

# Determination of the home advantage in handball Olympic Games and European Championships

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## ABSTRACT

Gutiérrez, O., Fernández, J.J. & Saavedra, M. (2014). Determination of the home advantage in handball Olympic Games and European Championships. *J. Hum. Sport Exerc.*, 9(4), pp.752-760. Home advantage (HA) has typically been focused in competitions in which the same number of home games and away games are played, but it should be noted that there are other competitions that take place at the home of only one organizer. In this study, 2,758 games of handball were analyzed. The variables registered were the number of games won, the number of games drawn, the number of games lost, the number of goals scored, the number of goals against and the gender of the competitors. The significance of the level of advantage in playing at home was calculated for the variable of points obtained, assuming the null hypothesis that playing at home has no advantage. The Wilcoxon signed rank was used to contrast home advantage signification. The advantage of playing at home and the advantage of playing away in male and female competitions were compared using the Mann–Whitney test. The significance of the difference between the goals (both scored by and scored against) when a team played at home or played away from home was determined using t tests. Pearson and Spearman bivariate correlations were used to establish the level of association between the classification of a team and the number of points obtained as a result of the advantage of playing at home. No significant advantage to playing at home in the Olympic Games or European Championships was found for either gender. However, a direct association exists between playing at home and the points obtained in a competition. There is also a significant inverse association between playing at home and the final classification of a team. **Key words:** SPORT TEAM, PERFORMANCE ANALYSIS, TEAM RANKING, HOME ADVANTAGE.

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## INTRODUCTION

In both individual and team sports, one team may seem to have an advantage over its opponents. Koppet (1972) proved this scientifically. This advantage is called the home advantage (HA) and results in better performance when a team plays at home (Bray et al., 2005).

The first studies of the home advantage were conducted by Schwartz et al. (1977), who established a home advantage in professional baseball (53%), professional football (60%), professional hockey (64%) and college basketball (64%). Edwards (1979) calculated the advantage of playing at home in professional football (54.4%), university football (58.6%) and professional baseball (55.6%), and Varca (1980) calculated an advantage of 70% for university teams that played at home. Later, Pollard (1986) established the advantage of playing at home in English football (65.2%), in NBA basketball (63.3%), in NHL hockey (59.9%), in American football (59.9%) and in American baseball (53.6%).

Pollard (1986) also established the existence of a home advantage in a study of the English Premier League, finding that 64% of the points won were by home teams. In addition, Page et al. (2007) found that in knockout phases that are played on home and away fields, the team that plays at home the second time around has a 50% greater probability of advancing.

In basketball, the existence of a home advantage is evident: 64% of all victories by male teams were found to be won at home (Courneya et al., 1992). The teams of the ACB league were found to win 55.2% of their victories at home (García et al., 2009).

Other studies based on the home advantage have covered many team sports: baseball (Adams et al., 1994; Dosseville, 2007; Levernier et al., 2007), football (Carmichael et al., 2005; Dosseville, 2007; Pollard, 2002; Sánchez et al., 2009; Seckin et al., 2007; Thomas et al., 2004; 2006), basketball (Greer, 1983; Jones, 2007; Moore et al., 1993; Varca, 1980), volleyball (Marcelino et al., 2009), rugby (Saavedra et al., in press; Thomas et al., 2008) and handball (Gutiérrez et al., 2012).

There have been few studies of the home advantage in handball. Over seven consecutive competition years (2002–2003 through 2008–2009), Meletakos et al. (2010) investigated in a longitudinal manner the final results of men's handball National Major League matches in seven European countries (Denmark, France, Germany, Greece, Poland, Spain and Sweden) and concluded that there were significant differences among the countries in the total number of goals scored per match. In addition, the seven countries were heterogeneous with respect to the percentages of close games, i.e., matches with a goal difference of two or less, as well as with respect to the outcomes of the matches (home win, away win, or draw).

Strauss and Bierschwale (2008) examined spectators and the home advantage in handball. The results showed a home advantage of 66.3%. Nonetheless, spectator variables such as the number and density of spectators were found to have little or no correlation to performance measures.

The present study concentrates on handball as there is little scientific literature on this topic, a sport that has different types of competition. The national leagues have a round-robin system, in which each team plays each other team on two occasions, once at home and once away from home.

On the other hand, the European Club Championships consist of a round-robin phase and a two-game elimination phase.

However, national team competitions have a different format, with two different phases: a classification round consisting of round-robin competition in groups, in which teams play the same number of games as the home team and as the away team, and a final phase in which the games are played in one venue and only one team plays as the home team (or two). The latter phase is the one considered in this investigation. The objective of the present study was to determine whether a home advantage exists in handball competitions that are played in one venue by evaluating the performance variations that may exist for home teams.

## **MATERIAL AND METHODS**

### *Participants*

The sample of the study was composed of 21 international handball events (male and female) taken from all major competitions of this sport: 12 Olympic Games and 9 European Championships between 1936 and 2011. A total of 2,758 games were played, and only 365 of these games were played by home teams that organized the events.

### *Measures*

The variables considered were the number of matches won, the number of matches drawn, the number of matches lost, the number of goals scored and allowed, the number of goals scored and allowed in a game, the gender of the competitors and the championship involved. We calculated the number of points won (PW) and half of the points played ( $PP / 2$ ) to calculate the significance of the advantage of playing at home.

Olympic Games data was collected from the Internet site [www.ihf.info](http://www.ihf.info) and [www.eurohandball.com](http://www.eurohandball.com) for the European Championships.

### *Procedures*

Tournaments with one (or two) venues, such as the Olympic Games and the European Championships, have only one home team (or at most two). In these types of competitions, the home advantage is quantified by the number of matches won by the home team of the competition venue, expressed as a percentage of the total number of games played, quantifying the number of points won at home as the total percentage of points obtained (Pollard, 1986). Analyzing the home advantage independently for each team, the home advantage is established by comparing the performance of a team at home to its performance when it plays away from home. This comparison can be made using the percentage of games won at home in comparison to the total number of games played both at home and away, with draws considered to be half victories.

### *Statistical Analyses*

The degree of significance of the home advantage is calculated for the variable of points obtained, assuming the null hypothesis that playing at home provides no advantage (Pollard, 1985, 1986), meaning that one out of every two games would be won at home (50%). The comparison was made using the Wilcoxon signed rank test.

The comparison between the advantage of playing at home and that of playing away in male and female competitions was made using the Mann–Whitney test.

To compare the advantage of playing at home among the different types of events (Olympics Games and European Championships), the Kruskal–Wallis test was used.

The significance of differences in goals scored by and against local teams and visitors was determined using the t test for two independent samples, after ensuring normality (Kolmogorof–Smirnov in their variant Lilliefors or Kolmogorov–Smirnov) and equal variances (Levene). In case of noncompliance with the requirements, the nonparametric Mann-Whitney test was used.

The Spearman correlation was used to establish the level of association between the classification of a team and the home advantage. Pearson bivariate correlations were used to establish the level of association between the numbers of points obtained with the advantage of playing at home. In all cases, the level of significance of the tests was 5% ( $p < 0.05$ ).

Finally, to analyze the differences in ranking between teams when they play at home or as visitors, the Mann–Whitney test was used.

## RESULTS

No significant HA was detected for either the Olympic Games or the European Championships (Table 1). In the Olympic Games, the HA is  $35.6\% \pm 0.34\%$  ( $p < 0.082$ ) and in the European Championships the values is  $60.9\% \pm 0.28\%$  ( $p < 0.106$ ). In games played by male teams, the HA was found to be  $42.3\% \pm 0.34\%$  ( $p < 0.381$ ) in OG and  $52.6\% \pm 0.28\%$  ( $p < 0.722$ ) in EC, and in games played by female teams, the HA was found to be  $26.8\% \pm 0.35\%$  ( $p < 0.102$ ) in OG and  $67.4\% \pm 0.27\%$  ( $p < 0.081$ ) in EC.

**Table 1.** Advantage of playing at home in major events with on single venue in handball Olympic Games and European Championship

	Years Events	Number of games				HA		Wilcoxon	
		Played (as organizer)	Won	Drawn	Lost	%	S.E.	Significance	
<i>Olympic Games</i>	1936-2011		112	40	2	70	36.6	0.34	0.082
	12 Events	Male	71	29	2	40	42.3	0.34	0.381
	8 Events	Female	41	11	0	30	26.8	0.35	0.102
<i>European</i>	1936-2011		129	75	7	47	60.9	0.28	0.106
	9 Events	Male	57	27	6	24	52.6	0.28	0.722
	9 Events	Female	72	48	1	23	67.4	0.27	0.081

\*Statistic significance with the Wilcoxon signed-rank test.

### *Influence of being the team that organizes the event and the number of goals scored and allowed*

No significative differences between organizing and non organizing countries have been found, not in goals scored nor in goals conceded in any of the events analysed (OG y EC). In female category, some significative differences have been found in goals scored in OG, the organizing teams having an average of 6 more goals than local teams ( $p < 0,009$ ). Some differences have been found in conceded goals in EC ( $p < 0,008$ ), the non organizing teams having an average of 3 conceded goals more than the organizing teams (Table 2).

**Table 2.** Goals per game scored and received in teams that are local and not local (visitors) of the organizing country

<i>Goals scored per game</i>						
	<b>Gender</b>	<b>Condition</b>	<b>Goals / game</b>	<b>KS/KSL</b>	<b>Levene</b>	<b>Sig. Test T</b>
<b>OG</b>	<b>Male</b>	<i>Local</i>	21.2±3.8	0.200 <sup>a</sup>	0.313	0.802 <sup>c</sup>
		<i>Visitor</i>	21.5±5.2	0.339 <sup>b</sup>		
	<b>Female</b>	<i>Local</i>	18.6±5.3	0.551 <sup>b</sup>	0.593	<b>0.009<sup>c</sup></b>
		<i>Visitor</i>	24.2±5.5	0.200 <sup>a</sup>		
	<b>Gender</b>	<b>Condition</b>	<b>Goals / game</b>	<b>KS/KSL</b>	<b>Levene</b>	<b>Sig. Test T</b>
<b>EC</b>	<b>Male</b>	<i>Local</i>	26.3±3.8	0.168 <sup>a</sup>	0.136	0.840 <sup>c</sup>
		<i>Visitor</i>	26.5±2.9	0.200 <sup>a</sup>		
	<b>Female</b>	<i>Local</i>	25.2±3.2	0.200 <sup>a</sup>	0.790	0.718 <sup>c</sup>
		<i>Visitor</i>	24.8±3.3	0.200 <sup>a</sup>		
<i>Goals against per game</i>						
	<b>Gender</b>	<b>Condition</b>	<b>Goals / game</b>	<b>KS/KSL</b>	<b>Levene</b>	<b>Sig. Test T</b>
<b>OG</b>	<b>Male</b>	<i>Local</i>	22.3±8.3	0.200 <sup>a</sup>	0.022	0.653 <sup>d</sup>
		<i>Visitor</i>	21.7±5.1	0.200 <sup>a</sup>		
	<b>Female</b>	<i>Local</i>	24.7±7.3	0.200 <sup>a</sup>	0.379	0.617 <sup>c</sup>
		<i>Visitor</i>	23.6±5.6	0.290 <sup>b</sup>		
	<b>Gender</b>	<b>Condition</b>	<b>Goals / game</b>	<b>KS/KSL</b>	<b>Levene</b>	<b>Sig. Test T</b>
<b>EC</b>	<b>Male</b>	<i>Local</i>	26.4±3.8	0.200 <sup>a</sup>	0.612	0.627 <sup>c</sup>
		<i>Visitor</i>	27.0±3.5	0.200 <sup>a</sup>		
	<b>Female</b>	<i>Local</i>	22.8±3.2	0.200 <sup>a</sup>	0.733	<b>0.008<sup>c</sup></b>
		<i>Visitor</i>	25.8±3.4	0.402 <sup>b</sup>		

a Significance of the Lilliefors test.

b Significance of the Kolmogorov-Smirnov test.

c Significance of the t-test for two independent samples.

d Significance of the Mann-Whitney test.

#### *Influence of the gender of the participants on the home advantage*

No significant differences were detected using the Mann-Whitney tests between the male and female categories in the Olympic Games ( $p < 0.305$ ) or the European ( $p < 0.182$ ) Championships. The home advantage was found to be higher for female teams in the European Championships (15% higher), but in the Olympic Games, the home advantage for female teams was found to be 16% lower than for male teams.

#### *Influence of the competition on the home advantage*

In the male category, the mean rank in the Olympics (136.91) was higher than in the European Championships (128.82). But no significant differences were detected in comparing the two types of events (Mann-Whitney, significance of  $p < 0.390$ ).

The mean rank of the Olympics in the female category (100.77) was higher than in the European Championships (95.82). But no significant differences were detected in comparing the two types of events (Mann-Whitney, significance of  $p < 0.560$ ).

#### *Influence of the standard of the teams in the home advantage*

To measure the standard of a team, the final classification in each tournament and the points obtained by each team in each tournament were used. The classification association was found to be significant in the three tournaments (the Olympics and the European Championships) in both male and female categories,

as shown in table 3. In all situations, the association is strong (greater than 0.84) and inverted, which means that the better the classification is, the greater the advantage obtained by the team playing at home is and vice versa.

There is also a significant, direct and strong association between the number of points obtained and the advantage of playing at home.

**Table 3.** Association between the advantages of playing at home, the classification of a team and the points obtained in a competition

Competition		Classification		Points	
		Male	Female	Male	Female
Olympic Games	Pearson correlation	-0.984	-0.841	0.977	0.974
	Significance	<0.001	<0.010*	<0.001**	<0.001**
	Number of teams	12	8	12	8
European Champ.	Pearson correlation	-0.975	-0.951	0.983	0.983
	Significance	<0.001*	<0.001*	<0.001**	<0.001**
	Number of teams	9	10	9	10

\* Rho Spearman significance.

\*\* Pearson significance.

Comparison between teams that organize an event and the same teams when they are competing as non-organizers of major international handball events

No significant differences were found in the Olympic Games or in the European Championships (Table 4).

**Table 4.** Comparison between teams that organize an event and the same teams when not organizer

	Organizing country		Non organizing country		Diff.	Sig.	Events
	HA (P-W/D/L) <sup>1</sup>	Classification	%P (P-W/D/L) <sup>2</sup>	Classification			
<b>Olympic Games</b>							
Germany	100 (5-5/0/0)	1 (1)	47.8 (45-20/3/22)	6.75	5.75	0.222	1+8
Australia	0 (11-0/0/11)	11 (10-12)	Not classified		--	--	--
Canada	0 (10-0/0/10)	8.5 (6-11)	Not classified		--	--	--
China	23.1 (13-3/0/10)	9 (6-12)	42.5 (20-8/1/11)	5.50	-3.50	0.267	2+4
Korea	72.7 (11-8/0/3)	1.5 (1-2)	55.7 (70-36/6/28)	5.09	3.59	0.154	2+11
EEUU	36.7 (21-5/1/15)	8.5 (5-8-9-9)	10.7 (28-3/0/25)	9.17	0.67	0.610	4+6
Spain	50 (10-5/0/5)	6 (5-7)	49.2 (59-28/2/29)	6.56	0.56	0.999	2+9
Greece	23.1 (13-3/0/10)	8 (6-10)	Not classified		--	--	--
R.F.A.	35.7 (7-2/1/4)	6 (6)	64.7 (17-11/0/6)	3.33	-2.67	0.500	1+3
Sovietic Union	81.8 (11-9/0/2)	1.5 (1-2)	82.8 (29-22/4/3)	2.20	0.70	0.857	2+5
<b>European Championship</b>							
Germany	71.4 (7-5/0/2)	2 (2)	55.8 (113-59/8/46)	6.29	4.29	0.222	1+17
Austria	41.7 (6-2/1/3)	9 (9)	36.6 (41-15/0/26)	9	0	0.750	1+7
Croatia	58.3 (6-3/1/2)	6 (6)	56.3 (88-47/5/36)	6.43	0.43	0.933	1+14
Denmark	100 (15-15/0/0)	2.67 (1-1-6)	60.7 (98-57/5/36)	5.57	2.9	0.156	3+14
Slovenia	68.8 (8-5/1/2)	2 (2)	30.3 (61-16/5/40)	10.73	8.73	0.167	1+11
Spain	71.4 (7-5/0/2)	2 (2)	55 (90-45/9/36)	7.07	5.07	0.267	1+14
Holland	16.7 (6-1/0/5)	10 (10)	16.7 (12-2/0/10)	12.33	2.33	0.999	1+3
Hungry	75 (8-6/0/2)	3 (3)	52.8 (89-43/8/38)	7.53	4.53	0.250	1+15
Italy	33.3 (6-2/0/4)	11 (11)	Not classified		--	--	--
Macedonia	50 (6-3/0/3)	7 (7)	22.9 (24-4/3/17)	10	3	0.400	1+4
Norway	75 (16-11/2/3)	3.50 (1-6)	72.1 (77-52/7/18)	3.91	0.41	0.769	2+11
Portugal	0 (6-0/0/6)	12 (12)	29.5 (22-6/1/15)	12.20	0.20	0.999	1+5
Romania	50 (7-3/1/1)	4 (4)	51.7 (59-30/1/28)	7.56	3.56	0.400	1+9
Sweden	66.7 (15-10/0/5)	3.5 (1-6)	60.4 (77-45/3/29)	6.85	3.35	0.381	2+13
Switzerland	16.7 (3-0/1/2)	14 (14)	16.7 (9-1/1/7)	12.50	-1.5	0.667	1+2

<sup>1</sup> Home Advantage (Games Played - won/Drawn/Lost)

<sup>2</sup> Percentage of points won (Played-Won/Drawn/Lost)

\*Significance with Mann-Whitney Test

## DISCUSSION

Of the 365 games played by teams that organize the events, 211 were from the European Championships, and 154 were from the Olympic Games. The sample may not be balanced, but it is exhaustive, as it takes into account all games played in the three major events analyzed.

The greatest advantage of playing at home was found in the European Championships (52.6) followed by the Olympic Games (42.3). Other research that has examined the home advantage in handball has yielded similar results. Gutiérrez, Saavedra and Fernández (2012) analyzed the home advantage in Spanish league handball and set the value of the home advantage at 61.3%. Straus and Bierschwale (2008) analyzed the 1st Bundesliga and obtained a value of 66.2%. These values are consistent with the findings of most studies of the home advantage in team sports, as in the case of Pollard and Pollard (2005), who reported a home advantage of 60% for football and basketball and 55% for ice hockey, and are also consistent with the findings of the present study. The results concerning the home advantage in handball are very similar for the European Championships, but the results for the Olympic Games are much more varied. This may be explained by the choice of the organizing country. The European Championships are both specific to handball, such that the host is frequently a strong competitor in this sport. The Olympic Games are more global and include a multitude of sports. The organizing country may not be among the best in handball because its selection is based on many factors, and the Olympic Games are organized by an institution that is different from those that organize the European Championships. Although Jacklin (2005) and Morton (2006) found no relationship between the quality of a team and the home advantage, there are numerous studies showing that the better the rating of a team, the stronger the home advantage (Bray, 1999; Gutiérrez et al., 2012; Pollard, 1986). The countries participating in the European Championships of handball are all at a similar level, as this sport is concentrated mainly in Europe, so none of the local teams involved have a strong advantage in terms of quality.

In addition, handball is a sport that depends on an objective point system, unlike other sports that depend on a subjective point system. Thus, in Olympic Games handball there is no possibility of referee influence in favor of the local team (Balmer et al., 2001). This difference may be sufficient to explain why no advantage to playing at home was detected for Olympic Games handball matches.

On the other hand, in the European Championships, no significant advantage to playing at home was detected either, which may be because few tournaments have been played to date (9 events).

It may be possible that no differences were found between male and female teams that played at home because the international events analyzed were of the highest standard, at which the level of professionalism is the maximum for both male and female teams. This would be consistent with the findings of studies that have shown that 64% of victories in male basketball games occur at home (Courneya and Carron, 1992).

The average ranks in the European Championships in the female categories are much similar than in the Olympic Games. Thus, we can say that there are not significant differences among the two events.

To measure the standard of a team, the final classification in each tournament and the points obtained by each team in each tournament were used. The classification association is significant for the two tournaments in both the male and female categories (greater than 0.84). We can therefore conclude that the higher the standard of a team, the greater the advantage obtained when playing at home.

This is consistent with the results of studies of the standards of competition and the home advantage in the Spanish football league by Sánchez et al. (2008) and Saavedra et al. (in press), which indicate that the teams in the first division that finished in the top positions in the table had obtained a greater advantage when they played at home: a total of 66.1% victories.

In future research, we intend to analyze the effects of variables of the game that vary according to the location of the match and whether the performance of some players changes more than that of other players when playing at home versus when playing away from home.

## CONCLUSIONS

The advantage of playing at home is lower in the Olympic Games than in the European Championships. As noted before, this may be due to the various selection criteria that make the Olympic Games different from the European Championships.

A significant direct association exists between the advantage of playing at home and the points obtained in a competition. In addition, a significant inverse association exists between the advantage of playing at home and the final classification of a team.

We conclude by mentioning that significant differences in the goals allowed per game were detected for female category in goals scored in OG ( $p < 0.009$ ) and in goals allowed in EC ( $p < 0.008$ ).

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