

Defense tactics in high-level teams in Beach handball

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Abstract

Beach handball is a rapidly widespread sport. Tactics can affect the performance in high level. Specifically, defense tactics in this sport is a crucial factor for the performance of a team. Research data and information so far are limited. The aim of our study was to determine the most effective tactics applied in defense. The preferred method of reporting was video-analysis. Overall, 16 games were analyzed, in total 1074 attacks, from the games of the 2017 European Beach Handball Championship, so as to examine different defense tactics (defense formations) of the game. The variables analyzed, were, the shots to the target and their efficiency. The χ^2 test was used to compare the differences between the formations of defense (initial defense formation vs final defense formation). Wilcoxon test was used to compare the differences between the final defense formations regarding to goals, post-out shots and goalkeeper's saves. The SPSS 22 statistical program was utilized for the analysis of the results and the method applied was descriptive and inferential statistics. During both initial and final position of the defenders, most of the time (33.1% and 63%), chose to be, all three, positioned by the goal area line (3:0). The χ^2 test showed that most of the time, there were statistically significant differences between the initial and final tactical defense formations. Wilcoxon test showed that the comparison of the defense formations with each other in relation to the goals, saves and post-out shots, revealed that, there are statistical differences among them $p < 0.05$. In conclusion, defense tactics in beach handball, focus mainly on defensive formations that have passive form and philosophy. It is obvious that more research is needed to provide information and scientific data, helping to clarify the defensive tactics in high level beach handball.

Keywords: Defense, tactics, Beach handball, effectiveness, formations

Introduction

Beach sports are quite widespread and appeal to a wide range of athletes, including professional athletes and simple recreational athletes. The aim of these athletes is to satisfy the need for socialization, relaxation, pleasant experiences and at the same time a sporting activity in their free time (Belka, Hulka, Safar, Weisser & Chadimova, 2015). Beach handball has been played for the first time, on a small island in southern Italy, Isola di Piondi. In the same place in 1992 was organized the first tournament, while in 1993 the first international tournament was held in Rome (Italy). Later on, in 2000, the first official European championship was held in Gaeta, Italy ("EHF Beach Handball History", 2018). The first World Championship was held in Akita, Japan in 2001 ("History of Beach Handball, 2018). The next world championship will be held in Kazan, Russia in July 2018 ("USA Beach Handball", 2018). This sport is one of the fastest growing and highly popular sports, and recently the ANOC decided to include Beach Handball in the World Beach Games in San Diego (USA) in 2019 ("Beach Handball in World Beach Games", 2017).

Beach handball is played on a 27x12m sand court. It is played by two teams. Each team consists of a goalkeeper and three field players. The goalkeeper during the attack and due to the rule of free substitutions, is changed by a field player (specialist). There are two sets of ten minutes in the game and if there is a draw, then 5 individual throws are performed by each team by turns and continue until there is a winner. This process is called a shootout ("Rules of the Game (Beach Handball)", 2017). Beach Handball is different from indoor Handball in such way that someone could tell that specific rules, like for instance the lack of physical contact and the permanent numerical superiority in attack, give a clear advantage in attack. This numeric superiority is formed with the use of the "specialist", a player who takes the place of the goalkeeper during attack (4 attacking players vs 3 defenders) (Neukum, 2008). Beach Handball is a highly attractive team sport with high intensity that combines both speed and power, but also moves that require precision and flexibility, such as, on

air and spin shots even from the goalkeepers (Pueo, Jimenez-Olmedo, Penichet-Tomas, Becerra, & Agullo, 2017; Belka et al., 2015).

As far as Greece is concerned, this sport has a great response. Recently, the International Committee of the Mediterranean Games has commissioned the city of Patra to host the 2019 Mediterranean Beach Games. This is excellent news for Greek beach handball, which will be able to make another great success at its headquarters after National Women's Silver Medal and 4th National Men's in Pescara in 2015 ("Mediterranean Beach Games of 2019", 2017). Recently the national team of Greece won the 6th place in EURO 2017 in Croatia and qualified for the World Championship to be held in Russia in 2018 in Kazan ("Hellenic Handball Federation", 2017).

Beach soccer and beach Volley, are both, thoroughly examined by researchers over the past years, a fact that someone cannot find at beach handball, where it is not possible to find enough scientific researches up to day and especially for high level tournaments. But, hopefully this will change, because of the increasing interest in different aspects of the game (Rokavec, 2009). Additionally, tactic can affect the performance and the success in team sports (Carmichael & Thomas, 1995). Specifically in team handball tactical defense plays an important role during game and is a crucial factor for the performance of a team (Brack, 2002). All these are leading to the aim of our study which is to determine the most effective tactics applied in defense, in order to make the attack less effective in relation to the outcome of the throws made during the attack.

Materials and Methods

The sample of the study was derived from the games of the 2017 European Beach Handball Championship which took place from the 20th till 25th of June in Zagreb, at the lake of Jarun in Croatia. The first 6 teams of the final placement in this tournament, go directly to the next World Championship which will take place at Kazan in Russia. The games that were taken in account, were in the phase of placement, quarterfinals, semifinals and finals of both men and women.

The preferred method of reporting was video-analysis. Overall, 16 games were analyzed (8 men games and 8 women games). Four games (two games for men and two games for women) were analyzed in the phase of quarterfinals, four games (two games for men and two games for women) were analyzed during the semifinals and eight games were analyzed at the final day (the final, the game for the 3rd and 4th position, the game for the 5th and 6th position and the game for the 7th and 8th position for both men and women). In total, it has been analyzed 1074 attacks so as to examine different defense tactics (defense formations) of the game.

The variables analyzed, were, the shots to the target (goalpost) and their efficiency (post-outshot, goal and goalkeeper's save) in each game. 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 χ^2 test was used to compare the differences between the formations of defense (initial defense formation vs final defense formation) for 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). Moreover the nonparametric Wilcoxon test was used to compare the differences between the final defense formations regarding to goals, post-out shots and goalkeeper's saves. The level of significance was determined at 0.05.

Results

The descriptive statistic reveals that the initial tactical defense formation which was used in the initial phase of the attack most of the times was 3:0 (33.1%). The next mostly used formation was with 2:1L (the player who is next to substitution area) (17%). Table 1 shows the initial defense formations. More specifically table 1 shows the initial formation of defensive players, their frequency and their percent.

Table 1. Initial defense formations

Defense Formations	Frequency	Percent %
3:0	356	33.1
2:1C	155	14.4
2:1 L	183	17
2:1R	42	3.9
1:2CL	89	8.3
1:2CR	24	2.2
1:2RL	66	6.1
0:3	141	13.1
MtM	14	1.3
EQ	4	0.4
Total	1074	100%

More over descriptive statistic reveals, that, the final tactical defense formation which was used most of the times, in the final phase of the attack, was 3:0 (63%). The second mostly used formation was 2:1C (19.9%). Table 2 shows the final defense formations. More specifically table 2 shows the final defensive formations, their frequency and their percent.

Table 2. Final defense formations

Defense Formations	Frequency	Percent %
3:0	677	63
2:1C	214	19.9
2:1 L	78	7.3
2:1R	16	1.5
1:2CL	27	2.5
1:2CR	8	0.7
1:2RL	20	1.9
0:3	20	1.9
MtM	12	1.1
EQ	2	0.2
Total	1074	100%

The χ^2 test showed that the variable "initial defense formation" showed a 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 ($p = 0.66$).

In addition, in the 3:0 and 2:1C formations, we had an increase from the initial formation of the particular defense to the final set. More specifically, in the defense formation 3:0 there was an increase of 29.9%. In the defensive formation, 2:1C increased by 5.5%. In all other defensive formations, we had a reduction in percentages with the larger reduction between the initial defensive formation and the final defensive formation, at the 0:3 with 11.2% and 2:1L by 9.7%.

The various defensive formations which were used, led the attack attempts to break the defense, to develop from three different points on the court. From the left side of the defense there were made 305 attempts to shoot (34.2%), from the center 331 (37.1%) and 256 attempts to shoot (28.7%) from the right side of the defense. A total of 892 attempts were made in order to break the defense, with a shot from some point of the court. From these efforts, 69 resulted a penalty throw. All 823 attempts were throws to the goal. From these, 531 (64.5%) scored goals, 183 (22.2%) were saved by the goalkeepers, and 109 (13.3%) hit the goalpost or went out.

Furthermore the descriptive statistic reveals that the final defense formations sometimes lead to penalties throws as a result of the attacking efforts. More specifically from 1074 attacks during game, defense conceded 69 penalties (6.4%). Moreover the various defense formations led to 40 steals of the ball (3.7%) and the attack to 142 turnovers (13.2%).

As far as the effectiveness of the defense is concerned with the ball's steals, but also with the errors of the attack caused by the impact of the defense, they are shown in Tables 3 and 4.

Table 3. Ball's steals in each final defense formation.

Defense Formations	Frequency	Percent %
3:0	16	40
2:1C	14	35
2:1 L	3	7.5
2:1R	1	2.5
1:2CL	0	0
1:2CR	0	0
1:2RL	2	5
0:3	4	10
MtM	0	0
EQ	0	0
Total	40	100%

Table 4. Attack turnovers in each final defense formation.

Defense Formations	Frequency	Percent %
3:0	84	59.2
2:1C	24	16.9
2:1 L	12	8.5
2:1R	4	2.8
1:2CL	2	1.4
1:2CR	2	1.4
1:2RL	7	4.9
0:3	5	3.5
MtM	2	1.4
EQ	0	0
Total	142	100%

Table 5 shows the frequency and percentages of the defensive formations in relation to the goals, the saves made by the goalkeepers and the throws that ended on the goalposts or went out.

Table 5. Descriptive statistics regarding goals, saves and post – out shots in all defense formations.

Defense Formations	Goals		Saves		Post-outs	
	Frequency	%	Frequency	%	Frequency	%
3:0	342	64.4	119	65.1	80	73.4
2:1C	110	20.7	28	15.3	15	13.8
2:1L	40	7.5	13	7.1	5	4.6
2:1R	3	0.6	4	2.2	3	2.7
1:2CL	14	2.6	4	2.2	4	3.7
1:2CR	2	0.4	3	1.7	1	0.9
1:2RL	5	0.9	5	2.7	0	0
0:3	6	1.2	5	2.7	0	0
MtM	7	1.3	2	1	1	0.9
EQ	2	0.4	0	0	0	0
Total	531	100%	183	100%	109	100%

Still from the Wilcoxon test it appeared that there were significant differences in some defensive formations with regard to the goals they received. Table 6 shows the differences of defensive formations in relation to the goals they received.

Table 6. Differences among defense formations regarding goals

Goals have been received by all defense formations										
	3:0	2:1C	2:1L	2:1R	1:2CL	1:2CR	1:2RL	0:3	MtM	EQ
3:0	342 vs 342 ***	342 vs 110***	342 vs 40***	342 vs 3***	342 vs 14***	342 vs 2***	342 vs 5***	342 vs 6***	342 vs 7***	342 vs 2***
2:1C	342 vs 110***	110 vs 110	110 vs 40***	110 vs 3***	110 vs 14***	110 vs 2***	110 vs 5***	110 vs 6***	110 vs 7***	110 vs 2***
2:1L	342 vs 40***	110 vs 40***	40 vs 40	40 vs 3***	40 vs 14***	40 vs 2***	40 vs 5***	40 vs 6***	40 vs 7***	40 vs 2***
2:1R	342 vs 3***	110 vs 3***	40 vs 3***	3 vs 3	3 vs 14**	3 vs 2 (ns)	3 vs 5 (ns)	3 vs 6 (ns)	3 vs 7 (ns)	3 vs 2 (ns)
1:2CL	342 vs 14***	110 vs 14***	40 vs 14***	3 vs 14**	14 vs 14	14 vs 2**	14 vs 5*	14 vs 6 (ns)	14 vs 7 (ns)	14 vs 2 (ns)
1:2CR	342 vs 2***	110 vs 2***	40 vs 2***	3 vs 2 (ns)	14 vs 2**	2 vs 2	2 vs 5 (ns)	2 vs 6 (ns)	2 vs 7 (ns)	2 vs 2 (ns)
1:2RL	342 vs 5***	110 vs 5***	40 vs 5***	3 vs 5 (ns)	14 vs 5*	2 vs 5 (ns)	5 vs 5 (ns)	5 vs 6 (ns)	5 vs 7 (ns)	5 vs 2 (ns)
0:3	342 vs 6***	110 vs 6***	40 vs 6***	3 vs 6 (ns)	14 vs 6 (ns)	2 vs 6 (ns)	5 vs 6 (ns)	6 vs 6 (ns)	6 vs 7 (ns)	6 vs 2 (ns)
MtM	342 vs 7***	110 vs 7***	40 vs 7***	3 vs 7 (ns)	14 vs 7 (ns)	2 vs 7 (ns)	5 vs 7 (ns)	6 vs 7 (ns)	7 vs 7 (ns)	7 vs 2 (ns)
EQ	342 vs 2***	110 vs 2***	40 vs 2***	3 vs 2 (ns)	14 vs 2 (ns)	2 vs 2 (ns)	5 vs 2 (ns)	6 vs 2 (ns)	7 vs 2 (ns)	2 vs 2 (ns)

Note. * 0.05, ** 0.01, *** 0.001, (ns) no significant

In addition, from the Wilcoxon test it appeared that there were significant differences in some defensive formations regarding the saves made by the goalkeeper. Table 7 shows the differences in defensive formations in relation to the saves that were made.

Table 7. Differences among defense formations regarding saves from goalkeeper.

Goalkeepers' saves in all defense formations										
	3:0	2:1C	2:1L	2:1R	1:2CL	1:2CR	1:2RL	0:3	MtM	EQ
3:0	119 vs 119	119 vs 28***	119 vs 13***	119 vs 4***	119 vs 4***	119 vs 3***	119 vs 5***	119 vs 5***	119 vs 2***	119 vs 0***
2:1C	119 vs 28***	28 vs 28	28 vs 13*	28 vs 4***	28 vs 4***	28 vs 3***	28 vs 5***	28 vs 5***	28 vs 2***	28 vs 0***
2:1L	119 vs 13***	28 vs 13*	13 vs 13	13 vs 4*	13 vs 4*	13 vs 3*	13 vs 5 (ns)	13 vs 5 (ns)	13 vs 2**	13 vs 0***
2:1R	119 vs 4***	28 vs 4***	13 vs 4*	4 vs 4	4 vs 4 (ns)	4 vs 3 (ns)	4 vs 5 (ns)	4 vs 5 (ns)	4 vs 2 (ns)	4 vs 0*
1:2CL	119 vs 4***	28 vs 4***	13 vs 4*	4 vs 4 (ns)	4 vs 4	4 vs 3 (ns)	4 vs 5 (ns)	4 vs 5 (ns)	4 vs 2 (ns)	4 vs 0*
1:2CR	119 vs 3***	28 vs 3***	13 vs 3*	4 vs 3 (ns)	4 vs 3 (ns)	3 vs 3	3 vs 5 (ns)	3 vs 5 (ns)	3 vs 2 (ns)	3 vs 0 (ns)
1:2RL	119 vs 5***	28 vs 5***	13 vs 5 (ns)	4 vs 5 (ns)	4 vs 5 (ns)	3 vs 5 (ns)	5 vs 5 (ns)	5 vs 5 (ns)	5 vs 2 (ns)	5 vs 0*
0:3	119 vs 5***	28 vs 5***	13 vs 5 (ns)	4 vs 5 (ns)	4 vs 5 (ns)	3 vs 5 (ns)	5 vs 5 (ns)	5 vs 5 (ns)	5 vs 2 (ns)	5 vs 0*
MtM	119 vs 2***	28 vs 2***	13 vs 2**	4 vs 2 (ns)	4 vs 2 (ns)	3 vs 2 (ns)	5 vs 2 (ns)	5 vs 2 (ns)	2 vs 2	2 vs 0 (ns)
EQ	119 vs 0***	28 vs 0***	13 vs 0***	4 vs 0*	4 vs 0*	3 vs 0 (ns)	5 vs 0*	5 vs 0*	2 vs 0 (ns)	0 vs 0

Note. * 0.05, ** 0.01, *** 0.001, (ns) no significant

Moreover, the Wilcoxon test revealed that there were significant differences in some defensive formations regarding the shots that ended on the goalpost or went out. Table 8 shows the differences in defensive formations in relation to the shots that ended on the goalpost or out.

Table 8. Differences among defense formations regarding post-out shots.

	Post-out shots									
	3:0	2:1C	2:1L	2:1R	1:2CL	1:2CR	1:2RL	0:3	MtM	EQ
3:0	80 vs 80	80 vs 15 ***	80 vs 5 ***	80 vs 3 ***	80 vs 5 ***	80 vs 1 ***	80 vs 0 ***	80 vs 0 ***	80 vs 1 ***	80 vs 0 ***
2:1C	80 vs 15 ***	15 vs 15	15 vs 5 *	15 vs 3 **	15 vs 4 *	15 vs 1 ***	15 vs 0 ***	15 vs 0 ***	15 vs 1 ***	15 vs 0 (ns)
2:1L	80 vs 5 ***	15 vs 5 *	5 vs 5	5 vs 3 (ns)	5 vs 4 (ns)	5 vs 1 (ns)	5 vs 0 *	5 vs 0 *	5 vs 1 (ns)	5 vs 0 *
2:1R	80 vs 3 ***	15 vs 3 **	5 vs 3 (ns)	3 vs 3	3 vs 4 (ns)	3 vs 1 (ns)	3 vs 0 (ns)	3 vs 0 (ns)	3 vs 0 (ns)	3 vs 0 (ns)
1:2CL	80 vs 5 ***	15 vs 4 *	5 vs 4 (ns)	3 vs 4 (ns)	4 vs 4	4 vs 1 (ns)	4 vs 0 *	4 vs 0 *	4 vs 1 (ns)	4 vs 0 *
1:2CR	80 vs 1 ***	15 vs 1 ***	5 vs 1 (ns)	3 vs 1 (ns)	4 vs 1 (ns)	1 vs 1	1 vs 0 (ns)	1 vs 0 (ns)	1 vs 1 (ns)	1 vs 0 (ns)
1:2RL	80 vs 0 ***	15 vs 0 ***	5 vs 0 *	3 vs 0 (ns)	4 vs 0 *	1 vs 0 (ns)	0 vs 0	0 vs 0 (ns)	0 vs 1 (ns)	0 vs 0 (ns)
0:3	80 vs 0 ***	15 vs 0 ***	5 vs 0 *	3 vs 0 (ns)	4 vs 0 *	1 vs 0 (ns)	0 vs 0 (ns)	0 vs 0 (ns)	0 vs 1 (ns)	0 vs 0 (ns)
MtM	80 vs 1 ***	15 vs 1 ***	5 vs 1 (ns)	3 vs 0 (ns)	4 vs 1 (ns)	1 vs 1 (ns)	0 vs 1 (ns)	0 vs 1 (ns)	1 vs 1 (ns)	1 vs 0 (ns)
EQ	80 vs 0 ***	15 vs 0 (ns)	5 vs 0 *	3 vs 0 (ns)	4 vs 0 *	1 vs 0 (ns)	0 vs 0 (ns)	0 vs 0 (ns)	1 vs 0 (ns)	0 vs 0 (ns)

Note. * 0.05, ** 0.01, *** 0.001, (ns) no significant

Discussion

As described in Table 1, the initial position of the defenders, most of the time (33.1%), they chose to be all three positioned by the goal area line (3:0), preferring a passive defense against the initial formation of the attackers. Probably this is because the defenders initially try to understand, more clearly, the tactic of the attack. The second most used initial tactical formation with 17% was that of the two defenders by the goal area line and the left side defender advanced (2:1L), followed by 14.4% the initial tactical formation two defenders by the goal area line and the central defender advanced (2:1C), two initial defense formations with more aggressive orientation and higher risk.

Regarding the final tactical formation of defense, Table 2 shows that, the highest percentage was presented with 3 defenders (3:0) by the goal area line (63%). Next most used tactics were with the 2:1C formation (19.9%), and the 2:1L formation (7.3%). From the above, it appears that the final defensive tactical choice in the majority of the occasions is applied by the three aforementioned formations. One possible explanation for the fact that the majority regularly chooses the final defensive formation 3:0 is that due to the mandatory numerical inferiority in defense, defenders try to cover more vital space as the attack attempts to take as much space as possible. Morillo-Baro, Reigal and Hernández-Mendo (2015) report that defense formations also depend on gender, stating that women are using more open defensive formations while men are using more closed defensive formations. The same writers report that men usually choose the defense formation 3:0. Moreover, the χ^2 test showed that there were statistically significant differences between the initial and final tactical formations in all tactical options except the defense 1:2RC. This suggests a mobility of the defensive formations from the initial phase of defense to its final phase. In particular, we would say that the defenders have a more aggressive tendency with greater risk in the initial defense formation, while in the final phase of the defense they have a more conservative and passive behavior. In particular, the strong increase in using defensive tactic 3:0 (increase from 33.1% to 63%) is probably due to decreases in the percentages of the other final tactics compared to the initial ones (0:3 and 2:1L).

Also from the results of the present study, it appeared that the overcoming of defensive formations takes place mostly from the central area, but with no big differences from left and right areas. The same conclusion that most of the efforts were made by the center came also from Skandalis, Hatzimanouil, Papanikolaou, Kanioglou and Yiannakos (2017). This is logical because the center has the biggest throwing angle. In addition, the numerically superior attack attempts to take advantage of all the areas on the court by exploiting the extra player in the attack. This is accomplished either by efforts starting from the left side and ending right, or by efforts starting from the right and ending on the left side.

Our results show that a mean of 33.1 goals is scored per game. The Gehrer and Posada (2010) study showed a slightly higher number per game, ie 36 goals for the 2010 World Championships, while Gruic, Vuleta, Bazzo and Ohnjec (2011), in their 2008 World Championship survey, concluded that the mean of goals scored per game is 30.

Still the results showed that the defense formations used during a game often lead not only to the reduced effectiveness of the attack, but also to ball steals as well as attack's mistakes. Thus, while the passive defensive defense system 3 has the highest percentage of steals (40%), yet from the cumulative analysis in Table 3 most of

the steals occur when defenses are open (60%), with defense 2:1L to dominate with a percentage 35%. Contrary to the above, it seems that the attack is led to errors mainly when the defense is 3:0 (59.2%) as showed in Table 4. The results of the present study are different than those of Gruic et al. (2011), who reported 17.2 technical mistakes per game. Our results show 11.4 mistakes per game. Probably over the course of time, the development of beach handball technique reduces technical mistakes. As stated by the above authors, the inadequate technical - tactical preparation, along with the effective defense performance lead the attackers to technical mistakes.

Also, from the descriptive statistics on the frequency and the relative percentages of goals, saves and post-outs, displayed by the various defense formations, we would say that the highest frequency and respectively the highest percentages had the defense formations 3:0 and 2:1C as shown in Table 5. This is logical due to the great use these two defense formations have had during the games. In particular, the first one was used with a percentage of 63% and the second with a percentage of 19.9% during the games and the final phase of defensive tactics. The results of this study are consistent with those of Skandalis et al. (2017), which reported an efficiency percentage of 58.8% for the attack. Our percentage was 64.5%. As for the goalkeeper's saves, Skandalis et al. (2017), reported an efficiency rate of 25.8%, while in our results was 22.2%.

With regard to the comparison of the defense formations with each other in relation to the goals they received, the saves made by the goalkeeper and the throws that ended on the post or out, from the results it appeared that, with respect to the goals as showed in Table 6, the 3 defense tactics that is, 3:0, 2:1C and 2:1L had the most significant differences with the other defensive formations. On the other hand, the 0:3, man to man and equal numbers of players between defense and offense had the fewest statistical differences with the other defensive formations in terms of goals scored.

As for the goalkeeper's saves, the most important statistical differences with the other defensive formations were again shown by the defensive tactics 3:0, 2:1C and 2:1L as shown in Table 7. On the contrary, the fewest statistical differences with the other formations were shown in the defensive formations 1:2RC, 1:2RL, 0:3 and the man to man formation.

In the case of the throws on the goalpost or those that ended out of the goal, Table 8 showed that, the formations 3:0 and 2:1C appeared to have the most significant differences with the other formations, while the fewer statistically significant differences showed the defensive formations 2:1R and man to man defense.

Conclusions

In conclusion, we would say that defense tactics in beach handball, especially at the level of national teams, focus mainly on defensive formations that have passive form and philosophy, due to the mandatory defense's numerical inferiority and attack numerical superiority. It is obvious that more research is needed to provide information and scientific data, helping to clarify the defensive tactics in high level beach handball.

References

- Beach Handball in World Beach Games*. Retrieved December 22, 2017 from: <http://www.e-handball.gr/%cf%83%cf%84%ce%b1-world-beach-games-%cf%84%ce%bf-beach-handball>
- Bělka, J., Hůlka, K., Šafář, M., Weisser, R., & Chadimova, J. (2015). Beach Handball and Beach Volleyball as Means Leading to Increasing Physical Activity of Recreational Sportspeople—Pilot Study. *Journal of Sports Science*, 3(4), 165-170.
- Brack, R. (2002). *Sportspielspezifische Trainingslehre: Wissenschafts-und objekttheoretische Grundlagen am Beispiel Handball*. Czwalina.
- Carmichael, F., & Thomas, D. (1995). Production and efficiency in team sports: an investigation of rugby league football. *Applied Economics*, 27(9), 859-869.
- EHF Beach Handball History*. Retrieved March 1, 2018 from: <http://bheuro2017.com/yac/2016/10/02/ehf-bh-history/>
- Gehrer, A. & Posada F. (2010). *Statistics from the 4th Beach Handball World Championships 2010 in Antalya*. Retrieved January 25, 2018 from: http://www.ihf.info/files/Uploads/Documents/9490Antalya2010_Statistics.pdf
- Gruic, I., Vuleta, D., Bazzo, M., & Ohnjec, K. (2011, November). Situational efficiency of teams in female part of tournament in the world beach handball championship in Cadiz. In *Proceedings 6th International Scientific Conference on Kinesiology* (pp. 524-528).
- Hellenic Handball Federation (press release)*. Retrieved December 28, 2017 from: <http://www.handball.org.gr/index.php/press-room/news/general/474-anakoinosi-oxe-28-6-2017>
- History of Beach Handball*. Retrieved February 22, 2018 from: <http://ubha.org.ua/en/about-beach-handball>
- Mediterranean Beach Games of 2019 in Patra*. Retrieved December 20, 2017 from: <http://www.e-handball.gr/category/beachhandball/>
- Morillo-Baro, J. P., Reigal, R. E., & Hernández-Mendo, A. (2015). Análisis del ataqueposicional de balonmano playa masculino y femenino mediantecoordenadaspolares.[Analysis of positional attack in beach handball male and female with polar coordinates]. *RICYDE. Revista Internacional de CienciasdelDeporte*. doi: 10.5232/ricyde, 11(41), 226-244.

- Neukum, T. (2008). *Beach Handball vs. Indoor Handball* /on line/. Retrieved February 1, 2018 from:
http://home.eSrohandball.com/ehf_files/PSblikation/WP_NeSkSm_Beach%20Handball%20vs%20Indoor%20Handball_E.pdf
- Pueo, B., Jimenez-Olmedo, J.M., Penichet-Tomas, A., Becerra M.O., & Agullo, J.J. E. (2017). Analysis of Time-Motion and Heart Rate in Elite Male and Female Beach Handball. *Journal of Sports Science and Medicine* 16, 450-458.
- Rokavec, D. (2009). *Beach Handball: application and influence on indoor handball*. Publications. Retrieved February 1, 2018 from:
http://home.eurohandball.com/ehf_files/Publikation/WP_Rokavec_BH%20application%20and%20influence%20on%20indoor%20handball_090313.pdf
- Rules of the Game (Beach Handball)*. Retrieved November 27, 2017 from:<http://www.ihf.info/en-us/thegame/statutesandregulations.aspx?catid=5>
- Skandalis, V., Hatzimanouil, D., Papanikolaou, F., Kanioglou, A., & Yiannakos, A. (2017). Effectiveness analysis in shooting in European Beach Handball Tournament (EBT) 2016. *Physical Training*, <http://ejmas.com/pt/2017/September> (electronical journal).
- USA Beach Handball to host the 2018 pan American beach handball championships*. Retrieved January 15, 2018 from:
<https://www.teamusa.org/USA-Team-Handball/News/2017/October/04/USA-BEACH-HANDBALL-TO-HOST-THE-2018-PAN-AMERICAN-BEACH-HANDBALL-CHAMPIONSHIPS>