SEASON GAME ANALYSIS OF ELITE MALE TEAM

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Abstract
The most important expectation of the trainers was the correct evaluation of the game analysis and the reflection of its effects on the trainings. Because of handball's complex nature, interpreting numerical data with objective field facts requires expertise. The aim of this study is to obtain feedback by interpreting the analysis of the matches played by a team Spor Toto (ST) that finished third in the Turkish Handball Men's Super League in the 2019-2020 regular season. 14 matches played in a season, 72 parameters were reported using video analysis and notational method. In the ST and opponent team analysis, independent sample T-test was used to determine offensive efficiency. Pearson correlation analysis was applied to the relationship between analysis parameters in matches played at home and away and the Mann Whitney U-test was used for the difference between won and lost matches. As a result, it was seen that ST team committed fewer fouls than their opponents, and ST applied the offensive tactic with greater success in his own court. Parameters in favor of ST for matches won and lost; number of shots, attack efficiency, number of goals, goalkeeper saves, outside- post-block shots, fouls and turnovers. Normally these parameters are required to win a handball game.

Keywords: Game analysis, season analysis, handball, attack, goalkeeper

Introduction
Handball is a physically demanding team sport with professional leagues in numerous countries and regularly held major international championships. During the 60 minutes game time (30 minutes per half with a 15-minute halftime break), players perform various types of movements and technical match activities intensively at short, intermittent time intervals. Actions such as throwing at the goal, struggling with opponents, jumping to shoot or block, sprints in transition play, sudden changes of direction to pass opponents, and feints constitute the structure of handball (Ziv and Lidor, 2009). Although handball games are played for 60 minutes, with breaks and timeouts, game lasts approximately 73-79 minutes for men and 71 minutes for women, and the effective playing time per match is 50:42±5:50 minutes (Gençoğlu and Gümüş, 2020). Depending on the possession of the ball, teams switch to offensive or defensive phases, and they change this position quickly as fast break-transition or settled attack-defense (set) with an average interval of 22-36 seconds. However, 88±6% of the game positions are mostly in set

attack or defense (Karcher and Buchheit, 2014). Sudden changes of direction and stopping constitute approximately 60% of the total actions, which were reported as 19.1-38.2 stops and 18.4-37.9 changes of direction, varying according to the positions. As in almost all sports, it is necessary to understand fatigue and pay attention to the loading/resting ratio to understand and develop appropriate strategies for handball (Gençoğlu and Gümüş, 2020; Povoas et al., 2014). Handball has continued to develop over the years, leading to increasing physical and technical demands on elite players. In addition, the increasing frequency and intensity of training and playing games have contributed to the increase in physical requirements for top-level players, and new rules in the last decade have made the game even faster and more intense. With the rule changes made by the International Handball Federation, the quick throw-in after a goal reduced the time between defense and attack. To develop the most appropriate training strategies for elite handball players, it is necessary to make a complete analysis of the game because knowledge of the requirements for handball are a prerequisite for planning and implementing the most appropriate training paradigms (Ronglan et al., 2006).

The analysis of sports competitions aims to provide objective and reliable performance indicators (both individual and collective) that can help coaching staff better understand how to improve the performance of their players and/or teams, and thus assist in planning training (Mackenzie R, Cushion, 2013; Prieto et al., 2015). A performance indicator is defined as the selection or combination of action variables that aim to describe some or all aspects of performance and must be related to successful outcomes to be useful (Hughes et al., 2002). The analysis of sports performance is important to examine different aspects of performance. The most important parameters are tactics, strategy, mechanical aspects of technique, physical aspects, coach behaviors, and referee reactions. In the specific case of game analysis in team sports, the increasing use of computerized notation systems and video-based analysis systems allows coaches (and analysts) to obtain valuable performance indicators to evaluate the performance of teams and players (Prieto et al., 2015).

Measuring and evaluating game performances an important role in planning the training process and competition. Game analyses aim to determine individual player performance, evaluate the overall fitness, technical and tactical skills of teams, and assess the overall and individual performance of opposing teams (Bilge, 2012). Post-game analyses aim to evaluate a team's performance in that game, while collective analyses following a specific season, tournament, or championship provide an assessment of a team's success or failure, technical and player roster, and even an overall evaluation of the sport (Pollany, 2006). From this point of view, this study aim of this study is to obtain feedback by interpreting the analysis of the matches played by a team Spor Toto (ST) that finished third in the Turkish Handball Men's Super League in the 2019-2020 regular season.\

Methodology
The Spor Toto (ST) team, which finished third in the Turkish Men's Handball Super League in the 2019-2020 season, participated in this study. Fourteen matches played in a season, 72 parameters were reported using video analysis and notational method (Bilge 2012). In the ST and opponent analysis, independent sample T-test was used to determine offensive efficiency. Pearson correlation analysis was applied to the relationship between analysis parameters in matches played at home and away and the Mann Whitney U-test was used for the difference between won and lost matches. The statistical procedures were executed on SPSS software (version 23.0, IMB, United States) for $p < 0.05$.

Results

Considering the differences in applying the parameters in matches ST with opponents; there is no significant difference in the number of attacks, attack efficiency, shoot efficiency, number of turnovers and fouls (p> 0.05). It has been determined that ST and other teams, which have similar averages to each other, show the most distinctive difference in the number of fouls. There is a significant difference in ST goalkeeper's saves compared to other teams (p <0.05). In other words, the number of goalkeeper saves of team ST is lower than the one of the other teams. There is a significant difference in terms of set-play offense number-efficiency, basic fast break number-efficiency and fast throw off number-efficiency (p <0.05). Among these parameters, it was determined that the ST team was superior in terms of average in the other parameters, while the opponent superiority was observed only in the number of set-play offense -efficiency. On the other hand, there is no statistically significant difference between ST and its opponents in the developed fast attack number-effectiveness (p> 0.05) (Table 1).

Table 1. T-test results for independent samples regarding the difference between the parameters applied by ST and opponents (n=14)

Parameters	Team	X.	SD	T	p
Number of attacks	ST	55,00	4,22	,434	,671
	Opponents	54,92	4,37		
Number of shots	ST	47,28	5,13	-,286	,779
	Opponents	47,64	5,13		
Number of goals	ST	27,57	3,61	,523	,610
	Opponents	27,00	3,92		
Attack Efficiency	ST	50,10	5,00	,419	,678
	Opponents	49,20	6,29		
Goalkeeper saves	ST	11,07	2,97	-2,994	,010*
	Opponents	13,92	2,97		
Number of wide shots	ST	3,92	1,73	2,539	,025
	Opponents	2,42	1,39		
Number of post hits	ST	2,85	1,61	,888	,391
	Opponents	2,28	1,32		
Number of blocked shots	ST	1,85	1,09	-,285	,780
	Opponents	2,00	1,35		
Turnovers	ST	11,71	2,36	,308	,763
	Opponents	11,35	3,07		
Number of getting fouls	ST	18,50	7,13	-1,811	,093
	Opponents	25,50	8,60		
Number of set-play offense	ST	33,35	3,89	-4,649	,000*
	Opponents	42,92	4,82		
Set-play offense goals	ST	16,85	3,71	-2,318	,037*
	Opponents	20,78	4,62		

Number of basic fast break	ST	6,64	2,87	2,243	,043*
	Opponents	4,21	2,15		
Basic fast break goals	ST	4,07	2,20	2,267	,041*
	Opponents	2,50	1,28		
Number of combined fast break	ST	8,14	3,77	1,987	,068
	Opponents	6,00	3,08		
Combined fast break goals	ST	3,78	2,00	1,000	,336
	Opponents	3,21	2,54		
Number of fast throw off	ST	6,63	2,87	4,564	,001*
	Opponents	2,27	2,64		
Fast throw off goals	ST	3,18	1,94	3,992	,003*
	Opponents	,63	,674		

*($p < 0.05$)

Considering the relationship between the parameters applied by the ST in the home and away games, there is a high level of relationship between the number of attacks and the number of goals in total (r = ,855), this increasing level of relationship in home matches (r =, 900) in away matches (r = ,705) falls. While there is a moderate correlation between the number of shots and the number of goals in total (r =, 667), interestingly, this correlation level decreases in home matches (r =, 557) and increases in away matches (r =, 752) ($p < 0.05$). In the analysis for all matches, a high level of correlation (r =, 806) was observed between goals scored in organized attacks, while this level of correlation increased in home matches (r =, 973) and decreased in away matches (r =, 724). Considering the relationship of the goals achieved with respect to the basic fast break, the high level in all matches (r = .844) increases very much in home matches (r =, 915) and decreases too much in the outer field matches (r =, 532) which will lose statistical significance. Looking at the relationship between another variation, combined fast break and goal numbers, there is a high level of correlation for all matches (r =, 806), as well as a close relationship (r =, 713) in home matches, but in away matches the team's goals. However, it was determined that the team used this parameter more in reaching the goal in away games and displayed a very high level of relationship (r =, 963). When fast throw off attack parameter is associated with goal, a close to medium level of association (r =, 722) is observed for all matches, while close to average relationships are determined in home (r =, 677) and away (r =, 759) matches. However, the low number of such attacks creates difficulties in interpreting the relationship levels (Table 2).

Table 2 Correlation results regarding the relationship between the parameters applied by the ST in home and away games.

Parameters		Number of shots	Organized attacks	Basic fast break	Combined fast break	Fast throw off
Total attacks	Pearson Correlation	,855*				
Attacks at home	Pearson Correlation	,900*				
Attacks at away	Pearson Correlation	,705*				
Total goals	Pearson Correlation	0,667	0,806	0,844	0,806	0,722
Goals at home	Pearson Correlation	0,557	0,973	0,915	0,713	0,677
Goals at away	Pearson Correlation	0,752	724	0,532	0,963	0,759

*($p < 0.05$)

The Mann Whitney U-test was applied for the difference between the analysis parameters of the matches won and lost by the ST team. When we look at the difference in terms of the analysis parameters of the ST winning and losing, there is no statistical difference in the parameters other than the number of shots (p> 0.05). When the averages of the analysis parameters of the ST were examined, it was observed that the ST team was superior in offense, goal, and attack efficiency, goalkeeper's efficiency, out, post, block and getting foul, while it was found to have lower average values in turnovers. There is a statistically significant difference in the number of shots (p <0.05). According to this finding, it was determined that team ST shots more while winning. In terms of offensive options, there is no significant difference except for combined fast break (p>0.05). When we look at the analysis parameters, it can be thought that the parameters such as number of fast break, fast break goals, number of basic fast break, number of combined fast break, combined fast break goals, number of fast throw off and fast throw off goals, 6 m shots and 7-9 m shots: have an effect on victory (Table 3).

Table 3. Mann Whitney U-test for the difference between parameters in matches won and lost by the ST

Number of attacks	Won	9	56,44	3,57	11,5	0,147
	Lost	5	52,4	4,39		
Number of shots	Won	9	49,56	4,69	5	,019*
	Lost	5	43,2	3,03		
Number of goals	Won	9	28,56	3,5	14	0,298
	Lost	5	25,8	3,42		
Attack efficiency	Won	9	50,66	5,93	17	0,518
	Lost	5	49,1	3,01		
Goalkeeper saves	Won	9	11,56	3,47	16,5	0,438
	Lost	5	10,2	1,79		
Number of wide shots	Won	9	4,22	1,92	18,5	0,606
	Lost	5	3,4	1,34		
Number of post hits	Won	9	3,33	1,8	11	0,147
	Lost	5	2	0,71		
Number of blocked shots	Won	9	1,89	0,93	20	0,797
	Lost	5	1,8	1,48		
Number of turnovers	Won	9	10,89	2,47	9	0,083
	Lost	5	13,2	1,3		
Number of fouls	Won	9	19	8,38	20,5	0,797
	Lost	5	17,6	4,83		
Number of 6 m shot	Won	9	12,44	4,25	17,5	0,518
	Lost	5	11	2,35		
6 m goals	Won	9	7,56	2,07	22	0,946
	Lost	5	7,6	2,07		
Number of 7-9 m shot	Won	9	3,89	2,26	13,5	0,24
	Lost	5	3	0,71		
7-9 m goals	Won	9	1,89	1,54	18	0,606
	Lost	5	1,4	1,52		
Number of 9 m shots	Won	9	13	4,36	22	0,954
	Lost	5	12,6	2,61		
9 m goals	Won	9	4,67	3,28	16	0,438
	Lost	5	5,4	2,51		
Number 7 m shots	Won	9	3,56	1,33	21	0,898
	Lost	5	3,4	1,82		
7 m goals	Won	9	2,89	1,54	22	0,957

	Lost	5	3	1,87		
Number of fast breaks	Won	9	16,67	4,06	12,5	0,19
	Lost	5	13,2	5,54		
Fast break goals	Won	9	11,56	3,17	12,5	0,185
	Lost	5	8,4	4,22		
Number of set-play offense	Won	9	32,11	3,41	10	0,112
	Lost	5	35,6	4,04		
Set-play offense goals	Won	9	16,56	4,5	16,5	0,438
	Lost	5	17,4	1,95		
Number of basic fast breaks	Won	9	7,33	3,04	13,5	0,24
	Lost	5	5,4	2,3		
Basic fast break goals	Won	9	4,44	2,46	17,5	0,518
	Lost	5	3,4	1,67		
Number of combined fast breaks	Won	9	9,78	3,6	5	**,019***
	Lost	5	5,2	1,92		
Combined fast break goals	Won	9	4,44	1,94	10,5	0,112
	Lost	5	2,6	1,67		
Number of fast throw off	Won	9	7,22	2,49	19	0,699
	Lost	5	6,2	3,27		
Fast throw off goals	Won	9	3,11	1,76	18	0,606
	Lost	5	2,4	2,07		

*($p < 0.05$)

Discussion

Feedback is defined as knowing about an players' performance during or after a sporting performance (Schmidt 1991). There are experimental studies on the types of feedback that coaches use and its effect on players motivation. When the studies in the literature are examined, it is still not known exactly what the effects of the feedback given by the coach on the performance of the athlete. Although feedback is used and recommended by many researchers considering that it affects performance it is not specified what it should be.

The fact that ST had more fouls than its opponents draws attention as a tactical choice. On the other hand, the goalkeeper performance, which is less effective than the opponents, can be explained by the fact that the first goalkeeper took too long as the game time in all matches fell out of the game over time. As a result of this determination, the ST handball team decided to transfer another goalkeeper for the new season. This action has shown that season analysis can effect the team setup in the next season for the professional clubs.

Positive parameters in favor of the home field that arise in the differences between the matches played by the ST in home and away; offensive efficiency, set-play offense efficiency, basic fast break and fast throw off efficiency. This shows that the team is more successful in providing the optimal attack setup in its own court. Opponent teams have found a solution with a successful retreat against ST basic fast break on their own court. Therefore, ST team had to use more fast break forms as combined, extended and fast throw-off in away games.

There is a significant difference between the advantage of playing at home and the points obtained in a competition in favor of ST. In addition, there is a significant inverse association between the advantage of playing at home and the final classification of a team (Gutierrez Aguilar et al., 2014). Several studies have emphasized the need to adjust the team's ability to quantify the advantage of playing at home; Lago- Penas et al. (2013) consider this domestic advantage to be at the behavioural level as a psychological factor for athletes; in contrast, Pic (2018) explains that the existence of the advantage of playing at home exists mainly in the

critical moments of handball games to obtain decisive success actions in favor of the home team.

The importance of these factors is reflected in the changes in team and player activities, and in the responses to game situations; the results are that home teams outnumber their opponents in terms of more aggressive defensive behavior, such as blocked shots, highly successful defensive actions and anticipations that can generate errors of the visiting teams (Gomez et al., 2014). As a result, playing matches at home causes players to make fewer mistakes (Krawczyk, 2015), which can be explained by the increase in player motivation and which can lead to a greater level of involvement in the game and greater accuracy.

Oliveira et al. (2012) studied the home advantage phenomenon and examined the five-minute periods in which teams scored more goals. The results confirmed the existence of a home advantage (64%), which was higher in balanced matches (71%) and lower in unbalanced matches (55%) but did not show any specific five-minute period of when the home advantage appeared. The last five-minute periods of each half of the match were those in which most goals were scored, especially in the second half.

Additionally, Pic (2018) verified the existence of home advantage at critical moments (match status and game result), while Oliveira et al. (2012) concluded that home advantage in handball depends upon the quality of opponent, and it is stronger in balanced games. Moreover, the authors concluded that the differences between the final outcome and game location were only identified in 6-m shot effectiveness.

Gomez et al. (2014) argue that the effect of the advantage at home can be affected by the interpretation of the referees that in turn influence the result of the match. In fact, a referee's decisions can favor local teams in disciplinary decisions. In addition, a feature of the visiting teams is that their defensive actions are poorer, due to dysfunctional aggression, which means that defensive players fail in preventing the attackers from making contacts; the players then end up committing absences or violations.

Typically, team performance indicators are provided from the comparison of winners and losers, and it is stated that no difference was found in the game style (positioned and fast breaks). It is essential to note the importance of the indicators established in goals scored, the effectiveness of total attacks and position attacks, total and long-range shooting efficiency and goalkeeper saves, as well as defensive actions that show significant differences between teams in relation to goalkeeper and defense (Skarbalius et al., 2013). The process of individual and collective defense actions as well as defensive match systems can become the main weapon of a team and can compensate for deficiencies in the offensive compartment (Gutierrez Aguilar & Ruiz, 2013).

Rogulj (2000) had the goal of determining which offensive and defensive collective tactics related to the duration of the match, the continuity, the systems, and the game structure that better differentiate between winning teams and losing teams. In his study, he used 27 performance indicators related to the competitive success situation of the teams. The main results revealed that winning teams were more efficient in fast transitions and individual action of progressing in attack. On the defensive end, winning teams were more efficient in executing defensive elements, and the losing teams committed several mistakes and executed inefficient shots in most of the fields' positions.

By involving a number of indicators of non-standard situational activity of the match, Foreti et al. (2013) present a contribution to defining the parameters of the situational efficiency of the players in a specific game position in handball. Understanding the importance and contribution of specific moments of the match to the final outcome can be very fruitful for coaches, in order to better perform they intervention. In this sense, individual performance indicators, such as

attack efficiency, shots from the wings and 7m penalties have a tendency to be considered as key indicators of the match standard (Skarbalius et al., 2013).

Conclusions

It can be observed that most articles focused on the study of offensive actions. In turn, many of the aforementioned studies focused their analysis on four main performance variables that seem to assume a greater importance: (1) in the shots where the main action under study, in relation to which different positions of the players, distances and situations of the game; (2) the differences between winning teams and losing teams; (3) Time Outs and their importance to coaches and teams; and (4) the relation between matches as home team and visitor. Regarding the methods of analysis, articles from the static perspective were based on descriptive and comparative studies of the cumulative statistics at the end of the match. In contrast, studies using the dynamic approach have used a variety of advanced analysis techniques to evaluate the time evolution of performance during the match.

As a result, it was seen that ST team committed more fouls than their opponents, and ST applied the offensive tactic with greater success in his own court. Parameters in favor of ST for matches won and lost; number of shots, attack efficiency, number of goals, goalkeeper saves, outside-post-block shots, fouls and turnovers. Normally these parameters are required to win a handball game. So the results are not surprise

References
1. Ziv, G.; Lidor, R. Physical characteristics, physiological attributes, and on-court performances of handball players: a review. Eur J Sport Sci. 2009, 9(6), 375-86.
2. Gençoğlu, C.; Gümüş, H. Performance Factors of Handball: Physiological Demands and Velocity of Ball Throwing Turkiye Klinikleri J Sports Sci. 2020, 12(1), 94-104.
3. Karcher, C.; Buchheit, M. On-court demands of elite handball, with special reference to playingpositions. Sport Med. 2014, 44(6), 797-814.
4. Póvoas, S.; Ascensão, A.; Magalhães, J.; Seabra, A.F.; Krustrup, P,; Soares, J. M.; et al. Physiological demands of elite team handball with special reference to playing position. J Strength Cond. Res. 2014, 28(2), 430-42.
5. Ronglan, L.T.; Raastad, T.; Børgesen, A. Neuromuscular fatigue and recovery in elite female handball players. Scand J Med Sci Sports, 2006, 16, 267–273.
6. Mackenzie, R.; Cushion, C. Performance analysis in football: A critical review and implications for future research. J Sports Sci. 2013, 31(6), 639-76.

7. Prieto, J.; Gómez, M.A .; Jaime Sampaio J. From a Static to a Dynamic Perspective in Handball Match Analysis: a. The Open Sports Sciences Journal 2015, 8, 25-34.

8. Hughes, M.D.; Bartlett, R.M. The use of performance indicators in performance analysis. J Sports Sci 2002; 10: 739-54.

9. Bilge ,M. (2012). Game Analysis of Olympic, World and European Championships in Men's Handball. Journal of Human Kinetic, 35, 109-118.

10. Pollany, W. 7th Men's European Championship - trend analysis, EHF Web Periodical 2006. Available at http://home.eurohandball.com/ehf_files/Publikation/WP_Pollany_Euro06_Trend_ Analysis.pdf; accessed on 05.05.2023.

11. Schmidt, R. A.; Lange, C.; Young, D. E. (1990). Optimizing summary knowledge of results for skill learning. Human Movement Science, 9, 325–348.

12. Gutiérrez, O., Ruiz, J. L. Game performance in the World Championship of handball 2011. Journal of Human Kinetics, 2013, 36, 137–147.

13. Lago-Penas, C.; Lago-Ballesteros, J.; Dellal, A.; Gomez, M. Game-related statistics that discriminated winning, drawing and losing teams from the Spanish soccer league. The Journal of Sports Science and Medicine 2010, 9(2), 288–293.

14. Pic, M. Performance and home advantage in handball. J Hum Kinetix 2018, 63(1), 61-71.

15. Gómez, M. A.; Lago, C.; Viaño, J.; González, I. Effects of game location, team quality and final outcome on game-related statistics in professional handball close games. Kinesiology 2014, 46(2), 249–257.

16. Krawczyk, P. Technical errors and the venue of the match in handball. Polish Journal of Sport & Tourism 2015, 22(1), 25–29.

17. Oliveira, T.; Gómez, M. A., Sampaio, J. Effects of game location, period, and quality of opposition in elite handball performances. Perceptual and Motor Skills 2012, 114(3), 783–794.

18. Rogulj, N.; Srhoj, V.; Srhoj, L. (2004). The contribution of collective attack tactics in differentiating handball score efficiency. Collegium Antropologicum 2004, 28(2), 739–746.

19. Foretic´, N.; Rogulj, N.; Papic´, V. Empirical model for evaluating situational efficiency in top level handball. International Journal of Performance Analysis in Sport 2013, 13, 275–293.

20. Skarbalius, A.; Vidunaite, G.; Kniubaite, A.; Reklaitiene, D.; Simanavicius, A. Importance of Sport Performance Monitoring for Sports Organization. Transform. Bus. Econ. 2019, 18, 279–303..