IZVORNI ZNANSTVENI ČLANAK / *ORIGINAL SCIENTIFIC PAPER*

# DIFERENTIAL ANALYSIS OF THE GUARD ROLE IN THE TEAM TACTICS IN WATER POLO (MALE)

## *Diferencijalna analiza uloge braniča u momčadskoj taktici u vaterpolu (muškarci)*

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*Summary*

*Collective tactics is based on division of the roles in all phases of the game. Positions, either role in the water polo, are instrumentality in realization of collective tactics. Roles in water polo are: center forward, guard, wing, external attacker and goal keeper. The aim in this study was to describe the role of the Guard (G) and to compare it with other roles. The subject of this investigation is description of all activities in the game without contact with the ball (all swimming, duels, play with player more or less). Data collection was performed by registration of player's activity during official games of the International Adriatic Water Polo League in the season 2009/10. Main units of measuring, entities, were position-player-quarter. The results were reiterated by 21 indicators and main statistics was compiled. Differential analysis for position G with respect to other players (positions) was performed on the basis of testing the model of binary logistic regression equitation. This proportion is evaluated on the basis of frequencies of backstroke swimming at maximum intensities (0.2:0-1) and frequencies swam by crawl technique at maximum intensity (2.9:2.3) as well as frequencies of breaststroke swimming at light intensity (1.45:1.0). In total distance swam G is statistically equal with other players. Statistically significant hi is different from other players in meters swam at maximum intensity (32.1:21.6) where there is a statistically significantly contribution of meters swam in crawl technique at maximum intensity (31.4:21.3). In the play with unequal number of players (player more/less) there are no significant differences regarding the players in other roles in the game. There is a statistically significant and remarkable difference of G from other players both in frequencies (3.1:2.6) and in the time (21.8:14.1) spent in duels. By application of binary logistic regression we defined differential characteristics of G regarding other roles in the game and that typified in equitation of play structure on the position G. Solitary contributions in prediction of role G are represented in linear equitation for position G. Results of this investigation will contribute in elaboration of water polo game model in the domain of situational play without ball (realization of the collective tactics regardless the choice of the type of tactics in either attack or defense). The result brings statistical descriptions of the role G as well as, in an unusual analysis, it brings comparative properties of the role G in relation to others.*

*Key words: Water polo, game, guard, statistics, model, logistic regression*

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*Sažetak*

*Kolektivna taktika temelji se na podjeli uloga u svim fazama igre. Pozicije, bilo koja uloga u vaterpolu, instrument su u realizaciji kolektivne taktike. Uloge u vaterpolu su: napadački centar, branič, krilo, vanjski napadač i branič. Cilj ovom istraživanju bio je opisati ulogu braniča (G) i usporediti je s ostalim ulogama. Predmet ovog istraživanja je opis svih aktivnosti u igri van kontakta s loptom (sva plivanja, dueli, igra s igračem više ili manje). Prikupljanje podataka obavljeno je registracijom igračevih aktivnosti na službenim utakmicama Međunarodne Jadranske vaterpolske lige u sezoni 2009./10. Osnovne jedinice mjerenja, entiteti, bili su pozicija – igra - četvrtina. Rezultati su registrirani preko 21 indikatora na temelju kojih je izvedena statistička obrada. Diferencijalna analiza za poziciju G u odnosu prema ostalim igračima (pozicijama) napravljena je na temelju testiranja modela binarne logističke regresijske jednadžbe. Te razlike izračunate su na temelju frekvencija u leđnom plivanju u maksimalnom intenzitetu (0.2:0-1), frekvencija u kraul plivanju u maksimalnom intenzitetu (2,9:2,3) i frekvencija u prsnom plivanju laganim intenzitetom (1,45:1,0). U ukupoj isplivanoj udaljenosti G je statistički izjednačen s drugim igračima. Statistički značajan hi razlikuje se od drugih plivača u metrima isplivanima maksimalnim intenzitetom (32,1:21,6) gdje postoji statistički značajan doprinos u metrima isplivanima u kraul tehnici maksimalnim intenzitetom (31,4:21,3). U igri s različitim brojem igrača (igrač više/manje) nema značajnih razlika u usporedbi s igračima na drugim pozicijama u utakmici. Postoji statistički značajna i iznimna razlika između G i drugih igrača i u frekvencijama (3,1:2,6) i u vremenu (21,8:14,1) provedenome u duelima. Primjenom binarne logističke regresije definirali smo diferencijalne karakteristike G u usporedbi s ostalim ulogama u igri, i to je rezultiralo jednadžbom strukture igre na poziciji G. Pojedinačni doprinosi u predviđanju uloge G prikazani su u linearnoj jednadžbi za poziciju G. Rezultati ovog istraživanja pridonijet će u izradi modela vaterpolske igre u situacijskim uvjetima u igri bez lopte (realizacija kolektivne taktike u odnosu prema izboru vrste taktike i u napadu i u obrani). Rezultat donosi statistički opis uloge G, te također, u specifičnoj analizi, donosi karakteristike uloge G u usporedbi s drugima.*

*Ključne riječi: Vaterpolo, utakmica, branič, statistika, model, logistička regresija*

## INTRODUCTION / *Uvod*

The tactic of collective Olympic sport game water polo is a plan which is count on the partition of the player's roles in the game. The water polo team consists of the 7 players with allocated roles: center forward, wing, guard, external attacker and goal keeper. Depending to the development of the play given roles can download any player, but it is usual that players play given role. Collective tactics in the defense divide on the two main types: /zone defense/, defense man on the man on the own half, on the whole playground and pressing as a drastic profile of such type of defense. In attack the tactics are focused on the efficiency on the goal acquirement. In the simplest tactics formed attack is performed as an attempt counter attack and subsequently as a positional attack. For any position (role in the game) tactics appointed playground area in which carry out activities of the players equal as the types of tasks in attack as well in defense. In such a manner players realize own tactical role in the game. Situations with player more or les, in the sense of the tactic in the game are specially interesting and considerable. Situation with player more or less arise as a result penalty expulsion (20 seconds). Such situations are great advantage or handicap for teams and representing extraordinary fragment of tactics. Actions which are carrying out in moving are defined by horizontal positions (horizontal phase in the game). All situations with player more or les, as well as duels are defined by vertical position (vertical phase in the game), regarding the surface of water line in swimming pool. In the total game duration it is possible to settled two main phases of player's activity: active and idle phase. Idle phase are situation in which player own active participation actualized by the overlooking the development of the game, but in situ and without contact with a ball. Idle phase directly raise the time spent in the quarter, and of course belong to vertical phase of the game. Idle phase are not include in this investigation (Bratuša at al 2002, 2003 ; Lozovina, V. 1979, 1985, Lozovina V. at al., 2000., 2002., 2003., 2004., 2006., 2007., Pavičić, L. 1991., Platonou, T. & Geladas, N. 2006.)

Acting of G. in the water polo comprises of holding respectively coverage the opponent and is the first and paramount element in the game. Successful coverage of opponent did not admit him to achieve advantage and from it realize. Guards their opponent could coverage in the place or in the motion using the different techniques. In the place, in the vertical position the opponent can be

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coverage behind, laterally and ahead. The type of chosen coverage depends with effect from actual situation. In the motion coverage the opponent is defined by the same principles. In every moment G. must be positioned on the centerline between opponent player with a ball and centre of own goal. Somewhat differences and variations can arise as a result of tactics choice; especially in the case of zone defense which can be perform in a different ways. Extraordinary is the implementation of "pressing-play" as a drastic variant of the "man unto man" defense. In the defense tasks G. used various techniques as well as: water polo crawl, water polo egg better (bicycle), all holdings and keepings opponent, lead the ball when is necessary, all techniques of handling the ball including passing and shutting the ball, block with one hand, water polo start and jump with take up the ball, finally light foul, when is necessary. Guards participate in contra attack and usually remain in second attack line where becoming external attacker in the phase of positional attack. Regarding the body mass guards can be divided as a light-guards-contra attackers and heavy-guards, contact players opponents of canter forwards. In the play of the guard dominated over maximal and maximal loads in vertical phase of the game, means duels and play with player more or less, but also great quantity of the swimming dominantly in maximal and sub maximal intensity, thus, very high intensity in horizontal phase of the game about what speak very high frequency of actions of a guard. For successful effect in so complex defensive tasks G. must be especially prepared (Lozovina V. 2009.).

The role of the heavy defender (guard) in defense starts from the moment when the opponents' center takes the position two meters from the goal. The objective of the heavy defender is to block the center forward during the attack. This task is heavy and complex, divided into two phases. In the first phase, is a fight for a choice position where direct contact is established between the center forward and the heavy defender. This duel happens in the vertical (vertical position of the body in relation to the water surface) under the condition of broken complex balance of both players. The second phase starts at the moment of the ball heading to the center forward. The primary objective of the heavy defender in the game is to gain a good position in the first phase, which will in the second phase allow him efficiency in less risk of a heavy foul and expulsion. When the opponent loses the ball, the task of the heavy defender is to quickly swim to the 2 m of the opponent's side. In the positional attack, the heavy defender takes a predetermined position, which is commonly at the side of the second line of attack. The offensive role of the heavy defender is to shoot from the last attack line, but rarely swim toward the opponent's goal. Because of this, the heavy defender's role is dominated by maximal and over maximal load in the vertical position (duels and playing with unequal number of players) and a large amount of maximal and sub maximal intensity of swimming in the horizontal position.

In experimental phase we registries activities of players on the official water polo games. It is placed and verified model for the play for one position (role in the game) by virtue of comparison model elements of one position with all others. Article cultivated basic tactical aspects guards play in differential analysis with other positions (Lames, M. 2006, Perl, J., 2006, Lozovina, M. and Lozovina, V. 2009).

(H1) It assumes that in indicators of DUEL (frequencies and duration) G. will have statistically significant greater values regarding the players with other roles in the game.

(H2) It assumes that activities of the G. explained by frequencies of the total swam meters in all intensities will be similar or same with activity of players in other roles in the game.

(H3) It assumes that the G. significantly defer from others in the meters swam in crawl and back stroke swimming in sub maximal and maximal intensities.

## METHODS / *Metode*

In experimental phase objectively are registered: quantities, means, frequencies and intensities of player's activities in the roles: wing, guard, center forward, and external attacker, during the official water polo games. That is achieved by monitoring and registration players' activity on the official games of International Adriatic Water polo League in season 2009/10. The basic statistics are calculated for: frequency of actions, quantities according to techniques of swimming in three intensities, for the phases where the players was in horizontal position. For vertical phase register was duels and play with unequal number of players. Activities were monitored by the system of 21 indicators on the 28 official matches. In this experiment was not reiterated play wit a ball, phase of the neither play nor types of tactic. The entities in this investigation are players – in given roles – in one quarter. Totally was reiterated 665 such entities. As well as the indicators values in the model was reiterated in frequencies, meters and seconds, expected values find oneself on

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the real and ordinal scale with expected normal and Poisson distribution. Placed is the model for guards role express by binary logistic regression equitation:

$$\ln[odds(Y=1)=Y=b0 + b1X1 + b2X2 + .. bmXm + e \quad (1)$$

Were the Y are play on the position guard, b coefficient of the ponder for variable X

## MEASUREMENTS / *Mjerenja*

Experiment was carried out on the official games of International Adriatic Water polo League in season 2009/10. Registration and data sampling was performed by five qualified surveyors, professors of kinesiology, and experienced water polo trainers. In the game, during the time the player spends in the play, all his movements, intensities and positions of the body (horizontal and vertical) were recorded. The criteria for estimation of work intensity, namely of burden, are: maximal, sub maximal and slight, were determined on the basis of swimming speed in the course of actions. Measurers were trained, measuring the same player on 10 games. The experiment was carried out only after a complete concordance among surveyors was achieved. They were positioned on a high-placed stand, which enabled optical coverage of the whole playing field. Standard water polo markers (2 m, 5 m, goal out line, center, etc.) enabled precise recording of swimming distances at various intensities of players. Each official recorded all activities of their designated player. At every moment, they had full view of the official time clock, which showed a down count of the official, clean game time and smaller time clocks that showed ball possession and attack time. Each official consecutively recorded every action taken by his designated player. In case a player was thrown out of the game or had not been in the game (excluding time either change of players,), time was measured when the player exited the game and reentered the game.

## DATA ANALYSIS / *Analiza podataka*

Al variables are presented by statistics: Min. Max, Med. A.M. and S.D. For testing the normality of distributions K.S.-test was performed. In the scope of identification of structure, respectively comparative relevance of individual measures for differentiation of the role G. from others, regression algorithm was applied, namely, in respect with metric characteristics of results on indicators, Binary Logistic Regression Model. Adequacy of placed model is tested by Hosmer and Lemeshow tests, Quantity of explained variance is obtained by Cox & Snell R Square i Nagelkerke R Square coefficient determination (multiple correlation). Calculated and present are Table with frequencies and guess percents of Model. For any variable B (Logistic beta), Wald (Sig.), (Odd Ratio – Exp (B), i 95% CI Exp (B) are calculated. In graphics are plotted all results (guard against other roles), given as relation expected probabilities on the Y axis, and expected standardized residuals on the X axis. For the purposes of interpretation the guards activity was calculated additions of indicators per swimming techniques (crawl and back stroke) in intensities (maximal, sub maximal and light), total number of actions frequencies and swam meters. These results are presented in histograms. For statistical conclusions we used lower rigorous criteria $p<0.05$ and more $p<0.001$.

## RESULTS AND DISCUSION / *Rezultati i rasprava*

Analyzing the frequencies in the swimming techniques in all intensities and total swimming, G. did not differentiate statistically significant from players in other roles. Statistically significant difference is noted in frequencies of all swimming's in maximal intensities (3.1:2.4). To this proportion, statistically significant, contributing frequencies in back stroke swimming in maximal intensity (0.2:0.1) and frequency swam in crawl technique in maximal intensity (2.9:2.3) as well as frequency of the breast swimming in light intensity (1.45:1). Frequencies of the breast swimming in light intensity are realized in defense tasks in the situations of position choice for better play in defense. Frequencies in crawl and back stroke techniques, swam in maximal intensity, where the G. are statistically significant different from other players, are realize by the activity in counter attack, wherewith G. materialized important part of the own tactics role within general teams tactics. In the total swam meters G. not statistically significant different from other players. In the meters swam in maximal intensity G. is statistically significant different from players in other roles in the game (32.1:21.6). That contributes meters swam in crawl technique in maximal intensity (32.4:21-3). In the meters swam in sub maximal intensity G. statistically significant defer from other players but the direction is contrastive from the direction of maximal swimming (84.7:91.2), means swam considerably less. Their typical defense tasks G. solved in the first defense line (nearer own goal) wherefrom, when prepossess the ball, inevitable swam in counter attack performed crawl swimming in maximal intensity. After attempt, but not realized,

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counter attack G. remain in the second attacks line, as a external attacker. If, in this position, his team lost the ball, the counter attack of the opponents he follows by back stroke swimming in maximal intensity, least near the center of the playfield, because of better control of defensive situation. In the vertical phase of the game G. spent somewhat less time in the play with unequal number of players (player more/les) then other players, but statistically insignificant. Statistically significant G. differs from players in other roles in the duels, as in frequencies of duels (3.1:2.6) so in the time spent in duels (21.8:14.1). Thus, he has considerably more duels where conducted longer time regarding other players. The main tactics role of the G. are neutralize attackers of opponent team, especially those allocate nearer the goal (players in first attack line). In such situations G. is constrained to play contact-play (duel), what obviously characterized his tactics role. Guard this role carry out in either tactical variant in defense.

By application of binary logistic regression are defined differential characteristics of the G. regarding other roles in the game and that typified in equitation of play structure on the position G. Adequacy of placed model is tested by Hosmer and Lemeshow tests. We conclude: The Model is very well calibrated ($HI^2 = 9.53$ with 8 degrees of freedom and $p = 0.30$). Coefficients of determination, ($R^2$) Cox &Snell (0.13) i Nagelkerke (0.19), are quite low, provided predict 19% of variance. Prediction for total are (78.9%), for G., low (23.6%) and for other roles (96.0%) (Table 4). Solitary contributions in prediction of role G. are representing in (Table 5.).

Linear equitation for position G. is:

$$\ln[\text{odds}(Y=1) = Y = -1.124 - 0.385_{\text{FDUEL}} + 0.080_{\text{MDUEL}}$$

Only two indicators in equitation typified the play structure on the position G. Both are responsible for vertical phase in the game, expressed by frequencies and durations of duels. Frequencies and durations divergently contribute characterization of the position G. By increasing of one unit value (SD), on indicator duration of duel, rise chance that the player will be better recognized as a G. and conversely if decreasing number of duels will be better recognized. In other words G. will be recognized if in the game has relatively less number of duels but in longer duration

## CONCLUSION / *Zaključak*

Analyzed position of the G. are statistically described by indicators of frequencies, types and quantities of movements, intensities in various modalities as well in horizontal phase so in vertical phase in the game, without respect at the type of tactics and phase of the play (attack, transition, defense). It is noted that the frequencies in the swimming techniques in all intensities and total swimming, G. did not differentiate statistically significant from players in other roles. Statistically significant differences are noted in frequencies of all swimming's in maximal intensities wherefore contributing frequencies in back stroke swimming in maximal intensity, frequency swam in crawl technique in maximal intensity as well as frequency of the breast swimming in light intensity In the total swam meters G. is not statistically significant different from other players. In the meters swam in maximal intensity G. is statistically significant different from players in other roles. That contributes meters swam in crawl technique in maximal intensity. In the meters swam in sub maximal intensity G. statistically significant defer from other players but the direction is contrastive from the direction of maximal swimming, means swam considerably less. Statistically significant G. differs from other players in the duels, as in frequencies of duels so in the time spent in them. That speaks about basic tactic role of the G. in collective tactics of the team. By application of binary logistic regression we defined differential characteristics of the G. regarding other roles in the game and that typified in equation of play structure on the position G. Solitary contributions in prediction of role G. are representing in linear equitation for position G. describes by two indicators which typified the play structure on the position G. Hypothesis, formulated in the context of the differences according to remaining positions in the border of chosen tactic expressed in: frequencies, time duration, swam meters in different techniques towards different intensities in horizontal and vertical phase of the game, as well as in the play with player more or less and in duels are confirmed in this investigation. Logistic regression manifests as a good choice of methodology for efficiently analyzing such kind of problems, from one segment of water polo game, defined by indicators on unequal measurement scale and specifically distributions. Such appearance to issues of set up hypothesis on the base verification of the placed model, are new and appear as effective. In the same manner, in the border of the same project, all other positions (roles in the game) are successfully elaborated. Results of this investigation will be contribution in elaboration of water polo game model in the domain of situational play

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without ball (realization of the collective tactics without respect against choice the type of tactics in attack either defense). Results brings statistical descriptions of the role center forward, besides, in unusual analysis brings comparative properties of the role center forward regarding others.

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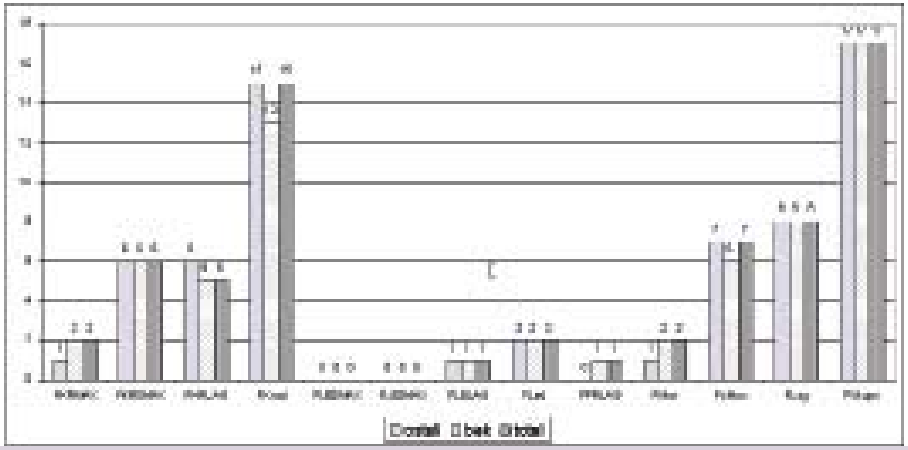
Table 1. Minimum, Median, Maximum, Mean and Std. Deviation Statistics of Frequencies
*Tablica 1. Statističke frekvencije minimalne, srednje, maksimalne, prosječne i standardne devijacije*

**Case Summaries**

| | bek | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | 1 | | | | | Total | | | | |
| | Minimum | Median | Maximum | Mean | Std. Deviation | Minimum | Median | Maximum | Mean | Std. Deviation | Minimum | Median | Maximum | Mean | Std. Deviation |
| FKRMAX*+ | 0 | 1 | 17 | 2,30 | 2,45 | 0 | 2 | 13 | 2,87 | 2,88 | 0 | 2 | 17 | 2,44 | 2,57 |
| FKRSMAX | 0 | 6 | 26 | 7,01 | 4,17 | 0 | 6 | 20 | 6,63 | 4 | 0 | 6 | 26 | 6,92 | 4,13 |
| FKRLAG | 0 | 6 | 20 | 6,19 | 4,04 | 0 | 5 | 19 | 5,66 | 3,87 | 0 | 5 | 20 | 6,06 | 4 |
| FKraul | 0 | 15 | 45 | 15,50 | 7,21 | 3 | 13 | 41 | 15,16 | 7,41 | 0 | 15 | 45 | 15,42 | 7,25 |
| FLEDMAX**++ | 0 | 0 | 4 | 0,11 | 0,44 | 0 | 0 | 4 | 0,20 | 0,51 | 0 | 0 | 4 | 0,13 | 0,46 |
| FLESMAX | 0 | 0 | 6 | 0,58 | 1,06 | 0 | 0 | 5 | 0,50 | 0,90 | 0 | 0 | 6 | 0,56 | 1,02 |
| FLELAG | 0 | 1 | 10 | 1,63 | 1,78 | 0 | 1 | 9 | 1,49 | 1,66 | 0 | 1 | 10 | 1,60 | 1,75 |
| FLed | 0 | 2 | 14 | 2,32 | 2,37 | 0 | 2 | 12 | 2,19 | 1,99 | 0 | 2 | 14 | 2,29 | 2,28 |
| FPRLAG**++ | 0 | 0 | 12 | 1,02 | 1,59 | 0 | 1 | 7 | 1,45 | 1,57 | 0 | 1 | 12 | 1,13 | 1,60 |
| FMax**++ | 0 | 1 | 21 | 2,41 | 2,65 | 0 | 2 | 17 | 3,07 | 3,11 | 0 | 2 | 21 | 2,57 | 2,78 |
| FsMax | 0 | 7 | 27 | 7,59 | 4,71 | 0 | 6 | 25 | 7,12 | 4,44 | 0 | 7 | 27 | 7,48 | 4,65 |
| FLag | 0 | 8 | 39 | 8,84 | 5,63 | 0 | 8 | 27 | 8,61 | 5,61 | 0 | 8 | 39 | 8,78 | 5,62 |
| FUkupno | 0 | 17 | 71 | 18,84 | 9,42 | 3 | 17 | 47 | 18,81 | 9,08 | 0 | 17 | 71 | 18,83 | 9,33 |

*/**KS – normal distribution at 0.05/0.01
+/++ significant - Mann-Whitney U at 0.05/0.01



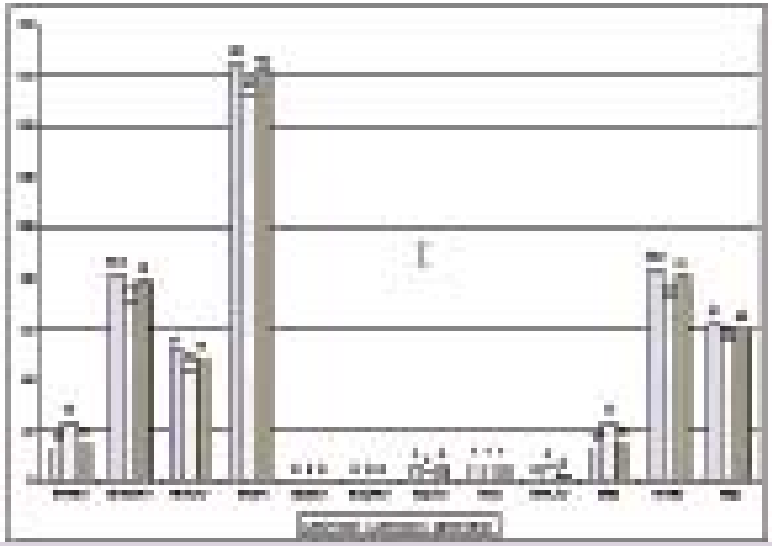
Graph 1. Histogram of Medians –frequencies of actions in various intensities – horizontal phase
*Grafikon 1. Histogram srednjih vrijednosti – frekvencije akcija u različitim intenzitetima – horizontalna faza*

Table 2. Minimum, Median, Maximum, Mean and Std. Deviation Statistics meters swam in various intensities – horizontal phase
*Tablica 2. Statistički podaci minimalne, srednje, maksimalne i standardne devijacije, metri isplivani različitim intenzitetima – horizontalna faza*

**Case Summaries**

| | bek | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | 1 | | | | | Total | | | | |
| | Minimum | Median | Maximum | Mean | Std. Deviation | Minimum | Median | Maximum | Mean | Std. Deviation | Minimum | Median | Maximum | Mean | Std. Deviation |
| MKRMAX**++ | 0 | 13 | 166 | 21,28 | 24,96 | 0 | 23 | 191 | 31,40 | 36,51 | 0 | 15 | 191 | 23,73 | 28,49 |
| MKRSMAX | 0 | 81,50 | 398 | 88,39 | 54,09 | 0 | 71 | 285 | 82,66 | 53,63 | 0 | 79 | 398 | 87 | 53,99 |
| MKRLAG | 0 | 51 | 213 | 57,27 | 40,27 | 0 | 44 | 166 | 50,68 | 35,91 | 0 | 49 | 213 | 55,67 | 39,34 |
| MKraul | 0 | 165 | 463 | 166,93 | 72,34 | 17 | 152 | 454 | 164,73 | 80,92 | 0 | 162 | 463 | 166,40 | 74,45 |
| MLEMAX**++ | 0 | 0 | 20 | 0,36 | 1,53 | 0 | 0 | 13 | 0,71 | 1,88 | 0 | 0 | 20 | 0,44 | 1,63 |
| MLESMAX | 0 | 0 | 67 | 2,81 | 6,32 | 0 | 0 | 22 | 2,06 | 4,15 | 0 | 0 | 67 | 2,63 | 5,88 |
| MLELAG | 0 | 5 | 75 | 7,74 | 9,35 | 0 | 4 | 58 | 6,78 | 8,96 | 0 | 5 | 75 | 7,51 | 9,26 |
| MLed | 0 | 7 | 75 | 10,90 | 12,13 | 0 | 7 | 58 | 9,55 | 10 | 0 | 7 | 75 | 10,57 | 11,66 |
| MPRLAG | 0 | 0 | 47 | 4,99 | 7,46 | 0 | 5 | 38 | 6,88 | 7,67 | 0 | 2 | 47 | 5,44 | 7,55 |
| MMax**++ | 0 | 13 | 166 | 21,63 | 25,57 | 0 | 23 | 191 | 32,11 | 37,17 | 0 | 15 | 191 | 24,17 | 29,12 |
| MsMax** | 0 | 83,50 | 400 | 91,19 | 55,18 | 0 | 72 | 291 | 84,71 | 54,76 | 0 | 81 | 400 | 89,63 | 55,11 |
| Mlag | 0 | 62 | 216 | 69,99 | 46,52 | 0 | 55 | 203 | 64,34 | 42,40 | 0 | 60 | 216 | 68,62 | 45,59 |
| MUkupno | 0 | 183 | 499 | 185,57 | 81,34 | 17 | 166 | 454 | 181,06 | 84,93 | 0 | 179 | 499 | 184,48 | 82,18 |

*/**KS – normal distribution at 0.05/0.01
+/++ significant - Mann-Whitney U at 0.05/0.01



Graph 2. Histogram of Medians –meters swam in various intensities – horizontal phase
*Grafikon 2. Histogram srednjih vrijednosti – metri isplivani različitim intenzitetima – horizontalna faza*





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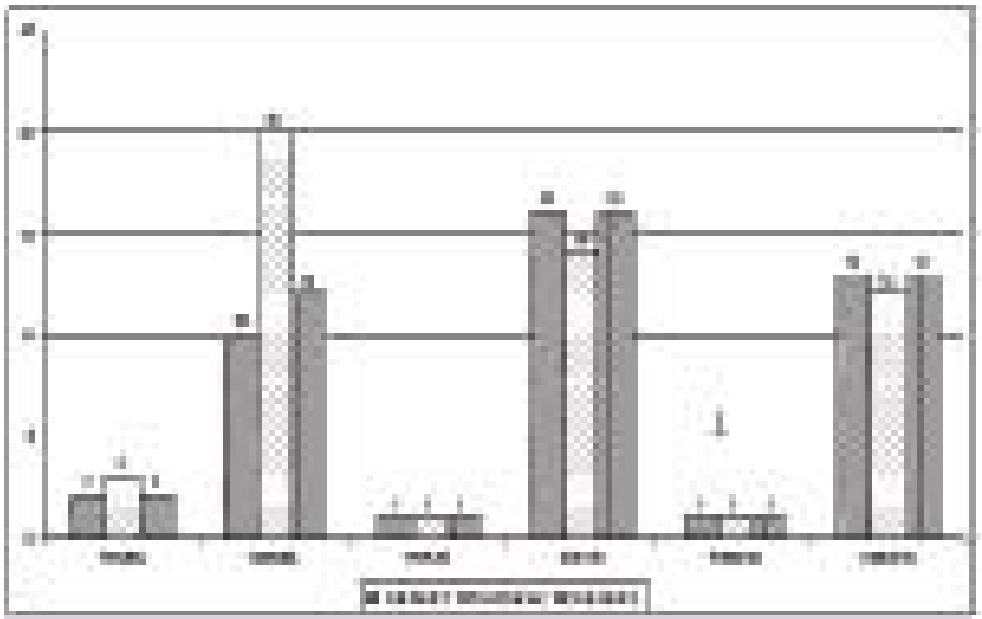
Table 3. Minimum, Median, Maximum, Mean and Std. Deviation Statistics duels, unequal number of players, total time in the play – vertical phase
*Tablica 3. Statistički podaci minimalne, srednje, maksimalne i standardne devijacije, dueli, nejednaki broj igrača, ukupno vrijeme provedeno u igri – vertikalna faza*

**Case Summaries**

| | bek | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | 1 | | | | | Total | | | | |
| | Minimum | Median | Maximum | Mean | Std. Deviation | Minimum | Median | Maximum | Mean | Std. Deviation | Minimum | Median | Maximum | Mean | Std. Deviation |
| FDUEL**++ | 0 | 2 | 10 | 2,62 | 2,35 | 0 | 3 | 9 | 3,09 | 2,02 | 0 | 2 | 10 | 2,74 | 2,28 |
| MDUEL**++ | 0 | 10 | 78 | 14,10 | 14,82 | 0 | 20 | 75 | 21,79 | 16,28 | 0 | 12 | 78 | 15,96 | 15,53 |
| FIGVIS | 0 | 1 | 7 | 1,29 | 1,15 | 0 | 1 | 5 | 1,11 | 1,10 | 0 | 1 | 7 | 1,25 | 1,14 |
| SIGVIS | 0 | 16 | 94 | 18,59 | 17,74 | 0 | 14 | 106 | 16,71 | 17,87 | 0 | 16 | 106 | 18,14 | 17,77 |
| FIGMAN | 0 | 1 | 5 | 0,96 | 0,92 | 0 | 1 | 4 | 0,84 | 0,92 | 0 | 1 | 5 | 0,93 | 0,92 |
| SIGMAN | 0 | 13 | 74 | 14,60 | 15,45 | 0 | 12 | 77 | 13,58 | 15,66 | 0 | 13 | 77 | 14,36 | 15,50 |
| SUKUPNO | 24 | 301 | 480 | 300,14 | 122,68 | 25 | 283 | 480 | 298,12 | 123,36 | 24 | 298 | 480 | 299,65 | 122,75 |

*/**KS – normal distribution at 0.05/0.01
+/++ significant - Mann-Whitney U at 0.05/0.01



Graph 3. Histogram of Medians – vertical phase
*Grafikon 3. Histogram srednjih vrijednosti – vertikalna faza*

**Test Statistics[a]**
***Statistika testa***

| | **Mann-Whitney U** | **Wilcoxon W** | Z | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|
| FKRMAX | 35731,000 | 162991,000 | -2,322 | ,020 |
| FKRSMAX | 37944,500 | 50985,500 | -1,242 | ,214 |
| FKRLAG | 37418,500 | 50459,500 | -1,491 | ,136 |
| FKraul | 38943,000 | 51984,000 | -,768 | ,442 |
| FLEDMAX | 36946,500 | 164206,500 | -3,211 | ,001 |
| FLESMAX | 40118,000 | 53159,000 | -,262 | ,793 |
| FLELAG | 38781,000 | 51822,000 | -,870 | ,384 |
| FLed | 40197,500 | 167457,500 | -,179 | ,858 |
| FPRLAG | 32177,000 | 159437,000 | -4,231 | ,000 |
| FMax | 35256,000 | 162516,000 | -2,547 | ,011 |
| MKRMAX | 33976,000 | 161236,000 | -3,125 | ,002 |
| MKRSMAX | 37394,000 | 50435,000 | -1,498 | ,134 |
| MKRLAG | 37104,000 | 50145,000 | -1,634 | ,102 |
| MKraul | 38500,000 | 51541,000 | -,976 | ,329 |
| MLEMAX | 36897,500 | 164157,500 | -3,251 | ,001 |
| MLESMAX | 39869,500 | 52910,500 | -,404 | ,686 |
| MLELAG | 37436,000 | 50477,000 | -1,505 | ,132 |
| MLed | 39279,000 | 52320,000 | -,614 | ,539 |
| MPRLAG | 32776,000 | 160036,000 | -3,890 | ,000 |
| MMax | 33841,000 | 161101,000 | -3,188 | ,001 |
| MsMax | 37030,500 | 50071,500 | -1,669 | ,095 |
| Mlag | 38043,000 | 51084,000 | -1,192 | ,233 |
| MUkupno | 38443,500 | 51484,500 | -1,003 | ,316 |
| FsMax | 37990,500 | 51031,500 | -1,220 | ,222 |
| FLag | 39391,000 | 52432,000 | -,558 | ,577 |
| FUkupn | 40240,500 | 167500,500 | -,156 | ,876 |
| FDUEL | 34169,500 | 161429,500 | -3,051 | ,002 |
| MDUEL | 28202,000 | 155462,000 | -5,855 | ,000 |
| FIGVIS | 36784,000 | 49825,000 | -1,858 | ,063 |
| SIGVIS | 37621,000 | 50662,000 | -1,411 | ,158 |
| FIGMAN | 37305,000 | 50346,000 | -1,639 | ,101 |
| SIGMAN | 38470,500 | 51511,500 | -1,019 | ,308 |
| SUKUPNO | 40192,500 | 53233,500 | -,179 | ,858 |

[a.] Grouping Variable: bek

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**Test Statistics[a]**
***Statistika testa***

| | Most Extreme Differences | | | Kolmogorov-Smirnov Z | Asymp. Sig. (2-tailed) |
|---|---|---|---|---|---|
| | Absolute | Positive | Negative | | |
| FKRMAX | ,137 | ,137 | -,002 | 1,516 | ,020 |
| FKRSMAX | ,081 | ,025 | -,081 | ,900 | ,393 |
| FKRLAG | ,097 | ,000 | -,097 | 1,077 | ,197 |
| FKraul | ,079 | ,020 | -,079 | ,867 | ,440 |
| FLEDMAX | ,091 | ,091 | ,000 | 1,001 | ,269 |
| FLESMAX | ,034 | ,001 | -,034 | ,374 | ,999 |
| FLELAG | ,069 | ,006 | -,069 | ,766 | ,600 |
| FLed | ,053 | ,048 | -,053 | ,580 | ,889 |
| FPRLAG | ,201 | ,201 | -,008 | 2,218 | ,000 |
| FMax | ,144 | ,144 | -,002 | 1,588 | ,013 |
| MKRMAX | ,171 | ,171 | ,000 | 1,893 | ,002 |
| MKRSMAX | ,105 | ,028 | -,105 | 1,164 | ,133 |
| MKRLAG | ,090 | ,004 | -,090 | ,995 | ,276 |
| MKraul | ,092 | ,051 | -,092 | 1,011 | ,258 |
| MLEMAX | ,091 | ,091 | -,002 | 1,001 | ,269 |
| MLESMAX | ,070 | ,001 | -,070 | ,771 | ,592 |
| MLELAG | ,072 | ,006 | -,072 | ,791 | ,559 |
| MLed | ,061 | ,035 | -,061 | ,678 | ,748 |
| MPRLAG | ,210 | ,210 | -,009 | 2,319 | ,000 |
| MMax | ,176 | ,176 | ,000 | 1,939 | ,001 |
| MsMax | ,118 | ,029 | -,118 | 1,306 | ,066 |
| Mlag | ,080 | ,028 | -,080 | ,882 | ,417 |
| MUkupno | ,090 | ,034 | -,090 | ,997 | ,273 |
| FsMax | ,078 | ,040 | -,078 | ,863 | ,445 |
| FLag | ,055 | ,018 | -,055 | ,604 | ,859 |
| FUkupn | ,037 | ,032 | -,037 | ,411 | ,996 |
| FDUEL | ,165 | ,165 | -,014 | 1,823 | ,003 |
| MDUEL | ,235 | ,235 | -,002 | 2,593 | ,000 |
| FIGVIS | ,068 | ,000 | -,068 | ,756 | ,618 |
| SIGVIS | ,068 | ,009 | -,068 | ,755 | ,619 |
| FIGMAN | ,065 | ,003 | -,065 | ,723 | ,672 |
| SIGMAN | ,063 | ,018 | -,063 | ,701 | ,709 |
| SUKUPNO | ,059 | ,033 | -,059 | ,647 | ,797 |

[a.] Grouping Variable: bek

**Model Summary**
***Sažetak modela***

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 644,919[a] | ,128 | ,191 |

[a.] Estimation terminated at iteration number 5 because parameter estimates changed by less than, 001.

**Hosmer and Lemeshow Test**
***Hosmer i Lemeshow test***

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 9,527 | 8 | ,300 |

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**Classification Table**
***Tablica klasifikacije***

| Observed | | Predicted | | |
|---|---|---|---|---|
| | | beck | | Percentage Correct |
| | | .00 | 1.00 | |
| beck | .00 | 487 | 17 | 96.6 |
| | 1.00 | 123 | 38 | 23.6 |
| Overall Percentage | | | | 78.9 |

[a.] The cut value is .500

Table 4. Results of Binary Logistic Regression (B-beta, S.E.-standard error, Wald -Chi-square test, P- level of significance, Exp(B) – Exp-beta, Ci – confidence interval 95%
*Tablica 4. Rezultati binarne logističke regresije (B-beta, S.E.-standardna greška, Wald-Chi na kvadrat test, P-razina značajnosti, Exp(B) – Exp-beta, Ci-interval sigurnosti 95%*

**Variables in the Equation**
***Varijable u jednadžbi***

| | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| FKRMAX | -,066 | ,089 | ,551 | 1 | ,458 | ,936 | ,786 | 1,115 |
| FKRSMAX | ,019 | ,070 | ,077 | 1 | ,782 | 1,020 | ,889 | 1,170 |
| FKRLAG | ,023 | ,071 | ,104 | 1 | ,747 | 1,023 | ,891 | 1,175 |
| FLEDMAX | -,131 | ,486 | ,072 | 1 | ,788 | ,878 | ,339 | 2,275 |
| FLESMAX | ,101 | ,227 | ,200 | 1 | ,655 | 1,107 | ,710 | 1,726 |
| FLELAG | ,132 | ,132 | 1,001 | 1 | ,317 | 1,141 | ,881 | 1,479 |
| FPRLAG | ,032 | ,162 | ,040 | 1 | ,842 | 1,033 | ,752 | 1,419 |
| MKRMAX | ,012 | ,008 | 2,349 | 1 | ,125 | 1,012 | ,997 | 1,027 |
| MKRSMAX | -,008 | ,005 | 2,719 | 1 | ,099 | ,992 | ,983 | 1,001 |
| MKRLAG | -,012 | ,007 | 2,973 | 1 | ,085 | ,988 | ,974 | 1,002 |
| MLEMAX | ,081 | ,134 | ,368 | 1 | ,544 | 1,084 | ,835 | 1,409 |
| MLESMAX | -,049 | ,045 | 1,163 | 1 | ,281 | ,953 | ,872 | 1,041 |
| MLELAG | -,017 | ,025 | ,501 | 1 | ,479 | ,983 | ,936 | 1,031 |
| MPRLAG | ,035 | ,033 | 1,140 | 1 | ,286 | 1,036 | ,971 | 1,106 |
| **FDUEL**** | **-,385** | **,098** | **15,328** | **1** | **,000** | **,680** | **,561** | **,825** |
| **MDUEL**** | **,080** | **,014** | **33,467** | **1** | **,000** | **1,084** | **1,055** | **1,114** |
| FIGVIS | -,389 | ,249 | 2,429 | 1 | ,119 | ,678 | ,416 | 1,105 |
| SIGVIS | ,020 | ,015 | 1,699 | 1 | ,192 | 1,020 | ,990 | 1,052 |
| FIGMAN | -,359 | ,302 | 1,418 | 1 | ,234 | ,698 | ,386 | 1,261 |
| SIGMAN | ,013 | ,018 | ,506 | 1 | ,477 | 1,013 | ,978 | 1,048 |
| SUKUPNO | ,002 | ,002 | ,969 | 1 | ,325 | 1,002 | ,998 | 1,006 |
| Constant | -1,124 | ,268 | 17,570 | 1 | ,000 | ,325 | | |

[a.] Variable(s) entered on step 1: FKRMAX, FKRSMAX, FKRLAG, FLEDMAX, FLESMAX, FLELAG, FPRLAG, MKRMAX, MKRSMAX, MKRLAG, MLEMAX, MLESMAX, MLELAG, MPRLAG, FDUEL, MDUEL, FIGVIS, SIGVIS, FIGMAN, SIGMAN, SUKUPNO.

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