

# Gender differentiation in tactical options in defense and attack on beach handball

Konstantinos Gkagkanas<sup>1</sup>✉ • Dimitris Hatzimanouil<sup>2</sup> • Vasilis Skandalis<sup>2</sup>

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## Abstract

Although beach handball comes from the sport that is played indoors it has significant differences from it. The aim of the study was to investigate and compare tactical options in both defense and attack between men and women. In 16 games from 2017 European Beach Handball Championship, 1074 attacks and defense situations were analyzed, in order to examine different attack and defense tactics. The selected method was video-analysis. The  $\chi^2$ -test was used to compare the differences between the formations in defense and attack. In defense the results showed that men use more often 3:0, 2:1C and 2:1L formations, while women use more often 3:0. From the comparison between men and women it appeared that, in the initial formation of defense, there are significant differences, while in the final tactical formation are minimal. Men, in the initial and final tactical option in attack, used the system with one pivot and the specialist in center. Women use the same formation but also the one with a pivot and specialist at the left side of the attack at the substitution area. In the initial attack formation, appeared few significant changes between men and women, while in the final tactical formation there were no changes. Finally, the final throwing attempts, men choose to make them mainly from the center while women from the right and from the ce-

nter. In conclusion, we can say that men's and women's tactical choices in defense and offense show some differences, but these differences are small.

**Keywords** Tactic's analyses • Video analysis • Sand sport

## Introduction

Beach Handball is an impressive sport that comes from the sport that is played indoors and is directly related to it (Zapardiel, Ferragut, Paramio & Lozano, 2015). This sport has significant differences from the indoor handball, such as the fact that contacts with opponents are not allowed, and that dribbling is allowed but in a different way and not the one we encounter in indoor handball ("Rules of the Game", 2017). This sport is particularly exciting because it involves a lot often, actions like inflight shots and spin-shots (360 degrees). During the game, the goalkeeper turns into a "specialist" who is the main player of the game, as his/her goals are two pointers (Skandalis, Hatzimanouil, Papanikolaou, Kanioglou & Yiannakos, 2017). Beach handball requires highly developed skills such as strength and speed, as high jumps and complex moves must be performed on a sandy pitch of at least 40 centimeters thick (Gehrer & Posada 2010).

This sport started in the early 90's and has since then flourished throughout the world with World and European competitions, held every second year ("EHF Beach Handball History", 2018). The next World Championship will be held in Kazan, Russia, with the participation of the Greek Natio-

✉ kgaganas@yahoo.com

<sup>1</sup> Teacher of Physical Education, Greece

<sup>2</sup> Aristotle University of Thessaloniki, Faculty of Physical Education and Sports Science, Thessaloniki, Greece

nal Women's Team, as well as Greek referees and observers, ranking our country into the global elite of the sport. ("USA Beach Handball", 2018; "In word beach handball championship John Meimaridis", 2018). So, the upcoming World Championship in Russia will be of great interest to Greece. In recent years, although there has been an increase in the number of scientific studies concerning team sports, in this particular sport, there is no specialized field research in areas that would help coaches, better and more effectively manage the flow and development of a match. Thus, in addition to the mere recording and frequency of the various actions of the competitors, data and information are needed to clarify technical - tactical issues and issues relating to the sport. Therefore, it is clear from the above that there is a need for reliable, valid and accurate studies presenting data on both attacking and defensive options for both men and women, particularly at high level (Morillo-Baro, Reigal, & Hernández-Mendo 2015; Rokavec, 2009).

Regarding tactics, it seems to be an important factor in team sports and affects the performance of a team and consequently the result of a match (Carmichael & Thomas, 1995). In particular, Brack (2002) reports that tactics in handball are a critical factor during the game. Skandalis et al. (2017) report that there is an increasing interest in issues that concern beach handball, including the tactics of the sport. This also led to the purpose of this study, which was to investigate and compare tactical options in both defense and attack of the national beach handball teams between men and women in the European Championship of 2017.

## Method

The field of the study was at the 2017 European Beach Handball Championship which took place in June at the lake of Jarun in Croatia and the sample came from the games of the tournament. There was a direct qualification to the next World Championship, which will take place at Kazan in Russia, for the first six teams. Finals, semifinals, quarterfinals and phase of placement games were taken under consideration for both men and women.

Totally, 16 games were analyzed (8 women games and 8 men games). From the phase of quarterfinals four games (two games for both women and men), four games (two games for both women and men) from the semifinals and eight games from the final's

day (the final, 3rd and 4th position game, 5th and 6th position game and 7th and 8th position game for both women and men). The selected method was video-analysis.

Specifically, 1074 attacks and defense situations, in order to examine different attack and defense tactics (attack and defense formations) of the game, were analyzed. In addition, we analyzed the attempts ending with a shot from some point of the court that were made so to break the defense.

The SPSS 22 (IBM, USA) statistical program was utilized for the analysis of the results and the method applied was descriptive and inferential statistics. The  $\chi^2$ -test was used to compare the differences between the formations of defense and attack (initial defense formation vs final defense formation, initial attack formation vs final attack formation). For defense we use the variables: 3 defenders aligned by the goal area line (3:0), 2 defenders aligned by the goal area line and the center defender forwarded (2:1C), 2 defenders aligned by the goal area line and the left side player forwarded (2:1L), 2 players aligned by the goal area line and the right side player forwarded (2:1R), 1 defender aligned by the goal area line and both the left side defender and the center defender forwarded (1:2LC), 1 defender aligned by the goal area line and both the right side defender and the center defender forwarded (1:2RC), the center defender aligned by the goal area line and 2 side defenders forwarded (1:2RL), all 3 defenders forwarded (0:3), man to man (MtM), equal number of players between defense and offense (EQ).

For attack we use the variables: 1. 3 back players – 1 line player /specialist at the center position, 2. 3 back players – 1 line player / specialist at the left side of the attack (at the substitution area), 3. 3 back players – 1 line player / specialist at the right side of the attack (opposite of the substitution area), 4. 4 back players – no line player / specialist at the far left side of the attack (at the substitution area), 5. 4 back players – no line player / specialist at the far right side of the attack (opposite of the substitution area), 6. 4 back players – no line player / specialist at the second left position of the attack, 7. 4 back players – no line player / specialist at second right position of the attack, 8. 3 back players – 1 line player (specialist), 9. Numerical equality 3 vs 3 / no specialist, 10. Numerical inferiority 2 vs 3 / no specialist. The level of significance was determined at 0.05.

## Results

Regarding initial and final defense formations the results showed that men use more often 3:0, 2:1C and 2:1L formations.

**Table 1.** Initial and final defense formations in men's tournament

Serial number	Initial defense Formations	Frequency	Percent %	Final defense Formations	Frequency	Percent %	
1	3:0	103*	19,1	3:0	282*	52.1	
2	2:1C	107*	19.7	2:1C	155*	28.6	
3	2:1L	113*	20.8	2:1 L	54*	10	
4	2:1R	15*	2.8	2:1R	2*	0.4	
5	1:2CL	75*	13.8	1:2CL	18*	3.3	
6	1:2CR	14	2.6	1:2CR	4	0.7	
7	1:2RL	39*	7.2	1:2RL	11*	2	
8	0:3	69*	12.7	0:3	11*	2	
9	MtM	6*	1.1	MtM	5*	0.9	
10	EQ	1	0.2	EQ	-	0	
Total		542	100%			542	100

Legend: \* Significant difference  $p < 0.001$  between initial and final defense formation

In men's tournament the  $\chi^2$ -test showed that the variable "initial defense formation" showed statistically significant difference with the "final defense formation". In particular, in all formations we had statistically significant differences  $p < 0.001$  between an initial defensive formation and its final formation (final specific formation), except for the defensive formation 1:2CR, which did not show statistically significant difference ( $p = 0.818$ ).

The results for initial and final defense formations showed that women use very often the same formations as men. More specifically women use more often 3:0, 2:1C and 2:1L formations.

**Table 2.** Initial and final defense formations in women's tournament

Serial number	Initial defense Formations	Frequency	Percent %	Final defense Formations	Frequency	Percent %	
1	3:0	253*	47.6	3:0	395*	74.2	
2	2:1C	48*	9.0	2:1C	59*	11.1	
3	2:1L	70*	13.2	2:1 L	24*	4.5	
4	2:1R	27*	5.1	2:1R	14*	2.6	
5	1:2CL	14*	2.6	1:2CL	9*	1.7	
6	1:2CR	10	1.9	1:2CR	4	0.8	
7	1:2RL	27*	5.1	1:2RL	9*	1.7	
8	0:3	72*	13.5	0:3	9*	1.7	
9	MtM	8*	1.5	MtM	7*	1.3	
10	EQ	3*	0.6	EQ	2*	0.4	
Total		532	100%			532	100

In women's tournament the  $\chi^2$ -test showed that the variable "initial defense formation" showed statistically significant difference with the "final defense formation". In particular, in all formations we

had statistically significant differences  $p < 0.001$  between an initial defensive formation and its final formation (final specific formation), except for the defensive formation 1:2CR which did not show statistically significant difference ( $p = 0.846$ ).

As regards the “initial defense formation” there were also statistically significant differences between men and women. More specifically  $\chi^2$ -test showed that in formation 3:0 ( $p = 0.000$ ), in formation 2:1C ( $p = 0.018$ ), in formation 2:1L ( $p = 0.003$ ) and in formation 0:3 ( $p = 0.021$ ) there were statistically significant differences. In all other formations we had no statistically significant differences.

Furthermore, there were also statistically significant differences in the “final defense formation” between men and women. From  $\chi^2$ -test showed it appears that that in formation 3:0 ( $p = 0.000$ ) and in formation 2:1C ( $p = 0.001$ ) there were statistically significant differences. In all other formations we had no statistically significant differences.

The results also showed that in attack formations in men’s tournament, men beach handball players use more often the formation 1 (3 back players – 1-line player /specialist at the center position).

**Table 3.** Initial and final attack formations in men’s tournament

Serial number	Initial defense Formations	Frequency	Percent %	Final defense Formations	Frequency	Percent %
1	1	406*	74.9	1	435*	80.3
2	2	32*	5.9	2	35*	6.5
3	3	27*	5	3	24*	4.4
4	4	57*	10.5	4	39*	7.2
5	5	2	0.4	5	1	0.2
6	6	4*	0.7	6	2*	0.4
7	7	6	1.1	7	-	-
8	8	-	-	8	-	-
9	9	8*	1.5	9	6*	1.1
10	10	-	-	10	-	-
Total		542	100%		542	100

In men’s tournament the  $\chi^2$ -test showed that the variable “initial attack formation” showed statistically significant difference with the “final attack formation”. In particular, in all formations we had statistically significant differences  $p < 0.001$  between an initial attack formation and its final formation (final specific formation), except for the attack formation 5 (4 back players – no line player / specialist at the far-right side of the attack (opposite of the substitution area) which did not show statistically significant difference ( $p = 0.951$ ).

Furthermore, the descriptive statistic reveals that in the initial and in the final attack formations in women’s tournament, women use more often formations 1 and 2 (3 back players – 1-line player /specialist at the center position and 3 back players – 1-line player / specialist at the left side of the attack and specifically at the substitution area).

**Table 4.** Initial and final attack formations in women's tournament

Serial number	Initial defense Formations	Frequency	Percent %	Final defense Formations	Frequency	Percent %
1	1	174*	32.7	1	218*	41
2	2	134*	25.2	2	178*	33.5
3	3	14*	2.6	3	54*	10.2
4	4	86*	16.2	4	47*	8.8
5	5	30*	5.6	5	6*	1.1
6	6	50*	9.4	6	7*	1.3
7	7	23*	4.3	7	5*	0.9
8	8	2	0.4	8	2	0.4
9	9	19*	3.6	9	14*	2.6
10	10	-	-	10	1	0.2
Total		532	100%		532	100

In women's tournament the  $\chi^2$ -test showed that the variable "initial attack formation" showed statistically significant difference with the "final attack formation". In particular, in all formations we had statistically significant differences  $p < 0.001$  between an initial defensive formation and its final formation (final specific formation), except for the attack formation 8 (3 back players – 1-line player "specialist") which did not show statistically significant difference ( $p = 0.931$ ).

In terms the "initial attack formation", there were also statistically significant differences between men and women. More specifically  $\chi^2$ -test showed that in formation 2 (3 back players – 1-line player / specialist

at the left side of the attack "at the substitution area")  $p = 0.013$  and in formation 5 (4 back players – no line player / specialist at the far-right side of the attack "opposite of the substitution area")  $p = 0.006$  there were statistically significant differences. In all other formations we had no statistically significant differences.

Finally, the results showed that there were no statistically significant differences in the "final attack formation" between men and women.

Descriptive statistic revealed that a total of 892 attempts were made in order to break the defense, ending with a shot from some point of the court.

**Table 5.** Attempts from each point of the court in all final attack formations in men's tournament

Serial number	Final attack Formations	Attempts		
		Left side	Center	Right side
1	1	113	136	120
2	2	9	15	7
3	3	5	8	5
4	4	6	17	11
5	5	0	1	0
6	6	1	0	1
7	7	0	0	0
8	8	0	0	0
9	9	0	0	4
10	10	0	0	0
		134	177	148
Total in all three			459	

**Table 6.** Attempts from each point of the court in all final attack formations in women's tournament.

Serial number	Final attack Formations	Attempts		
		Left side	Center	Right side
1	1	47	76	61
2	2	50	49	56
3	3	5	15	19
4	4	14	9	11
5	5	1	1	2
6	6	1	2	3
7	7	1	0	2
8	8	0	0	0
9	9	3	2	3
10	10	0	0	0
		122	154	157
Total in all three		433		

## Discussion

Particular for men, the regular tactical defense formation which they most often use is the 3:0, 2:1C and 2:1L systems. Regarding the final tactical formation in men, they usually use 3:0 and 2:1C in their final choice in defense. One possible explanation for the fact that the majority usually chooses the final defensive formation 3:0 is that due to mandatory numerical inferiority in defense, defenders try to cover more vital space as the attack attempts take as much space as possible. Morillo-Baro et al. (2015), reported that men are using more closed defensive formations and that they choose the defense formation 3:0. In addition from the  $\chi^2$ -test, appeared that between initial and final formation in the defense, there is great mobility. More specifically, there are a large number of transitions from one form of defense to another depending on the formation of the opponent's attack or the specific conditions of the match. Morillo-Baro et al. (2015), report that in men's tournament regarding the importance of the specialist, the defense many times in order to reduce the activity and ability of this player prefers an open defense system, mainly towards the center (because the specialist plays in the center).

Correspondingly, the results showed that women use the 3:0 system most of the time in the initial formation in defense. The same system (3:0) is used most of the time in the final defense formation. Generally speaking, women use the same tactical options as men in the initial and final defense

formations but at a lower frequency (3:0, 2:1C and 2:1L). These results are in contrast to those of Morillo-Baro et al. (2015), who reported that women are using open defensive formations. In addition to the  $\chi^2$ -test, it appeared that between initial and final formation in the defense, there is great mobility. Thus, except 1:2CR system, in all other defense systems we had either positive or negative changes between the initial or the final defensive formation. This is probably due to the fact that the defender's risk more in the initial phase than in the final phase of the defense.

From the comparison of men and women ( $\chi^2$ -test) it appeared that in the initial formation of defense, there are significant statistical differences. In particular there are differences in the 3:0, 2:1C, 2:1L, and 0:3 systems. In addition, at the final tactical choice in defense, the  $\chi^2$ -test showed that there were few statistically significant differences between men and women specifically in the 3:0 and 2:1C formations. In the final tactical defense options there were no significant changes. So, we would say that both men and women in the final tactical choice have a uniformity in the defense systems they use. However, women in the final defensive formation make greater use of the 3:0, while the 2:1C formation they are less likely to use.

For the attack we could say that results showed that in the men's tournament, in the initial and final tactical selection during attack, men were mainly using the 1 attack formation. One possible reason for this is the ability of the specialist in shooting two pointers without attempting spin shots or in flight

shots that makes him a very dangerous player for the defense (Skandalis et al., 2017).

From the  $\chi^2$ -test it appeared that between initial and final tactical formation in the attack, men, except in the formation 5, there were no significant changes. Probably this is due to the fact that the attack, in opposition to the defense is oriented to a certain tactical formation from the beginning to the end of the attack obviously because of the fact that the attack is played almost all the time with numerical superiority.

From the descriptive statistics at women, it appeared that in the initial and final tactical selection in the attack, often used formations 1 and 2. Possible explanations for the preferences is that, in formation 1 is the best possible view of the goal and for the formation 2 is the speed of positioning. These findings are consistent with the results of Morillo-Baro et al. (2015), who reported that while developed attack, women, depends on the position of the specialist. Moreover, these two formations give the specialist a clear advantage against defense. This method of developing the game in attack, both in men and women is widespread since it enables the specialist to score a two-pointer more easily when his defender is blocked (Morillo-Baro et al., 2015). From the  $\chi^2$ -test it appeared that there are significant changes between initial and final tactical selection in the attack, except for system 8, in women. This suggests that the attack in female beach handball, passes through a mobility cycle until it ends up in its final formation.

From the comparison between men and women in the initial attack option, it appeared ( $\chi^2$ -test) that there were insufficient significant changes. In particular, there were differences in formations 2 and 5. Finally, the comparison between men and women in the final tactical option from the results has shown that there were no changes. From the above it appears that the initial and final attacking options of men and women are related and do not differ greatly.

Regarding the final throwing attempts, it seems that men choose to make them mainly from the center. These results are in accordance with Skandalis et al. (2017), who found that, for the players of this level, most of the time their attempts were made from the center. Possibly that happens because the center has the largest throwing angle. On the other hand, women try most of their efforts from the right and secondly from the center. From these it is obvious that moving the ball from left to right is easier and more natural than being moved from right to left. These results are in contrast to those of Morillo-Baro et al.

(2015), who reported that female players try to attack from the left side of the court while men try to attack from the right side of the court. Skandalis et al. (2017) report that women try to attempt throws from the center of the attack.

Still, the results of this research agree with those of Skandalis et al. (2017), who reported that men have an average of throwing efforts 56 per game and women 54.2 per game. In our results, men had 57.3 and women 54.1 attempts to throw. Finally, men mostly attempt their ultimate attacking efforts with attacking formation 1, while women with attacking formations 1 and 2. This is logical because both these attacking formations give a clear advantage to the specialist to score a two-pointer (Morillo-Baro et al., 2015).

## Conclusion

In conclusion, we would say that men's and women's tactical choices in both defense and offense show some differences between them and between genders. These differences, however, we could say that they are often small. In the final defensive selection both men and women choose mainly the 3: 0 closed defense formation, while in the final attacking option both men and women often choose the formation 1, thus highlighting the decisive and important role of the specialist who is usually chosen to be positioned and used in the best possible way. Furthermore, the final attempts to throw, men choose to make them mainly from the center, while women from the right and from the center.

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