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## ORIGINAL

# GOALKEEPER-FIELD PLAYER IN SITUATIONS OF OFFENSIVE NUMERICAL INFERIORITY IN HANDBALL: PENALTY OR ADVANTAGE?

## PORTERO-JUGADOR EN SITUACIONES DE INFERIORIDAD NUMÉRICA OFENSIVA EN BALONMANO: ¿PENALIZACIÓN O VENTAJA?

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### ABSTRACT

The main goal was to analyze the end results in offensive actions between teams that do or do not employ the goalkeeper-field player in situations of offensive numerical inferiority in handball. The secondary objectives focus on analyzing the use and behavior of the goalkeeper-field player, as well as its role in the final offensive result and following actions in terms of the opposing team's counterattack.

86 official match reports from the 22<sup>nd</sup> Women's Handball World Championship (Denmark 2015) were analyzed, and the viewing, analysis and registration of the 927 situations of offensive numerical inferiority were carried out, as well as the pertinent statistical study with SPSS v.24.

The results show that the tactical or strategic use of the goalkeeper-field player favors goal scoring in situations of offensive numerical inferiority and does not punish the team which employs it, since there's no significant difference in the probability of conceding a goal in counterattack.

**KEY WORDS:** handball, goalkeeper-field player, offensive numerical inferiority, sports performance.

## RESUMEN

El objetivo principal fue analizar el resultado final de la acción ofensiva entre los equipos que utilizan, o no, el portero-jugador en situaciones de inferioridad numérica ofensiva en balonmano. Los objetivos secundarios se centran en analizar cómo es la utilización y el comportamiento del portero-jugador y su relación con el resultado final ofensivo y la posterior acción con respecto al contraataque del equipo contrario.

Se analizaron las actas oficiales de 86 partidos del 22<sup>o</sup> Campeonato del Mundo de Balonmano Femenino (Dinamarca 2015) y se realizó el visionado, análisis y registro de las 927 situaciones de inferioridad numérica ofensiva, así como el estudio estadístico pertinente con SPSS v.24.

Los resultados demuestran que el uso del recurso táctico o estratégico del portero-jugador favorece la obtención de gol en situaciones de inferioridad numérica ofensiva y no penaliza al equipo que lo utiliza, al no existir diferencia significativa en la probabilidad de recibir gol en contraataque.

**PALABRAS CLAVE:** balonmano, portero-jugador, inferioridad numérica ofensiva, rendimiento deportivo.

## 1. INTRODUCTION

One of the main themes in sports sciences is the research on athletic performance. Handball is a well-studied sport both in terms of formative stages (Antúnez, García, Sáez, Valle, & García, 2013; García, Ibáñez, Feu, Cañadas, & Parejo, 2008; Oliver & Sosa, 1996) and high performance (González, 2012; González, Botejara, Puñales, Trejo, & Ruy, 2013; de Pablos, 2015; Lozano & Camerino, 2012; Sierra-Guzmán, Sierra-Guzmán, Sánchez, & Sánchez, 2015; Sousa, Prudente, Sequeira, López-López, & Hernández-Mendo, 2015). The common goal of these studies is to determine the quantitative contribution of certain variables of play in the final results of actions by high performance handball teams. All this information is relevant when it comes to designing tactical or strategic plans that enable maximum performance, thus optimizing match results.

The variables which influence athletic performance are numerous and it is hard to pinpoint the most relevant. The majority of the articles that center their research on variables of play associated to success centered their studies on

shot effectiveness (de Pablos, 2015; Montoya, 2011; Rivilla-García, Navarro Grande & Sampedro, 2012), but Anton's (2010) presents a different aim.

Antón (2010) speaks of a possible new tactical-strategic contribution, the "fake goalkeeper". In the course of his article, he establishes an evolutive analysis of offensive numerical inferiority play and the variables that determine the usage of this tactical resource, asking the following question: is the use of a "fake goalkeeper" during offensive numerical inferiority really a new and interesting contribution? After formulating the question, he then takes a general look at its past and present use, results from actions witnessed live in different competitions, advantages and disadvantages of its use, etc. Finally, he leaves the door open to further, sufficiently rigorous scientific research that provides reliable and generalizable statistical results.

Even though this tactical or strategic resource has been used (be it systematically or in isolated cases, and almost always in cases of offensive numerical inferiority) by different teams in several national and international competitions, the truth is that there are very few published research projects that analyze its use and performance. The scarce scientific literature found on the subject, the need to look for answers on it, and the personal link to handball, are the reasons that justify the realization of this study, whose main objective is to know, analyze and compare the end results of offensive numerical inferiority actions between teams that use or do not the goalkeeper-field player ("fake goalkeeper"), in addition to studying the behavior of the goalkeeper-field player and its relationship with the offensive final result and the subsequent action with respect to the counterattack of the opposing team.

## **2. MATERIAL AND METHODOLOGY**

### **2.1. Sample**

The sample used in this study is composed of all 927 offensive numerical inferiority situations generated by the 24 women's teams participating in the 22<sup>nd</sup> Women's Handball World Championship which took place in Denmark in 2015.

Information on 86 out of the 88 matches carried out in all stages of the Championship is collected and registered. Out of those 86 matches, 707 penalties (two-minute duration) were recorded, which generated 927 offensive numerical inferiorities (154 with goalkeeper-field player and 773 without).

### **2.2. Instrument and research variables**

The tool contrived and designed *ad hoc* for this analysis is an observation template, validated by a group of experts, in which the following variables are defined and registered:

**Table 1.** Research variables, description and categories.

Variables	Description	Categories
<b>STAGE</b>	This segment differentiates the various stages in which the competition is divided.	<ul style="list-style-type: none"> <li>- Group stage</li> <li>- Eighth finals</li> <li>- President's Cup</li> <li>- Quarter-finals</li> <li>- Semi-finals</li> <li>- Final match</li> <li>- Qualifying matches</li> </ul>
<b>TEAM</b>	Numerical identification (1 to 24) of each team participating in the World Championship by alphabetical order in English.	
<b>GOALKEEPER-FIELD PLAYER</b>	Existence, or not, of the figure of the goalkeeper-field player in the analyzed situations of offensive numerical inferiority. It consists on the use of a goalkeeper as a field player, or the substitution of the goalkeeper by a field player wearing a jersey of the same color as the keeper which identifies him/her as such.	<ul style="list-style-type: none"> <li>- Goalkeeper-field player.</li> <li>- No goalkeeper-field player.</li> </ul>
<b>FRTI</b>	Final Result of Team during Inferiority. Records the different final results of team actions during offensive numerical inferiority.	<ul style="list-style-type: none"> <li>- Goal for.</li> <li>- No goal (throw out).</li> <li>- No goal (keeper saves).</li> <li>- No goal (technical foul, too many steps, double dribble, stepping on the 6 m line ...).</li> <li>- No goal (pass-reception error).</li> <li>- No goal (ball interception).</li> <li>- No goal (offensive foul).</li> <li>- No goal (passive play).</li> <li>- No goal (gives 7-meter throw and goal).</li> <li>- No goal (gives 7-meter throw and misses).</li> <li>- No goal (block).</li> </ul>

**If goalkeeper-field player exists, the following variables apply:**

- No counterattack.
- Counterattack and no shot. Positional attack: the team with numerical superiority initiates counterattack but this is not completed, and positional attack is used instead.

<b>FORTS</b>	Final Offensive Result for Team with Superiority. Once the team in numerical inferiority loses possession, we will analyze if there exists or not a counterattack stage with a favorable result for the team with numerical superiority.	<ul style="list-style-type: none"> <li>- Counterattack and no shot. Ball loss: the team with numerical superiority initiates counterattack and loses ball possession.</li> <li>- Counterattack and goal.</li> <li>- Counterattack and no goal.</li> </ul>
<b>MINUTE</b>	Match minute in which the 2-minute suspension of a player forces the team to attack in inferiority for 2 minutes. They are grouped in 5-minute intervals (0,00 to 4,59; 5,00 to 9,59, etc.).	
<b>SCORE</b>	Goal difference between the team that uses goalkeeper-field player and the opposing team at the moment in which the team with offensive numerical inferiority makes use of this tactical resource (+2, -3, etc.).	
<b>BENCH AREA</b>	Goalkeeper-field player positioning on the court with regard to the exchange area. Three areas are observed in terms of the goalkeeper-field player's positioning when exiting the court.	<p>The court is divided in three areas according to positioning:</p> <ul style="list-style-type: none"> <li>- Bench area: The goalkeeper-field player is between the closest area to his substitution area (full-back, winger or pivot closest to his substitution area) and the center-court area, that is, at 6m. maximum, parallel to the sideline of his/their substitution area .</li> <li>- Area opposed to the bench: The goalkeeper-field player is between the farthest area from the substitution area (full-back, winger or pivot farthest away from his substitution area) and the central line, that is, at 6m. maximum, parallel to the sideline opposite his/their substitution area.</li> <li>- Central area: The goalkeeper-field player is in center-back position (center-back or pivot in center-field) between both bench areas, that is, more than 8 m. from both sidelines.</li> </ul>
<b>PLAYER POSITIONING</b>	Specific positioning where the goalkeeper-field player is placed upon entering the court.	<ul style="list-style-type: none"> <li>- Right winger.</li> <li>- Left winger.</li> <li>- Right back.</li> <li>- Left back.</li> <li>- Center-back.</li> <li>- Pivot.</li> <li>- Secondary pivot.</li> </ul>

<b>GFI</b>	Goalkeeper-field player intervention. Participation of this player during his team's possession of the ball.	<ul style="list-style-type: none"><li>- Doesn't receive the ball.</li><li>- Passes the ball.</li><li>- Intervenes by initiating a collective tactical procedure.</li><li>- Intervenes during a collective tactical procedure.</li><li>- Intervenes by ending the collective tactical procedure.</li><li>- Doesn't end possession. Passes the ball: the Goalkeeper-field player leaves the playing field before the end of his team's possession, participating in the offensive action.</li><li>- Doesn't end possession. Doesn't receive or pass the ball. Goalkeeper-field player leaves playing field before the end of his team's possession, not participating in the offensive action.</li></ul>
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### 2.3. Data collection and analysis techniques

In this study, of notational-observational and cross-sectional design, data collection was done through official match reports published by the IHF, as well as digital recordings and viewings of those 86 games, registering and codifying all possible variables in the study template designed to this effect. Afterwards, the registered data is dumped into the IBM program SPSS (Statistical Package for Social Sciences) v.24.0 for its statistical analysis.

For the comparative and descriptive analysis was used the distribution of frequency and cross-checked tables with expected and observed frequencies by means of Pearson's chi-squared test, considering that difference is significative when the value of  $p < 0,05$ .

The observers had previous training, and regarding data quality control, there was an analysis of inter-observer concordance by means of Cohen's Kappa coefficient, resulting in a 0,96 concordance rate.

### 3. RESULTS

The results are structured in two stages, the first being eminently descriptive, which aims to offer general information on the behavior of the variables studied; and the second referring to the comparative analysis of data on the final result of offensive numerical inferiority actions.

### 3.1. Descriptive analysis

- 63,8% (591/927) of offensive numerical inferiority situations happened in the preliminary stage of the Championship, decreasing as it proceeded in direct proportion to the number of teams that remained competing.
- The goalkeeper-field player tactic was used in 154 out the total of 927 (16,6%) situations of offensive numerical inferiority that came about as consequence of the 707 2-minute suspension, with the highest frequency, 16,2% (25/154), from the 25<sup>th</sup> minute of the 1<sup>st</sup> period and between the 40<sup>th</sup> and 45<sup>th</sup> minute of the second period, 16,2% (25/154).
- Based on the distribution frequencies, the use of the goalkeeper-field player constitutes a 6,5% of the total in situations where the score is tied (10/154), a little higher, 7,8% (12/154) when the goal difference is negative (-1 and -3 goals), and highest when a favorable goal difference is superior to 5, 18,8% (29/154), and also when the negative goal difference is superior to 5, 11% (17/154).
- The goalkeeper-field player is positioned most frequently in the central area of the court, with a 44,2% (68/154) of the total, followed by the closest area to the substitutions area, 36,4% (56/154), and the farthest area from the substitutions area being the least frequent with 19,4% (30/154).
- The most utilized position is center-back with 43,6% (67/154) of occasions, followed by right back, left back and right winger with 20,1% (31/154), 14,3% (22/154) and 13,6% (21/154) respectively.
- Once the goalkeeper-field player has occupied their specific position, they intervene 40,3% (62/154) of the time in collective tactical procedures, they start it in 5,8% (9/154), and they end it in 6,5% (10/154). They don't receive the ball in 14,9% (23/154) of the interventions, and they don't complete possession time on the court 21,4% (33/154) of the time.
- In 35,7% (293/927) of all offensive inferiority situations there were 331 goals scored. However, in 64,3% (634/927) of these situations of numerical inferiority there were no goals scored, be it by means of shooting actions, 29,7% (275/927) (save or missed shot), by effective defensive actions in the opposing team, 7,4% (68/927) (block or interception), by a pass-reception error, 10,7% (99/927), or by technical foul in 9% (83/927) of occasions.
- Once possession for the team with numerical inferiority is over, 14% (130/927) of the time it results in a goal conceded as a consequence of a counterattack, as well as an additional 8,7% (81/927) of unfinished counterattacks. Notwithstanding, the most frequent situation was that of no counterattack at all, 66,7% (618/927).



### 3.2. Comparative analysis

- The use of a goalkeeper-field player in different stages of the Championship is higher in the preliminary stages, although the statistical signification is limited due to the reduced sample size in the Group stage.

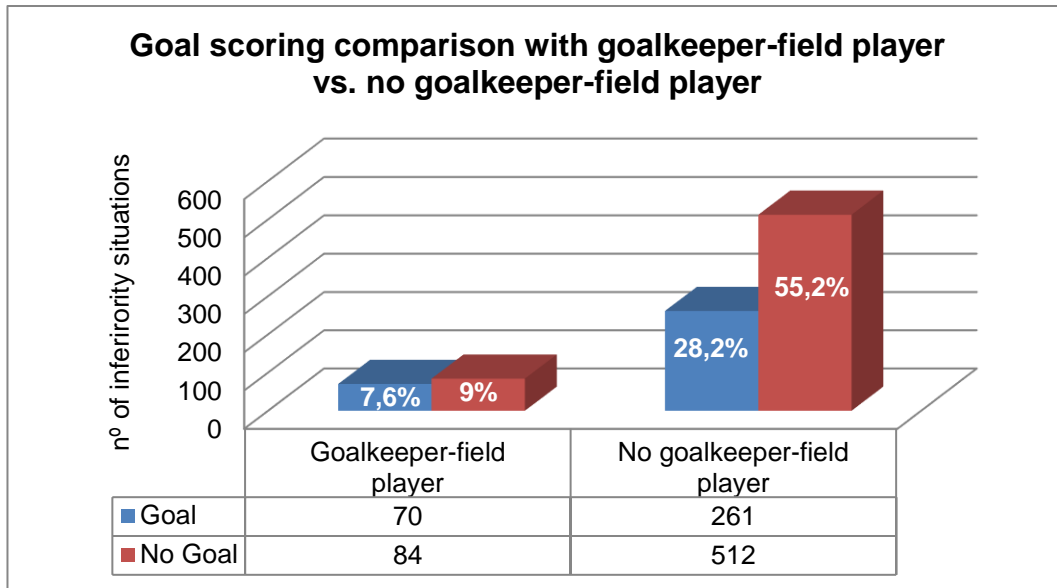
The most relevant results are shown in Table 2.

**Table 2.** Most relevant results in terms of analysis and goal scoring/no goal scoring.

Categories	Goal	No goal
No goalkeeper-field player present	261/773 (33,76%)	512/773 (66,23%)
Conceded goal without goalkeeper-field player	109/773 (14,1%)	664/773 (85,89%)
Goalkeeper-field player present	70/154 (45,45%)	84/154 (54,54%)
Conceded goal with goalkeeper-field player present	21/154 (13,64%)	133/154 (86,36%)
Bench area	26/154 (16,9%)	30/154 (19,5%)
Area opposed to bench area	12/154 (7,9%)	18/154 (11,7%)
Central area	32/154 (20,7%)	36/154 (23,3%)
Right winger	12/154 (7,8%)	9/154 (5,8%)
Left winger	1/154 (0,6%)	8/154 (5,2%)
Right back	15/154 (9,7%)	16/154 (10,4%)
Left back	8/154 (5,2%)	14/154 (9,1%)
Center-back	32/154 (20,8%)	35/154 (22,7%)
Pivot	2/154 (1,3%)	2/154 (1,3%)
Does not receive ball	10/154 (6,5%)	13/154 (8,4%)
Passes the ball	17/154 (11%)	33/154 (21,4%)
Intervenies by starting a tactical procedure	7/154 (4,5%)	2/154 (1,3)
Intervenies during ongoing tactical procedure	29/154 (18,8%)	33/154 (21,4%)
Finishes a tactical procedure	7/154 (4,5%)	3/154 (1,9%)

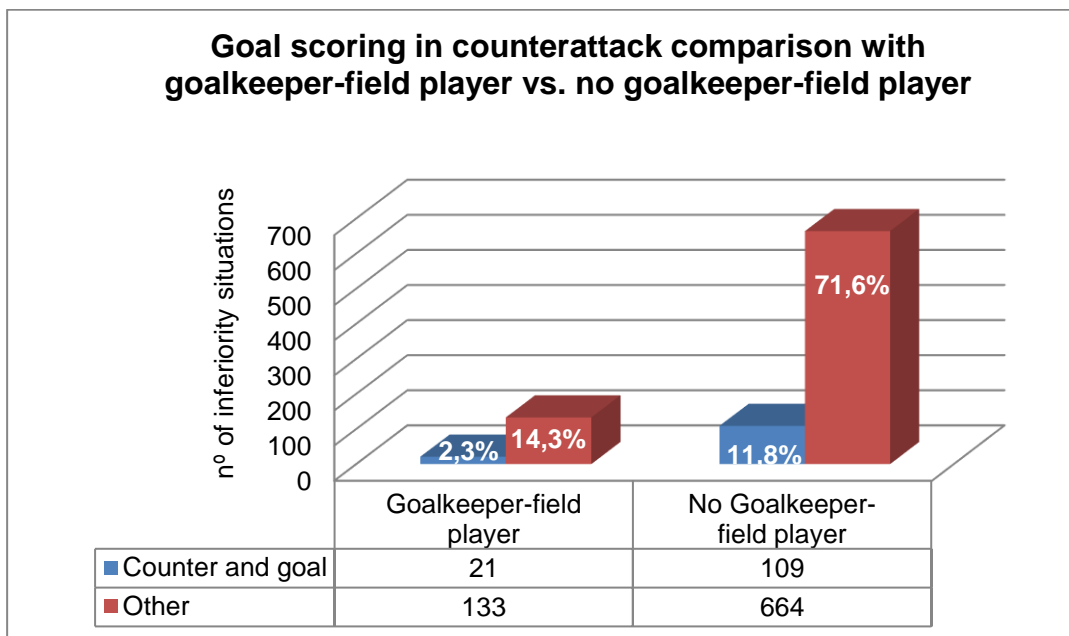
- The probability of scoring a goal in offensive numerical inferiority is higher when using the goalkeeper-field player tactic than when not, with a statistically significant difference ( $p = 0,006$ ). Furthermore, the use of a “fake goalkeeper” results in 70 goals scored in 154 situations of inferiority, or 45,45% of the time, as opposed to 261 goals in 773 situations of offensive inferiority without a goalkeeper-field player, which translates to 33,76% of the time.
- On the other hand, there is a high percentage (55,2%) of situations in which the goalkeeper-field player does not participate at all and that do not end in offensive success (goal scored), as opposed to only 9% of the time when a goalkeeper-field player participates and does not end in offensive success.





**Figure 1.** Goal scoring comparison with goalkeeper-field player vs. no goalkeeper-field player.

- There are no statistically significant differences ( $p = 0,979$ ) between the use or no use of a goalkeeper-field player and the probability of conceding a goal because of a counterattack by a team with numerical superiority. The opposing team manages 2,3% of goal success in counterattacks when a goalkeeper-field player has been used, as opposed to a 11,8% of goal success when not, and a 14,3% of goal failure in counterattack when a goalkeeper-field player is present, as opposed to a 71,6% when not.



**Figure 2.** Goal scoring in counterattacks comparison with goalkeeper-field player vs. no goalkeeper-field player

- The final result of the action with goalkeeper-field action is not influenced by the area in which they are initially placed in the court with regard to the bench area ( $p = 0,854$  /  $p = 0,504$  /  $p = 0,722$ ), nor by the specific role which they occupy.

- It must be noted that, although lacking statistical significance, the majority of the goals are scored when the goalkeeper-field player is in the central area of the court and, specifically, in the role of center-back.
- A behavioral analysis of the goalkeeper-field player tactic and their intervention in plays yields no significant differences, independently of whether they intervene in an ongoing tactical procedure ( $p = 0,787$ ) or in a finished tactical procedure ( $p = 0,107$ ). However, there are significant differences when the goalkeeper-field player initiates the tactical procedure ( $p = 0,045$ ), scoring a goal in 4,5% of occasions, as opposed to 1,3% of all numerical inferiority situations in which they initiate the tactical procedure and no goal is score.
- No differences are perceived ( $p = 0,237$ ) in goal scoring when the goalkeeper-field player does not receive the ball or does not end possession, that is to say, leaves the court before finalizing possession in offensive numerical inferiority.
- Teams which use a goalkeeper-field player often follow the same tactical procedure, regardless of match circumstances, that is to say, each one repeats, in high percentage, the use of the same tactical procedure.

**Table 3.** Distribution of frequency and usage % of the most utilized tactical procedure by each team.

Team	Tactical procedure	Total inferiorities with goalkeeper-field player	%
Norway	20	24	83,33%
Romania	13	21	61,90%
Argentina	4	7	57,14%
Netherlands	14	25	56%
Japan	21	43	48,83%
Sweden	10	28	35,71%

#### 4. DISCUSSION

As mentioned earlier, there is not much literature with which to establish comparisons that forward a discussion. There is only the publication by Antón (2010) in which he expresses his experience and that of other coaches in regard to this tactic, as well as his competition records, without an exhaustive statistical analysis.

In his article, Antón (2010) highlights that in major competitions there are few teams which use this tactic, “in the Women’s World Championship in China, only Argentina used it” (p.16), which stands out in comparison with the 37,5% (9/24) of teams that used it in 2015’s Women’s World Championship. Likewise, it is notable that its use is usually reduced to “extreme” situations, whereas the present study reveals that 6,5% of the times a team uses a goalkeeper-field player in situations of a tied score, 11% when the team is losing by five or more

goals and 18,8% when the team is winning by five or more goals. Furthermore, far from being used in “extreme” situations, teams like Norway, Netherlands, Japan or Sweden use it almost systematically (in more than 50% of their offensive numerical inferiority situations).

By comparison, the same author claims he has never witnessed a favorable goal as a consequence to this strategy, nor a shot on goal, by the goalkeeper-field player, interesting contrast with this study’s results, which shows that the goalkeeper-field player finishes the play 6,4% (10/154) of the time, scoring a goal in 4,5% (7/10) of the occasions. Moreover, this study shows that more goals are scored in numerical inferiority with a goalkeeper-field player than without, with a statistically significant difference ( $p = 0,006$ ). 70 goals are scored (45,5%) in 154 situations of numerical inferiority with goalkeeper-field player, as opposed to 261 goals (33,76%) in 773 situations of inferiority without goalkeeper-field player.

In this study, data analysis shows that, even though no significant differences exist in the behavior of the goalkeeper-field player, there does exist a higher frequency of the use in the specific role of center-back (43,6%), and their participation during a tactical procedure in 40,3% of the situations. Regarding “punishment” for the use of goalkeeper-field players, Antón (2010) points out the inconvenience of “leaving the goal open and without protection- (p.19) and the possibility that the opposing team score a goal because of a counterattack after the attacking team lost possession of the ball. According to this study, only 2,3% of all goals conceded from a counterattack happened when the team used a goalkeeper-field player, as opposed to 11,8% when not used in situations of offensive numerical inferiority.

Lastly, teams that use the goalkeeper-field player tactic do so independently of the match’s circumstances and, also, repeating the same tactical procedure with high frequency. It is notable that three out of the first four qualified teams in the Championship (Norway, Netherlands and Romania) are the ones that most frequently use this tactic and most frequently repeat the same tactical procedure.

## 5. CONCLUSIONS

- The use of the goalkeeper-field player as a strategic resource favors goal scoring in situations of offensive numerical inferiority vs. not using it.
- The use of a goalkeeper-field player in situations of offensive numerical inferiority does not “punish” the team that deploys it, since there is no difference in the probability of conceding a goal with or without. In other words, to suffer a 2-minute suspension hardly negatively affects the infracting team’s attacking so long they use a goalkeeper-field player.
- The use percentage of a goalkeeper-field player is significantly higher in the Preliminary Round than in more advanced stages of the Championship.

- According to the analyzed sample, the use of a goalkeeper-field player happens mainly when the score's goal difference is bigger, be it in favor or against. The goalkeeper-field player tactic is less used when the score is tied.
- The goalkeeper-field player is used most frequently in the final minutes of the 1<sup>st</sup> period of the match and towards the half of the second, significantly lowering its use in the last 10 minutes of a match.
- There are no significant differences between the behavior of the goalkeeper-field player in regard to the bench area (closer, farther or central area) where the player starts its action, nor in regard to the specific role it occupies in the court.
- In terms of goal scoring, the participation of a goalkeeper-field player does show significant differences when they are the ones starting the tactical procedure, though not so when their intervention is reduced to not receiving or passing the ball, intervening during an ongoing tactical procedure, or leaving the court before the end of possession.
- The teams that use a goalkeeper-field player usually deploy the same tactical procedure, regardless of the circumstances of the match.
- Three out of the first four qualified teams in the Championship (Norway, Netherlands and Romania) are the ones that most frequently utilize this tactic and repeat the same tactical procedure with the highest percentage.

As a final thought, should we consider allowing the use of a goalkeeper-field player during a 2-minute suspension, even if according to this study it actually ends up benefitting the infracting team's attack by using it?

## **6. PRACTICAL APPLICATIONS AND FUTURE LINES OF INQUIRY**

Having concluded this study, and although its results and conclusions are limited to a single analyzed competition, the implications that this research can carry, among others, are:

- To provide technical insight into the use and performance of the goalkeeper-field player in handball, and with it help them to design tactical and strategic plans that allow them to adapt to the play, be it offensive or defensive, favoring their performance and athletic success against other teams.
- To facilitate the International Handball Federation with scientifically contrasted information on the 2015 Women's Handball World Championship, concerning the use and performance of the goalkeeper-field player.

- To highlight the great applicability of this study in order to contribute towards the improvement and advancement of the game of handball, whether at a national or international level.
- To take into consideration and give importance to high performance women's playstyle.
- To point the way towards which offensive numerical inferiority plays are going, and help other researchers by providing studies on this matter in order to be able to continue developing this line of inquiry, and discussing its results.
- Finally, it is of importance to pinpoint some future lines of inquiry that this study could open:
  - To extrapolate the sample of this study to younger categories.
  - To extrapolate the sample of this study to male categories.
  - To carry out comparative studies between men's and women's categories.
  - To continue the study from a defensive standpoint.
  - Samples could be done from a single team, or several teams, throughout various competitions, in Europe or the World, or even during a longer period of time, eg. an olympic cycle.
  - To formalize a comparative study considering the new rule officially implemented in July 2016 for the Olympic Games in Río de Janeiro. This new rule establishes that a 7-player attack is allowed and that it is not mandatory one of these players be identified as a goalkeeper. This allows the goalkeeper to leave the court when their team recovers ball possession and to have a field player enter in order to attack with 7 players. When possession is over, any of the players may leave the court and the keeper return, as opposed to the older rule that only the player with the shirt of the keeper's same color could return.

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