Phys. Educ. Sport Stud. Res. 3(2); 77-95 (2024)
DOI: 10.56003/pessr.v3i2.340

Physical Education and
Sport: Studies and Research

ORIGINAL RESEARCH Open Access

Analysis of Game Variables and Influence on Defensive Success in Elite Handball

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Submitted : March 5, 2024
Accepted : May 14, 2024
Published : October 16, 2024

Abstract

Background: The analysis of defensive game variables in handball is essential to increase the performance of a team.

Objectives: This study aimed to analyse defensive success based on the game variables and situational variables that predict defensive efficiency in elite handball.

Methods: The sample was composed of 1925 competition units in the defensive phase. Data from 16 matches of the XXIII Men's Handball World Championship of 2013 were analysed. The dependent variable was the defensive efficiency in each unit, and the independent variables were defensive actions, zones of field, location of the shot, numerical situation, and duration of the defense. Data were obtained from the *HandballTAS* tool (Handball Tactic Analysis System). The collected data were analysed quantitatively through inferential statistics (independent sample t-test) with the assistance of SPSS 22.0.

Results: The defenses analysed in which an offensive foul, a ball recovery or steal, a throw block and a passive play action were recorded, achieved defensive success. In the analysis of field areas, the greatest defensive efficiency was obtained in shots from zone 1, with 60%, and from zone 2, with 54%. The highest percentages of goalkeeper effectiveness correspond to the middle zone, and the central zone. The greatest defensive efficiency was obtained in a warning of passive play situation with 70% and in numerical superiority situation with 67%. Finally, in the analysis of the duration, the greatest defensive efficiency was obtained in the half defenses (26 ≤ 50 seconds) with 60%.

Conclusion: This study serves to demonstrate which defensive game variables have the greatest influence on defensive efficiency. This aspect will serve to help the coach make decisions during a handball match and increase the probability of success in each defense.

Keywords: Defensive efficiency, game analysis, team handball, performance indicators, World Championships.

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INTRODUCTION

Analysis of competitive activity is of special importance in team sports such as handball. Sports success is determined by the individual technical and tactical performance of the team (Ferrari et al., 2019; Gómez et al., 2014). A match is a sporting event in which two teams compete for victory, demonstrating their state of preparation. The measure to establish success is the number of goals scored by the teams (Ćeleš et al., 2019; Daza et al., 2017; Font et al., 2022).

Analysing defensive success is of great relevance to establishing differences between winning teams and losing teams (Gutiérrez & Ruiz, 2013; Hatzimanouil et al., 2022). Several studies analyse the influence of performance indicators on defensive effectiveness, and the degree to which these factors are determining factors in the outcome of the match (de Paula et al., 2020; Gómez-López, et al., 2021). Defensive success is essential to increase a team's performance. According to Gruič et al. (2006), winning teams have greater efficiency in shooting and greater defensive efficiency. Thanks to greater defensive efficiency, the possibility of making counterattacks increases, and scoring more easily. There are variables in the analysis of the game that are fundamental to establish the defensive effectiveness of a team, such as recoveries and blocks. It can also be considered a defensive success to stop the rhythm of play of the rival attack (Font et al., 2022).

Among the performance indicators that influence defensive effectiveness is throw block. Studies reveal the importance of blocks as a defensive element, establishing significant differences in teams (Curiţianu et al., 2015; Lago-Penas et al., 2013). Other performance factors related to defensive effectiveness are ball recoveries or steals (de Paula et al., 2020), defensive punishment (Milanović et al., 2018) and defensive fouls (Saavedra et al., 2018). Goalkeeper performance is the most studied indicator related to the team's defensive effectiveness (Cabrera-Quercini et al., 2022; Gómez-López et al., 2020; Hansen et al., 2017; Krawczyk et al., 2021; Krawczyk & Bodasiński, 2022; Yannakos et al., 2019). Daza et al. (2017), concluded that the goalkeeper's saves, technical fouls, and steals are the key indicators of team performance.

Attending to the spatial parameters, the areas of the field where the teams finish their attacks are an element that differentiates the strategic approach and the game model of each team (González-García et al., 2023). Other studies indicate differences in the effectiveness of saves depending on the throwing area and the tactical situation of the

attacker (Hatzimanouil et al., 2017; Krawczyk & Bodasiński, 2022). Some studies have shown the importance of analysing spatial variables and their influence on defensive effectiveness (Antonis et al., 2019; Yamada et al., 2014). Burger et al. (2013), carried out a study on the goals scored by dividing the field into five different zones, the left wing player, the left back player, the middle back player, the right back player and the right wing player. Yamada et al. (2014), in a comparison between teams at the 2007 Women's World Championship, established statistically significant differences between winning and losing teams in the number of throws from 6 meters, but not in the effectiveness of the throw from any of the areas.

Another aspect that can influence defensive effectiveness is the number of players on each team. The incidence of success or failure of actions in offensive and defensive numerical superiority determines the outcome of the match (Amatria et al., 2020; Beiztegui-Casado et al., 2019; Trejo & Planas, 2018). The efficiency indices in situations of offensive inferiority, both those relating to offensive efficiency and those referring to defensive efficiency, presented better values in the winning teams than in the losing ones, so they could be used as predictors of a winning team (Ferrari et al., 2019; Ferrari et al., 2022). Regarding the temporal parameters, the duration of the attacks is a factor that can determine the success rate, therefore, influence the defensive effectiveness of the defending team (Ferrari et al., 2022; Vaz et al., 2023). In the study by Rogulj et al. (2011), the type of attack is differentiated based on its duration: counterattack (attack against a defence of 5 seconds), prolonged counterattack (maximum 10 seconds), short attacks (maximum 25 seconds), medium attacks (maximum 50 seconds) and long attacks (from 50 seconds).

Considering this context, this study aimed to analyse the defensive efficiency based on game variables and situational variables of the national teams participating in the 2013 Men's Handball World Championship.

METHOD

Study Design and Participants

The observation unit analysed in the matches is the competition unit in which the observed team is not in possession of the ball (Lago-Ballesteros et al., 2012). The sample was 1925 competition units in the defensive phase, obtained from 16 matches of the XXIII Men's Handball World Championship held in 2013. To obtain data from the teams with a high level of performance, the matches of the first phase were discarded. The matches

analysed were obtained from the official website of the Spanish national television: www.rtve.es. Similar studies have used the same procedure to obtain data (González-García & Casáis, 2023; Martín et al., 2013). This study conformed to the standard set by the Declaration of Helsinki and was approved by the University of Vigo ethics committee with the code number 4-1292-15.

Research Instruments

Data were obtained from the HandballTAS tool (Handball Tactic Analysis System) which has been validated in a previous study (González-García et al., 2016). The reliability values of the individual actions were calculated following the method developed by (Hopkins, 2017). The HandballTAS tool was analysed, and we obtained good inter-observer reliability (the intra-class correlation coefficients varied from 0.77 to 1.00, showing a good level of reliability, and standardised typical errors were located in a range from 0 to 0.55) of the actions of the players involved in the match as registered by the independent observers.

Variables

The dependent variable analysed was defensive efficiency, which depends on defensive success. Defensive success is considered when the defending team does not receive a goal and does not change to a situation of defensive inferiority. The independent variables are divided into defensive game variables, field variables, location variables, numerical situation variables and duration variables. The defensive game variables were:

Overcome by direct opponent (ODO): Defensive action in which the defensive player is overcome by an attacker with ball possession using a displacement, feint, or fixation. Surpassing an adversary in the one-to-one action is overcome by the direct opponent.

Free-throw (FT): The attacking player is the subject of an infraction by a defending player.

Offensive foul (OF): An attacking player performs an infraction on the defending player; thus, the defending player loses possession.

Steal (ST): The defensive team recovers the possession of the ball, and the offensive team loses the possession of ball. The defense team's success is a reason for this.

Recovery (RE): The defensive team recovers the possession of the ball, and the offensive team loses the possession of ball. An error made by the attacking team caused this.

7-metres (7M): Action of a defender against the rules that destroys a clear goal chance of an attacker. The referee then indicates the corresponding infraction.

Throw block (TB): Throwing directed to goal but neutralized following the rules by a defender before the goalkeeper can intercept it.

Defensive punishment (DP): Disciplinary sanction implemented by the referee resulting in a yellow card, an exclusion, or a red card.

Passive play (PP): Sanction indicated by the referee on the player to whom the attacking team loses possession due to a previous warning of passive play.

Field variables analysed were 8 different zones depending on the area where the shooting takes place (Figure 1).

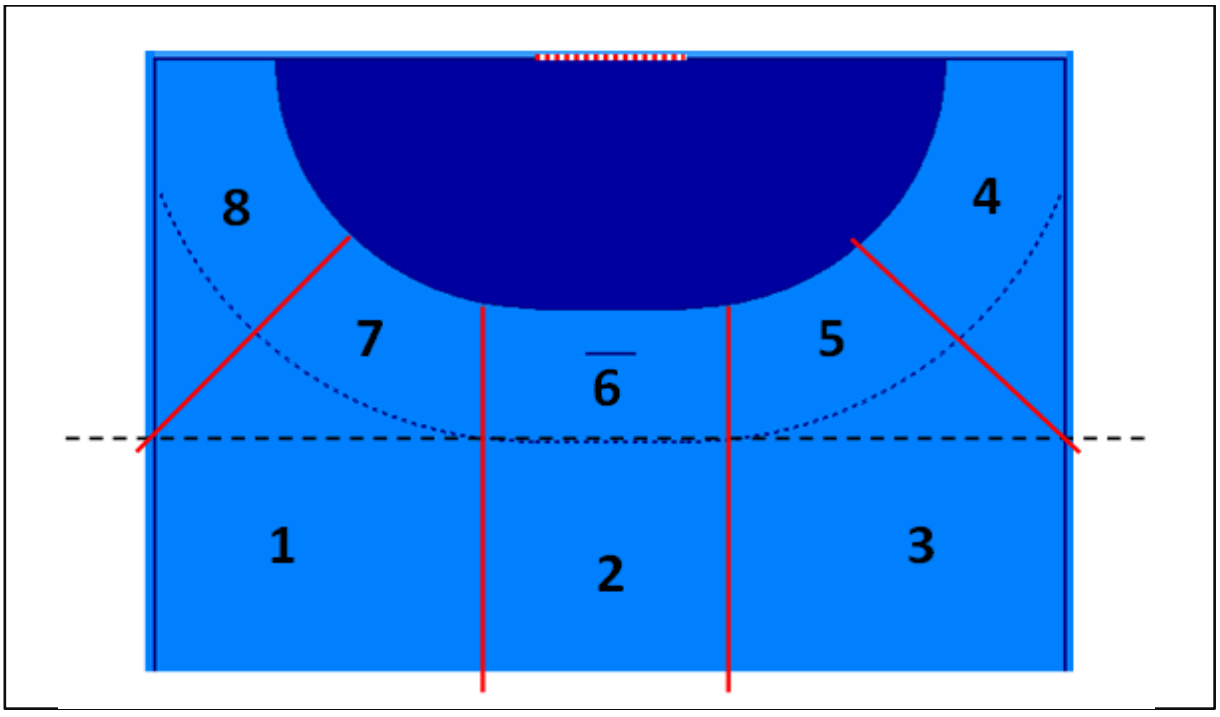

Figure 1. Field area where the shooting was recorded

The location variables refer to the area of the goal where the shot is directed. A total of 12 areas was analysed (Figure 4). The shots that are not directed towards the goal are classified as outside.

Numerical situation variables depending on whether the number of players in the defensive team was in numerical equality, inferiority, or superiority, it was classified as a

warning of passive play, regardless of the number of players, when the attacking team does not intend to throw a goal and the referee raises his right arm indicating the forewarning signal for passive play.

Duration variables depending on the time elapsed in each defence, it is classified as a fast defence, with timing of less than or equal to 10 seconds; short defence, greater than 10 seconds and less than or equal to 25 seconds; half defence, greater than 25 seconds and less than or equal to 50 seconds; and long defence, greater than 50 seconds.

Data Analysis

A descriptive analysis of the variables recorded with the observation tool was carried out through sample characterization statistics. Data are presented as mean, standard deviation, standard error of the mean and percentage mean difference. Recorded actions are calculated based on defensive efficiency. For the study of comparison of means between the independent variables, an independent samples t-test was carried out based on the number of goals received by each of the defences. The analysis was performed using IBM SPSS Statistics Application for Windows, Version 22.0 (Armonk, NY: IBM Corp.). According to the analysis, statistical significance was $p<0.001$ or $p<0.05$.

RESULTS AND DISCUSSION

Results

The results showed a total of 1925 units of observation, of which 1076 (55.9%) finished with defensive success (without goal) and 849 (44.1%) not finished with success (with goal). Descriptive analysis of defensive actions is shown in Figure 2. 75% of the actions in which a defender was overcome by direct opponent finished with a goal. This action reduced defensive efficiency, and only 32 times recorded did not end with a goal. 60% of free-throw committed finished with defensive success. The defenses analysed in which an offensive foul, a ball recovery or steal, a throw block and a passive play action were recorded, achieved defensive success, and finished without a goal. Defensive effectiveness was reduced by 29% when 7 meters were recorded, and in 43% of the cases in which a defensive punishment was recorded there was defensive success.

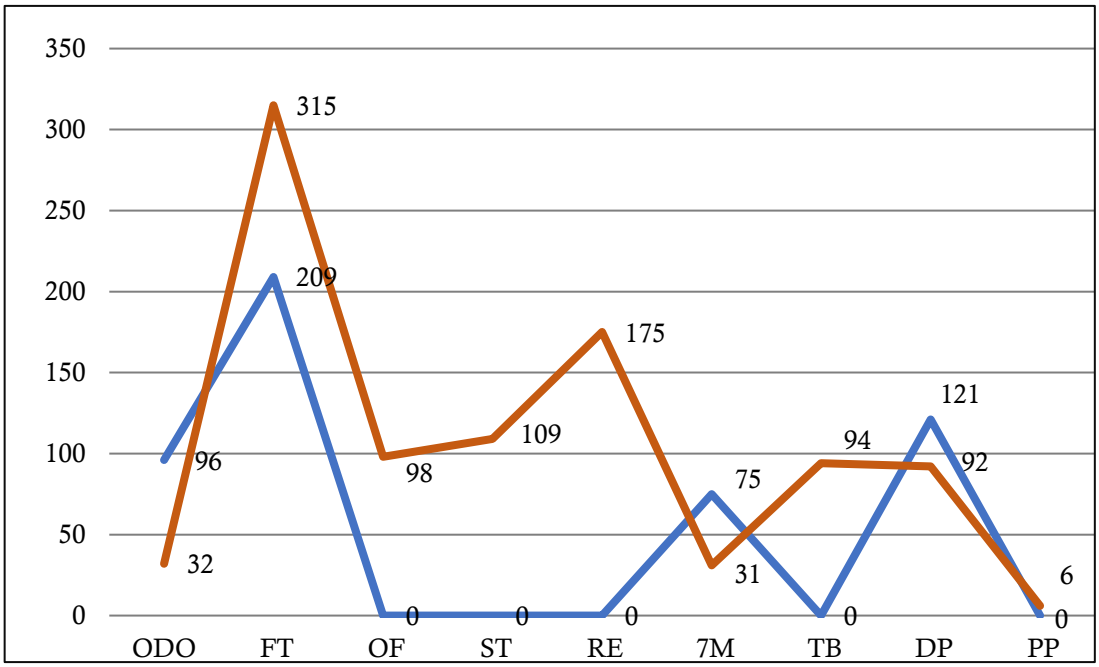

Figure 2. Analysis of defensive efficiency based on defensive actions
Note: ODO: Overcome by direct opponent; FT: Free-throw; OF: Offensive foul; ST: Steal; RE: Recovery; 7M: 7-metres; TB: Throw block; DP: Defensive punishment; PP: Passive play (Red line: actions with success, Blue line: actions without success).

The analysis of comparison of defensive actions means based on defensive efficiency (Table 1) showed as statistically significant variables (p≤ .001) overcome by direct opponent, offensive fouls, recoveries, 7 meters, throw blocks and defensive punishment. The free throw action was not significant.

Table 1. Independent samples t-test of defensive actions

Defensive actions	Not success		Success		Mean Difference (95% CI)	*p*
	M±SD	SE	M±SD	SE		
Overcome by direct opponent	0,11±0,316	0,010	0,02±0,169	0,005	[0,061; 0,105]	,000*
Free-throw	0,35±0,704	0,024	0,41±0,725	0,022	[-0,118; 0,010]	,101
Offensive foul	0±0	0	0,09±0,286	0,008	[-0,109;-0,070]	,000*
Steal/Recovery	0±0	0	0,10±0,300	0,009	[-0,120;-0,080]	,000*
7-metres	0,08±0,283	0,009	0,02±0,167	0,005	[0,039; 0,079]	,000*
Throw block	0±0	0	0,08±0,272	0,008	[-0,099;-0,062]	,000*
Defensive punishment	8,55±1,160	0,040	8,72±0,948	0,029	[-0,259;-0,070]	,001*

**$p \leq .001$; SD: Standard Deviation; SE: Standard Error; CI: Confidence Interval

In the analysis by field areas (Figure 3), the greatest defensive efficiency was obtained in shots from zone 1, with 60%, and from zone 2, with 54%. The average defensive efficiency in shots from no deep zones (zones 1, 2 and 3) was 56%. The average defensive efficiency in shots from deep zones (zones 5, 6 and 7) was 26%. The defensive efficiency in shots from the wing-right (zone 5) was 48% and from the wing-left (zone 8) was 40%.

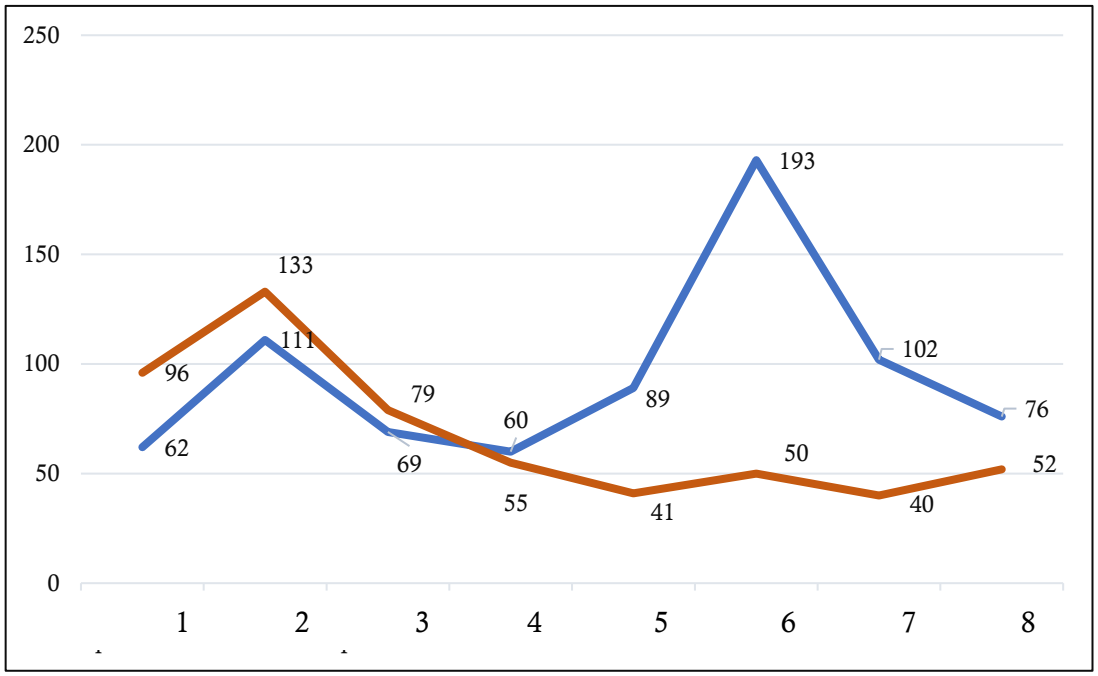

Figure 3. Analysis of defensive efficiency based on field area
Note: Red line: actions with success, Blue line: actions without success.

The analysis of comparison of field area means based on defensive efficiency (Table 2) showed zones 5, 6, 7 and 8 as statistically significant variables (p< .001).

Table 2. Independent samples t-test of area field

Field area	Not success		Success		Mean Difference (95% CI)	*p*
	M±SD	SE	M±SD	SE		
1	0,07±0,260	0,008	0,09±0,286	0,008	[-0,007; 0,041]	,176
2	0,26±0,674	0,023	0,24±0,660	0,020	[-0,072; 0,047]	,685
3	0,24±0,820	0,028	0,22±0,782	0,023	[-0,095; -0,048]	,521
4	0,28±1,025	0,035	0,20±0,881	0,026	[-0,163; -0,007]	,072
5	0,52±1,532	0,052	0,19±0,968	0,029	[-0,441; -0,216]	,000*
6	1,36±2,516	0,086	0,28±1,275	0,038	[-1,252; -0,906]	,000*
7	0,84±2,277	0,078	0,26±1,340	0,040	[-0,737; -0,410]	,000*
8	0,71±2,285	0,078	0,38±1,716	0,052	[-0,508; -0,150]	,000*

**$p \leq .001$; SD: Standard Deviation; SE: Standard Error; CI: Confidence Interval

Figure 4 showed the effectiveness of the goalkeeper according to the location in goal, divided into 12 zones. The highest percentages of goalkeeper effectiveness correspond to the middle zone (zones 4, 5 and 6), and the central zone (zones 2, 5, 8 and 11). The lowest efficiency percentages were found in zones 10 and 12, which correspond to shots aimed at the lower zone with a previous bounce in the goal area.

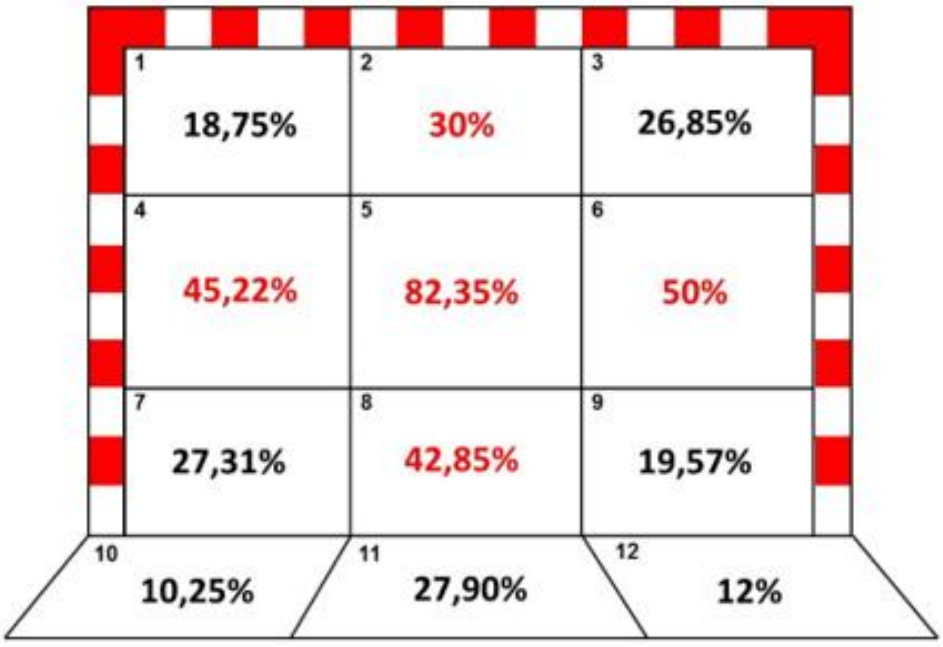

Figure 4. Analysis of defensive efficiency based on the location

The analysis of comparison of location means based on defensive efficiency (Table 3) showed all zones except zone 6 as statistically significant variables ($p \leq .001$; $p < .05$).

Table 3. Independent samples t-test of location

Location	Not success		Success		Mean Difference (95% CI)	*p*
	M±SD	SE	M±SD	SE		
1	0,09±0,289	0,009	0,01±0,131	0,004	[-0,093; -0,054]	,000*
2	0,11±0,466	0,016	0,04±0,283	0,008	[-0,108; -0,040]	,000*
3	0,27±0,872	0,029	0,08±0,486	0,014	[-0,259; -0,136]	,000*
4	0,40±1,207	0,041	0,26±0,993	0,030	[-0,239; -0,042]	,005*
5	0,01±0,296	0,010	0,06±0,566	0,017	[0,005; 0,089]	,027*
6	0,55±1,734	0,059	0,43±1,556	0,047	[-0,263; 0,031]	,122
7	1,29±2,719	0,093	0,40±1,631	0,049	[-1,087; -0,694]	,000*
8	0,37±1,696	0,058	0,22±1,317	0,040	[-0,288; -0,019]	,025*
9	2,00±3,746	0,128	0,38±1,821	0,055	[-1,874; -1,363]	,000*
10	0,41±1,989	0,068	0,05±0,745	0,022	[-0,485; -0,227]	,000*
11	0,40±2,064	0,070	0,14±1,247	0,038	[-0,407; -0,109]	,001*
12	0,31±1,907	0,065	0,03±0,633	0,019	[-0,399; -0,155]	,000*

**$p \leq .001$; SD: Standard Deviation; SE: Standard Error; CI: Confidence Interval

In the analysis of the numerical situation (Figure 5), the greatest defensive efficiency was obtained in a warning of passive play situation with 70% and in numerical superiority situation with 67%. In numerical equality situation, the percentage of defensive efficiency was 55%, and numerical inferiority situation it decreased to 46%.

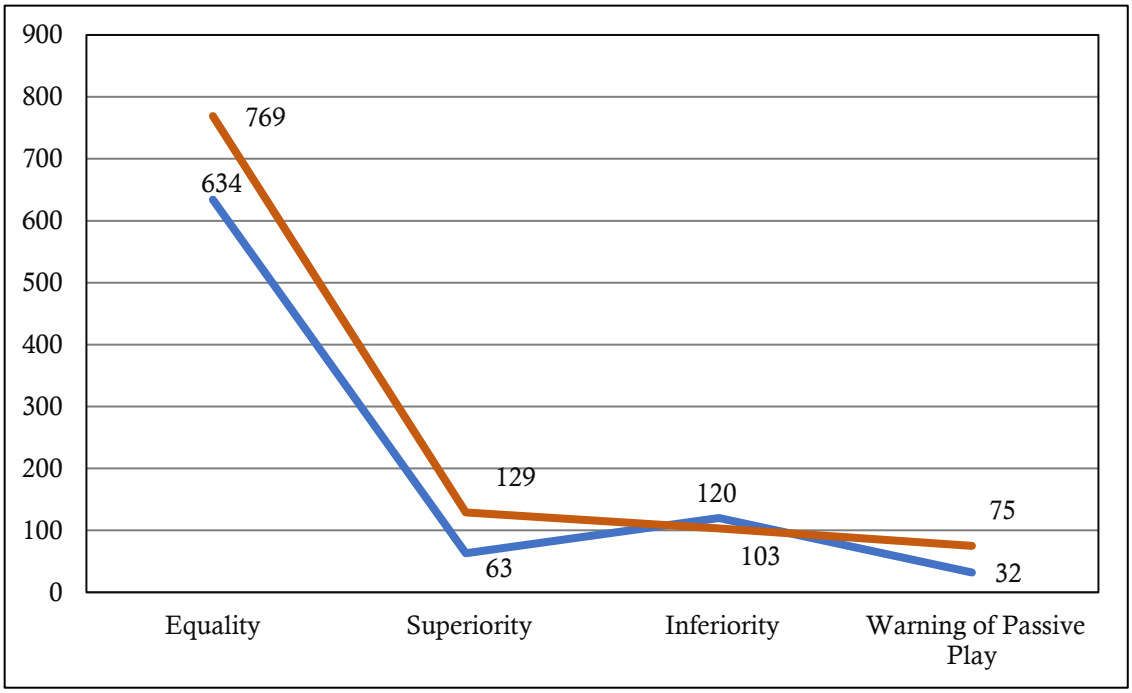

Figure 5. Analysis of defensive efficiency based on the numerical situation
Note: Red line: actions with success, Blue line: actions without success.

The analysis of comparison of numerical situation means based on defensive efficiency (Table 4) showed all numerical situations except the numerical equality situation as statistically significant variables (p<.01).

Table 4. Independent samples t-test of numerical situation

Numerical situation	Not success		Success		Mean Difference (95% CI)	*p*
	M±SD	SE	M±SD	SE		
Equality	2,24±1,305	0,044	2,14±1,355	0,041	[-0,023; 0,216]	,116
Superiority	1,13±2,788	0,095	0,76±2,354	0,071	[0,134; 0,594]	,002*
Inferiority	0,44±1,573	0,054	0,71±1,949	0,059	[-0,435; -0,112]	,001*
Warning of Passive Play	0,18±0,952	0,032	0,34±1,273	0,038	[-0,263; -0,057]	,002*

**$p \leq .001$; SD: Standard Deviation; SE: Standard Error; CI: Confidence Interval

In the analysis of the duration (Figure 6), the greatest defensive efficiency was obtained in the half defenses (26 ≤ 50 seconds) with 60%. Long defenses (≥ 51 seconds) obtained a defensive efficiency of 57%. Short defenses (11 ≥ 25 seconds) achieved a defensive efficiency of 56%, and fast defenses (≤ 10 seconds) achieved the lowest defensive efficiency with 45%.

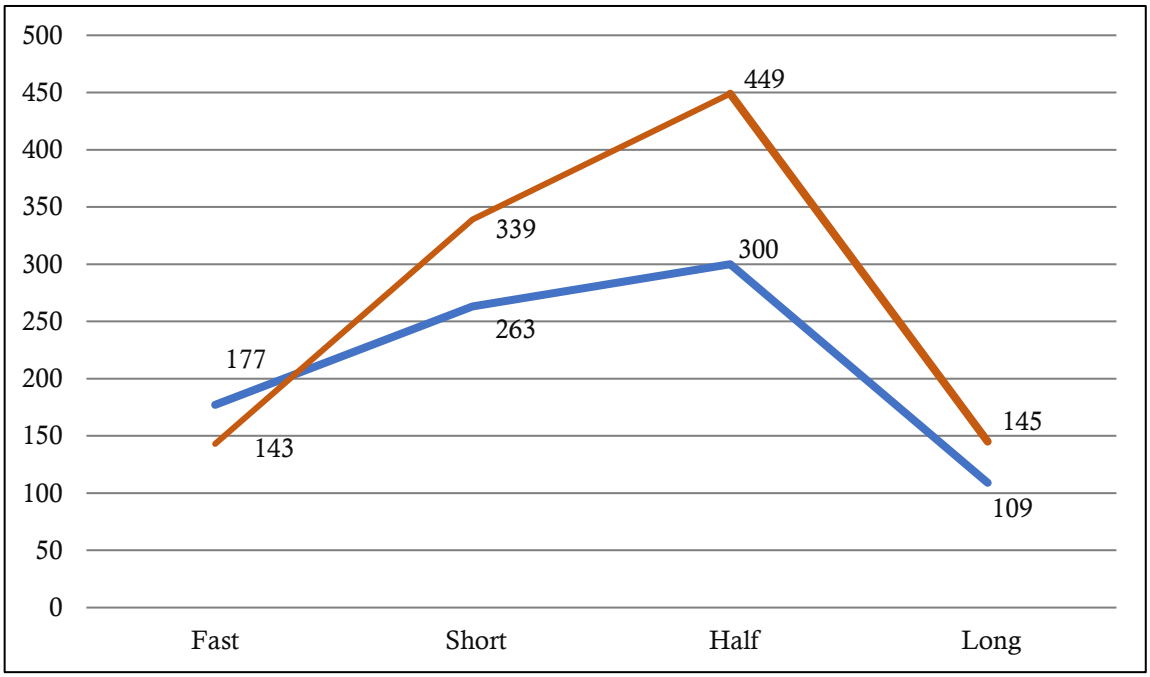

Figure 6. Analysis of defensive efficiency based on the duration
Note: Red line: actions with success, Blue line: actions without success.

The analysis of comparison of duration means based on defensive efficiency (Table 5) showed fast and half defenses as statistically significant variables ($p<.01$). The short and long defenses did not obtain statistically significant differences. The average defenses achieved the highest value with an average of 1.25 without goals.

Table 5. Independent samples t-test of duration

Duration	Not success		Success		Mean Difference (95% CI)	*p*
	M±SD	SE	M±SD	SE		
Fast	0,20±0,406	0,013	0,13±0,339	0,010	[0,042; 0,108]	,000*
Short	0,61±0,925	0,031	0,63±0,929	0,028	[-0,094; 0,072]	,804
Half	1,06±1,434	0,049	1,25±1,480	0,045	[-0,323; -0,060]	,004*
Long	0,51±1,338	0,045	0,53±1,366	0,041	[-0,147; 0,096]	,682

**$p \leq .001$; SD: Standard Deviation; SE: Standard Error; CI: Confidence Interval

DISCUSSION

In this study, defensive performance indicators and their influence on defensive efficiency were investigated. The results showed differences in individual variables, spatial, situational, and temporal variables in relation to defensive effectiveness. At the individual level, significant differences were shown in the variables overcome by direct opponent, offensive fouls, recoveries, 7 meters, throw blocks and defensive punishment. In the location of the shot, the least defensive success was obtained in the lower areas. In the situation of numerical equality, no significant differences were obtained and defenses with a duration between $26 \leq 50$ seconds achieved the greatest defensive success.

Previous research has compared winning and losing teams and the difference that existed in defensive performance between them (Antonis et al., 2019; Balint, 2013; Curiţianu et al., 2015). Some studies analyse the influence of defensive performance indicators on the outcome of the match (de Paula et al., 2020; Keisuke et al., 2022) and few studies analyse defensive efficiency based on the result of each competition unit (Daza et al., 2017).The results of this study affirm that defensive variables such as overcome by direct opponent, offensive foul, steal, 7 meters, throw block, and defensive punishment have an influence on defensive efficiency. For example, in 60% of free-throw actions a goal is not scored, and when the action of overcome by direct opponent occurs, the percentage of defensive efficiency decreases by 25%. As in the study Curiţianu et al. (2015), significant differences were established between the teams in relation to technical fouls.

Curiţianu et al. (2015), analyse defense interceptions, throw blocks, and sanctions received on defense. Teams with a greater number of these parameters indicate a more aggressive tendency of their players. Belcic & Sporis (2012), do not establish significant differences in throw blocks in teams from different categories of the Croatian Handball League, obtaining an average of 0.83 ± 0.75. Yamada et al. (2014), do not obtain statistically significant differences in the number of throw blocks made between winning and losing teams, achieving an average per game of 10 throw blocks made by the winners and 5 throw blocks by the losers. The study by Antonis et al. (2019), established an average of 2.25 throw blocks per match for winning teams, and 1.49 throw blocks for losing teams. In the present study, significant differences were shown in the throw block action, but it must be considered that this difference is described, based on the result of each defense, and not on the outcome of the match. Other studies affirm the importance of ball recoveries in defensive success (Balint, 2013; Curiţianu et al., 2015; Skarbalius et al., 2013). In the study by de Paula et al. (2020) showed an average of 4.3 steals of the ball for winning teams and 3.8 for losing teams in games with a difference of 1 to 8 goals. The difference was greater in matches with a difference of more than 20 goals, 7.9 for the winning teams and 3.1 for the losing teams.

Many studies have analysed the percentage of throwing efficiency in different areas of the field such as 6 meters, 7 meters and 9 meters (Ćeleš et al., 2019; de Paula et al., 2020; Karastergios et al., 2017; Saavedra et al., 2018). But sometimes they do not differentiate between shoots based on depth and laterality. This study, 8 field areas are differentiated to

establish the area that has the greatest influence on defensive efficiency. Greater defensive efficiency was obtained with shots received from areas far from the goal and from areas with a lower angle, such as wing-shots areas. Defensive efficiency decreased with shots made from deep zones and decreased to a greater extent from 6 meters, where only 20% defensive efficiency was obtained. The goalkeeper's best efficiency percentages are achieved in shots from areas far from the goal (zone 1, 2 and 3). The goalkeeper's effectiveness is reduced with wing-shots (44.03%), and even more with 6 meters-shots (25.43%). To achieve the greatest defensive effectiveness, shots from positions close to the goal and from central areas should be avoided and try to get the opponent to take shots as far from the goal and with the smallest possible angle. According to the study by Sevim & Bilge (2007), in the analysis of three international championships, 30% efficiency in the goalkeeper is considered an average of success. Bilge (2012), shows a goalkeeper efficiency percentage of 34.19 on average in different Olympics, World Championships and European Championships. In the study by Lago-Penas et al. (2013), analysing the effectiveness of the goalkeeper in the ASOBAL League, established an efficiency of 30.56 in 6-meter throws, 22.34 in 7-meter throws, and 43.99 in 9-meter throws for local teams. The importance of goalkeeper effectiveness in the outcome of matches is highlighted in various research (González-Ramírez et al., 2017; Krawczyk et al., 2021; Krawczyk & Bodasiński, 2022; Yannakos et al., 2019). A high efficiency of the goalkeeper increases the possibility of achieving victory. Skarbalius et al. (2013), analyse the effectiveness of the goalkeeper of four European Championships. Winning teams achieve greater success than losing teams in goalkeeper effectiveness against shots from 6 meters, 7 meters, wing-shots, and counterattack. Regarding the percentage of saves in the different championships, it is between 33.6-37.3% for the winners and between 28.4-32.6% for the losers, and the effectiveness of the goalkeeper in long shots is statistically significant ($p < .05$).

Various studies have analysed the effectiveness of the goalkeeper based on 9 location areas in the goal (Gómez-López et al., 2021; Hansen et al., 2017). However, no study has assessed the effectiveness of the goalkeeper according to 12 zones in locating shots. The results of this study affirm that zones 10 and 12 of the goal are essential, because they are the areas with the least defensive efficiency for the goalkeeper.

Regarding defensive efficiency based on the numerical situation, the results showed that in a situation of numerical equality the percentage of defensive efficiency was 54.81%.

In numerical superiority, the defensive efficiency was 67.18%, and in a situation of numerical inferiority, the defensive efficiency decreased to 46.18%. The warning of passive play situation obtains the greatest defensive efficiency with 70.09%. For example, in the study by Skarbalius et al. (2013), show significant differences in winning teams and losing teams by obtaining greater effectiveness in situations of numerical inferiority. Yamada et al. (2014), establish a difference between winning and losing teams between the number of shots and their effectiveness in different situations depending on the number of players. However, they do not discover significant differences in shots, either from close distances or from distances far from the goal, in situations of equality, inferiority and defensive superiority. For Trejo & Planas (2018), in a situation of offensive numerical inferiority, the throwing efficiency was double for the winning teams in relation to the losing ones. In this specific situation, they stated that achieving a throwing efficiency of 58% was associated with winning a match. In the study by González-García et al. (2023), the probability of success in the attack is reduced by 49% in warning of the passive play and by 43% in a situation of numerical inferiority. Therefore, defending in warning of the passive play warning or numerical superiority increases the percentage of defensive success.

Regarding the duration of defensives, half defenses (26 ≤ 50 seconds) achieve the greatest defensive efficiency with 59.94%, long defenses obtain 57.08%, short defenses 56.31%, and fast defenses defensive efficiency decreases to 44.68%. It must be considered that good defensive work is decisive in achieving defensive success. Teams with better defensive performance have more chances of recovering the ball and have more opportunities to make a quick attack to score more easily (Gutiérrez & Ruiz, 2013). In the same way that the lowest defensive efficiency is achieved in short sequences, it is important to avoid rapid attacks or at least delay them as much as possible (Almeida et al., 2020; Pueo et al., 2022). The success of the teams' counterattack is due to an adequate defensive system, a quick reaction to the opponent's shot, a quick transition and good shot selection.

CONCLUSION

To sum up, this study focused on analysing defensive performance indicators and how they influence defensive efficiency. Specific variables that decrease defensive efficiency have been analysed, such as the action overcome by direct opponent. Regarding spatial variables, it has been shown that receiving a shot from the not deep zones and lateral areas increases defensive effectiveness by 50% and 21% respectively. This aspect should be

considered in 1x1 situations during the match, with it always being preferable for an attacker to shoot in areas far from the goal and in areas with a low angle.

As for the goalkeeper's effectiveness, it increases depending on the location of the shot in the goal, obtaining maximum effectiveness in the middle zone and in the central zone. The effectiveness of the goalkeeper decreases when shots are directed to the low areas after a bounce in the goal area. In relation to the numerical situation, the greatest defensive efficiency has been demonstrated in a warning of passive play situation and in a situation of numerical superiority. Regarding the duration of the defense, the half defenses showed greater defensive efficiency. Therefore, training defenses with a half duration is essential and the attack should be delayed with interruptions to reach defenses with this duration.

Finally, this study serves to demonstrate which defensive game variables have the greatest influence on defensive efficiency. This aspect will serve to help the coach make decisions during a handball match and increase the probability of success in each defense.

LIMITATIONS

Study variables such as goal difference on the scoreboard, effectiveness depending on the period of play, the degree of quality of the teams, and track record in other championships and international competitions were not considered. From a methodological perspective, the results are limited by the sample size, since data were only taken from one world championship. In addition, the influence of match status has not been taken (if the analysed team is winning, losing, or drawing) and how the variables analysed in the study have a direct influence on the result of the match.

CONFLICT OF INTEREST

The author hereby declares that this research is free from conflicts of interest with any party.

AUTHOR'S CONTRIBUTION

Iván González García contributed in preparing concepts, formulating methods, conducting research, processing results, interpretations, and conclusions, editing the final version.

FUNDING/SPONSORSHIP

This research does not receive external funding.

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