

## AN ANALYSIS OF THE DIFFERENCES IN EFFICIENCY OF MAN-UP IN WATER POLO ACCORDING TO THE SPEED OF REALIZATION

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### Abstract

The scope of this research is the identification and the explanation of differences of three levels of water polo players in some parameters of man-up efficiency. Using the Kruskal-Wallis test and multiple comparisons of mean ranks for all groups at the significance level of  $\alpha=0.05$ , the hypothesis that there are significant differences between three levels of water polo players in four of the fifteen variables of man-up efficiency in water polo was confirmed. The results indicate that high quality teams are dominated in medium-speed realization because it is very probably they need less time to find the optimal situation for realizing the man-up situation than the medium and low quality teams. There is a reasonable possibility that the differences are probably caused by the degree of learned and implemented tactical knowledge, the degree of scoring ability and the best selection for certain roles in the team.

**Key words:** *power play, moment of realization, water polo efficiency*

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### Introduction

The efficiency of man-up in water polo can be defined as the ability to achieve goals in situations with numerical superiority, always in a chance opportunity and in accordance with the game situation. Efficiency of man-up in water polo is very closely related to the shooting skill. A player in man-up game situations usually executed as an open shot from a clear chance, in accordance with the momentary score and time pressure what mean that a shooter is responsible to provide optimal conditions for shot performance (Hraste, Dizdar, & Trninić, 2008). The results of one study (Hraste, Dizdar, & Trninić, 2010) show that the quality of all attack players significantly depends from the ability of successful shooting performance in man-up situation.

Efficiency of man-up in water polo as an indicator of technical and tactical ability is an important factor that determines the result in water polo game (Takagi, Nishijima, Enomoto, & Stewart, 2005; Platanou, 2004). Some studies discovered a significant difference of man-up efficiency between different level of water polo teams (Garcia-Marin, Iturriaga, & Manuel, 2017; Hraste, Jelaska, & Granić, 2016; Tucher, Canossa, Cabral, Garrido, & De Souza Castro, 2015; Lupo, Condello, Capranica, & Tessitore, 2014). In research is determined and explained a significant difference of man-up efficiency between different ages and roles of water polo players (Hraste, Jelaska, & Lozovina, 2014). In another study confirmed that the mean number of goals achieved in one game in the top level water polo game was  $2.9 \pm 1.7$  (Platanou, 2004).

Water polo skills in man-up situations is necessary to learn and improve through the entire water polo career. Progress in performance in young water polo players is achieved due to the acquisition of new motor skills and development of certain motor abilities (Hraste, Karninčić, & Drpić, 2016). Indicators of man-up efficiency in water polo are the instruments for diagnosing and predicting the course of player's development.

According to the rules of the water polo game, the penalty time for the excluded player changed and decreased throughout the history (Hraste, Bebić, & Rudić, 2013). According to today's rules the penalty time for the excluded player is 20 seconds. However, the team in attack objectively has more space-time maneuver possibilities for realization because excluded player after the expiration of twenty seconds needs from the space for excluded players a few seconds to take his role in the defensive position. This transition from the space of the excluded players can last until the end of an attack lasting 30 seconds. For this reason often, in unofficial statistics such situations are observed as man-up situations. Coaches and players decide for one of the three options in the man-up tactic according to the speed of realization. The first option refers to the so-called quick realization (the first six seconds of penalty time). Another possibility relates to the realization in the time interval from seventh to seventeenth-second of penalty time. In water polo jargon the discusion is about medium-speed realization. The third possibility relates to the slow realization (realization from seventeen to thirty seconds of the duration of the attack). Quick realization is usually played on unprepared defense with a man-down and always in potential striking

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situation of scoring. However, quick realization may also be the preference of the coach in the man-up tactics. The remaining two types of man-up realization also depend on the probability of the situation and the preference of the coach.

The number and duration of man-up situations were measured for all water polo roles (Lozovina & Lozovina, 2007). It is interesting that among the various levels of water polo players there are no differences in the number of extorted exclusion, however, the efficiency of man-up with regard to the level and role of players significantly differentiates them (Hraste, Jelaska, & Granić, 2016).

The scope of this research is the identification and the explanation of differences of three level of top water polo players in efficiency of man-up situation.

The following hypotheses were set in accordance with scope:

H0 - no statistically significant difference in efficiency of man-up between the three levels of water polo players;

H1 - there exists a statistically significant difference in efficiency of man-up between the three levels of water polo players.

## Methods

### *Sample of entities*

The sample of teams for analysis was taken from 132 games from the Adriatic Water Polo League in the competition season 2013/14. For this research 12 teams were divided into three levels. The high level teams in this league were in the first four places: Primorje, Jug, Mladost i Jadran HN. Teams that were in fifth to eighth place (Mornar, Budva, POŠK and Primorac) are recognised as medium level. The lowest level teams were in the last four places: Jadran S, Medveščak, Šibenik and Branik.

### *Sample of variables*

The sample of variables includes 15 variables, indicators of efficiency; of which 3 are team's efficiency indicators and 12 are indicators of efficiency of individual players according to their duties or roles: centre forward, centre defender, right side player and left side player.

### List of variables:

1. All-players quick realization man-up (QR);
2. Centre forward quick realization man-up (QRCF);
3. Centre defender quick realization man-up (QRCD);
4. Left side player quick realization man-up (QRLS);
5. Right side player quick realization man-up (QRRS);
6. All-players medium-speed realization man-up (MSR);
7. Centre forward medium-speed realization man-up (MSRCF);
8. Centre defender medium-speed realization man-up (MSRCD);
9. Left side player medium-speed realization man-up (MSRSL);
10. Right side player medium-speed realization man-up (MSRRS);
11. All-players slow realization man-up (SR);
12. Centre forward slow realization man-up (SRCF);
13. Centre defender slow realization man-up (SRCD);
14. Left side player slow realization man-up (SRSL);
15. Right side player slow realization man-up (SRRS).

### Data collected

The data was collected from official records which are maintained during the playing of water polo games. Reliability of the data was tested by additional reviewing of 16 matches. Each frequency of variable for each group of players were collected and compared to official record. Reliability coefficients for single data were calculated as ratio of reviewed observed frequencies and official record frequencies. Reliability of official record was 1.00.

### Data processing methods

For the collected data the basic statistical parameters (mean, standard deviation, median) were calculated. These parameters were calculated separately for each level and total for all levels. Differences between three levels of water polo players in the phase space of 15 indicators of man-up efficiency were calculated using Kruskal-Wallis test due to absence of normality of the variable distribution. Level of statistical significance was set to 5% ( $\alpha = 0.05$ ).

When statistically significant differences were found, the multiple comparisons of mean ranks were used to determine pairs responsible for the differences. Data was processed by software Statistica 13.0, at the Faculty of Kinesiology, University of Split.

## Results

Table 1 shows the basic descriptive parameters of all variables (means, standard deviations and medians) for fifteen indicators of man-up efficiency for all three levels of water polo players total and separately for each level of water polo players (high, medium and low level)

TABLE 1  
Means and standard deviations ( $M \pm SD$ ) and median (Me) for fifteen indicators of man-up efficiency for each and all level of water polo players

Variables	High level water polo players (n=88)		Medium level water polo players (n=88)		Low level water polo players (n=88)		All three level water polo players (n=264)	
	M±SD	Me	M±SD	Me	M±SD	Me	M±SD	Me
QR	0.56±0.74	0	0.50±0.74	0	0.35±0.64	0	0.47±0.71	0
QRCF	0.10±0.34	0	0.13±0.37	0	0.07±0.30	0	0.10±0.33	0
QRCD	0.10±0,34	0	0.06±0,23	0	0.05±0,21	0	0.07±0,27	0
QRLS	0.15±0.39	0	0.14±0.38	0	0.13±0.40	0	0.14±0.39	0
QRRS	0.20±0.46	0	0.18±0.44	0	0.11±0.32	0	0.17±0.41	0
<b>MSR</b>	<b>2.39±1.74</b>	<b>2</b>	<b>1.88±1.60</b>	<b>2</b>	<b>1.43±1.22</b>	<b>0</b>	<b>1.90±1.58</b>	<b>2</b>
MSRCF	0.41±0.72	0	0.36±0.59	0	0.22±0.41	0	0.33±0.59	0
<b>MSRCD</b>	<b>0.60±0.82</b>	<b>0</b>	<b>0.32±0.64</b>	<b>0</b>	<b>0.26±0.69</b>	<b>0</b>	<b>0.39±0.73</b>	<b>0</b>
MSRSL	0.73±0.85	1	0.64±0.85	0	0.58±0.71	1	0.65±0.80	0
MSRRS	0.65±0.83	0	0.64±0.90	0	0.38±0.57	0	0.55±0.79	0
SR	1.68±1.32	1	1.53±1.08	1	1.51±1.15	1	1.53±1.19	1
SRCF	0.27±0.54	0	0.25±0.49	0	0.25±0.46	0	0.26±0.50	0
<b>SRCD</b>	<b>0.38±0.51</b>	<b>0</b>	<b>0.15±0.36</b>	<b>0</b>	<b>0.24±0.50</b>	<b>0</b>	<b>0.25±0.47</b>	<b>0</b>
SRLS	0.49±0.66	0	0.55±0.71	0	0.49±0.66	1	0.51±0.68	0
<b>SRRS</b>	<b>0.55±0.79</b>	<b>0</b>	<b>0.59±0.74</b>	<b>0</b>	<b>0.33±0.54</b>	<b>0</b>	<b>0.49±0.70</b>	<b>0</b>

### Legends:

QR - all-players quick realization man-up; QRCF - centre forward quick realization man-up; QRCD - centre defender quick realization man-up; QRLS - left side player quick realization man-up; QRRS - right side player quick realization man-up; MSR - all-players medium-speed realization man-up; MSRCF - centre forward medium-speed realization man-up; MSRCD - centre defender medium-speed realization man-up; MSRSL - left side player medium-speed realization man-up; MSRRS - right side player medium-speed realization man-up; SR - all-players slow realization man-up; SRCF - centre forward slow realization man-up; SRCD - centre defender slow realization man-up; SRIS - left side player slow realization man-up; SRRS - right side player slow realization man-up

In Table 1 from the results of means and standard deviations ( $M \pm SD$ ) can be observed that the realization of the team's man-up efficiency indicators for all three levels prevails a number of medium-quick realized man-up ( $1.90 \pm 1.58$ ) and a number of slow realized man-up ( $1.53 \pm 1.19$ ). The minimum number of the team's man-up efficiency realization happens at the quick realization ( $0.47 \pm 0.71$ ). Observing above mentioned realization across all groups, it can be seen that there is only a significant disparity in a number of medium-quick realized man-up (high level water polo players  $2.39 \pm 1.74$ , medium level water polo players  $1.88 \pm 1.60$  and low level water polo players  $1.43 \pm 1.22$ ). Looking at individual realization across all groups, there is a significant disparity in the variables of man-up centre defender medium-speed realization, man-up centre defender slow realization and man-up right side player slow realization.

Table 2 presents the results of Kruskal-Wallis test by three levels water polo players (high, medium and low level) in all 15 indicators of man-up efficiency.

Table 2

Kruskal-Wallis test and multiple comparisons of mean ranks (H-test value, p - empirical significance level) for fifteen indicators of man-up efficiency for high level water polo players (I), medium level water polo players (II) and low level water polo players (III)

Variables	H	p	I-II	I-III	II-III
QR	4.48	0.11	-	-	-
QRCF	1.76	0.41	-	-	-
QRCD	1.67	0.43	-	-	-
QRLS	0.44	0.80	-	-	-
QRRS	1.77	0.41	-	-	-
<b>MSR</b>	<b>13.92</b>	<b>0.00</b>	<b>1.00</b>	<b>0.00</b>	<b>0.00</b>
MSRCF	3.42	0.18	-	-	-
<b>MSRCD</b>	<b>14.48</b>	<b>0.00</b>	<b>0.10</b>	<b>0.01</b>	<b>1.00</b>
MSRLS	1.05	0.59	-	-	-
MSRRS	4.56	0.10	-	-	-
SR	3.83	0.15	-	-	-
SRCF	0.02	0.99	-	-	-
<b>SRCD</b>	<b>11.75</b>	<b>0.00</b>	<b>0.04</b>	<b>0.24</b>	<b>1.00</b>
SRLS	0.27	0.87	-	-	-
<b>SRRS</b>	<b>6.13</b>	<b>0.04</b>	<b>1.00</b>	<b>0.18</b>	<b>0.10</b>

Legends: QR - all-players quick realization man-up; QRCF - centre forward quick realization man-up; QRCD - centre defender quick realization man-up; QRLS - left side player quick realization man-up; QRRS - right side player quick realization man-up; MSR - all-players medium-speed realization man-up; MSRCF - centre forward medium-speed realization man-up; MSRCD - centre defender medium-speed realization man-up; MSRLS - left side player medium-speed realization man-up; MSRRS - right side player medium-speed realization man-up; SR - all-players slow realization man-up; SRCF - centre forward slow realization man-up; SRCD - centre defender slow realization man-up; SRIS - left side player slow realization man-up; SRRS - right side player slow realization man-up

Results show a statistically significant difference in the level of significance ( $p < 0.05$ ) for following variables: number of medium-speed all-players realization (MSR); number of medium-speed man-up centre defender realization (MSRCD); number of slow man-up centre defender realization (SRCD); number of slow right side player realization (SRRS).

As it can be seen from table 2, multiple comparisons of mean ranks for four variables showed significant differences ( $p < 0.05$ ) among three pairs of observed groups.

**Discussion**

Statistically significant differences are observed in only one of three indicators of a team's man-up efficiency. These statistically significant differences are present in the numbers of medium-speed all-players realization (MSR).

Statistically significant differences in the number of medium-speed all-players realization (MSR) variables between the high and low level as for between the medium and low level water polo teams is probably the result of the far weaker performance of the players in low level teams in their the ability to exploit man-up situations in relation the higher level groups.

Above mentioned lack of quality in medium-speed realization of the lower levels water polo players very likely to the largest extent explains statistically significant differences in number of medium-speed man-up centre defender realization (MSRCD) between the high and low level water polo teams.

The statistically significant differences between high and medium level water polo teams in the variable number of slow man-up centre defender realization (SRCD) and between high and low level water polo teams in the variable number of medium-speed man-up centre defender realization (MSRCD) show that only in the high level teams, the central defender is an excellent shooter. In the man-down situation the tactics for many teams is usually to cover the wing and perimeter positions better, while the covering of the close range positions is left with a higher level of risk. It is very probable that only high quality centre defenders come to the fore in those difficult conditions of realization. Those results are in accordance with the center defense's role in offense. Meaning his high scoring close range performance in man-up situations (Hraste et al., 2010).

In some previous studies has also been identified the statistically significant differences of man-up efficiency in water polo between the observed groups of subjects (Hraste et al., 2016; Takagi et al., 2005; Platanou, 2004).

**Conclusion**

In this study the range of the parameters that describe the man-up efficiency of different levels of water polo players is established and explained. It was found that there was a statistically significant difference between the different level groups of water polo players in the four variables of man-up efficiency.

From the observations above it can be concluded that on the basis of some man-up efficiency parameters it is possible to differentiate three level groups of water polo players.

The differences are caused by degree of learned, implemented tactical knowledge in man-up situations, by degree of man-up scoring abilities and good selection for certain roles in the water polo game.

Based on indicators of man-up efficiency in match situations the efficiency parameters give the opportunity for rational, good selection of players within a team, and also the selection of a good tactical man-up and man-down concept and training methods to achieve the best results in the situations with numerical superiority.

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## ANALIZA RAZLIKA U UČINKOVITOSTI IGRAČA VIŠE U VATERPOLU PREMA BRZINI REALIZACIJE

### Sažetak

Cilj je ovog istraživanja utvrđivanje i objašnjavanje razlika kod tri nivoa vaterpolista u nekim parametrima učinkovitosti igrača više. Koristeći Kruskal-Wallisov test i Post-hoc analizu za utvrđivanje parova odgovornih za postojanje razlika za sve grupe na razini značajnosti  $\alpha=0,05$  potvrđena je hipoteza da postoje značajne razlike između skupina ispitanika u četiri od petnaest varijabli učinkovitost igrača više u vaterpolu. Rezultati ukazuju da su visoko kvalitetne momčadi dominantne kod srednje brze realizacije jer im je vrlo vjerojatno potrebno manje vremena u pronalasku optimalne situacije za realizaciju igrača više u odnosu na momčadi srednje i niske kvalitete. Postoji opravdana mogućnost da su razlike uzrokovane stupnjem usvojenosti i primjene nekih taktičkih znanja, stupnjem realizatorskih sposobnosti i najboljom selekcijom za određene uloge u momčadi.

**Ključne riječi:** igrač više, trenutak realizacije, učinkovitost u vaterpolu

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