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## DIFFERENCES IN ACYCLICAL ACTIVITIES OF HANDBALL PLAYERS IN DIFFERENT PLAYING POSITIONS

### 1. Introduction

The intensity and volume of work-rate or large-scale movements in team handball are very heterogeneous. During a match, acyclical (intermittent) activities (passing the ball, various kinds of shots, jumps, etc.) occur along with the player's large-scale movements (running, walking, moving sideways, etc.). In team handball loading of players is a combination of both, large-scale movements and acyclical activities. (Šibila, Vuleta & Pori, 2004)

Acyclical activities are single instant activities with different motor structure that occur during the match on their own or in connection with other acyclical activities and large-scale movements. Players perform acyclical movement with an aim of gaining the advantage in space and time over the opponent (Pori, 2003). They can be used as a beginning of cyclical movements (e.g. jump for the ball and a transition into running or handling of the ball), they can be performed during the cyclical movements (e.g. change of direction of the movement, receiving, passing, intercepting and knocking the ball out whilst running) or to conclude cyclical movements (e.g. stopping and shoving the opponent, shot on goal). Acyclical activities are during the handball match present in all the phases of the game and are performed both with and without the ball.

Several complex analyses of acyclical activities of handball players during the matches can be found in available sources (Cuesta, 1991; Kuchenbecker & Zieschang, 1992; Kotzamanidis, Chatzikotoluas, & Giannakos, 1999; Pori, 1998; Bon, 2001, Pori, 2003). Closest to the subject of present article are researches by Bon (2001) and Pori (2003). Bon (2001) used video recordings to collect, edit and analyse fourteen acyclical activities. In the attacking phase Bon found in average 1150 activities of this kind, among them 731 passes, 207 runs at the goal and 60 shots on goal. The players from the chosen sample were from the point of view of the execution of acyclical activities more active in the first half of the match. Pori (2003) used the model matches to thoroughly analyse the acyclical activities of wing players in the game model with two different defence systems. Pori found that there are no statistically significant differences between the two defence systems in variables, which describe the activities in the attacking phase (with the exception of passes and breaching the defence). Differences were noticed in defence activities, as in the 3:2:1 zone defence system twice as often stopping and shoving the attacking players and approaching the dangerous players were recorded than in the 6:0 zone defence system.

The goal of the present study was to find out the frequency of occurrence of acyclical activities in various playing positions. The aim of the research was to analyse the differences between the acyclical activities of players in different playing positions during the attacking phase of game of handball. In particular, the differences between the selected acyclical variables in the first and the second half of the game as well as in the whole match were observed.

### 2. Methodology
2.1 Sample of measured subjects

Sample of measured subjects included 72 senior male handball players (average age $23.1 \pm 4.2$ yrs; average height $189 \pm 7.2$ cm; average body mass $86.3 \pm 6.8$ kg) and was divided into six sub-samples according to their playing position in the phase of attack. 24 wing players (12 left wings and 12 right wings), 36 back players (12 left back players, 12 middle back players in 12 right back players) and 12 pivots were analysed.

2.2 Sample of variables

In the selection of the sample of variables, the research by Pori (2003) was followed. Sample of variables included seven most frequent acyclical activities in the attacking phase (pass, shot on goal, run towards the goal, fall/ recovery, block, breach of defence and jump)

2.3 Data collection

The sample of matches was represented with 12 matches from the 2007 World Handball Championships for Men in Germany. Four first-round matches, four quarter final matches, two semi finals and the matches for third and first place were analysed. All the selected matches were recorded from TV SLO (Slovenia), HRV (Croatia) and DSF (Deutche Sport Fernsehen). Data collection of acyclical activities of observed players based on the Softory match system (SILKEBORK, DENMARK).

2.4 Data analysis

Collected data were analysed with the use of selected descriptive statistical methods. Multivariate analysis of variance was used to calculate the differences between the acyclical activities of players in different attacking positions.

### 3. Results and Discussion
Table 1 shows average values of selected variables of acyclical activities separately for the first and second half and a whole match in total. Higher average values in almost all variables (with the exception blocks and breaches of defence) can be noticed for the three back players (left, right and central back player), compared to the wing and pivot players. Differences are most noticeable in variables "runs", "passes", "shots" and "jumps", as the results show two to four times higher frequency of occurrence for back players, compared to wing and pivot players. Variance analysis similarly confirms statistically significant differences in all of the chosen acyclical activities between the various attacking playing positions (see Table 2).

The result are comparable with the research by Pori (1998), who did an in-depth analysis of some of the most frequent acyclical activities in the attacking phase on a sample of nine matches from the 1997 World Handball Championships in Kumamoto, Japan. He analysed 473 attacks against the set defence and found a different average frequency of occurrence of acyclical activities during the match for various playing positions. The back players from the chosen sample have performed in average almost three times more acyclical activities in comparison to wing and pivot players.

***Table 1.*** *Average frequency of occurrence of selected acyclical activities in various playing positions*

|  |  | LW | LB | MB | RB | RW | P | X |
|---|---|---|---|---|---|---|---|---|
| Run to-wards the goal | 1H | 4,4 ± 2 | 17,8 ± 7,6 | 21,3 ± 7,4 | 15,3 ± 6,2 | 6,2 ± 1,7 | 0,4 ± 0,2 | 10,9 ± 9,1 |
|  | 2H | 3,4 ± 1,9 | 19,4 ± 7,1 | 22,8 ± 6,3 | 16,6 ± 5,5 | 4,5 ± 2,5 | 0,1 ± 0,06 | 11,1 ± 10 |
|  | EM | 7,8 ± 3,1 | 37,3 ± 12,9 | 44,1 ± 12 | 31,8 ± 10,9 | 10,7 ± 3,3 | 0,5 ± 0,3 | 22 ± 18,4 |
| Pass | 1H | 18,9 ± 7,8 | 69,4 ± 11,7 | 90,8 ± 10,5 | 73,4 ± 13,1 | 23,5 ± 7,7 | 18,8 ± 4,3 | 49,2 ± 31,1 |
|  | 2H | 17,3 ± 7 | 64,6 ± 15,7 | 86,3 ± 16 | 69,8 ± 14,2 | 25 ± 8,3 | 16,8 ± 7,8 | 46,6 ± 30,4 |
|  | EM | 36,2 ± 13,5 | 134 ± 24,9 | 177 ± 20,3 | 143,3 ± 23 | 48 ± 15,6 | 35,7 ± 11,3 | 95,8 ± 60,5 |
| Shots on goal | 1H | 3,1 ± 1,5 | 8,6 ± 2,8 | 5,8 ± 2,7 | 6 ± 2,9 | 4,4 ± 2,9 | 3,4 ± 1,9 | 5,2 ± 3,1 |
|  | 2H | 3,1 ± 1,7 | 8,5 ± 1,9 | 5,1 ± 3,4 | 5 ± 2,3 | 3,8 ± 2,4 | 3,2 ± 1,4 | 4,8 ± 2,9 |
|  | EM | 6,2 ± 3,1 | 17,1 ± 3,6 | 10,9 ± 5,9 | 11 ± 4,3 | 8,3 ± 4,7 | 6,6 ± 3,1 | 10 ± 5,4 |
| Breach of defence | 1H | 4,5 ± 1,7 | 11,4 ± 3,3 | 11,4 ± 3,7 | 9,3 ± 3,1 | 6,1 ± 2,6 | 10,3 ± 5,2 | 8,8 ± 4,2 |
|  | 2H | 3,5 ± 1,6 | 9,4 ± 4 | 11,4 ± 6,7 | 9 ± 2,6 | 5,4 ± 3,4 | 9,7 ± 4,2 | 8,1 ± 4,8 |
|  | EM | 8 ± 2,5 | 20,8 ± 6,7 | 22,8 ± 9,2 | 18,3 ± 4,1 | 11,5 ± 5,1 | 20 ± 9,1 | 16,9 ± 8,3 |
| Block | 1H | 0,2 ± 0,3 | 0,1 ± 0,3 | 1,6 ± 1,1 | 0,1 ± 0,3 | 0,5 ± 0,7 | 13,8 ± 2,8 | 2,7 ± 5,2 |
|  | 2H | 0,2 ± 0,6 | 0,3 ± 0,6 | 0,9 ± 1 | 0,7 ± 1,7 | 0 ± 0 | 13,4 ± 3,5 | 2,6 ± 5,1 |
|  | EM | 0,4 ± 0,3 | 0,4 ± 0,5 | 2,6 ± 1,3 | 08 ± 1,1 | 0,5 ± 0,8 | 27,2 ± 4,2 | 5,3 ± 5,8 |
| Fall/ reco-very | 1H | 1,8 ± 1,1 | 3,7 ± 2,3 | 3,2 ± 2 | 2,6 ± 1,9 | 2,1 ± 2 | 4,6 ± 1,3 | 3 ± 2,1 |
|  | 2H | 0,7 ± 0,6 | 3,8 ± 1,7 | 2,9 ± 2,4 | 2 ± 1,2 | 1,8 ± 1,6 | 3,5 ± 1,8 | 2,5 ± 1,9 |
|  | EM | 2,4 ± 1,6 | 7,5 ± 3,3 | 6,1 ± 3,8 | 4,6 ± 2,2 | 3,9 ± 3,3 | 8,1 ± 2,8 | 5,4 ± 3,4 |
| **Jump** | 1H | 3,2 ± 1,9 | 12,8 ± 3,8 | 6,6 ± 2,5 | 7,7 ± 3,8 | 4,5 ± 2,4 | 2,3 ± 1,7 | 6,2 ± 4,4 |
|  | 2H | 2,2 ± 1,1 | 11,5 ± 3,3 | 6,3 ± 3,4 | 8,8 ± 4,9 | 4,0 ± 2,3 | 2,8 ± 1,4 | 5,9 ± 4,5 |
|  | EM | 5,4 ± 2 | 24,3 ± 6,1 | 12,8 ± 5,1 | 16,5 ± 7,8 | 8,5 ± 4,3 | 5,1 ± 2,6 | 12,1 ± 8,4 |

*Key: LW – left wing; LB – left back; MB – middle back; RB – right back; RW – right wing; P – pivot; 1H – 1ˢᵗ half time; 2H - 2ⁿᵈ half time; EM – entire match;*

**Table 2.** *The differences in selected acyclical activities between playing positions*

| | | df | Mean square | F | Sig. |
|---|---|---|---|---|---|
| Run towards the goal | 1H | 71 | 26,6 | 31,4 | ,000 |
| | 2H | 71 | 21,6 | 51,1 | ,000 |
| | EM | 71 | 74,7 | 51,7 | ,000 |
| Pass | 1H | 71 | 92,3 | 135,8 | ,000 |
| | 2H | 71 | 147,6 | 75,5 | ,000 |
| | EM | 71 | 351,7 | 134,6 | ,000 |
| Shots on goal | 1H | 71 | 6,4 | 7,7 | ,000 |
| | 2H | 71 | 5,2 | 9,3 | ,000 |
| | EM | 71 | 17,7 | 11 | ,000 |
| Breach of defence | 1H | 71 | 11,9 | 8,5 | ,000 |
| | 2H | 71 | 16,9 | 6,3 | ,000 |
| | EM | 71 | 43,5 | 9,4 | ,000 |
| Block | 1H | 71 | 1,6 | 218,2 | ,000 |
| | 2H | 71 | 2,8 | 120,5 | ,000 |
| | EM | 71 | 7,3 | 189,8 | ,000 |
| Fall/recovery | 1H | 71 | 3,4 | 3,9 | ,004 |
| | 2H | 71 | 2,8 | 6,1 | ,000 |
| | EM | 71 | 8,7 | 6,5 | ,000 |
| **Jump** | 1H | 71 | 8,0 | 21,9 | ,000 |
| | 2H | 71 | 9,3 | 17,4 | ,000 |
| | EM | 71 | 25,3 | 26,2 | ,000 |

*Key: 1H – 1st half time; 2H - 2nd half time; EM – entire match;*

It seems that the position of middle back players is the most outstanding of all three back positions, when considering the amount of performed acyclical activities. During the matches 177 passes, 44 active runs towards the goal, 23 breaches of defence, 11 shots on goal and 13 jumps were recorded. Left and right back players have in average performed more shots on goal and jumps, which is understandable, as the middle back player is most often also a playmaker, who creates opportunities for his team players in attack.

The results of pivot players in the present research need to be viewed wisely due to the particularity of the playing position. Namely, pivot players are positioned between the opponent's defence players and are constantly obstructed, which makes it harder for pivot players to receive the ball. Therefore, the results of pivot players show significantly lower amount of passes and runs towards the goal in comparison to back players. In contrast, the number of blocks, falls and recoveries and breaches of defence point to high load rate of this playing position. Pivot players in the present research have during the matches set in average 27 blocks, fell and recovered 8 times and 20 times actively breached the defence in order to receive the ball. As previously mentioned, pivot players

perform the majority of acyclical activities in the presence of defence players, which results in hidden body contacts. Such resistance and struggle for space require activation of large amount of muscular mass and the loss of strength in the attacking phase. Similar conclusions were also found in the article by Taborski (2001).

The average values of selected acyclical activities have also been calculated for all playing positions. The results show that the players from the chosen sample performed in average 22 active runs towards the goal, 96 passes of the ball, 10 shots on goal, 17 active breaches of defence, 5 blocks, 5 falls and recoveries and 12 jumps.

## 4. Conclusion

Data about the modelling characteristics of the game in different playing positions in handball are very important from the aspect of achieving the elite results. This information contributes towards an in-depth understanding of specifics of individual playing positions and consequently leads to more precise planning of the training process. The results of the analysis show that the frequency of occurrence of acyclical activities vary for different playing positions. The amount of acyclical activities was in the majority of variables two to four times higher for back players, compared to wing and pivot players. The reasons can be found mainly in the starting positions of various playing positions. Back players are positioned in the game against the set defence in the centre of the court; their responsibility is to prepare the attack and create the opportunities for wing and pivot players. Therefore, it is understandable for their loads to be higher. The position of pivot player has to be analysed specifically, as it is very exposed despite the low number of recorded acyclical activities, due to subtle body contacts and constant struggle for space. In the analysed matches the pivot players have breached the defence 20 times and set 27 blocks.

## 5. References

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### *SUMMARY*

### *DIFFERENCES IN ACYCLICAL ACTIVITIES OF HANDBALL PLAYERS IN DIFFERENT PLAYING POSITIONS*

*The aim of the research was to analyse the differences between the acyclical activities of players in different playing positions during the attacking phase of game of handball. In particular, the differences between the selected acyclical variables in the first and the second half of the game as well as in the whole match were observed. Sample of measured subjects included 72 senior male handball players (average age 23.1 ± 4.2 yrs; average height 189 ± 7.2 cm; average body mass 86.3 ± 6.8 kg) and was divided into six sub-samples according to their playing position. Sample of variables included seven most frequent acyclical activities in the phase of attack. Data collection of acyclical activities of observed players based on the Softory match system (Silkebork, Denmark). Collected data were analysed with the use of selected descriptive statistical methods. Multivariate analysis of variance was used to calculate the differences between the acyclical activities of players in different attacking positions. Statistically significant differences between the groups of players in different playing positions were found for average frequencies of acyclical variables. Differences between the acyclical activities of back players are quite small, compared to relatively large differences between the activities of wing players and pivots. Analysis of the frequency of acyclical activities in the first and second half of the match also revealed statistically significant differences. Results show that the frequency of most often acyclical activities in the phase of attack depends on the playing position and different intervals of the game.*