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Original scientific paper

Comparison of Game-Related Statistics in Men's International Championships between Winning and Losing Teams according to Margin of Victory

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ABSTRACT

The aims of this study were (i) to compare water polo game-related statistics by game outcome (winning and losing teams) and margins of victory (close games, unbalanced games, and very unbalanced games), and (ii) to identify characteristics that mark the differences in performances for each group of margin of victory. The game-related statistics of the 308 men's matches played in seven International Championships (Olympic Games, World and European Championships) were analysed. A cluster analysis established three groups (close games, unbalanced games, and very unbalanced games) according to the margin of victory. Differences between game outcomes (winning or losing teams) and margins of victory (close, unbalanced, and very unbalanced games) were determined using the chi-squared statistic, also calculating the effect sizes of the differences. A discriminant analysis was then performed applying the sample-splitting method according to game outcome (winning and losing teams) by margin of victory. It was found that the game-related statistics differentiate the winning from the losing teams in each final score group, with 7 (offensive and defensive) variables differentiating winners from losers in close games, 16 in unbalanced games, and 11 in very unbalanced games. In all three types of game, the game-related statistics were shown to discriminate performance (85% or more), with two variables being discriminatory by game outcome (winning or losing teams) in all three cases: shots and goalkeeper-blocked shots.

***Key words**: coaching, game analysis, prediction, team sport, training*

Introduction

Water polo is a multifaceted sport[1], characterized by a large number of rapid bursts of swimming, changes of direction, passes, and shots. It is a high-intensity sport in which players swim, jump, pass the ball, and struggle against their opponents using blockades, splashing, contact, and pushing[2]. Although it is the oldest team sport in the history of the modern Olympic Games, relatively few investigations have been made of the game analysis characteristics of water polo[3]. Academic interest in the sport has been growing, however, as reflected by the burgeoning number of »notational analyses« in recent years[4–7]. These quantify the technical and tactical playing aspects of a game through game-related statistics based mainly on frequencies and effectiveness percentages[8], and have already come to be regarded as a good instrument with which to interpret play in team sports[9]. These studies has focused on analysing the differences in game statistics between winning and losing teams in terms of championship standard[5], offensive and defensive coefficients[4], play situations[6], importance of goalkeeper[10], sex[2], types of shot[11], and phase of the championship[12,13]. A factor in water polo which has only been studied from the perspectives of physiology[14] or notational analysis[15,16] is the margin of victory (the goal difference in the final score between winning and losing teams) that distinguishes winning from losing teams. This factor has, however, indeed been taken into account in other team sports such as basketball[17] and rugby[18]. In water polo, there have

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just been a few recent studies considering field players only which take into account the differences in the final score and the connection with specific situations (even, counterattack, power-play, and transition)[6,15,16,19,20]. The variables analysed in those studies focus on attack, without including, for example, goalkeeper game-related statistics, even though other studies suggest that the goalkeeper is the most important defensive player and has clearly different characteristics from those of the other players[10]. In fact, goalkeeper-blocked shots is one of the variables that differentiate winning and losing teams in the final phases (semi-finals and medal) of competitions for men[12], and in the preliminary phase of competitions for women[13]. Thus, the aims of this study were (i) to compare water polo game-related statistics by game outcome (winning and losing teams) and margins of victory (close games, unbalanced games, and very unbalanced games), and (ii) to identify characteristics that mark the differences in performances for each group of margin of victory.

Methods

Subjects

We analysed the results and game-related statistics of 308 men's matches played in seven International Championship: 12th FINA World Championships 2007 (Melbourne, Australia); 28th European Water Polo Championships 2008 (Málaga, Spain); 13th FINA World Championships 2009 (Rome, Italy); 29th European Water Polo LEN Championships 2010 (Zagreb, Croatia); 14th FINA World Championships 2011 (Shanghai, China); 30th European Water Polo LEN Championships 2012 (Eindhoven, Netherlands) and the 30th Olympics Games 2012 (London, UK). All the Championships in the northern hemisphere were contested in open-air Olympic pools in summer months (July and/or August). The 308 games analysed were divided into close (N=190), unbalanced (N=88), and very unbalanced (N=30) games (see the *Statistical analyses* Section).

Procedures

All the results were retrieved from the box scores on the Official Website of OMEGA Timing (http://www.omegatiming.com/). These official box scores provide information on the game statistics analysed both for each player and for the team collectively. The data were retrieved by two of the authors (JMS and AGH), and entered manually into an Excel file. They were then subjected to a random check by another of the authors (YE) in order to detect possible errors. Once the errors had been dealt with, the data were analysed statistically. No informed consent was necessary because the information used is in the public domain on the Website. The analysis of public data taken from Websites is habitual in the field of water polo in particular[2,12,13], and of water sports in general[21,22].

The game-related statistics considered can be grouped into four categories: offensive, defensive, goalkeeper-related, and general game-related statistics. All variables were analyzed as the percentage converted or made on the total number of possible actions. These game-related statistics are already of general use among men water polo coaches and technicians, and are those that have been used in earlier studies[2,6,12,13]. The offensive game-related statistics were (9): goals (total); even goals (goals during the even-playing situation of numerical equality); centre goals (goals at the centre point of the mid-court line after each goal); power-play goals (goals during a power-play – a playing situation of numerical superiority); 5-m goals (goals at a distance ?5 m); penalty goals (goals from a penalty); counterattack goals (goals during a situation of counterattack); assists (number of passes from one offensive player to another leading directly to a goal being scored); and offensive fouls (number of losses of ball possession due to committing a foul). The defensive game-related statistics were (2): steals (number of turnovers in favour of the defence due to actions of anticipation and snatching the ball), blocked shots (shots stopped or diverted by the defenders). The goalkeeper-related game statistics were (7): goalkeeper-blocked shots (shots blocked by the goalkeeper); even goalkeeper-blocked shots (shots blocked by the goalkeeper during even actions); goalkeeper-blocked centre shots (shots by the centre forward which were blocked by the goalkeeper); power-play goalkeeper-blocked shots (shots blocked by the goalkeeper during power-play actions); goalkeeper-blocked 5-m shots (shots performed at a distance <5 m and blocked by the goalkeeper); goalkeeper-blocked penalty shots (penalties blocked by the goalkeeper); and counterattack goalkeeper-blocked shots (shots blocked by the goalkeeper during counterattack actions). The general game-related statistics were (5): sprints (number of sprints won – possession of the first ball in each quarter – divided by four, i.e., the number of sprints per game); definitive exclusion (number of players committing fouls which led to their definitive expulsion from the game); timeouts (number of timeouts used throughout the game); possessions (a team's total number of possessions of the ball in a game, recognizable by all the restarts of the 30-second clock marking the maximum time allowed for each ball possession); and possession time (a team's clock-time in minutes of possession of the ball in a game).

Statistical analyses

A cluster analysis established three groups according to margins of victory. The technique used was the k-means method in which prototypes (centroids) that represent clusters are computed by optimizing the squared error function[23]. The results correctly classified 61.7% of the matches with margins of victory of from 1 to 4 goals (close games), 28.6% of those from 5 to 10 goals difference (unbalanced games), and 9.7% of those with 11 goals or more difference (very unbalanced games). Other studies have used a similar nomenclature[6]. Basic statistical descriptors (mean and standard deviation) were calculated by game outcome (winning and losing teams) and margin of victory (close games, unbalanced games, and very unbalanced games). To analyse the differences between the winning and the losing teams, two types of analysis were done: a chi-squared analysis and a discriminant analysis. Thus, chi-squared statistics were used to reveal the differences between the game outcome (winning and losing teams) in each of the three phases. This is the recommended technique when the descriptors are discrete frequency response variables[24,25]. The effect sizes of the differences were calculated[26]. This was followed by a discriminant analysis, using the sample-splitting method according to game outcome (winning and losing teams) and margin of victory (close games, unbalanced games, and very unbalanced games). The criterion used to determine whether or not a variable was discriminatory was Wilks's lambda (λ), which measures the deviations within each group with respect to the total deviations. The sample-splitting method included initially the variable that best minimized the value of λ, provided that the value of F was greater than a certain critical value (F=3.84, »include«). From that point on, the method combines the variables pairwise. The new variable is selected if λ is greater than the value of the input F. However, before introducing a variable one tries to eliminate some of those already selected, as long as the increase in the minimized λ is below a critical threshold (F=2.71, »remove«). We thus calculated λ, the canonical correlation index (deviations of the between-group discriminant scores relative to the total deviations), and the percentage of correctly classified matches by margin of victory (close games, unbalanced games, and very unbalanced games). This methodological approach has been used in studies of other aquatic disciplines such as swimming[27]. A p-value <0.05 was considered to be statistically significant. The statistical analysis was performed with the software package SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

Results

Table 1 presents the basic descriptors of the variables by match outcome (winning/losing teams) in each margin of victorycategory. The number of variables differentiating winners from losers was 7 in close games, 16 in unbalanced games, and 11 in very unbalanced games.

Table 2 presents the results of the discriminant analysis (Wilks's lambda, the canonical correlation index, and the percentage of teams correctly classified) for each margin of victory category. The predictive models classified correctly 85% of the close games using eight variables (goals, goalkeeper-blocked shots, possession time, offensive fouls, steals, sprints, blocked shots, even goals), 97% of the unbalanced games using five variables (goals, goalkeeper-blocked shots, offensive fouls, sprints, goalkeeper-blocked penalty shots), and 95% of the very unbalanced games using four variables (goals, goalkeeper--blocked shots, goalkeeper-blocked power-play shots, offensive fouls).

Discussion

This study has analysed the differences and predictive power of game statistics between winning and losing teams depending on the goal difference in the final result (close games, unbalanced games, and very unbalanced games). The game statistics analysed represent the frequency and effectiveness of specific technical and tactical actions that take place during a match[28]. There were found to be differences in game statistics between the three types of games, with the model being able to predict the winning teams in all types, attaining 85% correct classification in close games, 97% in unbalanced games, and 95% in very unbalanced games. These results are of particular interest for coaches in that they identify the determinant variables depending on the differences in the margin of victory[6,29].

Differences by game outcome (winning/losing teams)

Fewer variables differentiate winning and losing teams in close games (7 of 23) than in the other two types of games (16 in unbalanced, 11 in very unbalanced). This appears to indicate that, when the end result was closely unbalanced, the winning teams had more difficulty obtaining differences in their game statistics over the losing teams. It is also consistent with other studies which analysed either one particular championship[2] or the different phases of a championship (preliminary, qualifying, and final)[12,13]. Thus, when there exist greater differences between the various teams (preliminary phase), more variables distinguish winning from losing teams than in the following two phases (qualifying, and final), both in men[12] and in women[13]. Nonetheless, analysing the results together, one sees that there are four variables which differentiate the winners from the losers in all types of games (close, unbalanced, and very unbalanced). Three of these variables relate to greater offensive efficiency of the winning teams (power play goals, assists, and counterattacks), and the fourth to greater defensive efficiency (steals). Thus, power play goals and assists reflect the ability to score in powerplay or to make a pass that ends in a goal, respectively. Specifically, the assists reflect goals which were preceded by a pass to a player with positional advantage over the defender in situations of even. The power-play goals reflect the team's ability to score when it is in numerical superiority, but it also requires the player making the final shot to have received the ball when he has a positional advantage over the defence. Indeed, a large proportion of the total number of goals a team scores occur in power-play situations[7]. A team's ability to defend in this situation appears to play a substantial role in the outcome of the game, especially when there is little difference between the two teams[30]. Steals are the result of appropriate defensive play that leads to the attacking team losing possession of the ball, stopping the offensive action from ending with a shot, and allowing the possibility of a counterattack. In this sense, a greater number of counterattacks has been ob-

TABLE 1.
BASIC DESCRIPTORS (MEAN AND STANDARD DEVIATION), CHI-SQUARED STATISTIC, P-VALUE, AND THE EFFECT SIZES OF THE DIFFERENCES (COHEN'S D) FOR EACH VARIABLE ACCORDING TO THE GAME OUTCOME IN EACH TYPE OF MATCH

Variable	Close (N=190)					Unbalanced (N=88)					Very unbalanced (N=30)				
	Winners X±SD	Losers X±SD	χ^2	p	ES	Winners X±SD	Losers X±SD	χ^2	p	ES	Winners X±SD	Losers X±SD	χ^2	p	ES
Goals (%)[a]	37.9±9.09	28.8±8.77	210.1	0.129	4.24	43.7±9.47	23.3±8.24	151.1	0.043	4.92	51.5±9.38	20.3±8.90	60.0	0.157	5.63
Even goals (%)[a]	35.8±19.8	26.8±55.1	109.4	0.006	0.22	37.2±19.6	19.5±16.1	72.8	0.054	0.99	43.1±16.3	18.6±15.5	40.9	0.134	1.54
Centre goals (%)[a]	39.7±36.5	28.2±33.7	24.0	0.241	0.33	49.6±35.0	29.5±35.2	44.1	0.001	0.57	48.5±29.0	23.1±40.0	29.9	0.018	0.73
Power-play goals (%)[a]	56.1±21.1	21.1±46.6	84.3	0.011	0.97	59.7±23.1	41.3±25.4	59.9	0.003	0.76	64.6±17.5	37.9±26.6	45.5	0.010	1.19
5-m goals (%)[a]	18.1±13.9	14.5±12.1	60.1	0.401	0.28	28.0±18.8	11.2±11.5	74.9	0.003	1.08	38.4±25.6	7.92±10.1	38.7	0.040	1.57
Penalty goals (%)[a]	51.4±48.2	41.2±46.8	19.3	0.311	0.21	50.2±46.6	44.4±48.1	7.37	0.288	0.12	67.2±42.1	38.9±46.7	6.73	0.081	0.64
Counterattacks (%)[a]	31.8±43.1	20.1±30.6	23.2	0.003	0.31	51.8±44.6	15.6±35.1	32.2	<0.001	0.90	53.7±46.6	17.3±34.8	12.9	0.044	0.89
Assists (n)	5.37±3.30	3.92±2.49	28.8	0.017	0.50	6.60±2.89	3.00±2.08	70.5	<0.001	1.43	7.53±4.25	2.62±1.92	26.5	0.033	1.49
Offensive fouls (n)	13.1±3.73	13.6±3.87	19.0	0.699	–0.13	12.2±3.54	15.1±3.70	40.8	0.004	–0.80	11.1±2.93	18.7±4.95	36.9	0.012	–1.87
Steals (n)	7.05±3.16	6.24±2.39	27.6	0.050	0.29	8.39±3.56	6.85±3.04	27.5	0.036	0.47	11.1±4.30	5.80±3.10	31.1	0.013	1.41
Blocked shots (n)	3.17±1.93	2.56±1.73	12.7	0.177	0.33	3.10±1.81	2.02±1.62	20.9	0.008	0.63	2.70±1.64	1.72±1.31	8.10	0.231	0.66
G.B. shots (%)[c]	55.6±12.4	45.7±11.4	170.9	0.127	0.83	62.3±11.5	41.5±10.2	137.7	0.013	1.91	67.7±13.7	34.3±9.62	60.0	0.208	2.82
Even G.B. shots (%)[c]	63.4±27.9	48.9±23.9	77.6	0.002	0.56	66.4±27.4	47.1±25.7	67.5	0.013	0.73	67.1±27.4	42.4±20.6	42.1	0.055	1.02
G.B. centre shots (%)[c]	40.3±42.0	35.6±37.1	16.3	0.292	0.12	44.2±40.7	34.6±33.9	42.3	<0.001	0.26	47.1±49.1	32.8±24.5	32.4	0.009	0.37
Power-playG.B.shots(%)[c]	36.7±26.2	29.3±21.2	49.7	0.097	0.31	37.1±30.4	24.6±21.9	40.2	0.037	0.47	39.7±31.6	24.8±16.5	26.0	0.164	0.59
G.B. 5 m shots (%)[c]	72.9±22.1	65.9±26.0	38.5	0.443	0.29	78.8±23.3	56.4±24.9	62.0	0.001	0.93	86.6±15.8	47.5±28.0	35.8	0.023	1.72
G.B. penalty shots (%)[c]	13.3±30.7	7.59±24.6	12.5	0.406	0.21	7.66±24.2	14.2±31.8	4.11	0.391	–0.23	3.57±13.1	10.0±24.2	1.62	0.445	–0.33
Counterattacks G.B. (%)[c]	11.6±31.5	18.7±35.2	19.3	0.013	–0.21	10.6±29.8	18.6±33.0	9.02	0.108	–0.25	20.5±37.5	5.36±20.8	4.15	0.245	0.50
Sprints (%)[b]	55.3±32.6	44.8±32.5	16.7	0.081	0.32	66.7±25.3	33.5±25.4	54.6	<0.001	1.31	62.5±32.0	37.5±32.0	9.10	0.059	0.78
Definitively exclusion (N)	1.21±1.24	0.94±0.89	10.9	0.092	0.25	0.58±0.74	0.81±0.85	3.69	0.297	–0.29	0.17±0.38	0.90±0.92	13.8	0.003	–1.04
Timeouts (N)	1.62±0.72	1.71±0.64	3.27	0.351	–0.13	1.09±0.74	1.50±0.59	16.1	<0.001	–0.61	0.80±0.85	1.27±0.78	5.06	0.080	–0.58
Possessions (N)	39.5±4.13	39.4±4.14	24.3	0.443	0.02	39.9±3.47	39.7±3.22	18.77	0.281	0.06	43.0±3.92	41.5±2.34	22.5	0.021	0.46
Possession time (min)	16.35±1.27	15.99±1.22	23.5	0.525	–1.37	15.2±1.45	16.1±1.50	136.0	0.412	–0.61	14.9±0.81	16.8±0.93	48.0	0.314	–2.18

[a] number of shots converted/number of shots; [b] number sprints won/number of sprints swum; [c] number of shots saved/number of shots; G.B. = goalkeeper-blocked, s = shot; ES = Effect sizes.

TABLE 2.
DISCRIMINANT ANALYSIS MODELS FOR TYPE OF MATCH, GIVING THE PERCENTAGE CORRECTLY CLASSIFIED, WILKS'S Λ, CANONICAL CORRELATION INDEX, AND VARIABLES INCLUDED IN THE MODEL BY ORDER OF SELECTION

Phase	Close	Unbalanced	Very unbalanced
Percentage correctly classified	85.0	96.8	94.7
Wilks's lambda	0.488	0.905	0.971
Canonical correlation index	0.715	0.181	0.058
Variables selected	Shots, goalkeeper-blocked shots, possessions time, offensive fouls, steals, sprints, blocked shots, even goals	Shots, goalkeeper-blocked shots, offensive fouls, sprints, goalkeeper-blocked penalty shots	Shots, goalkeeper-blocked shots, Power-play goalkeeper-blocked shots, offensive fouls

served to differentiate the winning from the losing teams[12,13,15,30].

In the close games, in addition to the variables already mentioned, the winning teams differ from the losers in offensive even goals complemented with better goalkeeper offensive action in this same situation (goalkeeper-blocked shots). These results agree with those found in the international championship qualifying phase in men[12] and in the final phase in women[13]. The effectiveness of the losing teams' goalkeeper in close-game counterattack situations (goalkeeper-blocked counterattacks) is greater than for the winning teams[2]. Although in the close games the centre goals variable did not differ between winners and losers, this does not detract from the relevance of the »centre forward«, since the scoring effectiveness of the centre forward is not the only function of the player in that position. For instance, the centre forward is the player who causes most exclusions[5] and probably makes a good number of assists, while forcing opposing defenders to move to provide help, thus leaving others of his own team-mates in a better position. The equality on the scoreboard and in the two teams' performance levels in close games seems to reveal that the ultimate objective of the centre forward when he receives the ball is not just to complete the play by scoring. Thus, the centre forward seeks to place himself between the defender and the goal (e.g., a hold without the ball within 5 metres will mean a penalty and counts as a 20-second exclusion) and to provoke the exclusion of his defender so as to play a man up. This situation has been shown to be decisive in the final outcome[7].

Finally, in both the unbalanced and the very unbalanced games, there are several variables besides the ones mentioned above that differentiate the winners from the losers. The winning teams show greater offensive efficiency in centre goals, 5-m goals, and offensive fouls, and greater defensive efficiency in goalkeeper-blocked shots and goalkeeper-blocked 5-m goals. Other studies report similar results in the qualifying phases of international championships in both men[12] and women[13]. Furthermore, the results show a superiority of the winning teams' play in situations of even. This suggests that the individual technique for shooting (centre goals and 5-m goals) and blocking (goalkeeper-blocked centre forward shots and goalkeeper-blocked 5-m goals) are essential elements for success in the unbalanced and very unbalanced games when in a situation of even[31].

Discriminatory power

The discriminatory power analysis model managed to correctly classify 85% of the teams in close games, 97% in unbalanced games, and 95% in very unbalanced games. The results showed that three variables are present in all three types of game: goals, goalkeeper-blocked shots, and offensive fouls. These results reflect the importance of setting up offensive situations that permit ending with a shot on goal, of stopping the opposing side' shots (goalkeeper-blocked shots) whether through the goalkeeper's own skill or through defensive systems chosen not to allow comfortable shooting situations, and, finally, of maintaining possession (offensive fouls). These findings are consistent with previous studies in men in the Beijing Olympics[2], and for women in all phases of international championships[13] and for men in the preliminary and qualifying phases of international championships[12].

Regarding the close games, as well as the variables already mentioned, the model also selected possession time, steals, sprints, blocked shots, and even goals. The results for sprints and even goals agree with previous studies of the more tightly disputed phases of championships (semi-finals and medal games)[12]. Steals and possession time differentiate the winning teams in close games. These two variables are linked because, added to the winning teams' defensive success, is the reduction in the possession time of the losing teams. Previous studies have shown the variable sprint to be a determining factor[12,13,32] (reflecting the importance of taking the initiative at the beginning of each period).

In the unbalanced games, goals, goalkeeper-blocked shots, offensive fouls, sprints, and goalkeeper-blocked penalty shots correctly classified 97% of the teams. Shooting effectiveness (goals) is a factor that correctly classifies the teams (winner/loser) in the three phases of the competition[12,13]. In unbalanced games, another variable that classifies the winning and losing teams is goalkeeper-blocked penalty shots, a game statistic that has been described as a discriminating factor when the game outcome analysed is between winners and losers[2], but which stands in contrast with a previous study which found that the penalty goals variable is not a determining factor for a team's winner or loser status. The goalkeeper's success against penalty shots (goalkeeper-blocked penalty shots) is a variable that discriminates between winning and losing for 73% of the teams in the finals of the competition in men[12] and 92% in the preliminary round games in women[13]. In the very unbalanced games, goalkeeper-blocked power-play shots is a variable in addition to those already mentioned that correctly classifies 95% of the teams, highlighting the importance of the defence in this situation of inferiority[7]. In this regard, earlier studies indicate the importance of preventing the opponent's successful completion of this situation of numerical inequality[5,30,33].

Limitations

This study has some limitations. First, the discriminant analysis used post hoc prediction. In interpreting the results, it needs to be borne in mind that this type of prediction usually gives higher values for the classification than a priori predictions. Second, in the very unbalanced games there occur matches in which at some point the result is no longer in any doubt, which could well influence the corresponding game-related statistics.

Conclusions

The present results allow coaches and researchers to see that water polo game-related statistics in international competitions differ according to the type of match (close, unbalanced, and very unbalanced games). Coaches and players can use these results as a referent against which to assess their performance and plan their team's training, especially for close games. The study has shown that fewer game statistics differentiate winning and losing teams when the games have ended with a small goal difference (close games) than when the difference has been larger. The three technical and tactical parameters that define the profile of the winners in this type of game are: greater efficiency in shooting from the perimeter in situations of even (even goals), in shooting in situations of numerical superiority (power-play goals), and in counterattack. With respect to defensive aspects, in close games, the greater number of steals and defensive success against shots from the perimeter in situations of even (goalkeeper-blocked shots) differentiate winners from losers, while the losers present a better percentage of stopping counterattacks (goalkeeper-blocked counterattacks). Games (unbalanced and very unbalanced) with a wider margin in the final score present a greater number of differences between winners and losers. In unbalanced games, the winning teams present more effective offensive and defensive actions. The discriminant analysis found that the variables goals, goalkeeper-blocked shots, and offensive fouls correctly classify more than 85% of the teams in all three types of game – close, unbalanced, and very unbalanced. It is in these three variables where coaches might look to improve their teams. However, further studies in this field should include comparisons with the new rule changes (i.e., to allow play to continue with the advantage rule at all times, no extra time, one timeout in each period of play, the time-wasting rule, etc.).

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USPOREDBA STATISTIKE IGRE KOD MUŠKIH MEĐUNARODNIH PRVENSTAVA IZMEĐU POBJEDNIČKIH I GUBITNIČKIH TIMOVA PREMA MARGINAMA POBJEDE

S A Ž E T A K

Ciljevi ovog istraživanja bili su (1) usporediti statistiku kod igre vaterpola pomoću ishoda igre (pobjedničkih i gubitničkih timova) i marginama pobjede (neizvjesna igra, neujednačena igra i vrlo neujednačena igra), i (2) utvrditi karakteristike koje obilježavaju razlike u perfomansama u svakoj skupini prema margini pobjede. Analizirani su statistički podaci dobiveni iz 308 muških utakmica odgiranih u sedam međunarodnih prvenstava (Olimpijske igre, svjetska i europska prvenstva). Klaster analizom utvrđene su tri grupe s obzirom na marginu pobjede (neizvjesne igre, neujednačene igre i vrlo neujednačene igre). Razlike između ishoda utakmice (pobjednički ili gubitnički tim) i margina pobjede (neizvjesne igre, neujednačene igre i vrlo neujednačene igre) su određene χ^2 testom, izračunavajući efektivnu vrijednost razlika. Zatim je provedena diskriminacijska analiza metodom cijepanja uzorka s obzirom na ishod igre i margine pobjede. Utvrđeno je kako statistika igre razlikuje pobjedničke timove od gubitničkih, u svakoj grupi prema konačnom rezultatu, sa 7 varijabla (ofenzivnim i defenzivnim) razlikujući pobjednika od gubitnika u neizvjesnim igrama, 16 u neujednačenim igrama i 11 u vrlo neujednačenim igrama. Kod sve tri vrste igre, statistika igre je pokazala diskriminacijske vrijednosti (85% i više), uz dvije varijable pokazane kao diskriminacijske prema ishodu (pobjedničkog i gubitničkog tima) kod sva tri slučaja: udaraca i udaraca obranjenih od strane vratara.