# Longitudinal Study on the Effectiveness of the Game Actions in Women's Handball at the Olympic Games (2004-2016)

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**Abstract**

This study may lead to the identification of the elements that indicate trends of women's handball for the period 2004-2016, thus creating the conditions for determining the principles for achieving training and participation in high level competitions. As a result of comparing the data obtained from the analysis performed, should be reconsidered margins actions efficiency benchmarks monitored to be useful in training and competition, by requiring reconsideration model performance handball game at senior level. Given that the survey covers the four editions of the Olympic Games and analyzed data obtained high degree of veridicity and which parts may be used for the following competitions.

*Keywords: handball, statistics, performance, Olympic Games*

## 1. Introduction

Handball was included in the Olympic program for the first time at the summer edition of the O.G. in Berlin 1936 as a demonstrative sport for males. In the women's first presence in the program is at O.G. Montreal 1976 in which 6 teams were present. The number of participating teams has gradually increased from 6 (1976-1984) to 8 (1988-1996), then at 10 (2000-2004) and since 2008 the Olympic handball tournament brought together 12 teams.

To neutralize distance shooters actions a number of solutions should be taken that take into account certain criteria: modifying space factors (to occupy trajectories of the player, spaces, changes of spaces, places of penetration, places exchange); modifying temporal factors (moments of intervention, speed of execution, accelerations of the movements); modifying modal factors (to vary the executive models, tactical means used the type of action, throwing arm´s trajectory) (Antón García J.L., 2014, p. 19).

Increasing the number of goals scored is a result of increasing the number of attacks as a result of shortening the attack time and marking goals on fast break; these are supported by dynamic and speed up game principles. To meet these requirements in the current handball, players must meet the new requirements of physical, technical and tactical required rapid and sustained pace of the game (Sevim, 2008, pp. 1-3, 31).

There is a correlation between the performance of the top teams and anthropometric parameters of players because a greater palm opening provides easy grip the ball and more confidence in throwing and a long arm and a good mobility is essential in achieving fast and effective shots (Skoufas, Kotzamanidis, Hatzikotoylas et al, 2003, pp. 469-484).

Achieving sports performance is based on the conception and implementation of the game strategy being developed optimal patterns of play are built and adapted to training models which determine the potential performance of the team. Factors that determine performance in the game of handball are explosive and fast actions, the maximal aerobic power and maximal aerobic speed, ability to perform supramaximal efforts in situations of incomplete recovery; they must be integrated in the optimization process of high-level training in handball (Leuciuc, 2012, pp. 9, 24).

To achieve the performance and training objectives, the body must adapt to specific handball effort resulted in optimal dosages of volume, intensity and complexity of training requests, because these three parameters vary from one moment to another of the game (Ghervan, 2006, p. 16).

## 2. Material - method

Determination of the effectiveness of the teams participating at the Olympic Games may be a reference to the revaluation model in play at senior level high performance handball.

This study may lead to the identification of elements that indicate trends of female handball for the period 2004-2016, thus creating the conditions for determining the principles for achieving training and participation in high level competitions.

In carrying out the study the main methods used were bibliographical research and statistics. The bibliographic method was used to study because of the analyses conducted by EHF and IHF lecturers. The statistical method was used to process the data supplied by IHF for Olympic Games after deployment and game actions quantified we used in the study.

## 3. Results and discussions

The game actions that provided the statistical analysis are: shots efficiency (6m, wing, 9m, 7m, fast break), goalkeepers efficiency, interception and blocked balls.

For these actions analysis was performed as follows: for all the participating teams (10 or 12), places 1-4, places 1-8 (Tables 1-3).

Table 1 Game actions efficiency for all teams

| Edition | Statistical parameters / Game actions | Shots efficiency (%) | | | Shots efficiency (%) | 7m shots efficiency (%) | Fast break efficiency (%) | Goalkeeers efficiency (%) | Interceptions (no.) | Blocked shots (no.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 6m | wing | backcourt | | | | | | |
| 2004 | X | 61.90 | 51.10 | 32.70 | 53.40 | 75.70 | 69.50 | 34.11 | 49.30 | 16.50 |
| 2008 | X | 67.08 | 50.50 | 34.33 | 52.17 | 68.83 | 66.25 | 33.33 | 36.92 | 23.58 |
| 2012 | X | 71.83 | 54.75 | 35.42 | 55.58 | 71.08 | 76.33 | 31.75 | 28.25 | 15.75 |
| 2016 | X | 61.42 | 50.58 | 34.25 | 55.25 | 75.58 | 74.92 | 31.50 | 16.83 | 12.83 |
| | **X** | **65.56** | **51.73** | **34.18** | **54.10** | **72.80** | **71.75** | **32.67** | **32.83** | **17.17** |
| | **S** | **4.90** | **2.03** | **1.12** | **1.60** | **3.41** | **4.70** | **1.25** | **13.72** | **4.56** |

Table 2 Game actions efficiency for places 1-4

| Edition | Statistical parameters / Game actions | Shots efficiency (%) | | | Shots efficiency (%) | 7m shots efficiency (%) | Fast break efficiency (%) | Goalkeeers efficiency (%) | Interceptions (no.) | Blocked shots (no.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 6m | wing | backcourt | | | | | | |
| 2004 | X | 65.50 | 56.50 | 31.25 | 55.25 | 77.00 | 73.50 | 37.25 | 59.50 | 22.75 |
| 2008 | X | 68.50 | 53.75 | 39.00 | 56.75 | 69.50 | 68.00 | 36.25 | 41.75 | 29.50 |
| 2012 | X | 68.75 | 60.25 | 36.75 | 55.75 | 67.75 | 69.75 | 34.75 | 33.25 | 18.25 |
| 2016 | X | 65.50 | 56.25 | 36.75 | 59 | 75.75 | 73.00 | 34.25 | 24.00 | 20.50 |
| | **X** | **67.06** | **56.69** | **35.94** | **56.69** | **72.50** | **71.06** | **35.63** | **39.63** | **22.75** |
| | **S** | **1.81** | **2.68** | **3.30** | **1.66** | **4.56** | **2.63** | **1.38** | **15.10** | **4.86** |

Table 3 Game actions efficiency for places 1-8

| Edition | Statistical parameters / Game actions | Shots efficiency (%) | | | Shots efficiency (%) | 7m shots efficiency (%) | Fast break efficiency (%) | Goalkeeers efficiency (%) | Interceptions (no.) | Blocked shots (no.) |
|---------|------------|-------|-------|-----------|------|-------|-------|-------|-------|-------|
| | | 6m | wing | backcourt | | | | | | |
| 2004 | X | 62.50 | 53.25 | 31.63 | 54.75 | 76.63 | 72.88 | 35.63 | 52.75 | 18.38 |
| 2008 | X | 69.63 | 52.38 | 35.75 | 54.13 | 70.38 | 68.88 | 34.75 | 42.50 | 27.00 |
| 2012 | X | 72.25 | 56.25 | 37.88 | 58.88 | 71.00 | 77.63 | 34.38 | 32.63 | 16.75 |
| 2016 | X | 64.63 | 51.38 | 35.75 | 58.25 | 79.25 | 77.13 | 32.50 | 20.63 | 16.00 |
| | **X** | **66.90** | **53.95** | **34.45** | **56.50** | **74.85** | **74.00** | **34.90** | **41.60** | **20.18** |
| | **S** | **3.95** | **2.31** | **2.89** | **2.41** | **3.94** | **3.56** | **1.74** | **15.54** | **4.63** |

The average efficiency of shots for all teams was 54.1% (minimum-52.17%, maximum-55.25%), the standard deviation is 1.6, which indicates very good homogeneity. For places 1-4, the average efficiency was 56.69% and for first 8 ranked was 56.5%. Very little visible difference between the averages of the first 4 and first 8 ranked teams, compared with the average of the all participating teams, which is 2.5% lower (Figure 1).

Analyzing shots efficiency according to the playing post, the best efficiency have shots from central 6m line (65.56% -67.06%), followed by wing shots (51.73% -56, 69%) and then shots from the 9m line (34.18% -35.94%) (Tables 1-3).
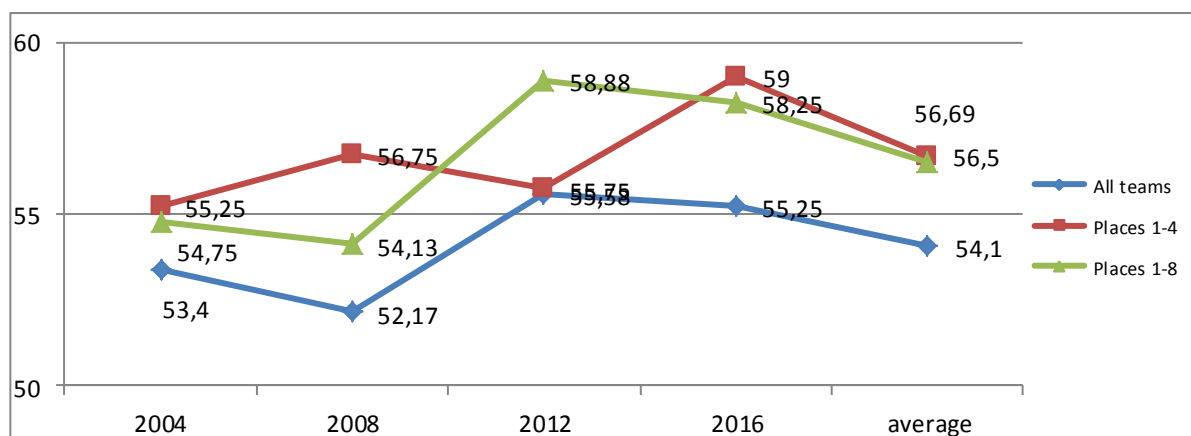


Figure 1 Shots efficiency

In the case of the 7m shots, the average of all participating teams is superior comparing to the first 4 ranked (+ 0.3%) because the average of the 8 top ranked teams was higher than of the other two categories analyzed (74.85%) (Figure 2).
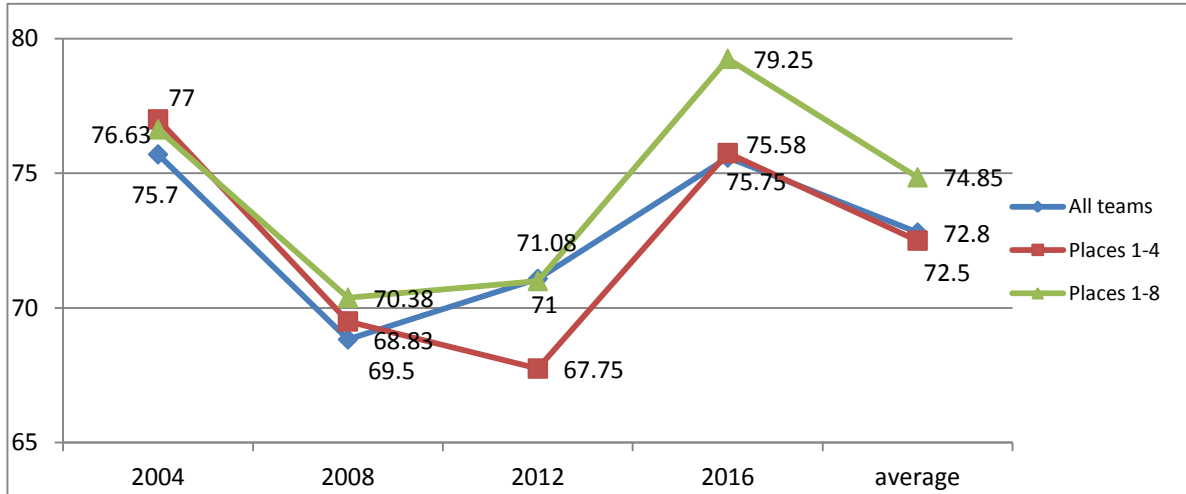
Figure 2 7m shots efficiency

The efficiency of the fast break indicated the best performance for the first 8 ranked teams (74%), followed by all teams participating (71.75%) and then the first 4 ranked (71.06%) (Figure 3).
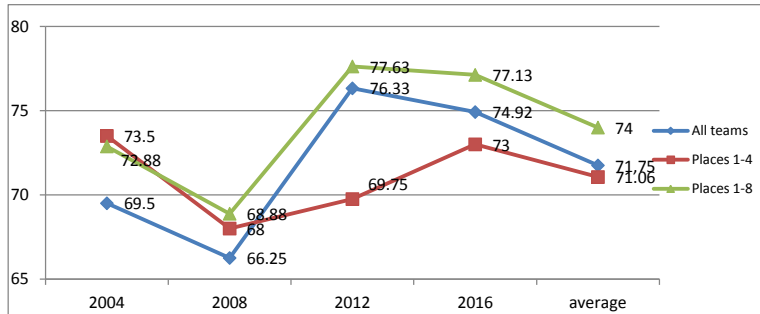


Figure 3 Fastbreak efficiency

Goalkeepers efficiency can be crucial to occupy a better position in the final ranking and the analysis performed on the 3 categories indicates this thing: first 4 ranked - 35.63%, first 8 ranked - 34.9%, all teams – 32.67%. In the case of the close teams value, goalkeepers can make the difference in the game, with effects reflected in their position in the final (Figure 4).
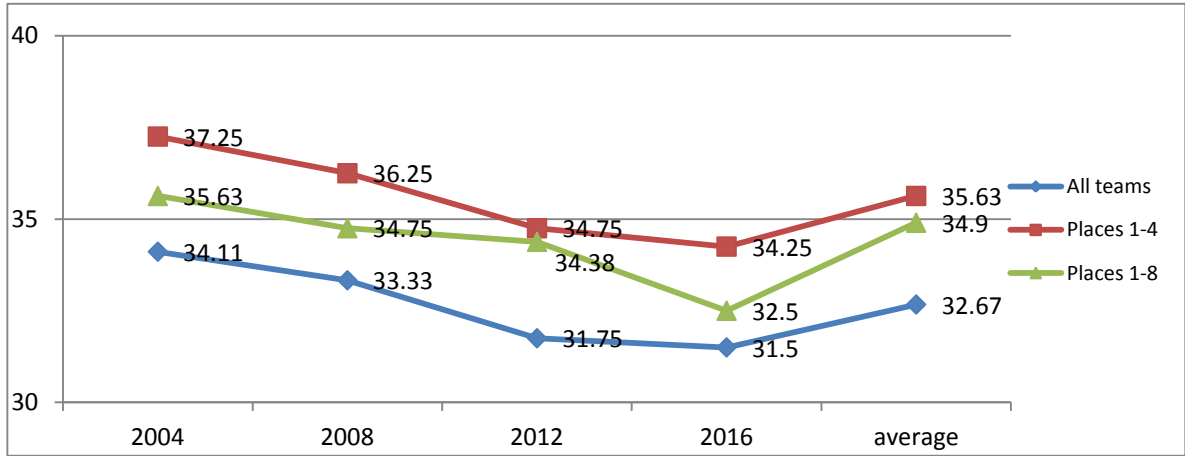
Figure 4 Goalkeepers efficiency

The offensive trends of a team are also given by the number of interceptions made, and the top eight teams dominate this indicator: top 8 ranked - 41.6, first 4 ranked - 39.63. The average of all teams is affected by the poor performance of teams in places 9-12, which make average to be 32.83. Figure 5 clear indicates downward trend of the interceptions over the period analyzed.
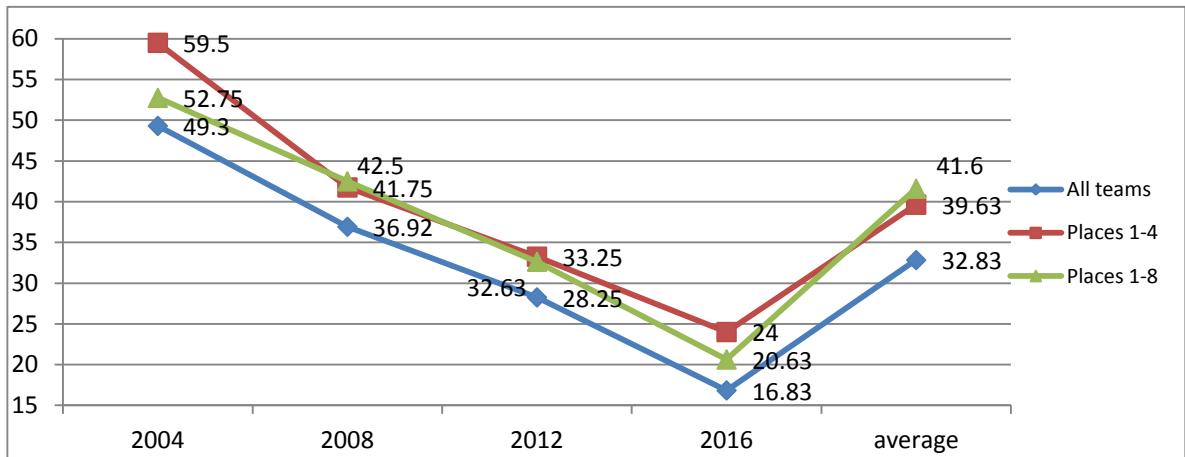


Figure 5 The evolution of the interceptions number

The defence phase efficiency is given and the number of successful blocked shots by defenders and the best ranked teams dominate this indicator: the first 4 ranked - 22.75, places 1-8 - 20.18, all teams – 17.17 (Figure 6).
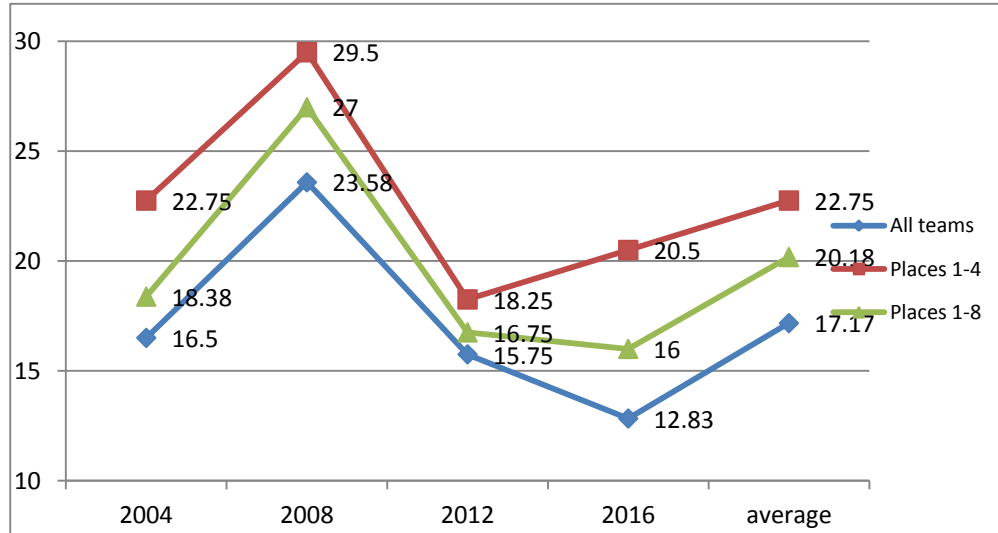
Figure 6 The evolution of the blocked shots

For every indicator analyzed for the game actions, at each of the four editions of the Olympic Games, there is a trend within certain limits efficiency (±0.3-7%), with normal fluctuations from one edition to another. The only indicator which is in visible decrease from an edition to another is the number of interceptions, in which from an average of 49.3 for all teams in 2004 to 16.83 in 2016 has been reached, then a 65% decrease in 12 years.

## 4. Conclusions

There are recommendations in specialized literature on the minimum effectiveness of the game actions (Taborsky, 2001, p. 26), given that we had as a benchmark for the study conducted on 3 categories (places 1-4 1st -8, all teams) (Table 4).

Table 4 Efficiency of game actions in our study compared with those from the specialized literature

| Game actions efficiency | Efficiency (Taborsky F., 2001) | Efficiency for all participant teams (our study) | Efficiency for places 1-4 (our study) | Efficiency for places 1-8 (our study) |
|---|---|---|---|---|
| backcourt shots | 40 – 45% | **34.18%** | **35.94%** | **34.45%** |
| wing shots | 55 – 60% | **51.73%** | 56.69% | **53.95%** |
| 6 m shots | 60 – 65% | 65.56% | 67.06% | 66.90% |
| fastbreak shots | 70 – 75% | 71.75% | 71.06% | 74% |
| 7 m shots | 75 – 80% | **72.80%** | **72.50%** | **74.85%** |
| attacks without shots | | 5.19 | 6.26 | 6.57 |
| | 15 – 20% | interceptions/game 2,71 blocked shots/game | interceptions/game 3,59 blocked shots/game | interceptions/game 3,19 blocked shots/game |
| goalkeepers | 35 – 40% | **32.67%** | 35.63% | **34.90%** |

In the case of 9m shots, efficiency is more than 5% (from 34.18 to 35.94%), below the minimum value recommended in the specialized literature (40%), this being valid in all 3 categories analyzed (places 1-4, places 1-8, all teams).

For 6 m shots the efficiency passes of 65%, i.e. 5%, is higher than the minimum requirement, which is why we consider that the minimum should be raised to 65%.

For wing shots only places 1-4 meet the minimum efficiency requirement (56.69%), in the other categories being below the recommended minimum efficiency (55%), with values of 51.73% (all teams) and 53.95% (places 1-8).

At 7m shots were recorded values below the minimum average (75%): 72.80% (all teams), 72.50% (places 1-4), 74.85% (places 1-8).

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In the case of the goalkeepers the optimum efficiency (35-40%) was reached only by first 4 ranked (35,63%), close to the minimum places 1-8 (34.90%) and 32.67% of all teams.

With these guidelines achieved, efficiency limits should be reconsidered for throws 9m and 7m shots downward by 5% as in any category not reached the minimal requirement, respectively to be monitored the efficiency shots for wings and goalkeepers, where only the first 4 ranked fulfilled the minimum benchmark. For 6m shots to be increased by 5% the minimum level because in all categories the upper margins were exceeded.

The difference in the game is made by the individual actions or carried out in small groups and the speed of decision is essential in achieving efficiency and performance, so that the actions of training should be to: focus on improving technique and tactics individual; capacity to solve the relation 1-1 in attack and defense; compliance with established tactical plan; improving collaboration in small groups (2-2, 3-3) (Táborský, 2011, pp. 9-10).

At the shots where not reached the minimum level it is recommended that in training be used more often game situations to be resolved and where to focus on increasing the efficiency of shots. In addition it has to work in conditions of fatigue and participation in friendly competitions where they have a way similar to the official ones (a numbers of 5-8 games in 15 days). Compliance with these requirements should be quantified in the following competitions, and this necessitates a subsequent reassessment to see whether the situations were solved.

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# Neuromuscular Exploration in Student Basketball Training

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## Abstract

**Introduction**The neuromuscular training is of present interest in the complex training of the students at "Carol Davila" University of Medicine and Pharmacy and also in achieving performance. Starting from the aspects of neuromuscular training, sports performance can make significant progress in terms of: explosive muscle strength, muscle strength, speed, agility and also neuromuscular control that creates the premises of a high-precision sports technique. Applying the method of myotonometry in the field of sports science and physical education has led to favorable results, which has led us to use it in designing and conducting the physical training programs of the representative basketball team of "Carol Davila" University of Medicine and Pharmacy, hoping to achieve superior performance.