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## THE OBSERVATION OF GENDER DIFFERENCES IN HANDBALL

### La observación de diferencias de género en balonmano

Miguel Pic Aguilar

Universidad de La Laguna  
IES GenetoRecibido: 27/09/2017  
Aceptado: 30/12/2017Correspondence:  
E-mail: [pic.aguilar.90@ull.edu.es](mailto:pic.aguilar.90@ull.edu.es)

#### Abstract

Overcoming a superficial view regarding the gender in handball, through the identification of differences between women and men in high level competitions is the objective of this work. Knowing on which observational variables or criteria (throwing, effectiveness, zone and referee signs) and categories these differences rely is essential for identifying strategic behaviors. An observational methodology was used to record the events of the game. Two women's and two men's handball matches were selected, belonging to the final phases of the London 2012 Olympic Games. The observational design was nomothetic, punctual and multidimensional. An 'ad hoc' tool was designed, and it was implemented by two evaluators. Once the data were recorded using the Lince software, they were analyzed through the data reduction technique Theme. The results evidenced the existence of T-patterns based on gender.

**Keywords:** gender; handball; observational methodology; T-patterns.

#### Resumen

Superar una mirada superficial en relación al género en balonmano, mediante la identificación de diferencias entre chicas y chicos en competiciones de alto nivel es objetivo del presente trabajo. Sobre qué variables o criterios (lanzamientos, efectividad, espacio y señalizaciones arbitrales) y categorías observacionales descansan estas diferencias resulta esencial para poder identificar comportamientos estratégicos. Se recurrió a una metodología observacional para registrar los eventos del juego. Fueron seleccionados dos partidos de balonmano femenino y dos partidos masculinos, pertenecientes a las fases finales de los juegos olímpicos de Londres 2012. El diseño observacional fue nomotético, puntual y multidimensional. Se diseñó una herramienta 'ad hoc', puesta en práctica por dos evaluadores. Una vez fueron registrados los datos mediante el software Lince, fueron analizados mediante la técnica de reducción de datos Theme. Los resultados evidenciaron la existencia T-patterns en función del género.

**Palabras clave:** género; balonmano; metodología observacional; T-patterns.

## Introduction

**P**robing into gender differences in sports practice has aroused special interest (Romarís, Refoyo & Lorenzo, 2016). Specialized literature dealing with gender differences can also be found in other contexts (Knight, 2002). From interdisciplinary approaches (Costa, Terracciano & McCrae, 2001) or from more specialized perspectives such as communication networks (Szell & Thurner, 2013), among other perspectives. Some research suggested that girls were more closely involved with co-operation, and boys with rivalry (Shwalb & Shwalb, 1985).

However, in recent studies this previous idea has been questioned. Although it was proved that boys showed a certain affinity for competing against girls, it was also noted that both girls and boys obtained positive emotions as a result of cooperating or rivaling (Kivikangas, Kätsyri, Järvelä & Ravaja, 2014). Gender research in sports requires a certain specificity, such as that found in sports such as football (Bradley, Dellal, Mohr, Castellano & Wilkie, 2014) or volleyball (Koch & Tilp, 2009). More successful attacks in favor of men were pointed out in the same sport (Kountouris et al., 2015) or when playing motor games.

When examining the scenario of the motor game, some differences were verified between girls and boys when playing. Previous research confirmed similar results linked to boys regarding competition and rivalry in motor games (Sluckin, 1981). It was found that girls preferred the development of activities related to cooperation (Shwalb & Shwalb, 1985). But women and men were also different regarding their reasons to become sports fans (Dietz-Uler, Harrick, End & Jacquemotte, 2000). Perhaps the lack of interest of the media (Sainz de Baranda, 2017) can help to explain the invisibility of 'sportswomen' (Sainz de Baranda, 2014).

Handball is a cooperative-oppositional (Parlebas, 2001) and invasive sport (Almond, 1983). With the aim of getting to know this sport better, progress was made regarding knowledge about attack actions (Rogulj, Srhoj & Srhoj, 2004) and the effectiveness of the launches (Sáez, Roldán & Feu, 2009). The speed reached by the ball in the throws was also studied (Rivilla, Sampedro, Navarro & Gómez, 2010). On the other hand (Carcasés, 2004) the effectiveness of pitches made by wingers was 54%, while around 42% for central defenders, among other studies on handball.

Except for a few examples (Lozano & Camerino, 2012), handball has dispensed with the temporal dimension to undertake research studies. A methodology that seems to have aroused interest among the scientific community, surely due to its adaptability, is the observational methodology. Probably because of its ecological character, that is to say, the possibility that it offers to study the object of study in a natural context (Anguera & Hernández-Mendo, 2014; Anguera, Magnusson & Jonsson, 2007) among other arguments.

Among other researches (Ávila, 2003; González, Botejara, Puñales, Trejo & Ruy, 2013) an observational methodology (Anguera & Hernández-Mendo, 2013) was used to study situations of handball inequality (Gutiérrez, Fernández & Borrás, 2010). The study concluded that the winning team condition offered better offensive and defensive efficiency ratings. In contrast, (Montoya, Moras & Anguera, 2013) were interested in completion actions specifically located in the right/left wings. Among the conclusions, it was justified that the increase in the participation of the extremes could explain the success of the teams.

Some observational studies have incorporated alternative analysis techniques to the classic ones. Despite this, there is still little scientific evidence that refers to the use of a temporal dimension in sports practice. To investigate the temporal dimension there is a technique of data reduction called Theme (Magnusson, 2000), which tries to evidence not only behavioral but also temporal regularities. That is, we look at the temporal dependence on the appearance of the behaviors susceptible of analysis. Investigations that included the temporal dimension analyzed the type of attack and the effectiveness of basketball shots (Fernández, Camerino, Anguera & Jonsson, 2009).

Recently (Pic, 2017) asymmetrical temporal structures among basketball teams were identified. Finishing actions in futsal have also been approached from a temporal perspective (Lapresa, Álvarez, Arana, Garzón & Caballero, 2013), as well as the attack efficiency in the same sport (Lapresa et al., 2015). On the other hand, possible problems of adaptation of children in the practice of football 7 and football 8 (Amatria, Lapresa, Arana, Anguera & Jonsson, 2017) or regularities in football (Zurloni, Cavalera, Diana, Elia & Jonsson, 2014) were investigated.

Authors (Lozano & Camerino, 2012) showed a starting positioning similar to the present study. On the one hand, they used an observational methodology and, on the other hand, they put into practice analysis using the Theme technique. Among the most relevant conclusions, it could be remarked that the most used tactical system is the structured one, and that self-organized transformations of the system would be advantageous for the teams. Following this line of research, (Lozano, Camerino & Hilenó, 2016) the activation of the offensive dynamic interaction in handball optimized the performance of handball teams.

For all of the above reasons, the purpose of the research was to identify gender differences between girls and boys in the practice of high-level handball matches. The registration system served as a support to verify the effectiveness of the throws, places of passage of the ball and interventions of the referee (Table 1).

## Method

### **Observational Design**

The study is located in quadrant III (Anguera, Blanco-Villaseñor, Hernández-Mendo, & Losada, 2011) because it was classified as nomothetic, because the behaviors of several teams were recorded; punctual, since the equipment that was studied was not followed up; and multidimensional, because the registration system was composed of different referential criteria.

### **Participants**

The matches selected for analysis were found at London 2012 Olympic Games. The men's matches (N = 2) were the final disputed by Sweden and France teams, and the semi-final played by Hungary and France. Women's matches (N = 2) were played between Norway and Montenegro teams, while the championship semi-final was played between Norway and Korea.

### **Observational tool**

In order to capture the behaviors of handball players, a mixed observational record system 'ad hoc' (Table 1) was designed, combining the definition of system of categories and field format. In order to know what happens in handball matches, the effectiveness of the throws, the ball's circulation space or the infractions indicated by the referees, could help to understand something more than the final result.

**Table 1.** Mixed recording system used by the evaluators. Each criterion (team, throws, effectiveness, zone and referee) had a categorical correspondence.

<b>Criteria</b>	<b>Codes and categorical description</b>
<b>Teams</b>	The analyzed teams received the name of (X) nor (Z).
<b>Throws</b>	Launches made with feet on the ground and arm over shoulder (a); hip or lower pitches (b). The throws (a) made in suspension or jump were denominated (as), while the low throws also in the air (bs).
<b>Effectiveness</b>	Effective offensive ending action or fine shot by throwing player (e); ineffective or failed offensive ending action by throwing player (ne).
<b>Zone</b>	When the ball of the team in possession crosses the half-way line (h), if the 9-meter line is crossed with the ball in the direction of the opposing goal (nf); but when crossing the line of 9 meters to retreat (nh).
<b>Referee</b>	When a player on the team in possession receives a foul and it is sanctioned with a free throw (gf); the penalty sign or 7 meters (si); breaks requested by coaches (br); while concluding one of the match halves (Ou).

### Procedure

The encoded registration was performed by using Lince software v.1.1 (Gabín, Camerino, Anguera & Castañer, 2012), on images downloaded from the YouTube website. Once the images were downloaded, the registration was done in two different moments by two neutral evaluators. To assure the quality of the data, the Pearson and Spearman correlation coefficients were applied. To apply this procedure, under all possible conditions (2 observers in 2 moments) the software Spss v24 was used. Values close to unity were reached under any circumstance, which ensured the quality of the records.

For the detection of T-Patterns by using Theme v.6 software (Noldus Information Technology bv) the following parameters were established: a) free patterns, b) significance level  $<.005$ , and c) a minimum frequency of 6 occurrences to form T-Pattern was required. Theme detects complex patterns gradually as combinations of simpler ones. According to Magnuson (2000, p-94-95) 'if A is an earlier and B a later component of the same recurring T-pattern, then, after an occurrence of A at  $t$ , there is an interval  $[t+d1, t+d2]$  ( $d2 \geq d1 \geq d0$ ) that tends to contain at least one occurrence of B more often than would be expected by chance'.

### Results

The number of T-patterns involved in the analyzed matches was different according to gender. On the one hand, the total patterns found in the girls were 12298, while the boys reached 18520. The different T-patterns were also found. Of these, the girls obtained 1402 and the boys 2256. In the boys were found more T-patterns than in the girls, and more variable.

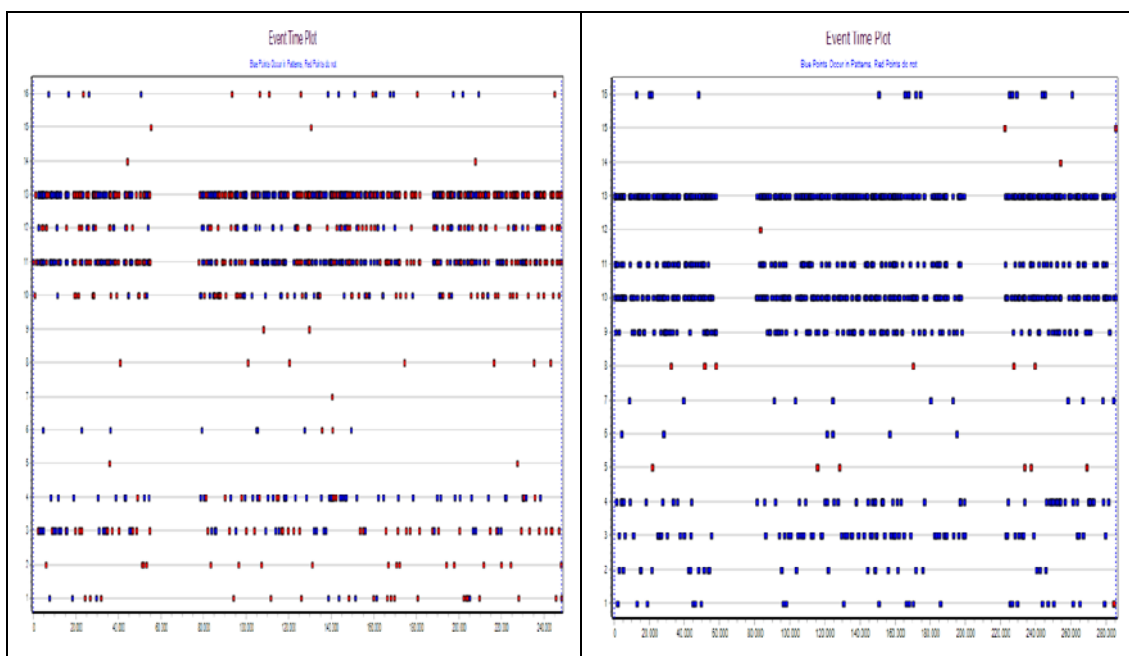
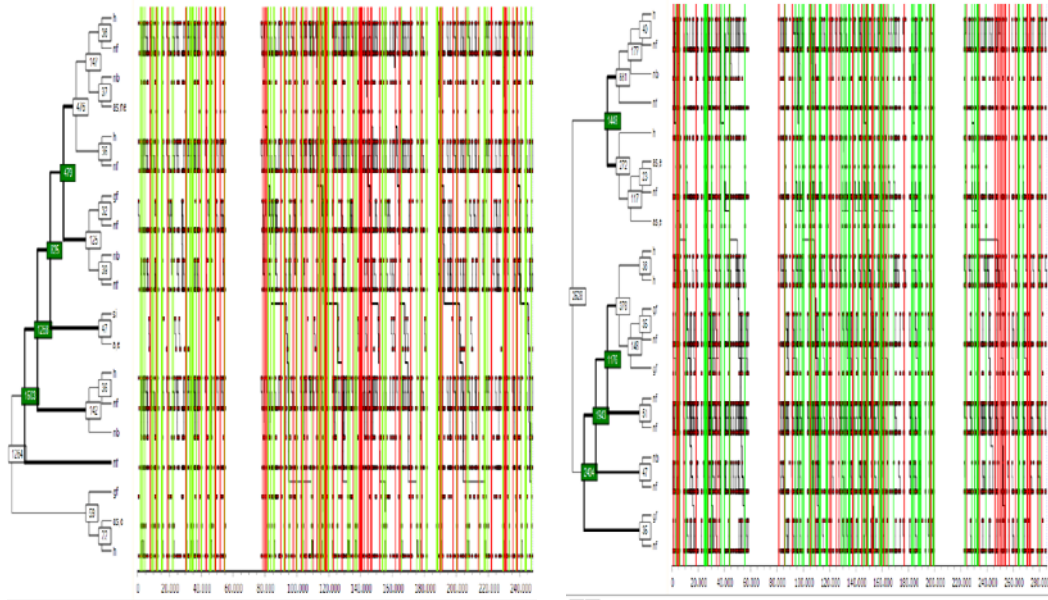


Figure 1. On the left of the image, the temporal distribution of girls' matches, while on the right boys' matches.

The blue dots (Figure 1) correspond to the identification of T-patterns, whereas the red dots would be behaviors not belonging to any of the T-patterns found. Thus, the girls showed more behaviors than did not belong with any T-patterns. However, red dots were scarce in the image on the right.



**Figure 2.** On the left of the image, the dendrogram generated by Theme with the most complex patterns found in girls on the left, and boys on the right.

Figure 2 is the dendrogram generated by Theme (Magnusson, 2000) of girls (left of the image) and boys (right of the image). The red and green colors correspond to the actual throwing behavior with the raised arm (above the shoulders) in suspension, which was the most used throw by girls and boys. While the boys reached a 55-pitch effectiveness (as, e), at the same time they missed 63 (as, ne) which offers a narrow margin between right and wrong. However, the level of success increased in girls to 71 effectiveness and 59 errors in the same throw as the boys.

Apparently, the red color of the girls' in figure 2 (left) is more intense. There was a more homogenous distribution of the misses in the throws (as, ne), whereas the boys also missed but these misses (throws) were concentrated in more concrete places.

When comparing the first dendrogram behaviors in girls and boys, it was verified that the behaviors that preceded the realization of ineffective throws type (as, ne) in girls were crossing the line of half field (h) with crossing the line of 9 meters in the sense of attack (nf) and crossing the same line in the opposite direction to (nb) with ineffective throws (as, ne).

In order to find a relationship with the throws in boys, it could be observed the first group of eight behaviors through which identical throws to the girls' (as, e) could be made, but with success. The behaviors that make up the T-pattern alternated crossing the line of the half field (h) with crossing the line of 9 meters (nb) and going back (nl). This latter behavior was directly linked to success at throws. The rest of the dendrogram did not detect any direct relationship with the success or failure of the throws, repeating the crossing of the half-field line (h-h), the free hits and associated with the crossing of the line of 9 meters in attack (gf-nf) and both with the free throws again (gf). The next 3 pairs of joined behaviors were equally bound to crossing the 9-meter line in the direction of the attack, both the same conduct with itself (nf-nf), as with re-crossing to exit it (nb-nf) and with the accomplishment of free strikes (gl-nf).

In girls, there was a relationship between the signaling of penalties (si) and their transformation into goals for the team by throwing (a, e). The set of behaviors (h-nf-nb) implies that temporal regularities were detected in the realization of the conducts of crossing the half-field line (h), crossing the 9-meter line (nf) to return to the original position before more distant of the rival goal (nb). Finally, the signing of free throws (gf) was related to the achievement of successful throws.

## Discussion

The objective of the work was to address possible gender differences in handball matches. In order to carry out the study, we were assisted by an observational methodology, which allowed us to carry out a study in a context of naturalness and spontaneity (Anguera, 2017) in order to achieve research purposes. The Theme tool (Magnusson, 1996; 2000) contributed to the identification of temporal regularities.

In this way, behavioral itineraries that took the codification of the mixed registration system could be evidenced. The lower number of T-Patterns in girls and boys suggests that the complexity of records organizing was greater in boys. That is to say, Theme (Magnusson, 2000) identified behavioral itineraries with greater temporal regularity (Zurloni et al., 2014; Pic, 2017) in boys; more behaviors were found in girls that could not be included within the identified T-patterns (Figure 1). Perhaps the rate at which the boys played seemed less disturbed than that of the girls and, on the other hand, the boys made much more studied decisions about the ball, repeating the combination of behaviors. It should be noted that the range of responses of the boys was also greater than that of girls.

Some studies have concluded that boys showed some attraction for rivalry while girls did not show it (Kivikangas et al., 2014). Girls' play may be less elaborate in situations of competitive stress. Activation of continuous waves of events (Figure 2) may be greater in boys in terms of regularity.

On the other hand, we saw that the quantification of effectiveness of the throws (as, ne) favored the girls rather than the boys. However, this type of effective throws appeared up to twice in the male dendogram and only one in the female dendogram. This argument is apparently a paradox. However, in this sense, it is necessary to include the temporal dimension in order to reveal these results. That is, although it was previously mentioned that the effectiveness of the throws (as, n) was superior in girls, and also that the ineffective throws (as, e) were superior in boys, it should also be borne in mind that the temporal distribution of events is important for Theme. That is, as it was verified in the dendogram of the girls, the red color was distributed more homogeneously than in boys (Figure 2) and for this reason the missing throws (as, ne) were identified in girls and not in boys.

More structured handball game systems (Lozano & Camerino, 2012) may generate more regular actions. Perhaps this key helps to understand that the girls' game was less structured and, therefore, fewer T-patterns were identified.

Among the limitations of the study, one could allude to the possible increase in the number of criteria and categories of the mixed registration system. Also, the sample increase and the inclusion of timeless analyzes could offer enriched results due to the crossing of conclusions. Other research groups could develop studies to analyze more specific situations of the game and thus reveal a greater specificity, following the trail of other researches that undertook the study of handball (Montoya et al., 2013).

## Conclusions

An observational methodology (Anguera & Hernández-Mendo, 2014; Anguera & Hernández-Mendo, 2016) and the data reduction technique Theme v6 (Magnusson, 2000) showed differences between girls and boys according to the requirements of temporality and behavioral registration. These differences would have been hardly discernible from a timeless perspective. Evidencing more T-patterns in boys than in girls is revealing of a greater strategic complexity. Thus, the challenge remains to make evident the invisible, to generate knowledge with true practical application.

Among possible applications, from a sports performance perspective, strategic enrichment with homologous gender could be a field of application, but a design of training tasks more in line with the needs according to the gender of the participants could also find in this work reasons for their application.

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