	6,00	12,00	13,00	12,00	4,00	11,00
G.D.	10,00	13,00	8,00	5,00	10,00	12,00	9,00	,00	7,00	,00
P.S.	10,00	,00	11,00	5,00	,00	11,00	12,00	10,00	11,00	12,00

The Table 1. shows the raw results for the whole sample consisting of twenty testees. The results obtained by all of the testees were recorded and each of the testees performed ten kicks onto the ball using the inner side of instep by favored leg in the state of fatigue and with even-tempered intensity.

Table 2. First horizontal line : Frequencies. Firs vertical line : Entity

	1	2	3	4	5	6	7	8	9	10
P.V.	5,00	,00	,00	11,00	13,00	13,00	11,00	12,00	12,00	9,00
G.I.	5,00	3,00	9,00	2,00	10,00	44,00	,00	11,00	11,00	8,00
K.M.	8,00	11,00	5,00	7,00	11,00	8,00	7,00	9,00	7,00	13,00
N.S.	12,00	11,00	17,00	5,00	17,00	7,00	11,00	11,00	10,00	1,00
D.Đ.	10,00	4,00	6,00	10,00	14,00	8,00	3,00	,00	13,00	6,00
M.M	10,00	13,00	7,00	,00	11,00	8,00	1,00	13,00	2,00	4,00
Đ.I.	10,00	10,00	10,00	15,00	3,00	,00	17,00	12,00	7,00	3,00
D.G.	7,00	3,00	8,00	,00	14,00	14,00	9,00	7,00	15,00	15,00
S.P.	3,00	9,00	5,00	4,00	1,00	14,00	11,00	7,00	3,00	7,00
J.S.	13,00	11,00	8,00	9,00	13,00	14,00	5,00	,00	1,00	6,00
I.S.	5,00	,00	,00	11,00	13,00	13,00	11,00	12,00	12,00	9,00
V.P.	5,00	3,00	9,00	2,00	10,00	44,00	,00	11,00	11,00	8,00
I.G.	8,00	11,00	5,00	7,00	11,00	8,00	7,00	9,00	7,00	13,00
M.K.	12,00	11,00	17,00	5,00	17,00	7,00	11,00	11,00	10,00	1,00
S.N.	10,00	4,00	6,00	10,00	14,00	8,00	3,00	,00	13,00	6,00
D.D.	10,00	13,00	7,00	,00	11,00	8,00	1,00	13,00	2,00	4,00
S.M.	10,00	10,00	10,00	15,00	3,00	,00	17,00	12,00	7,00	3,00
I.D.	7,00	3,00	8,00	,00	14,00	14,00	9,00	7,00	15,00	15,00
G.D.	3,00	9,00	5,00	4,00	1,00	14,00	11,00	7,00	3,00	7,00
P.S.	13,00	11,00	8,00	9,00	13,00	14,00	5,00	,00	1,00	6,00

The Table 2. shows the raw results for the whole sample consisting of twenty testees. The results obtained by all of the testees were recorded and each of the testees performed ten kicks onto the ball using the inner side of instep by unfavored leg in the state of rest and with even-tempered intensity.

Table 3. Measures of central tendency and frequency distribution for the variable No. 3. (unfavored leg, state of rest, optimal intensity)

Arithmetic mean	X-BAR	8.03
Standard error	Sx	0.33
Variance	VAR	21.13
Standard deviation	SD	4.60
Coefficient of variation	CV	56.86
Minimal readings in series	MIN	0
Maximal readings in series	MAX	17
Variational width	RANG	17
Asymmetry	SKEW	-0.20
Flatness	KURT	-0.88
Coefficient of safety	%	95

Table 4. Measures of central tendency and frequency distribution for the variable No. 5. (favored leg, state of fatigue, optimal intensity)

Arithmetic mean	X-BAR	9.50
Standard error	Sx	0.30
Variance	VAR	18.56
Standard deviation	SD	4.31
Coefficient of variation	CV	45.37
Minimal readings in series	MIN	0
Maximal readings in series	MAX	17
Variation width	RANK	17
Asymmetry	SKEW	-0.93
Flatness	KURT	0.16
Coefficient of safety	%	95

Table. 5. Statistic procedures of var 3 and var 5.

Arithmetic mean	X-BAR	-1.41
Standard error	Sx	0.48
Standard deviation	SD	6.82
t-test for small independent	t-mn	-2.92
Correlation coefficient	R	-0.73

Discussion

In order to have relible results of this research based on statistic methods, it is necessary to do a previous identification '' behaviour'' of a series of numbers, in other words, it is necessary to determine their arrangement, quantity realtions and their grouping. The measures of central tendency and frequency distribution, which were presented in the tables 3 and 4, give a sufficient number of data which can serve as a basis for determination of presentation of Gaus's curve line, which is a basis for identifying the level reliability of conclusions which were resumed in this research. The third and fourth moments were necessary for calculating flatness and asymmetry.

Table 6. Moments

Asymmetry (scewX,scewY) =	-.20	-.93
Flatness (curtX,curtY) =	-.88	-.16

The resulted values are not above the determined frames by convention and for that reason the values resulted by both of the frequencies can be considered correct for the purpose of a further research. Frequency distributions present grouping of measured values around arithmetic mean, individually for each of the data series.

Table 7. Basic data

Standard deviation (SD)	4.60	4.31
Variation width (VS)	17	17
Variance (M2) (varX,varY)	21.13	18.56
Variation coefficient (CV)	56.86	45.37
Standard error (SX,SY)	0.33	0.30

The grouping of calculated values determins Gaus's curve line and confirms, in a larger extent, the reliability of results which would be calculated by a certain statistical method. Having trial to determine the existence of statistically significant difference in the kick precision using the favored leg in the state of fatigue in relation to the kick precision using the unfavored leg in the state of rest and to find out if the results of two series of hits were mutually correlated as the aim of this research, the values of T-test and correlation coefficient were calculated as follows:

Table 8. T-test

t-test, SMALL , INDEPENDENT SAMPLES	(TN)	-2.92
CORRELATION COEFFICIENT	(r)	-0.73

Conclusion

According to the tables for determination of limit values for correlation coefficient, for the degree of freedom (number of frequencies) 18 (20-2) at the level of 0.01, and in order to have the existence of correlation between two series, it is necessary to have the correlation coefficient not lower than 0.561. As correlation coefficient in this research acquired the significant value (-0.73), it can be be concluded with confidence that there is a significant negative correaltion between the results gained by kicks performed by favored leg in the state of fatigue in relation to the kick performed by unfavored leg in the state of rest. According to the tables for determination of difference significance between two series of data, for the degree of freedom (number of frequencies) 18 (20-2) at the level of 0.01, and in order to have the existence of a significant difference between the two series, it is necessary that it amounts 2.88. Having the value of T-test of this research slightly higher (-2.92), it can be approximately concluded that there exist a significant difference in favor of the variable 5 between the results obtained by kicks performed by favored leg in the state of fatigue in relation to the kick performed by unfavored leg in the state of rest.

Literature

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UTJECAJ KOORDINACIJSKOG I FIZIOLOŠKOG FAKTORA NA TOČNOST UDARCA U NOGOMETU

Sažetak

U prethodnom istraživanju, jednom faktorskom analizom ekstrahirane su glavne komponente od kojih zavisi preciznost i točnost udarca nogom po lopti u nogometu. Budući je to pilot istraživanje vršeno na manjem uzorku, koji nije ispunjavao uvjete odnosa između broja varijabli i broja entiteta, ekstrahirani faktori nisu bili statistički pouzdani. Na osnovu toga autor ove studije se opredjelio da istraži kod mladih nogometnih profesionalaca efikasnost pogađanja loptom u cilj, ali sada zadovoljavajući uvjete istraživanja. Prema tablicama za određivanje značajnosti razlika između dva niza podataka, za stupnjeve slobode (broj frekvencija) 18 (20-2) na razini 0.01, da bi postojala značajna razlika između dva niza, neophodno je da bude >=2.88. Kako je u ovom istraživanju vrijednost t-testa veća (-2.92), može se zaključiti da između rezultata dobijenih udarcem protežiranom nogom u zamorenom stanju, u odnosu na udarac neprotežiranom nogom u odmorenom stanju postoji značajna razlika.

Ključne riječi: *nogomet, udarac po lopti, koordinacija*

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