Sport SPA Vol. 23 Issue 1: 46-51
DOI: 10.51558/1840-4561.2026.23.1.46

The Rapid Progress of Handball: An Analysis of Offensive Performance in Recent Men's European Handball Championships

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Abstract
Modern men's handball is characterized by a high level of intensity, rapid transitions, and increasingly diverse offensive strategies. The development of tactical systems and the increasing pace of play have contributed to changes in the ways teams create and finish scoring opportunities. The aim of this study was to examine goal-scoring patterns across the three analyzed Men's European Handball Championships held in 2020, 2022, and 2024, with particular emphasis on the distribution of different scoring origins and offensive actions. The analysis included goals scored from 6 metres, wing positions, 9 metres, 7-metre penalties, fastbreaks, breakthroughs, and fast throw-offs. Data were obtained from the official statistics of the European Handball Federation (EHF) for the 24 national teams participating in each championship, covering a total of 195 matches across the three tournaments. The selected variables provide an overview of the ways in which elite teams generated and converted scoring opportunities. A comparative analysis of the three championships was conducted to identify differences and changes in goal-scoring patterns over time. In addition, the chi-square (χ^2) test of independence was applied to determine whether statistically significant differences existed in the overall distribution of the analyzed scoring categories between the 2020, 2022, and 2024 European Championships. The results showed a statistically significant association between championship year and goal-scoring origin, $\chi^2(12) = 214$, $p < .001$. However, the effect size was small (Cramer's V = 0.099). The most prominent descriptive change was the increase in the proportion of goals scored from 6 metres, accompanied by a decrease in the relative contribution of wing and 9-metre goals. These findings suggest a gradual change in the offensive scoring profile of elite men's handball.
Keywords: handball, European Championship, offensive performance, goal-scoring patterns, tactical development.

Introductio
Handball is a dynamic and highly demanding team sport in which the speed of play, tactical organization, and efficiency in finishing scoring opportunities play an essential role in determining competitive success. Over the past decades, the sport has undergone considerable tactical and technical development, resulting in faster offensive transitions, greater diversity in attacking systems, and increased demands on players' decision-making and finishing efficiency. The development of modern handball has particularly influenced the structure of offensive play. Teams increasingly combine positional attacks with rapid transitions and different forms of penetration and shooting. Scoring opportunities can be created from several areas of the court, including the 6-metre area, wing positions, and the 9-metre distance, as well as through 7-metre penalties, fastbreaks, breakthroughs, and fast throw-offs. Fast throw-offs may be particularly relevant in situations where teams attempt to exploit temporary defensive disorganization immediately after conceding a goal. Although these scoring situations are fundamental components of modern handball, their frequency and contribution to overall scoring may vary between competitions and across different periods of the sport's development. Examining these changes can provide a broader understanding of how offensive strategies and scoring patterns have evolved at the highest level of international men's handball. Therefore, this study focuses on the analysis of goal-scoring patterns during the three analyzed Men's European Handball Championships, held in 2020, 2022, and 2024. The research examines seven categories of scoring situations: 6-metre goals, wing goals, 9-metre goals, 7-metre goals (penalties), fastbreaks, breakthroughs, and fast throw-offs. By comparing these variables across the three championships, the study seeks to identify differences in scoring patterns and determine whether the distribution of these scoring situations changed over time. The application of the chi-square (χ^2) test provides statistical evidence regarding whether the overall distribution of scoring situations differed significantly between the analyzed championships.

RESEARCH METHODOLOGY
This study used a comparative research design to examine goal-scoring patterns in elite men's handball during the three analyzed Men's European Handball Championships. Data were collected from the official

statistical records of the European Handball Federation (EHF) for the 2020, 2022, and 2024 European Championships. The analyzed tournaments were the 2020 Men's European Handball Championship hosted by Austria, Norway, and Sweden; the 2022 Championship hosted by Hungary and Slovakia; and the 2024 Championship hosted by Germany. Official EHF statistics were used as the primary data source in order to ensure consistency and reliability of the collected information.

Participants

The population consisted of the 24 national teams that participated in each of the analyzed European Handball Championships. A total of 65 matches were played and analyzed in each tournament, resulting in 195 matches across the three championships. The selected competitions represent major international tournaments involving Europe's highest-level national teams and therefore provide an appropriate basis for examining the development of goal-scoring patterns in elite men's handball.

Variables

The research included seven categories of scoring situations obtained from the official EHF statistics:

- 6-metre goals – goals scored from shooting situations close to the 6-metre line;
- Wing goals – goals originating from the left or right wing positions;
- 9-metre goals – goals scored from the backcourt area around the 9-metre line;
- 7-metre goals (penalties) – goals scored from 7-metre penalty throws awarded following violations committed by the defending team;
- Fastbreaks – goals resulting from rapid offensive transitions from defense to attack, before the opponent's defensive organization is fully established;
- Breakthroughs – goals resulting from an attacking player penetrating through the defensive formation and creating a scoring opportunity;
- Fast throw-offs – goals resulting from rapid offensive actions initiated immediately after a goal has been conceded, with the intention of exploiting temporary defensive disorganization.

The analysis focused on the frequency and distribution of successful scoring situations across the three championships.

Objectives and Hypotheses

The primary objective of this research was to determine whether differences existed in the distribution of goal-scoring situations between the 2020, 2022, and 2024 Men's European Handball Championships. More specifically, the study aimed to:

- examine the frequency of goals scored from 6 metres, wing positions, and 9 metres;
- analyze the frequency of 7-metre goals;
- examine the occurrence of breakthroughs;
- analyze the frequency of fastbreak goals;
- examine the occurrence of fast throw-off goals;
- compare the distribution of these scoring situations across the three European Championships;
- determine whether statistically significant differences existed in the overall distribution of scoring situations between the championships. Based on these objectives, the following hypothesis was formulated:

H1: There will be statistically significant differences in the distribution of goal-scoring situations between the 2020, 2022, and 2024 Men's European Handball Championships.
H2: There will be statistically significant differences in the frequency of goals scored from 6 metres, wing positions, and 9 metres across the three analyzed European Championships.
H3: There will be statistically significant differences in the frequency of 7-metre goals, breakthrough goals, and fastbreak goals across the 2020, 2022, and 2024 European Championships.
H4: There will be statistically significant differences in the frequency of fast throw-off goals across the three analyzed European Championships.
The hypotheses concerning individual scoring categories were considered separately from the overall distribution tested by the omnibus chi-square analysis.

Data Analysis

The collected data were organized according to the seven analyzed scoring categories and the three championship years (2020, 2022, and 2024). The frequency of each scoring situation was compared between the championships, and row percentages were calculated to describe the relative contribution of each category within each championship. To determine whether the observed differences in the overall distribution of scoring situations were statistically

significant, the chi-square (χ^2) test of independence was applied. The analysis examined the association between championship year and the distribution of the seven selected scoring categories: 6-metre goals, wing goals, 9-metre goals, 7-metre goals, fastbreak goals, breakthrough goals, and fast throw-off goals. Statistical significance was evaluated at $p < .05$. Cramer's V was used as a measure of effect size to assess the strength of the association between championship year and the distribution of scoring situations.

Results

The results of the statistical analysis of goal-scoring patterns across the 2020, 2022, and 2024 Men's European Handball Championships are presented in Tables 1 and 2. The analysis included 6-metre goals, wing goals, 9-metre goals, 7-metre goals (penalties), breakthrough goals, fastbreak goals, and fast throw-off goals. The results were compared across the three championships to identify differences in the distribution and frequency of the analyzed scoring situations. The statistical significance of the overall differences was assessed using the chi-square (χ^2) test.

Distribution of Scoring Situations

Contingency Tables

A		B							
		6m	Wing	9m	7m penalty	Fast break	Breakthrough	Fast throw-off	Total
2020	Observed	691	728	934	316	420	402	41	3532
	% within row	19.6%	20.6%	26.4%	8.9%	11.9%	11.4%	1.2%	100.0%
2022	Observed	855	746	706	367	427	498	34	3633
	% within row	23.5%	20.5%	19.4%	10.1%	11.8%	13.7%	0.9%	100.0%
2024	Observed	1084	464	843	358	492	489	48	3778
	% within row	28.7%	12.3%	22.3%	9.5%	13.0%	12.9%	1.3%	100.0%
Total	Observed	2630	1938	2483	1041	1339	1389	123	10943
	% within row	24.0%	17.7%	22.7%	9.5%	12.2%	12.7%	1.1%	100.0%

Table 1. Distribution of Scoring Situations Across the 2020, 2022, and 2024 Men's European Handball Championships. Table 1 presents the distribution of the analyzed scoring situations across the 2020, 2022, and 2024 Men's European Handball Championships. A total of 10,943 goals were classified according to their scoring origin across the three analyzed championships. Across all three championships, goals scored from 6 metres represented the most frequent category, with 2,630 goals, corresponding to 24.0% of the total. This was followed by 9-metre goals, with 2,483 goals (22.7%), while wing goals accounted for 1,938 goals (17.7%). Breakthrough goals and fastbreak goals represented 1,389 (12.7%) and 1,339 (12.2%) goals, respectively. A total of 1,041 7-metre goals (9.5%) and 123 fast throw-off goals (1.1%) were recorded. The distribution of scoring situations varied across the three championships. The number and relative proportion of 6-metre goals increased progressively, from 691 goals in 2020 (19.6%) to 855 in 2022 (23.5%) and 1,084 in 2024 (28.7%). This represents an increase of 9.1 percentage points between 2020 and 2024. In contrast, wing goals showed a substantial decrease in 2024, declining from 728 goals in 2020 (20.6%) and 746 in 2022 (20.5%) to 464 goals in 2024 (12.3%). The frequency of 9-metre goals decreased from 934 goals in 2020 (26.4%) to 706 in 2022 (19.4%), followed by an increase to 843 goals in 2024 (22.3%). Despite this increase between 2022 and 2024, the proportion in 2024 remained lower than in 2020.

The number of 7-metre goals increased from 316 in 2020 (8.9%) to 367 in 2022 (10.1%), followed by a slight decrease to 358 in 2024 (9.5%). Fastbreak goals showed a relatively stable distribution, increasing slightly from 420 goals in 2020 (11.9%) to 427 in 2022 (11.8%) and 492 in 2024 (13.0%). Similarly, breakthrough goals increased from 402 goals in 2020 (11.4%) to 498 in 2022 (13.7%), followed by a slightly lower value of 489 goals in 2024 (12.9%).

Fast throw-offs were the least frequent scoring category in all three championships, with 41 goals in 2020 (1.2%), 34 in 2022 (0.9%), and 48 in 2024 (1.3%). Overall, the

descriptive results indicate a clear change in the distribution of scoring situations across the three European Championships. The most prominent changes were the increase in the relative contribution of 6-metre goals and the decrease in the contribution of wing goals. Smaller changes were observed in fastbreaks, breakthroughs, 7-metre goals, and fast throw-offs.

χ^2 Tests

	Value	df	p
χ^2	214	12	<.001
N	10943		

Nominal

	Value
Phi-coefficient	NaN
Cramer's V	0.0990

Table 2. Chi-square Test and Effect Size for Goal-Scoring Origin Across the European Championships. The chi-square test demonstrated a statistically significant association between championship year and the overall distribution of goal-scoring situations, $\chi^2(12) = 214$, $p<.001$. Therefore, the distribution of goals across the seven scoring categories was not independent of the championship year. In other words, the overall pattern of goal-scoring origins changed significantly across the 2020, 2022, and 2024 European Championships. The first hypothesis (H1), which proposed that statistically significant differences would exist in the overall distribution of scoring situations between the three championships, was therefore supported. However, statistical significance should be interpreted together with the magnitude of the association. Cramer's V was 0.099, indicating a small association between championship year and goal-scoring origin. Thus, although the distribution of scoring situations differed statistically significantly across the championships, the overall strength of the association was relatively modest. The omnibus chi-square test indicates that the overall distribution differed between championships but does not, by itself, establish that every individual scoring category differed significantly. Therefore, the specific hypotheses concerning individual categories (H2-H4) require separate category-specific statistical analyses and should not be considered confirmed solely on the basis of the overall chi-square result.

Discussion

The findings demonstrate that the overall goal-scoring profile changed significantly across the three analyzed Men's European Handball Championships. The most prominent descriptive development was the substantial increase in the proportion of goals scored from the 6-metre area. The contribution of 6-metre goals increased from 19.6% in 2020 to 28.7% in 2024, representing the largest increase among the analyzed scoring categories. At the same time, the relative contribution of wing goals decreased markedly, while 9-metre goals also represented a smaller proportion of the total in 2024 than in 2020. The increase in 6-metre goals may indicate a greater emphasis on creating high-quality scoring opportunities close to the goal. Such opportunities can result from successful offensive combinations, penetration, pivot play, and the creation of space within or around the defensive formation. From a tactical perspective, this pattern may suggest that elite teams increasingly seek to create high-probability scoring situations rather than relying predominantly on long-range shooting. The decline in the proportion of wing goals is particularly notable. Wing goals accounted for 20.6% of all goals in 2020 but only 12.3% in 2024. This represents a reduction of 8.3 percentage points. One possible explanation is that modern attacking systems increasingly emphasize central penetration and the creation of scoring opportunities closer to the 6-metre line. However, this interpretation should be treated cautiously because the present study did not directly

analyze tactical formations, defensive systems, or the number of attempts generated from each position. A similar, although less pronounced, pattern was observed for 9-metre goals. Their proportion decreased from 26.4% in 2020 to 22.3% in 2024. When considered together with the increase in 6-metre goals, this finding may indicate a shift in the relative distribution of scoring opportunities from longer-range shooting toward closer-range finishing. Fastbreaks and breakthroughs showed comparatively smaller changes across the analyzed period. Fastbreak goals increased from 11.9% in 2020 to 13.0% in 2024, while breakthrough goals increased from 11.4% to 12.9%. These findings suggest that transition play and penetration remained important components of elite offensive performance. Nevertheless, their relative changes were considerably smaller than those observed for 6-metre and wing goals. The statistical analysis provides support for the first hypothesis. The significant chi-square result, $\chi^2(12) = 214$, $p < .001$, indicates that the overall distribution of scoring situations was significantly associated with championship year. However, the relatively small Cramer's V value ($V = 0.099$) indicates that the strength of this association was weak. This distinction is important when interpreting the findings. With a large sample of 10,943 goals, relatively modest differences in the distribution can produce statistically significant results. Therefore, the findings should not be interpreted as evidence of a dramatic transformation of offensive performance, but rather as evidence of a statistically detectable change in the scoring profile. The descriptive findings provide the clearest evidence of change in 6-metre, wing, and 9-metre scoring. In particular, the increase in 6-metre goals and the decrease in wing goals represent the most pronounced changes between 2020 and 2024. These changes may reflect developments in offensive organization, tactical priorities, and the creation of higher-quality scoring opportunities. Nevertheless, further statistical analysis at the individual-category level would be required before concluding that each of these specific categories changed significantly. The findings also have practical implications for coaches and performance analysts. The increased relative contribution of 6-metre goals may highlight the importance of offensive systems capable of creating penetration, pivot opportunities, and high-quality close-range shooting situations. At the same time, the reduction in the relative contribution of wing goals may encourage further investigation into how defensive systems and attacking structures influence the availability of wing shooting opportunities. The increase in the overall number of goals from 3,532 in 2020 to 3,778 in 2024 also indicates a higher total scoring output across the analyzed championships. However, because the number of matches and total goals may be influenced by tournament-specific factors, this increase should not by itself be interpreted as evidence of improved offensive efficiency. A more complete assessment of offensive efficiency would require information on the number of possessions, total attempts, shooting percentages, and other performance indicators. Future research should therefore combine goal-origin data with additional variables such as attack type, defensive system, possession duration, number of attacking attempts, shooting efficiency, transition frequency, and team-specific tactical characteristics. Such analyses would help determine whether the observed changes reflect a broader evolution of elite men's handball or differences in the tactical approaches used by individual teams across the championships. Overall, the results indicate that the distribution of scoring situations changed significantly across the three analyzed European Championships, while the small effect size indicates that the magnitude of the overall association was limited. The most prominent descriptive trend was the increased importance of 6-metre scoring and the simultaneous decline in the relative contribution of wing and 9-metre goals. These findings suggest an evolution in the offensive scoring profile of elite men's handball between 2020 and 2024, while also highlighting the need for more detailed analyses to determine the tactical factors underlying these changes.

Conclusion

The present study examined the distribution of scoring situations across the 2020, 2022, and 2024 Men's European Handball Championships. The results demonstrated a statistically significant difference in the overall distribution of scoring origins between the three championships, as indicated by the chi-square test, $\chi^2(12) = 214$, $p < .001$. However, the small Cramer's V value ($V = 0.099$) indicates that the overall strength of the association was relatively weak. The most notable change was the increase in the proportion of goals scored from 6 metres, from 19.6% in 2020 to 28.7% in 2024. In

contrast, the relative contribution of wing goals decreased from 20.6% to 12.3%, while 9-metre goals decreased from 26.4% to 22.3%. Other scoring categories, including 7-metre goals, fastbreaks, breakthroughs, and fast throw-offs, showed comparatively smaller changes. These findings suggest that the offensive scoring profile of elite men's handball has evolved over the analyzed period, particularly through an increased relative contribution of close-range scoring. Nevertheless, the small effect size indicates that the observed changes should be interpreted as a gradual rather than a substantial transformation of offensive performance. The findings may provide useful information for coaches, players, and performance analysts by highlighting changes in the distribution of scoring opportunities at the highest level of international men's handball. Further research should incorporate additional performance and tactical variables in order to provide a more comprehensive explanation of the observed changes.

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