

## DIFFERENCES BETWEEN PARAMETERS OF SITUATIONAL EFFICIENCY ACCORDING TO LEVEL OF COMPETITION IN CROATIAN HANDBALL LEAGUES (CASE STUDY)

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*Original scientific paper*

### Abstract

The purpose of this study was to determine differences between the parameters of situational efficiency in selected games according to the level of competition in the Croatian handball leagues. The sample consisted of 4 handball matches with 8 teams in selected league matches who play 3<sup>rd</sup> Croatian national handball league north, 2<sup>nd</sup> Croatian national handball league north, 1<sup>st</sup>B Croatian national handball league and Premier Croatian national handball league. Analysis of the players was conducted in four matches, and analysed by one game in each level of competition. With *t* - test for independent samples, there are statistically significant differences in variables blocked balls, dribbling faults and turnovers. Statistically significant differences have been established between Croatian handball leagues in this specific sample.

**Keywords:** handball, technical / tactical preparedness, handball leagues, specific and situational training

### Introduction

Handball belongs to a group of polystructural complex kinesiological activities (Milanović, 2009) where cyclic and acyclic structures of movement are dominant. Result in handball depends on cooperation between teammates which have intention to hit the goal. Positions in handball are left wing, left back, center back, right back, right wing, circle runner (pivot) and goalkeeper. All the mentioned positions are analyzed in this paper, with the exception of goalkeeper position. Depending on possession of the ball handball is divided into two phases. In phase of attack and in phase of defence, which are divided into sub-phases. Attack is a period in game where is most important to score a goal. Players in possession of the ball are time limited for implementation. Therefore is essential that attackers chose optimal choices of favourable decisions against the opposing defence. Defence in handball is a period in which opponent has the ball in his possession. Play in defence ends when: opponent scores a goal, the ball is seized in attack, player commits certain technical foul in attack or goalkeeper saves the ball (Malić, 1999). Within these typical phases of the game we can recognize different forms of technical and tactical actions in the attack and defence. These technical and tactical activities are topic of match analysis from the 3<sup>rd</sup> Croatian handball league north, 2<sup>nd</sup> Croatian handball league north, 1<sup>st</sup>B Croatian handball league and Croatian Premier league. Modern top-flight handball is characterized by high intensity activity throughout the game and emphasized dynamism, which requires a high level of functional and motor abilities of players. There is no motor or functional ability which is not important for success in handball, and considering the kinesiological features of handball, the most important are explosive strength, agility, specific strength, endurance, and coordination (Milanović, 2009).

During the match, players must be physically prepared for continuous sprints, jumps, changes of speed and direction, and explosive ball throwing (Clanton & Dwight, 1997, Marques & Gonzales-Badillo, 2006, Granados et al., 2007, Marques et al., 2007.).

Figure 1. Average distances covered by players (Bon et al., 2002)

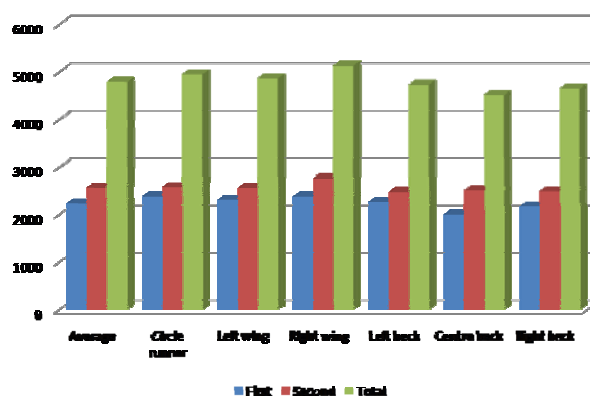
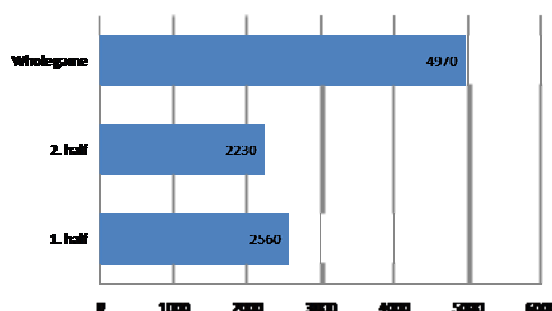


Figure 2. Average distances covered by players by positions (Bon et al., 2002)



In handball final result depends on fitness of players, but also, their interaction during the implementation of complex technical and tactical tasks during the game in which we cannot ignore impact of specific, conative traits and cognitive abilities of the participants in the game. Modern handball players require a high level of physical fitness. The proof is research in handball (Figure 2 and 3), where the gaming area is ten times smaller than in football (soccer ~ 8000 m<sup>2</sup>, handball 800 m<sup>2</sup>), but the players spend a little less than 5000 meters in motion during the game. The top-flight football teams in one game, cross between 10 and 13 kilometers (Jukic, Bok 2010, according to Mohr, Krusturp, Bangsbo, 2003, Stone 2007;). Handball players spend 7% of their games in the sprint, 25% in fast running, 31% in slow running and 37% in walking or standing (Sporiš et al., 2010). Looking inside of movement structures and heart rate during the game (Sibila et al., 2004), handball cannot be attributed separately to any energy system. Therefore it is possible to conclude that the handball is an intermittent high intensity body-contact team sport that requires a combination of aerobic and anaerobic energy sources (ATP, CP, glycogen) to perform a sequence of well-coordinated activities (Buchheit et al., 2009, Buchheit et al., 2010, Rannou et al. 2001, Souhail, 2010), where both energy sources are equally important. Teams competitive ability may be enhanced if performance can be sustained into the final minutes of play through some combination of altered tactics and the development of aerobic and anaerobic fitness (Chelly et al., 2011.). Handball game is marked by a variety of typical and atypical situations in the game which requires objective registration of particular situations in the game, and respectively the parameters of situational efficiency of each player in competition and situational conditions (Vuleta, et al., 2003). Every game is a specific manifestation of all abilities, qualities, skills and characteristics of athletes, but also of coaches and other supporting logistics. This is why the clash between two opponents produces a similar, but never the same development or course of a game result (Vuleta et al., 2005).

**Methods**

*Subjects*

Sample of this research were handball games in which we analyzed 8 handball teams with 14-16 players in each team. Compiled teams compete in Croatian handball leagues from the highest quality level of competition, Croatian Premier handball league till 3<sup>rd</sup> Croatian handball league north.

*Procedure*

We analyzed 8 handball teams in one game per league in 3<sup>rd</sup> Croatian Handball League North, 2<sup>nd</sup> Croatian handball league north, 1<sup>st</sup>B Croatian Handball League and Croatian Premier handball league. The obtained data were analyzed according to the positions and the predetermined parameters of situational efficiency. Time of a player spent in the field, as well as data for its efficacy in

situational analysis of the results is analyzed individually by positions. So the result obtained by statistical indicators of certain position is the total sum of the parameters of situational efficiency from all players which took part in analyzed game. Elements used in the analysis are divided into 8 groups of variables that represent the parameters of situational efficiency.

Table 1. Variables of situational effectiveness of players

TO	Turnovers
BS	Blocked shots
ST	Steps
WD	Wrong dribbling
BS	Basic shots
SS	Specific shots
SL	Shots with specific landing
TE	Technical errors

In variable *turnovers* we analysed all actions from attackers which finished with the ball in possession of the opposing team. *Blocked shots* were analysed as all shots on goal by the attackers which changed direction after contact with a defensive player, but did not end up in the goal, respectively goal was not scored from this action. In variable *steps* and *wrong dribbling* we have analysed all the errors that deviate from the rules of the handball game. Like too many steps in motion when a player has ball under control and all the mistakes that were made during the dribble. *Shots with specific landing* were recorded at each landing after a shot on goal, except from one feet landing and two foot landing that ended without touching the ground with arms, chest or back. In variable *basic shots* we analysed every shot on goal, which belongs to the basic shot in handball, while all the other shots were recorded in variable *specific shots*. A variable *technical errors* consists of passive play, violation of the goal-area line and offensive foul.

*Data analysis*

The statistical Package for Social Sciences SPSS (v18.0, SPSS Inc., Chicago, IL) was used for the statistical analysis. Central and dispersion parameters, arithmetic mean (AM) and standard deviation (SD) were calculated in selected matches of Croatian handball leagues. Normality of distribution was checked by the Kolmogorov - Smirnov test. Differences between the level of competition in Croatian handball leagues were tested by t - test for independent samples and the level of significance was set at p < 0,05.

**Results**

In Table 2. there are arithmetic means of the analyzed variables with the corresponding standard deviation. In order to determine statistical significance for selected matches of Croatian handball leagues, they are divided into four groups. Groups are numbered from 1 to 4 for easier interpretation of results for selected games in Croatian handball leagues. Abbreviations in further text: • Premier Croatian handball league - Premier

CHL; • 1.B Croatian handball league – 1.B CHL; • 2<sup>nd</sup> Croatian handball league North - 2 CHL-N; • 3<sup>rd</sup> Croatian handball league North - 3 CHL-N.

## Discussion

Statistically significant differences are established in the variable *turnovers* between 3 CHL-N and the first two leagues according to quality in Croatia Premier CHL and 1.B CHL. The differences are explained by weaker technical level in the lowest league, as well as reduced number of trainings overall and reduced number of technical trainings in microcycle compared to the teams from higher levels of competition (Buchheit, 2009). A large number of turnovers can also be interpreted by lower tactical knowledge as well as already mentioned deficits in microcycle preparations where teams from lower leagues do not spend enough time on activities with emphasis on technical and tactical training (Rogulj, 2011). Data analysis from the World Championship in Egypt in 1999 (Rogulj, 2000), are obtaining  $13.60 \pm 4.41$  turnovers in one game, but the result is much higher than the results obtained in Table 2. The reason for this is that variables *turnovers* are defined as any action in the attack that led to the change of possession in this research, whether it is a technical error, or the decisions of referees in favour of the defending team. In variables *blocked shots*, *steps*, *wrong dribbling*, *basic shooting* and *shots with specific landing* statistically significant differences were not established in any of the analyzed Croatian handball league matches. Variable *blocked shots* is determined by way of playing in defence, especially game system in the defence, and the density, depth and width of team defensive play (Šimenc et al., 1998). For example, in a shallow 6:0 defence there will be certainly more blocked shots during the game than in 3:3 defence (Vuleta, 1997). Because of these statements there are no statistically significant differences in any of the analyzed matches in variables *blocked shots*. According to the results of previous research from the World Handball Championship in 1999 in Egypt, there was  $3,30 \pm 2.67$  blocked shots in one game (Rogulj, 2000). The results obtained in Table 2 show lower figures in Croatian handball leagues ( $0.83 \pm 0.75$  /  $1.17 \pm 1.32$  /  $0.67 \pm 1.21$  /  $0.67 \pm 1.03$ ) compared to the results in top level handball. Variables *steps* and *wrong dribbling* are in domain of referees. As a handball referee in Croatian highest leagues I had noticed that referees in lower leagues made some mistakes during the game. According to this, results could have been different. But in this article, all analysed data was recorded only when it was clear referees decision or clear situation in the match. If we look at descriptive parameters of previously mentioned variables, we come to conclusion that there are no statistically significant differences between the leagues in those technical elements of handball game. According to the results of previous research (Vuleta et al, 1997) and analysis of team RK Medveščak from Zagreb, which was analyzed in the 1995/1996 season, in which they won first place in 1.B Croatian handball

league in variable *steps* and *wrong dribbling* there were no statistically significant differences in any level of competition. In variable *specific shots* there are statistically significant differences between 1.B CHL and 2. CHL-N, and 1.B CHL and 3. CHL-N. Specific shooting is result of long-term and planned specialization and technical preparation in handball. Players use specific shooting for "impossible" situations in game where a goal can be scored only on this way. Although attractive for the audience in some situations specific shooting is uncatchable for goalkeepers. Specific act of shooting is used less than the basic shooting in handball. For example ratio in Premier CHL between basic shots and specific shots was  $12.50 \pm 3.56$  to  $3.67 \pm 3.67$ , in 1.B CHL ratio was  $12.67 \pm 3.88$  to  $5.33 \pm 1.50$  in 2. CHL-N ratio was  $10.67 \pm 6.25$  to  $2.00 \pm 2.00$ , and in 3. CHL-N ratio was  $14.33 \pm 6.15$  to  $2.17 \pm 1.60$ . In analysis of situational efficiency in this paper variable *technical error* is different from the variables of technical errors that have been used in previous studies by other authors. Most authors describe the variables mentioned above the following technical errors: Violation of the goal-area line, offensive foul, subtraction of ball due to passive play (lack of activity in the attack), error in steps, wrong dribbling, turnovers and other technical errors. This thesis's variable technical errors consists of violation of the goal-area line, offensive foul and subtraction of ball due to passive play (lack of activity in the attack). While other technical errors such as steps, wrong dribbling and turnovers are defined and analyzed as separate variables. A statistically significant difference was established in the variable technical errors between 1.B CHL and 3. CHL-N. Like all the previously mentioned statistically significant differences, this one is also characterized by greater technical and tactical knowledge of players in the league of higher quality. Also a great impact on the analysis of this variable is handball referees knowledge, because the elements of violation of the goal-area line, offensive foul and subtraction of ball due to passive play (lack of activity in the attack) are in the jurisdiction of referee pair. Differences in the parameters of situational efficiency according to the level of competition in selected matches of Croatian handball league authors of this paper explain it with the differences between training volume in the annual cycle of training of individual teams, where teams training volume is much greater in higher leagues than in lower leagues (Srhoj, 2002). Teams from 3<sup>rd</sup> league train two to three times a week, while top teams in the Premier CHL train twice a day. Exceptions are during pre-season period when number of daily training sessions reaches number of three trainings. When you take a detailed look at lower league teams annual cycle training, it is impossible in week's few sessions to develop and maintain all needed abilities and characteristics that are relevant to success in handball according to equation of success in handball. Top teams, as well as those of medium quality spend up to 60% of their training time in technical and tactical training, and implementing the specific situation and the training activities.

## Conclusion

The purpose of this study was to determine differences between the parameters of situational efficiency in selected games according to the level of competition in the Croatian handball leagues. The sample consisted of 4 handball matches with 8 teams in selected league matches who play 3<sup>rd</sup> Croatian national handball league north, 2<sup>nd</sup> Croatian national handball league north, 1<sup>st</sup>B Croatian national handball league and Premier Croatian national handball league. Central and dispersion parameters, arithmetic mean (AM) and standard deviation (SD) in selected matches of Croatian handball league were calculated. Normality of distribution was verified with Kolmogorov - Smirnov test. The differences between the selected matches according to level of competition have been tested by t - test for independent samples and the level of significance was set at  $p < 0.05$ . With expert analysis of video recording of handball games parameters of situational efficiency can be a great help to coaches in planning and programming the annual training cycle.

Team that wants to progress from lower to higher league, except morphological, motor and functionally specific abilities and characteristics (with necessary normal health status of handball player) for each league, according to level of competition should spend as much time in specific and situational training. Therefore, task of trainers is to ensure sufficient number of trainings with increased volume (extensity and intensity) in the annual cycle of training. Training must be directed on technical and tactical preparedness of players, not neglecting basic and multilateral preparedness which are fundamental for all further upgrades in the level of the game. In Croatian handball leagues there are official statistics only in the Premier League and in 1<sup>st</sup> Croatian handball league for women. Coaches in lower leagues are forced to note their own statistics and parameters of situational efficiency. Additionally it can be concluded that keeping statistics in handball, or situational efficiency parameters can contribute to a better and more comprehensive development and the popularization of handball.

Table 2. Descriptive parameters (Mean  $\pm$  standard deviation)

	1	2	3	4
Varijable	Premier	1 <sup>st</sup> B CHL	2 <sup>nd</sup> CHL-N	3 <sup>rd</sup> CHL-N
IL	1,83 $\pm$ 1,83	1,83 $\pm$ 1,16	3,83 $\pm$ 3,25	5,00 $\pm$ 3,09\$®
BŠ	0,83 $\pm$ 0,75	1,17 $\pm$ 1,32	0,67 $\pm$ 1,21	0,67 $\pm$ 1,03
KO	0,50 $\pm$ 1,22	0,33 $\pm$ 0,51	0,67 $\pm$ 0,51	0,17 $\pm$ 0,40
PV	0,17 $\pm$ 0,40	0,33 $\pm$ 0,51	0,33 $\pm$ 0,51	0,50 $\pm$ 0,83
OŠ	12,50 $\pm$ 3,56	12,67 $\pm$ 3,88	10,67 $\pm$ 6,25	14,33 $\pm$ 6,15
SŠ	3,67 $\pm$ 3,67	5,33 $\pm$ 1,50	2,00 $\pm$ 2,00#	2,17 $\pm$ 1,60®
UP	3,83 $\pm$ 4,57	4,83 $\pm$ 4,16	2,83 $\pm$ 1,32	1,50 $\pm$ 1,64
TP	1,00 $\pm$ 0,89	0,50 $\pm$ 0,54	0,83 $\pm$ 0,75	2,00 $\pm$ 1,26®

\* $p < 0,05$  Statistical significant difference: \* - 1-2; # - 1-3; \$ - 1-4; # - 2-3; ® - 2-4; ∞ - 3-4  
TO – Turnovers, BS – Blocked shots, ST – Steps, WD – Wrong dribbling, BS – Basic Shots, SS – Specific shots, SL Shots with specific landing, TE – Technical errors

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## RAZLIKE IZMEĐU PARAMETARA SITUACIJSKE UČINKOVITOSTI U SKLADU S RAZINOM NATJECANJA U HRVATSKOJ RUKOMETNOJ LIGI (STUDIJA SLUČAJA)

### Sažetak

Svrha ovog istraživanja je bila utvrđivanje razlika između parametara situacijske učinkovitosti u odabranim utakmicama sukladno razini natjecanja u Hrvatskoj rukometnoj ligi. Uzorka se sastojao od 4 rukometne utakmice sa 8 momčadi u odabranim susretima koji su igrani u Trećoj Hrvatskoj nacionalnoj ligi - Sjever, Drugoj Hrvatskoj nacionalnoj ligi - Sjever, Prvoj B Hrvatskoj nacionalnoj ligi i Premijer Hrvatskoj nacionalnoj ligi. Analiza igrača izvršena je u 4 utakmice kao i analiza jedne utakmice u svakoj razini natjecanja. T-testom za nezavisne uzorke dobivene su statistički značajne razlike u varijablama blokiranih lopti, pogrškama u vođenju lopte i izgubljenim loptama. Statistički značajne razlike su utvrđene između Hrvatskih rukometnih liga u specifičnim uzorcima.

**Ključne riječi:** rukomet, tehnička / taktička priprema, rukometne lige, specifični i situacijski trening

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