Analysis of Tactical-Technical Attack Performance Factors: A Case Study of a Professional Women's Handball Team

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Abstract

Game analysis based on tactical-technical sports performance provides important information for coaches to periodize and evaluate team processes more accurately. The aim of this study was to analyze the probabilities of success in offensive situations by a Brazilian professional women's handball team. The method used was a quantitative, descriptive and case study approach, which was a professional women's handball team with national and international achievements. Data collection was based on the Handball Observation System, which allowed a total of 726 game actions to be evaluated from the two target competitions (world and national), 143 for the Women's Super Globe and 583 for the national handball league. The data was analyzed using the Lince program, which helps with video analysis (games from different sports), optimizing data verification, and the SPSS 23.0 software, using multinomial regression. The results showed that the team had 10.538 more probabilities of scoring when using basic tactical means, compared to 1-on-1 actions (CR = 1.061) and complex tactical means (CR = 1). The offensive organization showed greater probabilities (OR = 1.668) of scoring with the full team, in attacks from the central area of the court of less than 9 meters (OR = 1.917) and with shots between 21 and 40 minutes (OR = 1.393). There were also 7.968 more chances for the opposing goalkeeper to make a save when the team attacked with basic tactical means and 2.562 more chances for him to save the shot between 21 and 40 minutes.

Keywords: performance analysis, handball, sport

Introduction

The analysis of tactical-technical sports performance provides important information for coaches to periodize and evaluate team processes accurately. Performance analysis is associated with evaluating the players' individual and collective performance and its use is a determining factor in improving the skills and capabilities offered by sports, as well as the entire context of the players' training process (Collet et al., 2011; Porath et al., 2016; Lamas & Morales, 2022).

The analysis of actions in team and individual sports has

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grown exponentially in recent years, with several authors (Grehaigne et al., 1997; Lamas & Morales, 2022) have addressed the contextualization of match observation, performance analysis and game analysis. The analysis of possible information about the team and players can generate potential data to support the coaches' and managers' decisions, both in the tactical and technical training and in the physical one. This fact is linked to the players' performance level, which in a way allows coaches to modify the development of training sessions and tasks around the specificity of each player or the team in general (Pollard & Reep 1997; Oslin et al., 1998; Menezes & Reis 2010; Saad et al., 2013).

Performance analysis seeks to provide information that shows the coach the aspects/problems that deserve more attention (technical, tactical, physical or psychological) so that they can be solved during the sports training process (Greco & Benda, 1998; Prudente et al., 2004; Saad et al., 2013). It is also worth noting that, although complex, the task of analyzing a match can help identify potentialities or weaknesses, either in one's own team or in the opponent (Matias & Greco, 2009; Salles et al., 2017).

Specifically in handball, there are studies that provide data on tactical organization patterns (Santos, 2012), analysis of the handball game based on the coaches' opinion (Menezes et al., 2015) and the verification of play patterns, according to some type of specific position of a given player (Rodríguez & Anguera, 2018). Other studies look at the analysis of actions that differentiate winning teams from losing ones (Paula et al., 2020), as well as analyses that show some type of specific match actions, such as 2-2 disputes, numerical superiority and offensive actions (Sousa et al., 2014; Lozano et al., 2015; Lozano et al., 2016; Prudente et al., 2017; Amatria et al., 2020).

Generally speaking, the studies listed have focused on the coaches' perspective of certain situations that take place in a match (superiority, 2-2 situations, offensive actions, etc.), with the main conclusions being that the play patterns that develop offensive actions through the center, with basic tactical means, from between 6 and 9 meters, and that present a solid defensive balance during the matches with use of counter-attacks, were more successful in terms of team performance.

However, there is a need to broaden the analysis from the perspective of a team's attack since, in this way, certain play movements and patterns can be more reliably understood, bearing in mind that, although the game has the attack-defense duality, in order to achieve the objective proposed in handball, it is necessary to develop attack actions that overcome the opponent's defense.

In this context, it is necessary to have a more specific view of the performance process, taking into account the offensive aspects as the guiding principles of the game, as it is from the decision-making developed by the players that the match sequence takes place. In view of this, the research aims at advancing discussions around the process of analyzing tactical-technical performance factors that assess attack actions in handball. Therefore, the objective of this study was to analyze the probabilities for success in attack situations for a Brazilian professional women's handball team.

Method

This research is classified as an applied study with a quantitative approach, with a descriptive objective and based on a case study (Ato et al., 2013).

Data analysis

To analyze the tactical-technical performance factors, the Lince program was first used to analyze the videos of the target competitions (World Cup and National Handball League), which were then exported to an Excel spreadsheet. Subsequently, the IBM SPSS® 23.0 for Windows software was employed to perform the multinomial regression, adopting a 5% significance level to interpret the results. Thus, the study dependent variable corresponded to the match actions characterized as method: tactical means, offensive organization, campogram and attack time. The independent variables were the finishing parameters, specifically goal and save by the goalkeeper.

Inter- and intra-rater statistical analyses were performed, which were developed using the Kappa test, which aims to determine agreement between two or more groups, seeking consistency in the results. The inter-rater analysis of the tactical-technical performance factor analysis form obtained an agreement index between the values of 0.81 and 1, thus presenting an 'almost perfect' agreement, according to Landis and Koch (1977). The intra-rater analysis process was also carried out, which was developed by the doctoral student, who analyzed three games in a period of one week, leaving a gap of 15 days for analysis, to subsequently analyze the same sessions again. As in the inter-rater validation, the process of verifying the agreement index was between 0.81 and 1, also obtaining an 'almost perfect' result (LANDIS; KOCH, 1977).

Data collection

Initially, the identification forms for the coaches and players involved in the research process were filled in. The National Women's Handball League matches were filmed. The first phase was played using a group format (home and away matches), with the top teams in their respective groups competing in the final phase, concentrated over a five-day period. The process to collect information from the team's matches took place using a camera and a tripod. The equipment was positioned in the stands in the center of the court, with the possibility of turning the camera to the right or left in order to follow the ball movements (attack, defense and counter-attack).

The data from the IHF Women's Super Globe (Club World Cup) were taken from digital platforms where the matches are available (YouTube and Facebook of the team under study). The competition format was elimination and concentrated over a 4-day period, starting with the quarter-finals on day one, semi-finals on day two, and 3rd and 4th place play-offs and the final match on day four.

The information from the footage of the games was transcribed according to the Handball Observation System classification, where it was possible to analyze the tactical-technical performance factors of 726 match actions: 143 for the Women's Super Globe and 583 for the National League.

Research context and participants

The study participants were the coaches and players of an elite women's handball team from Brazil. The team was chosen on a non-probability-intentional basis (Guimarães, 2012), taking into account its prominence on the national handball scene, which is relevant when it comes to important achievements, as the team has already been three-time Brazilian handball champion, South American

champion, champion of the Brazilian university games, champion of the Brazilian handball cup and ten-time champion of the Santa Catarina open, as well as reaching the third place in the 2019 World Championship. In addition to these collective results, the team is notable for the number of players called up to the Brazilian national teams in the youth and adult categories, with the athlete who won the adult women's handball world championship in 2013 standing out.

Instruments

At a first instance, identification forms were used for the coaches and players, in order to obtain the specific characteristics of the research participants. In addition, the Handball Observation System (Prudente et al., 2004) was used to analyze tactical-technical performance factors, with the premise of evaluating both the offensive and defensive aspects of the team.

For this research, it was decided to only use the attack contexts, as it is during this process that the main performance variables take place and we can obtain patterns for analyzing how and in what way the team organizes itself during matches. It was therefore necessary to group some of the instrument's variables in an attempt to provide a better understanding of

the results based on the verification of matches in the Club World Cup and National League competitions. Specifically, the instrument was organized as follows:

- Finishing: goal, save by the goalkeeper;
- Method: counter-attack and organized attack;
- Tactical means: one-on-one, basic (breaking passes, pass and go, successive penetrations), complex (crosses, interchanges, blocking, entry of winger or playmaker as second pivot, rehearsed plays, etc.);
- Offensive organization: complete (six or seven players on the court for the attack) and incomplete (less than six players for the attack);
- Attack field: side field, center field -9 meters and center field +9 meters;
- Time: playing time up to 20 minutes, from 21 to 40 minutes, and from 41 to 60 minutes.

Results

Table 1 shows the Odds Ratios (ORs) of successful shots, according to the tactical-technical performance factors of the team under study. It was found that the team had 10.538 more probabilities of scoring when using basic tactical means, when compared to one-on-one actions (OR = 1.061) and complex tactical means (OR = 1).

Table 1. Odds Ratios of scoring or save by the goalkeeper, according to tactical-technical performance factors

Variables		OR 95% Confidence Interval			
Finishing - Goal		Sig.	OR	Lower limit	Upper limit
Method	Counter-attack	0.128	0.085	0.004	2.026
	Organized attack	.	1	.	.
Tactical means	One on one	0.867	1.061	0.503	2.239
	Basic	0.000*	10.538	2.941	37.758
	Complex	.	1	.	.
Offensive organization	Complete	0.353	1.668	0.567	4.907
	Incomplete	.	1	.	.
Offensive campogram	Side field	0.993	0.996	0.416	2.382
	Center field -9m	0.065	1.917	0.960	3.827
	Center field +9m	.	1	.	.
Time	Up to 20 minutes	0.947	1.023	0.532	1.966
	From 20 to 40 minutes	0.349	1.393	0.697	2.786
	From 40 to 60 minutes	.	1	.	.
Finishing – Save by the goalkeeper		Sig.	OR	Lower limit	Upper limit
Method	Counter-attack	0.605	0.480	0.030	7.739
	Organized attack	.	1	.	.
Tactical means	One on one	0.496	1.349	0.570	3.196
	Basic	0.003*	7.968	2.058	30.845
	Complex	.	1	.	.
Offensive organization	Complete	0.102	3.994	0.759	21.014
	Incomplete	.	1	.	.
Offensive campogram	Side field	0.449	0.705	0.255	1.946
	Center field -9m	0.686	1.178	0.532	2.608
	Center field +9m	.	1	.	.
Time	Up to 20 minutes	0.162	1.750	0.798	3.839
	From 21 to 40 minutes	0.023*	2.562	1.139	5.761
	From 41 to 60 minutes	.	1	.	.

With regard to the opposing goalkeeper defense OR, 7.968 more probabilities were found for the opposing goalkeeper when the team attacked with basic tactical means, when compared to one-on-one actions and complex tactical means. There were 2.562 more probabilities of the opposing goalkeeper saving the shots between the times of 21 to 40 minutes, when compared to 0 to 20 minutes (1.750) and 41 to 60 minutes (1).

Discussion

The objective of this study was to analyze the probabilities success the attack actions of a professional Brazilian women's handball team. The data obtained revealed that the team under study made both successes and errors when using the same tactical means (basic) and attack time in the same period (from 21 to 40 minutes). In this scenario, as the priority adopted by the team was to attack using basic tactical means to break through the opponent's defensive system, the success ORs using this performance factor also corresponded to the OR of the errors, as in both attack processes (goal or save by the goalkeeper), the variables stood out for shots. A similar situation was found in attack time, where the team predominantly hit and missed at playing times between 21 and 40 minutes. This can be explained by the fact that the team had a higher volume of actions during this time of the matches when compared to the initial (up to 20 minutes) and final (41 minutes to 60 minutes) phases.

These findings reinforce the evidence found with youth handball teams (Spanish championship - Martín & Guerrero, 2009) and adult handball teams (World Championship, European Championship, Olympic Games – Lozano et al., 2016 and EHF Champions League - Vaz et al., 2023). These research studies found that the most used tactical means were those considered basic, whereas more complex actions were only used in the first attack sequence.

The studies by Lozano et al., (2016) and Vaz et al. (2023) also found that the teams tried to finish their actions between 6 and 9 meters from the goal, as they found greater success probabilities in finishing from that space when compared to shots from the side field and from distances greater than 9 meters from the goal. On the other hand, a study by Almeida et al. (2020), with men's teams from the 2007-2019 world championships, discovered that the Top 8 teams developed more successful actions from 9 m and from the extremes, with the latter increasing over the years. In a way, the greater success odds at the end of an offensive action from situations considered to be simpler can be related to the complexity degree of the combined plays, as this more elaborate process can usually lead to errors at the time of its deployment, making it more difficult to finish the play with a goal (Souza et al., 2014).

When tactical behavior is analyzed during a formal match, many elements should be taken into account, and the main analysis index must have a direct link to who is on the court. In this sense, a study by Rodríguez and Anguera (2018), which analyzed the behavior of a Spanish adult team through the two central players, found that when one of them was on the court, the team was more dynamic, whereas when the other central player was playing, the team became more paced and organized. In this study, the main factor contributing to this difference in the team's attack behavior was organization of the attacks by different tactical means. This is similar to the findings of the current study, as the team had more probabilities of scoring when using basic tactical means.

As for the offensive construction process of the team under study, no differences were observed between the OR of the play method (counter-attack: OR = 0.085; organized attack: OR = 1) in development of the actions during the matches. In this sense, it stands out that the team attacked primarily in organized offensive actions, refraining from playing at speed even when they were numerically equal, inferior or superior. This finding differs from the information found in the study by Amatria et al. (2020) with teams taking part in the 2016 World Cup, which showed that the teams' main attack action, especially when they were outnumbered, was unstructured/standardized counter-attack.

Vaz et al. (2023) also considered that winning teams maintain a stable pattern of counter-attack actions during development of a match, as well as that they follow a trend of organized attacks. This situation shows how important counter-attack is for planning a match in handball and reinforces the need for a team to develop, improve and execute more offensive transition actions against its opponents in order to surprise them while they are returning to defense.

Studies such as the one by Hernández et al. (2010) have emphasized how important counter-attack is in handball, as they observed that counter-attack actions are more effective at scoring goals than positional play actions. From this perspective, Lozano and Camerino (2012) also emphasized that counter-attack is the most effective offensive situation when faced with any type of opposing defense. Finally, a study by Paula et al. (2020), which observed World Championship matches between 2007 and 2017 to detect discriminating variables between winners and losers, found that teams prioritized successful defensive behaviors and resorting to counter-attack situations.

In general, the results of the team studied based on the ORs and the tactical-technical performance factors are similar to the findings of other studies in the literature consulted. However, the data also revealed the need for the team to improve and develop counter-attack offensive transition actions when they recover the ball, given that some studies have shown the benefits of this option for achieving success in offensive actions.

This reinforces the important role of performance analysis in helping coaches and the technical committee of a team to develop training tasks based on the guiding parameters indicated. In addition, this type of analysis can help authenticate the practical experiences players have during training and formal matches (Teoldo et al., 2015).

Conclusion

The objective of this study was to analyze the probabilities the success in attack situations for a professional Brazilian women's handball team. According to the evidence found, it was noticed that the tactical-technical performance factors that contributed to the team's success in attack were, in particular: 1- Actions of basic tactical means; 2- Shots taken within 9 m from the goal; 3- Playing time between 21 and 40 minutes.

The study has the potential to analyze tactical-technical performance factors in high-level competitions such as the Club World Cup and the National League. In this sense, it can collaborate with the academic and scientific community by presenting results on the process of analyzing performance in two significant competitions contested by a team with recognized success in Brazilian women's handball. An important

contribution to the professional handball coaching community is that the findings shed light on the offensive construction process of an elite team's game. This opens new perspectives for designing the sports training process and analyzing performance during the season, given that this type of research is still scarce at the national level.

The main limitation of this study concerns the absence of complementary qualitative data, as semi-structured interviews with the coaching staff, for example, might better contextualize the data obtained and justify the tactical-technical options adopted by the team under study.

It is recommended that future research studies use the qualitative approach be used to complement the analysis, allowing the coaching staff's playing philosophy to be identified in greater detail, as well as other relevant data on decision-making regarding structuring of the team's training and playing model. The qualitative analysis of the match actions can thus provide more comprehensive information on the tactical-technical performance of the team and its opponents, which can render the sports teaching-learning-training process more robust and contextualized to individual and collective needs and potentialities.

Funding

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