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ATTACK TACTICS IN ELITE BEACH HANDBALL TEAMS

TAKTIKA NAPADA V VRHUNSKIH EKIPAH ROKOMETA NA MIVKI

ABSTRACT

Beach handball is a highly popular sport, but research information and data about it is limited. The aim of this study was to determine the most effective tactics for the shots made to be more successful. Overall, 1074 attacks from the 2017 European Beach Handball Championship were analysed. The variables analysed were shots at goal and their efficiency (video-analysis). The chi-squared test was used to compare the differences between formations (initial vs final attack formation). A Wilcoxon test was used to compare differences between the final attack formations with respect to goals, misses, and goalkeeper saves. The SPSS 22 statistical package was utilized for the analysis of the results. Descriptive and inferential statistics were applied. The chi-squared test showed that, although there were significant differences between initial and final attack formations, the percentage increase and decrease was not substantial. The most frequently used initial and final attack formation was the "3 back players – one line player /specialist at the centre position" (54% in initial and 60.8% in final attacks). The Wilcoxon test comparing the attack formations with each other in relation to goals, misses, and goalkeeper saves revealed significant differences at $p<0.05$. In conclusion, attack tactics in beach handball focus mainly on the role of the "specialist".

Keywords: Beach handball, effectiveness, formations, initial attack, final attack.

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IZVLEČEK

Rokomet na mivki je zelo priljubljen, vendar pa so informacije in podatki raziskav o tem športu omejeni. Cilj te raziskave je bil opredeliti najučinkovitejše taktike strelov za čim večjo uspešnost. Analizirali smo skupno 1,074 napadov iz Evropskega prvenstva v rokometu na mivki leta 2017. Analizirane spremenljivke so vključevale strele na gol in njihovo učinkovitost (videoanaliza). Test hi-kvadrat je bil izveden za primerjavo razlik med formacijami (začetna formacija proti končni formaciji v napadu). Wilcoxonov test smo uporabili za primerjanje razlik med končnimi formacijami v napadu glede na dosežene zadetke, zgrešene strele in obranjene strele. Rezultati so bili analizirani s pomočjo statističnega programskega paketa SPSS 22. Uporabili smo opisno in inferenčno statistiko. Test hi-kvadrat je pokazal, da kljub statistično pomembnim razlikam med začetnimi in končnimi formacijami v napadu odstotek povečanja in zmanjšanja ni bil bistven. Najpogosteje uporabljena začetna in končna formacija v napadu je bila »3 beki – 1 linijski igralec/specialist na centru« (54 % v začetnih in 60,8 % v končnih formacijah napada). Wilcoxonov test, ki je primerjal med seboj formacije v napadu glede na zadetke, zgrešene strele in obranjene strele, je pokazal značilne razlike pri $p < 0,05$. Članek se zaključi z ugotovitvijo, da se taktika napada v rokometu na mivki osredotoča predvsem na vlogo »specialista«.

Ključne besede: rokomet na mivki, učinkovitost, formacije, začetni napad, končni napad

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INTRODUCTION

Sports played on the beach and especially on sand have been very successful in the last 20 years. In particular, beach handball, which began in 1992 in Italy, is gaining in popularity every year. The relatively short history of international events includes the first European Championship held in Italy (2001) and the first World Championship in Akita, Japan (2001) (Gkagkanas, Hatzimanouil, Skandalis, Dimitriou, & Papadopoulou, 2018a). The most recent World Championship took place in Kazan, Russia in July 2018 (Gkagkanas, Hatzimanouil, & Skandalis, 2018b). The recognition and growing vogue of beach handball led the Association of National Olympic Committees to include beach handball in the next World Beach Games (Hatzimanouil et al., 2018).

The rules of the game are rather different from its cousin, team handball, although the game has its origins in that traditional sport. One difference is the court on which the sport is played. Namely, this is a sand court of dimensions 27m by 12m, and is divided into three parts – two goalkeeper areas and one playing area. Another big difference is the lack of contact, and consequently the frequency of fouls. A further aspect that substantially differentiates beach handball is the numerical superiority during attack: since the goalkeeper is removed and is replaced by a field player, the so-called specialist, the attack is always at an advantage. This numerical superiority provides a clear advantage to the attacking team (4 vs 3) and is the main characteristic of the game, along with two-pointers which are goals that count for two points instead of one. Each game comprises two sets rather than two halves, and if there is a tie at the end of a set then a golden goal rule comes into effect, and if each team wins one set then the teams engage in a challenge called a 'shootout' until one team wins (Achenbach et al., 2018).

In the context of the analysis of sport, it is important to consider all the parameters that define the development of action in the game: the rules of the game, techniques, tactics, space, time, and communication (Foretić, Rogulj, & Trninić, 2010). Moreover, beach handball is an attractive game, with high intensity and a combination of speed, strength, flexibility, and complicated moves from all players, including the goalkeepers (Bělka, Hůlka, Šafář, Weisser, & Chadimova, 2015; Pueo, Jimenez-Olmedo, Penichet-Tomas, Ortega, & Espina, 2017).

Despite the fact that it is a rapidly progressing sport, beach handball did not draw, until now, sufficient scientific attention when compared with beach soccer and beach volleyball. Tactics are a vital factor of attack, and it is well known that they can affect the result of a game and that they are a crucial factor of a team's overall performance (Carmichael & Thomas, 1995). In this context, the aim of our study was to determine the most effective tactics in attack in order for the shots made during that phase to be more successful.

MATERIAL AND METHODS

Participants and procedures

The sample of the study was derived from the games of the 2017 European Beach Handball Championship which took place from June 20th through June 25th in Zagreb, near the lake of Jarun in Croatia. The six highest ranking teams in this tournament could compete in the next World Championship. The games that were included in this study occurred during the quarterfinals, semifinals, and finals of both the men's and the women's competitions. A total of 16 games were analysed (eight men's games and eight women's games). Four games (two games

for men and two games for women) were analysed in the quarterfinals, four games (two games for men and two games for women) during the semifinals and eight games on the final day (this included the final game, the game for 3rd and 4th places, the game for 5th and 6th places, and the game for 7th and 8th places, for both men and women).

In total, video-analysis was used to study 1074 attacks for the purpose of examining different attack tactics (attack formations) in each game. The variables analysed consisted of shots at the target (i.e., within the goalposts) and their efficiency (misses, goals, and goalkeeper saves) in each game. The dependent variables were the initial and final attack formations: Formation 1 – 3 back players + 1 line player /specialist at the centre position; Formation 2 – 3 back players + 1 line player / specialist on the left side of the attack (in the substitution area); Formation 3 – 3 back players + 1 line player / specialist on the right side of the attack (opposite the substitution area); Formation 4 – 4 back players + no line player / specialist on the far left side of the attack (in the substitution area); Formation 5 – 4 back players + no line player / specialist on the far right side of the attack (opposite the substitution area); Formation 6 – 4 back players + no line player / specialist at the second left position of the attack; Formation 7 – 4 back players + no line player / specialist at the second right position of the attack; Formation 8 – 3 back players + 1 line player (specialist); Formation 9 – Numerical equality in a 3vs3 formation / no specialist; and formation 10 – Numerical inferiority in a 2vs3 formation / no specialist. The independent variables were total goals, total shooting effectiveness, specialist goals (miss and penalty), total specialist effectiveness, and goalkeeper saves.

Statistical analysis

For the purpose of the study's statistical analysis, descriptive statistics were used. Specifically, the frequency and percentage of values were used, as well as the mean and standard deviation (SD). The normality of the distributions was evaluated with the Kolmogorov-Smirnov test. The chi-squared (χ^2) test was used to compare the differences between the formations of attack (initial attack formation versus final attack formation). The nonparametric Wilcoxon test was used to compare the differences between the final attack formations with respect to the number of goals, misses, and goalkeeper saves. The level of significance was set at 0.05. Calculations were done using the Statistical Package for the Social Sciences (SPSS) version 22 (IBM, Armonk, NY, USA).

RESULTS

Table 1 lists the initial and the final attack player formations, their frequency of use and their percentage of use among all attack formations. The descriptive statistics reveal that the most frequently used initial tactical attack formation was formation 1 (54%). The next most frequently used initial was formation 2 (in which the specialist is next to the substitution area) (15.5%). The most frequently used final tactical attack formation was formation 1 (60.8%). The second most frequently used final formation was formation 2 (19.8%).

The χ^2 test showed that the variable "initial attack formation" showed a difference when compared with the variable "final attack formation". In particular, in all formations we found differences ($p<0.001$) between the initial attack formation and its corresponding final formation except for attack formation 8 which did not show a difference between the initial and the final versions ($p = 0.95$). In addition, in formations number 1, 2, 3, and 10 there were increases found in the

Table 1. Initial and final attack formations.

Initial attack formations	Frequency (n)	Percent (%)	Final attack formations	Frequency (n)	Percent (%)
1	580	54	1	653	60.8
2	166	15.5	2	213	19.8
3	41	3.8	3	78	7.3
4	143	13.3	4	86	8
5	32	3	5	7	0.7
6	54	5	6	9	0.8
7	29	2.7	7	5	0.5
8	2	0.2	8	2	0.2
9	27	2.5	9	20	1.9
10	0	0	10	1	0.1
Total	1074	100%	Total	1074	100%

percentages, and there were larger reductions between the initial attack formation and the final attack formation for formations 4 (5.3%) and 6 (4.2%).

The various attack formations that were used, in a pattern in which the attack attempts to break through the defence, developed from three different points on the court. From the right side of the attack, there were 305 attempts to shoot (34.2%); from the centre, 331 (37.1%) attempts to shoot; and from the left side of the attack, 256 attempts to shoot (28.7%). A total of 892 attempts were made in order to break through the defence with a shot from some point on the court. Of those attempts, 845 were line attempts while 47 were attempts that originated not from the line but from a long distance away. Moreover, 69 of these attempts resulted a penalty throw. All 823 attempts were shots at goal. Of these, 531 (64.5%) actually scored goals, 183 (22.2%) were saved by the goalkeepers, and 109 (13.3%) hit the goalpost or went out.

Tactics, solutions, and technique within those formations led to the final attack sometimes winning penalty throws as a result of the attack effort. Specifically, of the 1074 attacks during games, 69 won penalties (6.4%). Moreover, the various attack formations led to 40 instances of losing the ball (3.7%) and 142 turnovers (13.2%). As far as the inefficacy of the attack is concerned, we observed attacks that led to errors such as the ball being stolen, but also errors caused by the pressure of the defence. Specifically, final attack formation l led to 27 instances in which the ball was stolen by the defence (67.5%), final attack formation 2 led to 6 steals (15%), final attack formation 3 led to 2 steals (5%), and final attack formation 4 led to 5 steals (12.5%). In total, there were 40 instances of steals by the defence in these four final attack formations. Additionally, final attack formation 1 led to 84 turnovers (59.2%), final attack formation 2 led to 33 turnovers (23.2%), final attack formation 3 led to 10 turnovers (7.1%), final attack formation 4 led to 8 turnovers (5.6%), final attack formation 5 led to 1 turnover (0.7%), final attack formation 6 led to 1 turnover (0.7%), final attack formation 7 led to 1 turnover (0.7%), final attack formation 8 led to 1 turnover (0.7%), and final attack formation 9 led to 3 turnovers (2.1%). In total, all final attack formations led to 142 turnovers.

Table 2 lists the frequencies and efficiency percentages of the specialist final attack formations with respect to the number of goals, saves made by the goalkeepers, and throws that ended hitting

the goalposts or went out. The greatest efficiency was shown in formation 1 in specialist goals (41.4%). On the other hand, formation 1 also showed the greatest inefficiency in misses (96.6%), and was highest in goalkeeper saves and specialist penalties (12.7% and 6.6% respectively).

Table 2. Descriptive statistics with respect to goals, saves, misses, and penalties in all specialist final attack formations.

Attack formations	Specialist goals frequency	Specialist efficiency %	Keeper saves frequency	Keeper efficiency %	Specialist misses frequency	Specialist efficiency %	Specialist penalty frequency	Specialist efficiency %
1	62	41.4	19	12.7	5	3.4	10	6.6
2	17	11.3	8	5.4	3	2	3	2
3	11	7.4	3	2	0	0	1	0.6
4	5	3.4	6	4	1	0.6	0	0
5	3	2	0	0	1	0.6	0	0
6	0	0	0	0	0	0	0	0
7	1	0.6	1	0.6	0	0	1	0.6
8	1	0.6	0	0	0	0	0	0
9	3	2	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
Total	103		37		10		15	

Table 3 lists the frequencies and percentages of the final attack formations with respect to the number of goals, the number of saves made by the goalkeepers, and the number of shots that hit the goalposts or went out. High efficiency was shown in formation 1 in goals (39.1%), saves (14.6%), and misses (7.1%).

Table 3. Descriptive statistics with respect to goals, saves, and misses in all final attack formations.

Attack formations	Goals frequency	Goals %	Saves frequency	Saves %	Misses frequency	Misses %
1	321	39.1	120	14.6	59	17.1
2	103	12.5	31	3.8	29	3.6
3	44	5.4	11	1.3	5	0.7
4	38	4.6	15	1.8	14	11.7
5	5	0.6	0	0	1	0.1
6	6	0.7	1	0.1	0	0
7	2	0.2	1	0.1	0	0
8	1	0.1	0	0	0	0
9	11	1.4	4	0.4	1	0.1
10	0	0	0	0	0	0
Total	531		183		109	

The mean values and SD of goals, saves, and misses from all games were 33.18 ± 6.09, 11.43 ± 2.63, 6.81 ± 2.28, respectively. Table 4 lists the frequencies and the percentages of goals, saves, and misses in each separate game. The table also gives the Kolmogorov-Smirnov normality test results.

Table 4. Descriptive statistics with respect to goals, saves, and misses in each game separately with the results of the normality tests of their distributions.

Nº of game	Goals	%	Test of normality	Saves	%	Test of normality	Misses	%	Test of normality
1	37	69.8	0.000	7	13.3	0.000	9	16.9	0.000
2	31	67.4	0.000	11	23.9	0.000	4	8.7	0.000
3	31	62	0.000	15	30	0.000	4	8	0.000
4	38	70.4	0.000	10	18.5	0.000	6	11.1	0.000
5	32	62.7	0.000	11	21.6	0.000	8	15.7	0.000
6	52	80	0.000	9	13.8	0.000	4	6.2	0.000
7	24	57.2	0.000	9	21.4	0.000	9	21.4	0.000
8	29	58	0.000	11	22	0.000	10	20	0.000
9	30	63.8	0.000	9	19.2	0.000	8	17	0.000
10	30	63.8	0.000	13	27.6	0.000	4	8.6	0.000
11	33	64.7	0.000	11	21.6	0.000	7	13.7	0.000
12	34	69.4	0.000	9	18.4	0.000	6	12.2	0.000
13	36	62	0.000	13	22.4	0.000	9	15.6	0.000
14	29	52.8	0.000	16	29	0.000	10	18.2	0.000
15	31	63.3	0.000	14	28.6	0.000	4	8.1	0.000
16	34	60.7	0.000	15	26.8	0.000	7	12.5	0.000
Total	531			183			109		

Table 5 presents the differences between the final attack formations with respect to the number of goals. The Wilcoxon test showed that there were significant differences in some final attack formations with respect to the number of goals that players scored.

Although generally goalkeeper saves in any final attack formation differ in number, and this depends on individual quality, the Wilcoxon test showed that the number of saves had significant differences in some final attack formations. Table 6 lists the differences in final attack formations with respect to the number of saves that were made.

Moreover, the Wilcoxon test revealed significant differences in some final attack formations with respect to the number of shots that ended hitting the goalpost or went out. Table 7 shows the differences in final attack formations with respect to the number of shots that hit the goalpost or went out.

Table 5. Differences between final attack formations with respect to the number of goals.

	Goals that were scored by all final attack formations									
	1	2	3	4	5	6	7	8	9	10
1	-									
2	321 vs 103 ***	-								
3	321 vs 44 ***	103 vs 44 ***	-							
4	321 vs 38 ***	103 vs 38 ***	44 vs 38 (ns)	-						
5	321 vs 5 ***	103 vs 5 ***	44 vs 5 ***	38 vs 5 ***	-					
6	321 vs 6 ***	103 vs 6 ***	44 vs 6 ***	38 vs 6 ***	5 vs 6 (ns)	-				
7	321 vs 2 ***	103 vs 2 ***	44 vs 2 ***	38 vs 2 ***	5 vs 2 (ns)	6 vs 2 (ns)	-			
8	321 vs 1 ***	103 vs 1 ***	44 vs 1 ***	38 vs 1 ***	5 vs 1 (ns)	6 vs 1 (ns)	2 vs 1 (ns)	-		
9	321 vs 11 ***	103 vs 11 ***	44 vs 11 ***	38 vs 11 ***	5 vs 11 (ns)	6 vs 11 (ns)	2 vs 11 *	1 vs 11 **	-	
10	321 vs 0 ***	103 vs 0 ***	44 vs 0 ***	38 vs 0 ***	5 vs 0 ***	6 vs 0 *	2 vs 0 (ns)	1 vs 0 (ns)	11 vs 0 ***	-

Note. * 0.05, ** 0.01, *** 0.001, (ns) not significant.

Table 6. Differences between final attack formations with respect to the number of saves by the goalkeeper.

	Goalkeeper saves in all final attack formations									
	1	2	3	4	5	6	7	8	9	10
1	-									
2	120 vs 31 ***	-								
3	120 vs 11 ***	31 vs 11 **	-							
4	120 vs 15 ***	31 vs 15 *	11 vs 15 (ns)	-						
5	120 vs 0 ***	31 vs 0 ***	11 vs 0 ***	15 vs 0 ***	-					
6	120 vs 1 ***	31 vs 1 ***	11 vs 1 **	15 vs 1 ***	0 vs 1 (ns)	-				
7	120 vs 1 ***	31 vs 1 ***	11 vs 1 **	15 vs 1 ***	0 vs 1 (ns)	1 vs 1 (ns)	-			
8	120 vs 0 ***	31 vs 0 ***	11 vs 0 ***	15 vs 0 ***	0 vs 0 (ns)	1 vs 0 (ns)	1 vs 0 (ns)	-		
9	120 vs 4 ***	31 vs 4 ***	11 vs 4 (ns)	15 vs 4 *	0 vs 4 *	1 vs 4 (ns)	1 vs 4 (ns)	0 vs 4 *	-	
10	120 vs 0 ***	31 vs 0 ***	11 vs 0 ***	15 vs 0 ***	0 vs 0 (ns)	1 vs 0 (ns)	1 vs 0 (ns)	0 vs 0 (ns)	4 vs 0 *	-

Note. * 0.05, ** 0.01, *** 0.001, (ns) not significant.

Table 7. Differences between final attack formations with respect to misses.

	Misses									
	1	2	3	4	5	6	7	8	9	10
1	-									
2	59 vs 29 ***	-								
3	59 vs 5 ***	29 vs 5 ***	-							
4	59 vs 14 ***	29 vs 14 *	5 vs 14 *	-						
5	59 vs 1 ***	29 vs 1 ***	5 vs 1 (ns)	14 vs 1 ***	-					
6	59 vs 0 ***	29 vs 0 ***	5 vs 0 *	14 vs 0 ***	1 vs 0 (ns)	-				
7	59 vs 0 ***	29 vs 0 ***	5 vs 0 *	14 vs 0 ***	1 vs 0 (ns)	0 vs 0 (ns)	-			
8	59 vs 0 ***	29 vs 0 ***	5 vs 0 *	14 vs 0 ***	1 vs 0 (ns)	0 vs 0 (ns)	0 vs 0 (ns)	-		
9	59 vs 1 ***	29 vs 1 ***	5 vs 1 (ns)	14 vs 1 ***	1 vs 1 (ns)	0 vs 1 (ns)	0 vs 1 (ns)	0 vs 1 (ns)	-	
10	59 vs 0 ***	29 vs 0 ***	5 vs 0 *	14 vs 0 ***	1 vs 0 (ns)	0 vs 0 (ns)	0 vs 0 (ns)	0 vs 0 (ns)	1 vs 0 (ns)	-

Note. * 0.05, ** 0.01, *** 0.001, (ns) not significant.

DISCUSSION AND CONCLUSIONS

As seen in Table 1, the commonest initial position of the attackers was formation 1 (54%), meaning that players choose a play with the specialist in the centre and the pivot inside, on the line, during the initial phase of attack. One possible reason for this preference is the ability of the specialist to shoot two-pointers without needing to attempt spin shots or in-flight shots, which makes him or her a very dangerous player for the defence (Skandalis, Hatzimanouil, Papanikolaou, Kanioglou, & Yiannakos, 2017). The next most used initial tactical formations with frequencies of occurrence of 15.5% and 13.3% were formations 2 and 4, respectively, which underlines the crucial role of the specialist in all positions of the attack. These formations have one element in common, namely the initial position of the specialist on the substitution area side, which serves to speed up his/her positioning in the attack formation.

With regard to the final attack formations, formations 1 and 2 were the most commonly used, with frequencies of 60.8% and 19.8%, respectively (Table 1). One possible reason for the preference of formation 1 is that the placement of the specialist in the centre position affords them the best possible view of the goal. As for the preference for formation 2, the reason is the speed of positioning. These findings are consistent with a previous study (Morillo-Baro, Reigal, & Hernández-Mendo, 2015) which reported that attacks in both men's and women's games develop based on the position of the specialist, and that most of the time they happen from the left side.

According to our results, and specifically the results of the χ^2 test, the only attack formation that did not show a statistically significant difference between initial and final attack positioning was

formation 8. Although, from the initial to the final attack, a team may transition from one to another of many different formations, it is obvious that one must take into consideration that the initial and the final formations are the most important of all.

Our results (not presented in the tables) showed that most of the attempts to attack were made from the centre (37.1%), but there was no great difference in those from either the right (34.2%) or the left (28.7%) sides of the court. The small difference of the centre from the other areas is logical if one considers that the 'specialist' most frequently uses the centre area, and thus in that specific court area there are two players in the attack (specialist and line player). These results are consistent with Skandalis et al. (2017) who found that, for players of this level, attempts were more frequently made from the centre. This may be because the centre offers the largest throwing angle. In addition, attack attempts originate either from the left side and end on the right or from the right side and end on the left in order to take advantage of the full area of the court by exploiting the extra player in the attack. Morillo-Baro et al. (2015) reported differences between men and women players at this level with regard to the attack attempts. Women players attempt to attack from the left side of the court while men attempt to attack from the right side.

The results of the present study also showed that most of the time (94.7%) the attempts were made from the line. Long distance attempts were infrequent (5.3%). This finding makes sense because there are more possibilities for a player to score from the line. The results also showed that the players' efficiency was 39.1%. These results contrast with those of Skandalis et al. (2017) who found that in EBT (2016) the efficiency of men and women players was 58.8%. Our results also showed that an average of 33.1 goals were scored per game. The Gehrer & Posada study (2010) showed a slightly higher number per game (36 goals for the 2010 World Championships), while Gruić, Vuleta, Bazzeo, & Ohnjec (2011), in their 2008 World Championship survey, concluded that the mean number of goals scored per game was 30.

Sometimes attack attempts resulted in a penalty. Although this shows an advantage to the attack in our results, the occurrence of this situation was infrequent (6.4%). Another important factor in the present study was that although attack has a numerical superiority that gives a clear advantage (4vs3 players), attack formations also led to 40 losses of the ball (3.7%) and 142 turnovers (13.2%), including both steals and mistakes. This likely happens not only as a result of attack inefficacy but also due to the pressure from the defence which is sometimes very aggressive with its formations. Our results show 11.4 mistakes per game, while Gruić et al. (2011) reported 17.2 technical mistakes per game. Over the course of time, the development of beach handball technique probably reduces technical mistakes. As stated by those same authors, the attackers make technical mistakes when they have inadequate technical and tactical preparation, and also when the defence's performance is effective.

Descriptive statistics with respect to the number of goals, saves, misses and penalties in all final attack formations with the specialist showed that the highest level of efficiency was achieved in formation 1. This formation was used most often. In general, one can say that in formations 1 and 2, which are the most usual, the specialist demonstrated substantial efficiency. If one takes this into consideration, one can understand why this player is very important in this game. In those same formations (1 and 2), the specialist had the most inefficiency while in the same formations the goalkeeper had the most efficiency for the shots from the specialist. These results are different from those of Skandalis et al. (2017) who found that in EBT (2016) the efficiency of the specialist

was 49.5% and the goalkeeper's efficiency was 50.4% for the shots from the specialist. Those authors found higher percentages than our results.

When all the players including the specialist are measured, the percentage efficiency of the shots decreases. Specifically, in Table 3 (with all players), one sees that in formation 1 (the formation with the most use) all the players together had efficiencies of 39.1% while the specialist had an efficiency of 41.4%. In the same formation with all the players (formation 1), goalkeeper efficiency was 14.6% while the goalkeeper's efficiency against the specialist was 12.7% (Table 2). For misses, with all players in formation 1 the percentage was 7.1%, while the percentage with only the specialist was 3.4%.

The results from considering all the players in the present study are different from those of Skandalis et al. (2017) which showed an efficiency of high-level players (men and women) of 59.2%, goalkeeper efficiency of 25.7%, and 14.9% efficiency for the shots that hit the post or went out. All the above results reflect the importance of the specialist. This explains why the game centres around the specialist, and why all the players try to pass to him or her as being the most dangerous player of the attack (Skandalis et al., 2017; Morillo-Baro et al., 2015).

Comparing the attack formations with each other with respect to the number of goals they received, saves made by the goalkeeper, and throws that hit the post or went out, the results demonstrated that formations 1 and 2 had the most significant differences in the numbers of goals relative to the other attack formations (Table 5). These formations give the specialist a clear advantage against the defence. On the other hand, formations 5 and 6 showed the least significant differences relative to the other defensive formations in terms of goals scored. In both these formations, the specialist has a clear disadvantage against the defence.

For the goalkeeper saves, the most important significant differences with the other attack formations were exhibited by formations 1 and 2 (Table 6). In contrast, the smallest significant differences relative to the other formations correspond to attack formation 6. In the case of throws that hit the goalpost or went out (Table 7), formations 1 and 2 appeared to have the most significant differences relative to the other formations, while the smallest statistically significant differences where exhibited by the attack formations 5 and 9.

Although the strong point of the present study is the high level of the games that were examined, the results must be interpreted with caution and a number of limitations should be borne in mind. The first limitation is that the sample of the present study was too small. There were few games. There is a need for further research work with a larger sample size to ensure that the sample is representative of a population and that the statistical results can be generalized to a larger population. The second limitation concerns the lack of previous research works on this subject. Therefore, the present study has the aim of developing an entirely new type of research and of identifying this gap in the literature. Obviously, given this limitation, there is a need for more development in this area in the future with a view to fully clarifying this specific issue in beach handbal.

In conclusion, we can state that teams most often use in their initial and final formations a tactic in which players choose to play with the specialist in the centre and the pivot inside on the line. Less frequently, teams decide to play in initial and in final formations with the specialist next to the substitution area. This is determined by the rules of the games – specialists' goals are worth two points which lead to the specialist on the one hand making an especial effort to gain the best

possible view of the goal, and on the other hand to use speed of positioning to give him or her an advantage. Beach handball is a sport that is constantly evolving, and this fact must motivate the scientific community to put further effort into future research so as to provide more data on the use of attack tactics in this sport.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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