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## Comparison of home advantage in men's and women's Portuguese roller hockey league

### Comparación de la ventaja de jugar en casa según género en la liga portuguesa de hockey sobre patines

### Comparaçãõ da vantagem de jogar em casa dependendo do género na liga portuguesa de hóquei patins

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#### ABSTRACT

The purpose of this study was to quantify the home advantage in both men's and women's Portuguese professional division roller hockey leagues comparing the results obtained according to the sex of participants. The sample was composed of 2,080 roller hockey games (n = 1,632 in First men's division; and n = 448 in First women's division) between the 2009-2010 and 2016-17 seasons. Goals scored and received were also analysed when teams play at home. The results showed the existence of home advantage in both men's and women's leagues. Home advantage values were higher than 50% in both leagues, with significantly higher values in the male league (60.88% compared to 54.33%). Moreover, the results indicated that teams score a higher percentage of goals when playing at home with non-significant differences between sexes. Regarding the number of goals scored per match, the results showed a significant difference between the male and female divisions, with higher values for men's leagues. The results in relation to sex of participants are consistent with previous studies in other sports like football or water polo. The analysis of the home advantage could be useful to help roller hockey coaches to design alignments for each match and to plan the training loads according to match location.

**Keywords:** Roller hockey, gender, performance analysis, match variables, territoriality.

#### RESUMEN

El propósito de este estudio fue cuantificar la ventaja de jugar en casa en las ligas de hockey sobre patines masculina y femenina de la Primera división profesional portuguesa, comparando los resultados obtenidos según el sexo de los participantes. La muestra estuvo compuesta por 2.080 partidos de hockey sobre patines (n = 1.632 en la Primera

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división masculina y  $n = 448$  en la Primera división femenina) entre las temporadas 2009-2010 y 2016-17. Los goles marcados y recibidos también fueron analizados según la localización del partido. Los resultados mostraron la existencia de la ventaja de jugar en casa tanto en la liga masculina como femenina. Los valores de la ventaja de jugar en casa fueron superiores al 50% en ambas ligas, con valores significativamente más altos en la liga masculina (60,88% comparado con 54,33%). Además, los resultados indicaron que los equipos anotan un mayor porcentaje de goles cuando juegan en casa sin encontrar diferencias significativas entre los sexos. En cuanto al número de goles marcados por partido, los resultados mostraron una diferencia significativa entre ambas divisiones, con valores más altos para las ligas masculinas. Los resultados en relación con el sexo de los participantes están en consonancia con estudios previos realizados en otros deportes colectivos como fútbol o waterpolo. El análisis de la ventaja de jugar en casa podría ser útil para ayudar a los entrenadores de hockey sobre patines a decidir las alineaciones y a planificar las cargas de entrenamiento según la localización del partido.

**Palabras clave:** Hockey sobre patines, género, análisis de rendimiento, variables de partido, territorialidad.

## **RESUMO**

O propósito desse estudo foi quantificar a vantagem de jogar em casa nas ligas masculina e feminina de hóquei sobre patins da Primeira divisão profissional portuguesa, comparando os resultados obtidos dependendo do sexo dos participantes. A amostra foi composta por 2088 partidas de hóquei sobre patins ( $n = 1.632$  na Primeira divisão masculina e  $n = 448$  na Primeira divisão feminina) entre as temporadas 2009-2010 e 2016-17. Os goles marcados e recebidos também foram analisados conforme a localização do partido. Os resultados mostram a existência de vantagem de jogar em casa tanto na liga masculina como na feminina. Os valores da vantagem de jogar em casa são superiores ao 50% em ambas ligas, com valores significativamente maiores na liga masculina (60,88% comparado com os 54,33% da feminina). Por além disso, os resultados indicam que as equipas anotam uma maior percentagem de golos quando jogam em casa, sem encontrar diferenças significativas entre ambos sexos. Em quanto ao número de goles marcados por jogo, os resultados mostram uma diferença significativa entre as divisões masculina e feminina, com valores mais altos na liga masculina. Os resultados em relação ao sexo dos participantes estão em consonância com estudos prévios realizados noutros desportos coletivos como o futebol ou o pólo aquático. A análise da vantagem de jogar em casa poderia ser útil para ajudar aos técnicos de hóquei sobre patins no momento de decidir as alienações e de planificar as cargas dos treinamentos dependendo da localização do jogo.

**Palavras chave:** Hóquei sobre patins, género, análises de rendimento, variáveis de partido, territorialidade.

## Comparison of home advantage in Portuguese roller hockey league

### INTRODUCTION

The increasing professionalization of sports, in recent years, resulted in an increase of studies on the various parameters affecting the performance of players. The effect of match location -home (local) or away (visitor)- in determining the result of a sports competition is a widely studied phenomenon in sports science (Prieto, Gómez, & Pollard, 2013). This concept is known as "home advantage" (HA), and may be defined as the advantage the athlete or team has in competing at home compared with their performance abroad (Pollard, 1986). It was first studied by Schwartz & Barsky (1977) in different collective modalities of sports, such as basketball, ice hockey, American football, and baseball in the United States. Ever since HA has been widely accepted and documented in a variety of different sports (Legaz-Arrese, Moliner-Urdiales, & Munguía-Izquierdo, 2013), both individual -like tennis (Koning, 2011), judo (Brito, Miarka, de Durana, & Fukuda, 2017; Ferreira Julio, Panissa, Miarka, Takito, & Franchini, 2012), speed skating (Koning, 2005), boxing (Pic, 2018a) and golf (Nevill, Holder, Bardsley, Calvert, & Jones, 1997)-, and collective -like football (Gómez & Pollard, 2014; Pollard, 2006), basketball (Pollard & Gómez, 2013; Ribeiro, Mukherjee, & Zeng, 2016), rugby (McGuckin, Sinclair, Sealey, & Bowman, 2015; Thomas, Reeves, & Bell, 2008), handball (Oliveira, Gómez, & Sampaio, 2012; Pic, 2018b) and water polo (Prieto et al., 2013)-.

Pollard (1986) quantified HA as the number of points won at home expressed as a percentage of all points gained, while Courneya & Carron (1992) identified HA with a home winning percentage over 50% of the games played. Jamieson (2010) conducted a meta-analysis on several sports and estimated a HA figure about 60%.

Nowadays HA is a well-documented and widely accepted phenomenon, and there is evidence that varies from sport to sport, nationality or level. Another fact that could vary the HA value in a sport is the kind of competition, showing differences depending on whether the competition is a playoff, knockout or regular league (Page & Page, 2007; Pic & Castellano, 2016, 2017).

Accordingly, there has been an increase in research seeking to identify the different factors that may influence HA, and the causes and factors proposed from four major reviews (Carron, Loughhead, & Bray,

2005; Courneya & Carron, 1992; Nevill & Holder, 1999; Pollard, 2006) are: away-team travels, familiarity with local facilities, rules of games favouring the home team, local crowd support both on player performance and referee bias, territoriality, tactics, and miscellaneous psychological issues. Pollard (2008) argues that from none of these categories a clear level of influence is set, and it would be more appropriate to consider an interaction of causes.

Previous research in HA has mainly focused on male athletes (Prieto et al., 2013), and few studies have been devoted to comparing HA phenomenon in men's and women's competition, although all of them report a lower incidence in women's competition. Moore & Brylinsky (1995) reported greater HA for men in college basketball compared to women (64.4% vs. 54.4%) and, similarly, Prieto et al., (2013) reported a higher significant difference in water polo HA for men (58.60% to 53.70%), whereas Koning (2011) found significant HA for men but not for women in tennis. Conversely, other studies found no significant difference in sports like speed skating (Koning, 2005) or slalom canoe-kayak (Nibali, Hopkins, & Drinkwater, 2011). In addition, although HA is well studied in other collective sports, in roller hockey there is still a shortage of studies analysing the match variables (Arboix-Alió & Aguilera-Castells, 2018, 2019; Arboix-Alió, Buscà, & Aguilera-Castells, 2019; Gómez, Pollard, & Luis-Pascual, 2011) and no previous studies have been found comparing gender differences in HA.

In order to address these gaps, the objective of the present study was to quantify HA in both men and female roller hockey teams of the Portuguese professional division and to compare the results by gender. Secondary objectives were to assess if there were significant differences in the number of goals scored when teams play as local and to compare the number of goals per game between men and women.

### METHODS

#### *Sample*

The dataset of this study consists of eight years of the First Division of the Portuguese roller hockey league, from season 2009-2010 to season 2016-2017. A total of 2,080 matches ( $n = 1,632$  in men's First Division

and n = 448 in women's First Division) were analysed. Data were provided by the open-access web domain of the Portuguese national league (www.fpp.pt/HP/Historico/Classificacoes). Data were checked by using the independent web portal Okcat (www.okcat.cat) for match data.

The variables recorded were the total of matches played per season, the goals scored per match and the goals scored by each team, all of them disaggregated per sex.

*Quantification of home advantage*

The Portuguese roller hockey league has a balanced schedule of games in which each team plays every other once at home and once away during the season. In all games played there is a local team and a visitor since only the matches of the regular league have been included. This league structure allows an unbiased method for quantifying the HA over a complete season (Pollard & Pollard, 2005).

The point system of roller hockey in the analyzed seasons uses 3 points for a win, 1 point for a draw, and 0 points for a loss. As a quantification method, we used the method introduced by Pollard & Pollard (2005) which calculates HA as the number of points won at home expressed as a percentage of the total number of points won at home and away (Pollard, 2006).

*Statistical analysis*

The significance of HA was calculated assuming that there is an advantage when a team obtains a value

higher than 50% in the ratio of victories, assuming the null hypothesis that there is no HA (Pollard, 1986). Descriptive statistics methods were used to calculate mean and frequencies. The Kolmogorov-Smirnov test was used to confirm the data were normally distributed to confirm the use of parametric techniques. The Student t-test for independent samples was used to compare the HA effect and the goals according to the league (male and female). The Student t-test for related samples was used to compare the goals scored and received as a local team in each of the two leagues. The magnitude of the difference was determined by the Cohen's *d* effect size (ES) (Cohen, 1988). The Effect Size was considered either small ( $0.2 < ES \leq 0.5$ ), moderate ( $0.5 < ES \leq 0.8$ ) or large ( $ES > 0.8$ ) (Nakagawa & Cuthill, 2007). Statistical significance was set at 5% and all the analyses were performed using SPSS (Version 20 for Mac; SPSS Inc., Chicago, IL, USA).

**RESULTS**

Table 1 quantifies HA and descriptive variables. Overall, HA existed both in men and women's leagues, though women's HA was lower than for men (60.88% vs. 54.33%). This difference was statistically significant ( $p = 0.005$ ) and ranged from 0.49% (season 2013-2014) to 12.17% (season 2015-2016, the only one without HA in the women's league).

Furthermore, HA in men's league was consistent, with a trend towards a slow but steady decrease over time, whereas in women's league HA was inconsistently, and showed a sharp decline over time (Figure 1).

Table 1. Descriptive statistics and comparisons between sexes for Home Advantage.

| Season       | Men          |              |              | Women        |              |              | p             | 95% CI           | ES                  |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|------------------|---------------------|
|              | No. of Games | HA (%)       | SD           | No. of Games | HA (%)       | SD           |               |                  |                     |
| 2009-        | 182          | 61.54        | 3.67         | 56           | 59.15        | 17.49        | 0.023*        | 0.03-0.32        | 0.19 (small)        |
| 2010-        | 240          | 63.13        | 10.35        | 56           | 57.50        | 11.74        | 0.002*        | 0.09-0.39        | 0.51                |
| 2011-        | 210          | 60.43        | 13.00        | 56           | 53.66        | 22.50        | 0.883         | -0.09-0.21       | 0.37 (small)        |
| 2012-        | 240          | 61.17        | 10.13        | 56           | 50.00        | 26.09        | 0.033*        | -0.29-0.11       | 0.55                |
| 2013-        | 240          | 60.61        | 13.52        | 56           | 60.12        | 23.18        | 0.333         | 0.02-0.46        | 0.02 (small)        |
| 2014-        | 182          | 61.41        | 15.82        | 56           | 54.66        | 17.91        | 0.065         | 0.00-0.29        | 0.39 (small)        |
| 2015-        | 182          | 59.16        | 14.08        | 56           | 46.99        | 12.01        | 0.008*        | 0.01-0.18        | 0.93 (large)        |
| 2016-        | 156          | 58.59        | 11.05        | 56           | 52.69        | 21.05        | 0.727         | -0.17-0.12       | 0.35 (small)        |
| <b>TOTAL</b> | <b>1632</b>  | <b>60.88</b> | <b>11.45</b> | <b>448</b>   | <b>54.33</b> | <b>18.99</b> | <b>0.005*</b> | <b>0.02-0.09</b> | <b>0.42 (small)</b> |

HA = Home Advantage; SD = standard deviation; No. = Number; CI = confidence interval; ES = Effect Size; \*Significant difference between sexes for Home Advantage;  $p < 0.05$

## Comparison of home advantage in Portuguese roller hockey league

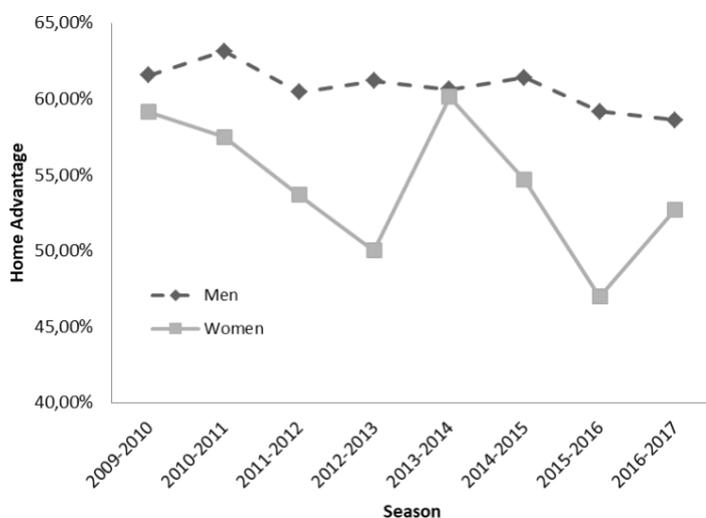


Figure 1. Changes in Home Advantage over time.

### DISCUSSION

The present study aimed to examine the HA in both men's and women's Portuguese professional division roller hockey leagues and to compare the results obtained according to gender. The results showed the existence of HA effect in both men's and women's leagues. These results are consistent with the study of Gómez et al. (2011) that first reported the HA effect in men's roller hockey in Spain as 58.3%, and with Arboix-Alió & Aguilera-Castells (2019), who quantified HA in Spanish men's roller hockey league as 59.8%. The study also demonstrated the existence of HA in women's roller hockey, which confirms the consensus of previous studies in other women's sports, like basketball (Gómez, Lorenzo, Ortega, & Olmedilla, 2007), football (Pollard & Gómez, 2012), water polo (Prieto et al., 2013), or netball (Pledger & Morton, 2010).

The comparison between the men's and women's league provided evidence of statistically significant greater HA in the men's league. As this was the first comparative study on HA in roller hockey, there are no previous studies to interpret the findings. However, these results were not unexpected as the available literature in other sports also shows evidence of

On analyzing the number of goals scored per match, which was the second objective of the study, it was observed a statistically significant higher number of goals when playing at home ( $p < 0.001$ ), both in men's and women's league. There were no differences between sex ( $p = 0.464$ ) (Table 2).

greater HA values in men's teams, as in football, where Pollard & Gómez (2012) analysed the HA effect in 26 European countries reporting higher male values in all the leagues, in water polo (Prieto et al., 2013), softball, and field-hockey (Gayton, Mutrie, & Hearn, 1987). By contrast, Koning (2011) reported a significant HA for men in tennis, while the performance of women players appeared to be unaffected by HA effect.

There are several possible explanations for the differences found between genders according to some of the factors allegedly related to the existence of HA effect, such as crowd effect and referee bias, territorial protection, and psychological aspects (Prieto et al., 2013). Although there are no obvious reasons why some of them should be different for men's and women's players, higher attendance at men's competitions may influence the higher men's HA (Pollard & Gómez, 2012). Similarly, earlier studies had shown that the crowd may subconsciously influence some referees to give advantage to the home team, influencing their decisions and leading to an officiating bias (Balmer, Nevill, & Lane, 2005; Dawson, Dobson, Goddard, & Wilson, 2007; Nevill, Balmer, & Mark Williams, 2002; Ste-Marie, 1996). Another argument for lower levels of HA in women's sports might relate to the fact that male's testosterone levels increase before a match, and the increase is even more pronounced when playing as local (Pollard, Prieto, & Gómez, 2017). According to Wolfson, Neave, & Anderson (2007), the testosterone level increase in females is lower and does not differ between home and away matches. Authors argue that the feeling of territorial protection of "home" is stronger in males than females, leading to increased testosterone levels and a more aggressive and dominant performance (Pollard et al., 2017).

Table 2.

Comparison of the number of goals scored per match expressed as Mean ( $\pm$ SD).

|                                   | Men                 | Women               | p      |
|-----------------------------------|---------------------|---------------------|--------|
| <b>Goals scored per match</b>     | 8.22 ( $\pm$ 0.49)  | 6.53 ( $\pm$ 0.36)  | 0.000* |
| <b>Goals scored as a local</b>    | 4.58 ( $\pm$ 0.32)  | 3.52 ( $\pm$ 0.31)  | 0.000* |
| <b>Goals scored as a visitant</b> | 3.64 ( $\pm$ 0.21)  | 3.01 ( $\pm$ 0.19)  | 0.000* |
| <b>Goals as local (%)</b>         | 55.73 ( $\pm$ 1.16) | 53.90 ( $\pm$ 2.89) | 0.464  |

SD\_Standard deviation; \*\_Significant difference between sexes for goals scored; p < 0.05

The evolution of HA figures in men's league over the period studied reported a steady decline, which is consistent with the findings in soccer in the major leagues of Europe by the reasons suggested by Pollard & Gómez (2012) and can also be seen in other sports like basketball (Ribeiro et al., 2016), suggesting that the effect of the HA phenomenon is slowly becoming weaker (Pollard, 1986, 2006, 2008; Pollard & Pollard, 2005). This evolution might be because teams are using smarter strategies to overcome disadvantages when playing away. The figures in women's league varied widely, with a clear trend line shifted downwards. This variability could be due to the process of professionalization in women's sports, slower than men's teams (Brito et al., 2017). In this sense, some studies indicate an inverse correlation between HA and the quality of the team, and thus Portuguese women's league would result in a very heterogeneous league, involving high-level teams with near amateur ones (Arboix-Alió et al., 2019).

On analysing the goals scored, results confirm the hypothesis of HA with a higher number of goals scored as local, both in men's and women's league. No significant difference was found in terms of gender. Similarly, other collective sports as football report double score when playing at home (Saavedra García, Gutiérrez Aguilar, Fernández Romero, & Sa Marques, 2015). The paucity of similar studies in roller hockey does not allow a comprehensive comparative analysis, but our results are similar to the study of Arboix-Alió & Aguilera-Castells (2019) in the Spanish men's first division of roller hockey. The Spanish figures were lower than the Portuguese both in mean HA (59.8% vs. 60.88%) and goals scored ( $7.13 \pm 0.50$  vs.  $8.22 \pm$

0.49%) (Arboix-Alió & Aguilera-Castells, 2018). One reason for that may be that the Portuguese league uses less speculative tactical systems and practice a more vertical game than the Spanish league, thus generating more chances of goals.

A limitation of the present study is that we did not consider all the possible causes of HA effect such as referee bias, travel, crowd behaviour, or competitive balance. Hence this study lacks information for a better understanding of the HA effect in general, and in roller hockey in particular. The strength of our study lies in the number of matches analyzed during an 8 year period, which is a comprehensive study on a minority sport over time. A future line of research would be the study of each of these factors considered individually and in combination with the others in men's and women's roller hockey.

## CONCLUSIONS

The results of this study reinforce the universality of HA existence in different sports competitions. The HA effect is now corroborated for another sport, roller hockey. According to the results obtained, the HA in the Portuguese roller hockey is 60.88% for the men's league and 54.33% for the women's league. Therefore, this investigation provides new knowledge for a better understanding of the HA effect in general, and the sport of roller hockey in particular.

## PRACTICAL APPLICATIONS

## Comparison of home advantage in Portuguese roller hockey league

The analysis of the HA could be useful to help roller hockey coaches to design alignments for each match or to help clubs' staff to plan the training loads whether the team plays at home or abroad. Apart from that, it could also be useful to prepare players with specific psychological exercises focusing on the game and not being distracted by a vocal home crowd or to avoid protest against referee decisions in order to minimize the disadvantage of playing away from home. Possible gender differences could help to understand this phenomenon in future lines of research.

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## Comparison of home advantage in Portuguese roller hockey league

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