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SITUATION EFFICIENCY INDICATORS RELATIONS DEPENDING ON THE OUTCOME OF WATER POLO MATCHES

SUMMARY:

The aim of the research was to determine the differences in the parameters of the situational efficiency between the winning and the defeated teams in the regular part of the A1 Regional Water polo competition in the season 2018/19. The sample includes the analysis of 82 water polo matches played within 18 rounds of the regular part of the league. Differences were found in 12 variables of team situational efficiency obtained based on official statistical reports from the games played. Using Man-Whitney U test, statistically significant differences were found in 8 out of 12 analyzed variables. The teams that ended the match as the winner were more dominant in almost all variables related to the efficiency of the shot, had more efficient goalkeeper, more efficient effect in the blockade of the shot, better use of the player more, and more efficient swimmers during swimming for the ball. The statistically significant differences in variables were not found; lost balls, won balls, an estimated 5 meter shots and the total number of fouls in the match.

Keywords: *A1 Regional water polo league, differences, match statistics*

INTRODUCTION

Water polo is a collective sports game that has been included in the Summer Olympic Games program since 1900 in Paris. Water polo and football are the oldest team sports branches of the Summer Olympics. The first gold medal at the Olympic Games in 1900 was won by Great Britain (Snayder, 2008). Its roots, water polo has even 100 years before joining the summer Olympics program, with water festivals held around 1800 in English cities. The first water polo match was played in the Crystal Palace in London in 1874, while the first official water polo rules were written by William Wilson in 1876 in Aberdeen, Scotland, in the "Bon Accord Club" (Snayder, 2008).). According to the first rules, the water polo game was characterized by an uncontrolled game that included a lot of diving, sinking opponents and balls, without much attention being paid to the technique or rules of the game (Hraste, Bebic, &Rudic, 2013).

Water polo has been continuously developing to the present day, with the occasional change in the rules of the game. The latest changes to the rules occurred at the extraordinary Congress of the International Water Sports Organization (FINA), in Hangzhou, China, in 2018. The first application of the new rules was on the Europa Cup in Zagreb (5-7 April, 2019). The new rules of the game should encourage its dynamism and attractiveness for viewers. Among other things, the new rules of the game include the following; after the corner and exclusion of the player the defending team, the time of the new attack is reduced to 20 seconds; within 6 yards from goal, any foul from the back of an attacker who holds the ball and moves towards the opponent's goal and tries to kick, the one will be punished with a five-meter shot; it is possible to achieve a goal from the free kick outside 6 meters; the corner performer can reach the goal with a straight shot from the corner or swimming from the corner and the shot; possible "flying changes" of the player to the center line of the pool; the team is entitled to two times time-out during the match; referees will be equipped with audio technology (headset and microphone) for easy communication one to another and else.

On the territory of the former Yugoslavia, a firefighter arrived thanks to students who studied in Hungary, Austria and Germany around 1907 (Rasovic, 1986). The first Yugoslavia participated with the water polo team was in the Olympic Games in 1936 in Berlin, and in 1968 it won the gold medal in Mexico for the first time.

Today, water polo is one of the most important sports branches in almost all former Yugoslav republics. Montenegro, Serbia and Croatia are the countries whose national teams occupy the very top of the world water polo. In order to preserve and affirm the water polo, in 2008, the Adriatic Water polo League was established, ie water polo competition, now called the Regional Water polo League. The regional water polo league is played by the best clubs from Montenegro, Serbia, Croatia and Slovenia. The regional water polo league is divided into A1 and A2 water polo league.

In addition to the fact that water polo is one of the most important sports branches in the countries of former Yugoslavia, scientific research dealing with water polo problems is very rare. Compared to other sporting disciplines (football, basketball, handball, martial arts), water polo researches are rather negligible. In general, the most commonly studied subjects are the basic and specific motorics of water polo players, the morphological status of water polo players, the relationships and relations of segments of the anthropological status of water polo players (Aleksandrovic, Naumovski, Radovanovic, Georgiev,&Popovski 2007; Bampouras&Marrin, 2009; Dopsaj, Madic,&Okicic, 2007; Janjic, Gardasevic,&Trivun, 2018; Melchiori, Manzi, Padua, Sardella,&Bonifazi, 2009; Tan,Polglaze,& Dawson, 2009; Tsekouras, 2005) and the like. There is much less representation of research for situational efficacy by analyzing the parameters of water polo matches statistics (Escalante, Saavedra, Mansilla, &Tella, 2011; Hrasteet al., 2013; Hraste, Jelaska,&Granic, 2016; Lupo, Tessitore, Minganti,&Capranica, 2010; Lupo, Tessitore, Minganti, King, Cortis,&Capranica, 2011; Mirvic, Rasidagic, &Bajric, 2014).

The subject of this research is the parameters of the team situational efficiency of the water polo matches of the Regional A1 League in the season 2018/19. The problem of the research is to determine whether there are statistically significant differences in the parameters of the team situational efficiency between the outcome of the winning match and the outcome of the defeating match in the regular part of the competition in the 2018/19 season.

The aim of the research is to determine the differences in the parameters of the team situational efficiency between the water polo teams that won the match and the water polo teams that were defeated in the regular part of the A1 Regional Water Polo League.

METHOD OF WORK

Sample research

A sample of 82 water polo matches of the A1 Regional Water Polo League, played in the regular part of the competition (18 rounds), was analyzed up to the Final Four in the season 2018/19. Out of the total sample of matches, which in part of 18 rounds of the regular part there were 90, games that ended with the unsolved result (5 games), official result (2 matches) and matches for which statistics were not completed (1 game) were exempted.

On the basis of the criteria the result of the match, win or defeat, from the total sample, 2 sub-sorts are defined;

- the result of the victory of 82 outcomes,
- the result defeat 82 outcomes.

A1 Regal Water polo League in the 2018/19 season played the following clubs; (PVK Jadran Customs and Primorac from Montenegro, BVK Crvena Zvezda, Partizan and VK Sabac from Serbia, HAVK Mladost, Jug CO, Jadran Split, Naval Brodosas and KLA Posk from Croatia).

Variables sample

Variables sample represent 12 parameters of team situational efficiency. The survey covers the following variables; total percentage of shots (UKŠUT%)the percentage of shots from the game (ŠIGRA%), the percentage of shots with the player more (IGVIŠ%), the percentage of the shot from 5 meters (ŠUT5M%), the percentage of the shot from the counter (ŠKONT%), the percentage of goal keeper defense ODBRG%), lost balls (IZGBL), won balls (OSVOL), blocked shots (BLOKŠ), percentage of realization of the player more (RIGRV%), swimming for the ball (PLIVL) and fouls (FAUL). Data for all variables are downloaded from the official A1 Regional Water Polo website (http://www.rwp-league.com), based on available official league statistics. The reliability of the official statistics of the Regional Water polo League was checked in the Hraste et al., (2016), where a maximum reliability coefficient of 1.00 was determined.

Data processing methods

For all data collected, the arithmetic mean (Mean) and standard deviation (SD) are calculated. Distribution normality was tested using Kolmogorov - Smirnov test (KS). For statistical purposes data processing for the purpose of determining differences, Man-Whitney U was applied (Mann-Whitney Utest), non-parametric test for two independent samples. Data processing is performed in the software packageIBM SPSS 20.0 for Windows.

RESULTS AND DISCUSSION

Table 1 presents the results from the descriptive statics domain, the arithmetic mean (Mean) and the standard deviation (SD). Also, Table 1 presents the results for Kolmogorov-Smirnov test and the level of statistical significance of the test (p). Based on Kolmogorov-Smirnov's Z values, as well as its statistical significance (p), it was concluded that the distribution of results was not normally distributed in 6 variables in group number 1 (outcome of the winning game) and in 7 variables in group number 2 (outcome of the losing game). The distortion of the distribution of results in a significant number of variables in both groups caused the application of the non-parametric statistical method Mann-Whitney U test for determining the differences between two independent samples (Table 2).

Table 1.

Descriptive statistics of situational efficiency variables

Variables	Match Outcome Winning (Group 1) N = 82				Match outcome defeat(Group 2) N = 82			
	MEAN	SD	KS-Z	p	MEAN	SD	KS-Z	p
UKŠUT%	48.17	17.02	**1.38**	**.04**	33.45	18.08	**1.62**	**.01**
ŠIGRA%	39.06	19.55	**1.48**	**.02**	27.06	20.95	**2.09**	**.00**
IGVIŠ%	63.78	21.08	.82	.50	46.88	26.70	.76	.59
ŠUT5M%	73.83	43.96	**2.91**	**.00**	62.00	44.72	**1.93**	**.00**
ŠKONT%	53.18	40.75	**1.63**	**.01**	38.07	43.12	**2.37**	**.00**
ODBRG%	53.03	17.60	1.24	.08	35.56	14.30	.86	.44
IZGBL	5.63	4.47	1.09	.18	7.09	5.75	1.06	.20
OSVOL	5.87	5.28	1.21	.10	4.80	4.29	**1.44**	**.03**
BLOKŠ	2.23	1.89	**1.64**	**.00**	1.60	1.72	**1.69**	**.00**
RIGRV%	50.16	20.11	.94	.33	31.50	19.00	.78	.56
PLIVL	2.65	.97	**1.83**	**.00**	1.28	.98	**1.78**	**.00**
FAUL	9.52	3.40	.82	.50	9.92	2.60	1.04	.22

Legend: Mean** - arithmetic mean**, SD** - standard deviation**, KS - Z** - Kolmogorov Smirnov Z value**, p** - level of statistical significance, eclipse**.

Table 2 shows the results of differences in the variables in team situational efficiency based on the Mann-Whitney U test. It was found that among the winning and defeated water polo teams, there are statistically significant differences in 8 out of 12 analyzed variables of situational efficiency, expressed through the parameters of the official statistics of the water polo match.

Table 2.

Mann-Whitney's U test results

Variables	Match Outcome Winning (Group 1)			Match outcome defeat (Group 2)					
	Mean Rank	Grouped Median	N	Mean Rank	Grouped Median	N	MWU test	Z	p
UKŠUT%	**107.55**	**42.65**	**82**	**57.45**	**27.73**	**82**	**1308.00**	**-6.75**	**.00**
ŠIGRA%	**102.53**	**35.85**	**82**	**62.47**	**22.86**	**82**	**1719.50**	**-5.40**	**.00**
IGVIŠ%	**98.33**	**62.22**	**82**	**66.67**	**46.55**	**82**	**2064.00**	**-4.27**	**.00**
ŠUT5M%	44.66	90.62	43	35.63	78.94	34	616.50	-1.38	.16
ŠKONT%	**91.52**	**53.57**	**82**	**73.48**	**29.26**	**82**	**2622.00**	**-2.66**	**.00**
ODBRG%	**107.90**	**55.05**	**82**	**57.10**	**37.80**	**82**	**1279.50**	**-6.85**	**.00**
IZGBL	77.16	5.62	82	87.84	7.28	82	3800.00	1.44	.14
OSVOL	86.28	4.87	82	78.72	3.81	82	3052.00	-1.02	.30
BLOKŠ	**90.78**	**1.85**	**82**	**74.22**	**1.28**	**82**	**2683.00**	**-2.28**	**.02**
RIGRV%	**102.73**	**45.50**	**82**	**62.27**	**31.15**	**82**	**1703.00**	**-5.46**	**.00**
PLIVL	**109.62**	**2.66**	**82**	**55.38**	**1.25**	**82**	**1138.50**	**-7.54**	**.00**
FAUL	79.88	9.40	82	85.12	9.72	82	3577.00	.71	.47

***Legend:** Mean Rank Value - Grouped Median - Median grouped data (the value between the lower and upper limits of the group interval in which the median is located), **N** - the number of matches, **MWU** - the value of Mann Whitney's U test, **Z** - approximation, **p** - level of statistical significance*

By individual analysis of the difference between the winning and the defeated teams it was found that the winning team (grouped median - 42.65%) had a significantly dominant total percentage of shots in the match (UKŠUT%), compared to the losing teams (grouped median - 27.73%). Water polo teams that won in matches had a statistically significantly better percentage of shots from the game (35.85% - 22.86%), as well as the percentage of shots with the player more in the match (62.22% - 46.55%). Based on the difference (53.57% - 29.26) in the variable percentage of the shot from the contour (SKKONT%), it can be assumed that the winning teams were physically prepared. The teams that were winning, almost every second attack from the contrary ended with a goal, while the defeated teams scored goal from every third attack from the counter. Similar results were also found in the research Mirvic,et al., (2014), where it was established that the water polo representations that achieved victories at the World Championship in Shanghai 2011 achieved a significantly higher number of goals from the contrary than the losing teams. Also, the difference in the efficiency of the shots from the contour was confirmed in the research Lupo,et al.,(2010), where the difference in statistical parameters was established between the water polo team of the different ranking of the competition.

A significant role in the final outcome of the game has the goalkeeper efficiency. With the teams that won, the percentage of goalkeeper defense at the match was 55.05%, while in defeated teams this percentage was 37.80%. So, the goalkeepers contributed to the victory of their team, by defending every second opponent's shot. The performance of the goalkeeper in the defeat was every third successful defense or performance of 37.80%. A statistically significant difference in situational efficiency between the outcome of the match is the winner - defeated, is also realized in the variable block shot (1.85 - 1.28).

Also, in the variable the percentage of player's more performance (RIGRV%) was statistically significant difference in favor of the outcome of the winning match. Water polo teams that ended the match winning, nearly every second attack with the player more wassuccessful (45.50%). With the teams that ended the match with defeat, the player more realization was worse and amounted to 31.15%, or approximately every third successful attack with the player more. Similar results, compared to statistically significant differences, were also found in the research of Hraste, et al., (2016), where the difference was also established in the realization of the player more in favor of the 4 first-ranked teams compared to the other teams in the A1 Regional Water polo League (season 2013/14).

A statistically significant difference in situational efficiency was also found in the floating ball variable (PLIVL) variable. With the team that ended the game with a win, swimmers for the first ball by quarter, won the ball almost 3 times per game (2.66), while swimmers from the defeated team scored the first ball in quarter-finals on average for one-quarter per game (1.25) . Winning a ball when swimming at the start of a quarter of a water polo game puts the team in a more favorable position in terms of more attacks per quarter and the game in general. Also, the teams that often win the first ball in the quarter have faster players, more physically ready, which can be the prevailing of the match in terms of counter attack and the like. The team of American physiologists ranked the water polo as the most demanding sporting game in the physiological sense of all the sporting activities they were exploring (baseball, basketball, cross-country, football, golf, rugby, softball, swimming, tennis, volleyball and wrestling). This scoring included ratings for aerobic endurance, flexibility, anaerobic endurance, body composition, speed, strength, and more (according to Snyder, 2008). Accordingly, the differences in situational efficiency between the winning team and the defeated team, will be significantly more visible if the players of these teams are not at the highest level of physical fitness.In variables; lost and won balls, match fouls and a 5-meter penalty shot, there was no statistically significant difference between the outcome of the match - defeat.

CONCLUSION

On the basis of the Mann-Whitney U Test, it was established that between the water polo team that won the match and the team that lost the matches in the regular part of A1 Regional Water Polo League (season 2018/19) there are statistically significant differences in 8 out of 12 analyzed variables. By analyzing the differences between the team situational efficiency variables, it can be noted that the winner of a water polo match will be the team that has better shooters efficiency, more successful performance of the player more, and a better effect of the blockade of the shot, as well as more successful goalkeeper on goal. Also, a very significant difference between the winning team and the team that lost the match, was noted in the swim speed for the ball.

The obtained results can contribute in the preparation and running of the game, or the tactical realization of the game in accordance with the knowledge of the weaknesses and advantages of some water polo teams. According to Hraste, et al.,(2015), empirical results show that statistical data are a good instrument for water polo players quality assessment.

The general conclusion of the research is that the differences in the situation efficiency are significant and big between the teams that ended the match winning it against the teams that recorded the defeat. If the water polo team wins the first quarter only once, successfully realizes every third attack with the player more, realizes successfully every third action from the counter, and has a poor overall shooter efficiency, as well as the efficiency of the goalkeeper, the outcome of the match will not be favorable.

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