

## DIFFERENCE IN CORRECT KICKING OF THE SOCCER BALL WITH RESTED WEEK LEG EXPRESSED WITH DIFFERENT INTENSITY

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### **Abstract**

(This sample is valid only for research where 3 and 4 variables were treated)

Group of young soccer professionals was hitting goal in the same way from the same distance. Each respondent kicked with both legs for ten times. In the first case the kick was performed with rested week leg with optimal intensity for 10 times, and after special program of relaxation in order to let them rest the muscles that are engaged the most in kicking the ball, other 10 kicks was performed with rested strong leg with maximal intensity. After statistic procedure processing, we determined that maximal intensity significantly influenced decrease in accuracy of hitting goal, which confirmed criteria hypothesis.

**Key words:** foot kick on the ball, inner foot, week leg; strong leg, state of rest, fatigue state, optimal intensity, maximal intensity, accuracy, correlation, arithmetic means significant difference.

### **INTRODUCTION**

Hypothetical space includes unknown term in a form of a question does accuracy of the kick depends on its intensity, if the kick is performed with the week leg in optimum state of warm up. On this occasion the author used data from macro - project where relations of accuracy level in different states of kicking the ball into goal with strong and week leg in different states of fatigue and intensity were enclosed. According to that the author decided to research the efficacy of shooting the ball in goal with young football professionals, but this time satisfying the conditions of the research and isolating following variables and their correlations:

- The accuracy of the kick with inner foot of week leg in state of a rest with medium intensity (VAR.3).
- The accuracy of the kick with inner foot of a week leg in state of a rest with maximal intensity (VAR.4).
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For this research we selected only three terms: ACURACY in football, according to general convention, represents series of kicks closest to the determined goal, which is usually placed in the center of shooting area. STRONG LEG is the leg that is capable to shoot better, and we also call it favorable leg. In most cases that is the right leg. It is called strong leg because the kick with that leg is better and the leg is used more then the other leg. WEEK LEG is the other leg, usually left, that is not used so often if high level of efficacy is required.

According to selected variables we can conclude that the main goal of this study includes mental but also physiological area. The problematic of impact on accuracy of the kick with inner foot using week leg with different intensity in that sense forming suitable hypothetic space.

There are only two factors treated in this research. Does bigger impact on the accuracy of the kick with inner foot using week leg makes optimal intensity or maximal intensity. Related to this we set following hypotheses: On the accuracy of the kick with inner foot with week leg bigger influence has optimal intensity (H1). On the accuracy of the kick with inner foot with week leg bigger influence has maximal intensity (H2). There is significant correlation between accuracy of the kick with inner foot using week rested leg with medium intensity and the accuracy of the kick with inner foot using week rested leg with maximal intensity (H3). There is no significant correlation between accuracy of the kick with inner foot using week rested leg with medium intensity and the accuracy of the kick with inner foot using week rested leg with maximal intensity (H4).

### **METHOD**

#### **Participants**

This partial sample was presented to youth of football club in Federal League. Everyone took regular medical examination and was healthy. Not

even one respondent had physical or mental defect. Each respondent was subject to many years of systematic training in the club managed by qualified coach. After elimination of individuals that could not take this test for objective or subjective reasons, the sample was reduced to entity of 20 respondents.

### Instruments

This sample included two ways of kicking the ball with foot and shooting at goal, which can be effectively used in situations of football game:

Leg: Week.

State: Rested.

Intensity: Optimal.

(VAR No.3)

Leg: Week.

State: Rested.

Intensity: Maximum.

(VAR No.4)

The weather was favorable; worm, sunny, no wind. The humidity and atmospheric pressures were normal. It was outdoors, grass court, grass mown and dry earth. Distance from the goal was 20 m. Spacing line was marked. The place for the ball was also marked. The respondents were wearing sports outfit, dressed in sports shorts and dress and football shoes. The balls used for an experiment were according to Federal Association regulations.

For this experiment on a solid vertical field we drew goal according to standard dimensions (7, 32 x 3, 44 m). Entire surface of the goal was divided

into 4 equal quadrants with two interrelated lines. These two lines were crossing in the middle of the goal. From the crossing point, actually from vertical goal projection we drew concentric circles. The first circle was the size of soccer ball diameter (22, 1 cm). All other circles were placed on the mutual distance for a size of a soccer ball diameter. From central circle which was the size of soccer ball projection left and right we marked 16 distances of soccer ball diameter. From central circle up and down 11 such distances were marked. Central circle totals 17 points which was maximum points for one kick and peripheral circles left and right total 1 point. As closer to the center points were they total more points. Each miss was 0 points

### RESULTS

Twenty respondents performed ten kicks with inner foot in two relevant ways, with the aim to hit the first (central) concentric circle on the goal surface, with circle diameter equal to diameter of a soccer ball.

In table 1 we presented raw results for entire sample of 20 respondents. All respondent's results were noted, and each performed 10 kicks with inner foot using week leg in rested state with optimal intensity.

In table 2. we presented raw results for entire sample of 20 respondents. All respondent's results were noted, and each performed 10 kicks with inner foot using week leg in rested state with maximal intensity.

Table 1. First horizontal: Frequencies. First vertical: 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.D.	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
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In table 1. we presented raw results for entire sample of 20 respondents. All respondent's results were noted, and each performed 10 kicks with

inner foot using week leg in fatigue state with optimal intensity.

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

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

In table 2. we presented raw results for entire sample of 20 respondents. All respondent's results were noted, and each performed 10 kicks with

inner foot using week rested leg and maximal intensity.

Table 3. The measures of central tendency and frequency distribution for variable No. 3. (week leg, rested state, intensity optimal)

Arithmetic mean	<b>X-BAR</b>	8.03
Standard error	Sx	0.33
Variance	VAR	21.13
Standard deviation	SD	4.60
Variation coefficient	CV	56.86
Minimal values in sequence	MIN	0
Maximal values in sequence	MAX	17
Variation width	RANG	17
Asymmetry	SKEW	-0.20
Flatness	KURT	-0.88
Reliability coefficient	%	95

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

Arithmetic mean	<b>X-BAR</b>	4.47
Standard error	Sx	0.47
Variance	VAR	28.14
Standard deviation	SD	6.71
Variation coefficient	CV	107.29
Minimal values in sequence	MIN	0
Maximal values in sequence	MAX	16
Variation width	RANG	16
Asymmetry	SKEW	0.59
Flatness	KURT	-1.11
Reliability coefficient	%	95

Table No. 5 Statistic procedures of variable pairs: Variable 3 (week leg, state rested, intensity optimal), Variable 4(week leg, state rested, intensity maximal)

Arithmetic mean	X-BAR	3.15
Standard error	Sx	0.52
Standard deviation	SD	7.37
t-test for small independent samples	t-mn	6.04
Correlation coefficient	R	-0.10

**INTERPRETATION AND DISCUSSION**

To make results of the research with statistical methods reliable, it is necessary to previously determine “behavior” of series of numbers, i.e. determination of their disposition, their quantity relations and their grouping. Measures of central tendency and frequency distribution, presented in the tables 3 and 4, provide enough data

according which we can define picture of Gause’s curve, which can further determine the conclusion reliability level, summarized in this research.

The third and fourth moments were necessary for calculating flatness and asymmetry of Gaus’s curve;

Asymmetry (scewX,scewY) =	-0.20	0.59
Flatness (curtX,curtY) =	-0.88	1.11

Obtained values do not exceed conventional frames, so the values of both frequencies can be considered as correct for further research. Frequency distribution (SD,VS,varX,varY,CV,Sx

i Sy) present grouping of measured values around arithmetic means, separately for each data sequence:

Standard deviation (SD)	4.60	5.30
Variation width (VS)	17	17
Variance(M2) (varX,varY)	21.13	28.14
Variation coefficient (CV)	56.86	107.29
Standard error (Sx,Sy)	0.33	0.38

Grouping of calculated values determines correct Gause’s curve and confirms result reliability which will be calculated with certain statistical method. As the goal of this research was to determine whether there is statistically

significant difference in a kick accuracy with week leg in state of fatigue regarding to kick accuracy with week leg in rested state and whether are this two series of data in correlation,

the values of t- test and correlation coefficient

are calculated:

t-test, SMALL, INDEPENDENT SAMPLES	(TN)	6.04
CORRELATION COEFFICIENT	(r)	-0.10

In table 3, we presented individual results (number of points) of all respondents, totally 200 data. After statistic processing, the following relations are determined:

Variance (VAR=21.13) is bigger then variation width ( $\check{V}\check{S}=17$ ) so data variability is heterogenic.

Standard deviation (SD=4.60) is smaller then variation width ( $\check{V}\check{S}=17$ ) and we can say there is higher level of similarity of statistical units in this variable.

Variation coefficient (CV=56.86) with its size indicates that data distribution of this set is moderately homogenous.

Asymmetry (SKEW=-0.2) has negative sign which means Gause's curve is "aslope" toward bigger set values. Asymmetry of Gause's curve moves in a tolerant range from -2 to +2 and we can consider that positioning of the results in this set slightly asymmetric.

Flatness (KURT=-0.88) has negative sign so Gause's curve shows slight platycurticness. All the values of this set are in range (from +3 to -3) and we can consider that positioning of the results in this set is acceptable

Measures of central tendency and frequency distribution of all respondent results, where each of them performed 10 kicks with inner foot using week leg, in rested state with maximal intensity, give affirmative answer that this set can further be a subject to standard statistic procedures.

In table 4. we presented individual results (scores) of all respondents, totally 200 data. After statistic processing the following relations are determined:

Variance (VAR=28.14) is bigger then variation width ( $\check{V}\check{S}=16$ ) so data variability is not acceptable.

Standard deviation (SD=5.30) is smaller then variation width ( $\check{V}\check{S}=16$ ) and we can say there is a higher level of similarity of statistical units in this variable.

Variation coefficient (CV=107.29) with its size indicates that the data distribution of this set is extremely heterogenic.

Asymmetry (SKEW=0.59) has positive sign which means that Gause's curve is "aslope" toward lower set values. Asymmetry of Gause's curve moves in a tolerant range from -2 to +2 and we can consider that positioning of the results in this set slightly asymmetric.

Flatness (KURT=-1.11) has negative sign so Gause's curve shows slight platycurticness. All the values of this set are in range (from +3 to -3) and we can consider that positioning of the results in this set is acceptable

Measures of central tendency and frequency distribution of all respondent results, where each of them performed 10 kicks with inner foot using week leg, in rested state with maximal intensity, give affirmative answer that this set can further be a subject to standard statistic procedures.

The individual results of all respondents, totally 400 data, were paired and presented in tables 1 and 2. After statistic procedures processing the following relations were determined:

For this sample ( $20+20-2=38$ ) with the level of reliability 95%, conventional bound value of t-test for small, independent samples equals **2.021**. In this case **t-test** = 6.04 so we can conclude that between variable No. 3: kick with week leg in rested state with optimal intensity and variable No. 4: kick with week leg in rested state with maximal intensity, there is significant difference in favor of variable 3 which confirms hypothesis (H1).

Correlation coefficient for this pair of variables equals **r** = -0,1 and since bound value of Pirson's coefficient of simple linear correlation for this sample determined with convention to the level **0.444**, between variable No. 3 and variable No 4 we conclude there is no significant correlation, which confirms hypothesis (H4).

## CONCLUSION

Generally we can conclude that in the moment of causing impulse with maximal intensity with earlier obtained dynamic stereotype, the level of coordination decreases. Since, in this study we research complex variables, relevant for

situational sector in soccer; we can also conclude that from all relevant simple variables, in confirming extracted factor **accuracy**, the most important simple variable **intensity** regarding simple variable **fatigue level**.

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## RAZLIKE U PRAVILNOSTI ŠUTIRANJA FUDBALSKE LOPTE ODMORNOM SLABIJOM NOGOM RAZLIČITIM INTEZITETOM

*Originalni naučni rad*

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### **Sažetak:**

(ovaj primer važi samo za rad gde su tretirane samo varijable 3 i 4)

Grupa mladih fudbalskih profesionalaca je na isti način i sa istog rastojanja pogađala određeni cilj. Svaki ispitanik je izvršio udarac dva put po deset puta. U prvom slučaju izvršeno je deset udaraca neprotežiranom nogom u odmorenom stanju i sa optimalnim intenzitetom, i nakon posebnog programa relaksacionih vežbi sa ciljem da se što više odmora mišići koji najviše učestvuju u udarcu nogom po lopti, izvršeno je ponovo deset udaraca neprotežiranom nogom u odmorenom stanju, ali sada sa maksimalnim intenzitetom. Nakon odgovarajuće statističke obrade, utvrđeno je da je maksimalni intenzitet statistički značajno uticao na smanjenje tačnosti pogađanje cilja, čime je potvrđena kriterijumska hipoteza.

**Ključne reči:** udarac nogom po lopti; unutrašnja strana hrpta stopala; protežirana noga; neprotežirana noga; stanje odmorenosti; stanje zamorenosti; optimalni intenzitet; maksimalni intenzitet; tačnost; korelacija; značajnost razlika aritmetičkih sredina.

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