

# **DIFFERENCES BETWEEN THE WINNING AND DEFEATED FEMALE HANDBALL TEAMS IN RELATION TO THE TYPE AND DURATION OF ATTACKS**

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## **Summary**

From the video-records of the matches of the 2010 European Women's Handball Championships in Denmark and Norway 2710 attacks were extracted for the analysis. The sample of variables contains: attack type and duration of attacks. The aim of the research was to determine the difference between the winning and defeated teams according to the observed variables.

## **Keywords**

Structural analysis, performance (situational efficiency), notation analysis, handball games, stage attacks

## **Introduction**

A complex system of handball game represents the integration of elements in handball techniques and tactics as well as their application in competitive conditions according to the rules. Diversity and a large number of active participants (players), semi active participants (referees, coaches, coaching staff) and passive participants (spectators) generate the progress of game, marked with characteristic sequences (phases) that interchange in different time periods on different space segments of handball court.

Handball match is a system in which alternate game's state interchange and they are divided into attack phase and defence phase. If those two main phases are observed in context of stability of the court, it can be said that the phase of defence has a stabilizing function while attack phase has destabilizing function (Vuleta and Gruić, 2004). The conversion between these states (transition) is an inactive for performance in attack or defence. Depending on the way of execution, and finalization, sequence of actions in the transition phase, defines the structure of the defence and attack phase. Attack in team handball can be viewed as makroevent or decomposed segment of a match consisting of a series of events (Rogulj, 2009). The attack phase of the game is a situation in which one team possesses the ball. Begins at the moment in which a team gains a property of the ball, and lasts as long as the ball is not lost. The aim of the attack is to achieve a goal by deliberate actions (Šimenc, Pavlin and Vuleta, 1998).

This study was conducted to determine which registered values of the observed variables and to what extent (types of attacks and duration of attacks) contribute to situational efficiency in team handball, i.e. to determine the difference between the winning and the defeated teams at the Championship on the basis of the observed variables.

## Methods

Sample of entities in this study is 2710 attacks registered in the European Women's Handball Championship 2010 in Denmark and Norway. For description of the entities (attacks) variables *types of attack* and the *duration of the attack* were used. Variable type of attacks is divided into three categories, namely three modalities: position, transition, and other attacks. Situational interaction of opposing players i.e. the connection between attacks and defence of the opposing team (Rogulj, 2003) is taken into the consideration in the classification of types of attacks which means the transition attacks (counter-attacks) imply an attack on an unorganized defence, and positional attacks imply an attack on organized defence. In the other group (specific) attacks there are all those attacks which by all their performance characteristics do not belong to any of the above types of attacks. Duration of attacks is defined as time in which a team is in phase of attack according to the rules of handball.

Data were collected from video records of Women's European Handball Championship 2010 in Denmark and Norway, which were available at the official internet EHF (European Handball Federation) website <http://www.ehf-euro.com/Stream.2860.0.html> #. Specially designed software that allows online statistical and video analysis of games of different sports (football, basketball, water polo) made a specific modality adjusted to team handball. For the purposes of this research into the programme defined variables have been introduced (tagged), videos were attached from games of championship, and after they were analysed individual entities or attacks were extracted. To each "sliced" attack the corresponding values or a defined set of variables were attributed. Each variable was uniquely defined.

In accordance with set objectives and metric characteristics of the variables appropriate parametric and non-parametric statistical methods were applied. Descriptive analysis of nominal variable of types of attacks was made by grouping multi-dimensional data. The data obtained are presented by contingency tables. At the same time, they are presented graphically in 3D bivariate frequency histograms and stacked graphs column and rows vertical orientation. Basic descriptive parameters (the number of entities, the arithmetic mean, minimum value, maximum value and standard deviation) were calculated for a quantitative continuous variable (duration of attack). To determine the difference between nominal variables  $\chi^2$  - test for two or more independent samples was applied. The  $\chi^2$  - test was used to determine the statistical significance differences between successful and unsuccessful teams by type of attack. Kruskal -Wallis test and univariate analysis of variance (ANOVA) were used to test the difference between a winning and defeated team according to the variable duration of attacks.

## Results and Discussion

Out of the total of 2710 attacks played, the winning team played a total of 1356 attacks, and defeated only two attacks less i.e. 1354 attacks. Recorded numerically almost identical frequencies of attacks played for the winning and defeated teams have a different structure according to the basic types of attacks (position, transition, others). Winning teams have played a total of 1057 positional attacks (PN), 236 transitional (TN) and 65 other attacks (ON). Defeated teams have played a total of 1115 positional attacks, then 177 transition and 62 other attacks.

**Table 1.** Frequency of different types of attacks for the winning and defeated teams (observed, by columns, by rows)

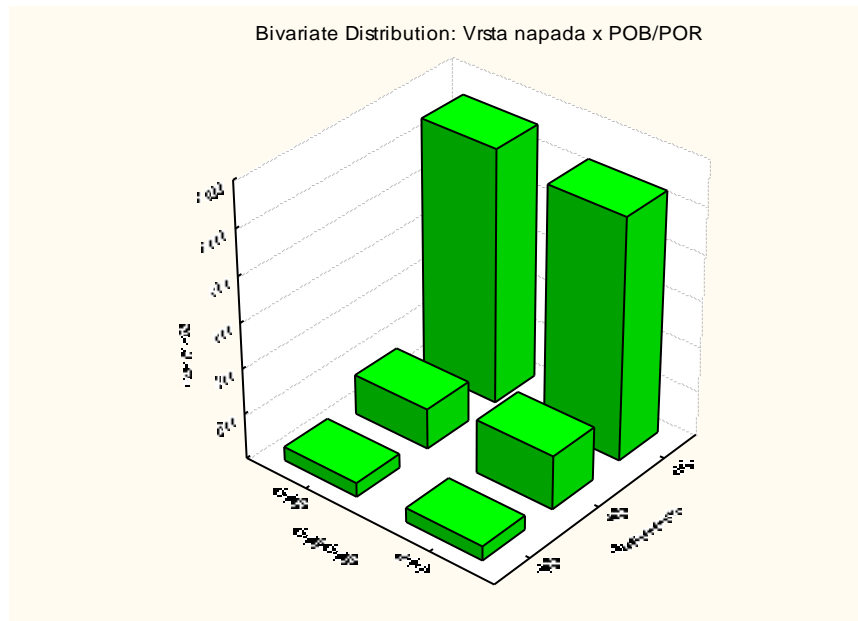
Type of Attacks	observed frequency			columns %		rows %	
	WIN	DEF	Total	WIN	DEF	WIN	DEF
PN	1057	1115	2172	77,95%	82,35%	48,66%	51,34%
TN	236	177	413	17,40%	13,07%	57,14%	42,86%
ON	63	62	125	4,65%	4,58%	50,40%	49,60%
<b>Total</b>	<b>1356</b>	<b>1354</b>	<b>2710</b>				

PN- positional attacks, TN- transitional attacks; ON- other attacks ; WIN- winning teams; DEF- defeated teams

$$\chi^2 = 9,98, df=2, p=0,01;$$

The calculated value of  $\chi^2$  - test ( $\chi^2 = 9.98$ ) suggests that the winning and the defeated teams significantly statistical differ with respect to the type of attack.

Registered ratio of structural units of handball game i.e. attacks (two attacks more for winning) indicates approximately equal conditions for success, with approximately the same number of situations that allow a change of match results. Insight into the structure of these attacks (Table 1) allows explaining the statistically significant differences of performance through positional and transitional states of handball game. Detailed insight into the obtained differences allows graphics of structure of particular attacks according recorded frequencies for successful and unsuccessful teams (Figure 1, 2, 3).

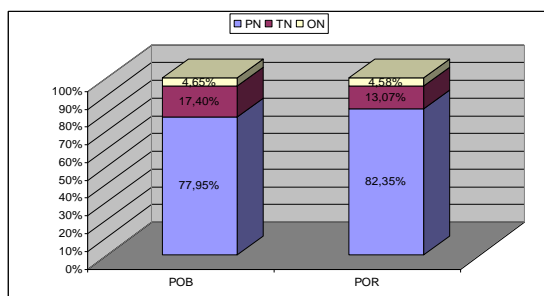


**Figure 1.** Structure of attacks types for wining and defeated teams

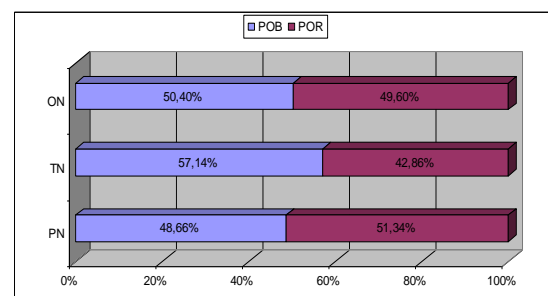
Figure 2 shows that the overall structure of the attack winning team defined by 77.95% positional attacks, 17.40% transition attack and 4.65% of other attacks, while the structure of the attack defeated team is defined by 82.35% positional attacks, 13.07% transition attack and 4.85% of other attacks.

Previous studies indicate a significantly larger number of positional than the transition attacks (Skarabalius, 2011; Šibila et al., 2011). The above mentioned also reveals that the most common segments of handball match, observed in confrontation of two teams (teams in defence / teams in attack), took place on set and organized defence (usually zonal or combined), and on the other hand organized and set game in the positional attack. Both teams used elements of individual techniques (different ways of shooting performance, fints with or without the ball, etc.), then the elements of group tactics (stabbing, double passes, different modes of exchange places ("cross") to/from the ball blocks, runs, etc.) combinations involving all players (individual, group and collective technical and tactical elements of handball game) have built and implemented positional attacks.

4.4% more of previously described positional attacks were recorded in the overall structure type of attack for defeated team in relation to the winning team. The ratio of transition attack (attack) in the overall structure of the basic types of attacks successful and unsuccessful teams indicates a greater prevalence (4.33% increases) for the winning team. Other attacks participate in defining the overall structure of the attack for winning and the defeated team with equal share.



**Figure 2.** *Type of attacks-WIN/DEF*



**Figure 3.** *WIN/DEF – Type of attacks*

The structure of certain types of attacks (positioning, transition, and others) and their classification with regard to the implementation of successful and unsuccessful teams (Figure 3) indicates that the winning team performed 48.66%, and defeated 51.34% of the total positioning attacks. The transition attacks in winning (57.14%) and a defeated (42.86%) teams reveals the greatest difference between them. Namely, the winning team carried out a 15.28% more transition attacks than the defeated team in relation to the total number of transition attack (counter-attacks). The significance of the attack on the unorganized defence as reliable indicators of the successful performance is recognized in a number of studies (Rogulj, 2003 to Kovač and Đukic (1980), Tukić (1983), Praznik (1991); Gruić, 2006; Hianik, 2008). Other attacks are nearly identical to both successfully applied different teams. In the implementation of individual, group or collective counter-attack action the biggest difference recorded in the application of the same in the winning and the defeated teams. The winning teams turned potential situations in the transition state of the handball game into transition attacks with the higher frequency of the performance than the defeated teams.

Table 2 presents the basic statistical parameters: mean, minimum and maximum values and standard deviation for the variable duration of the attack separately for the winning and defeated teams.

**Table 2.** *Descriptive statistic (duration of the attack -WIN/DEF)*

WIN/DEF	Duration of the attack				
	N	AS	Min	Max	Std.Dev.
WIN	1356	23,43	1,00	80,00	14,05
DEF	1354	23,33	1,00	81,00	13,69
TOTAL	2710	23,38	1,00	81,00	13,87

Results of Kruskal-Wallis test and analysis of variance indicated that there is no statistically significant difference in the duration of attacks between the winning and the defeated teams.

**Table 3.** *Kruskal-Wallis test and Analysis of variance*

Duration of the attack			
H=0,00	p=0,06 p=0,96	F=0,04	p=0,85

Uniformity in duration of attacks for winning and defeated teams can be explained by different quantities of the types of attacks. Namely, as the winning teams had more transition attacks than defeated teams with average slightly shorter duration and longer construction attacks i.e. longer positional attacks, there was a compensation by which average total duration of attack assumes similar number values for winning and defeated teams (Table 4).

**Table 4.** *Duration of positional and transition attacks (WIN/DEF)*

	positional attacks		transition attacks	
	N	duration	N	duration
WIN	1057	27,65	236	7,34
DEF	1115	26,32	177	7,38

Total differences between successful and unsuccessful teams stem from differences in the number of transition attacks that are based on: the efficiency of creating conditions for transition attacks and maintenance of initially created advantages that classified the attack as transition (disorganized opposing defence and created a numerical and spatial advantage in relation to the opposing team). In relation to the variable duration of the attack there were no statistically significant differences between successful and unsuccessful teams, and the possible reasons are that defeated teams failed to make the transition potential attacks and such attacks often ended up as position attacks, and thus the duration of the attack in winning and the defeated teams was approximately the same.

## **Conclusions**

This research is an attempt to clarify the situational efficiency in team handball, by analyzing the frequencies and values of the observed variables in relation to success, i.e. to establish the characteristics of successful and unsuccessful teams.

The performance efficiency observed by differences between winning and defeated teams shows that the application of a number of transitional attacks (57.14% and 42.86% winning/defeated teams) contributes to success of teams in competition. Researching the structure of team handball game well as defining factors of situational efficiency is burdened by a number of limiting factors, especially by technical complexity of the analysis of competitive conditions and by the determination of players' anthropological features which makes it difficult to determine its exact values (Rogulj, 2003).

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