The Attractiveness of Indonesian Handball Competitions Based on Men's and Women's National-Level Multi-Event Games
(A Statistical Analysis Study of the PON IX Exhibition 2016, PON XX 2021, and PON XXI 2024)

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ABSTRACT

This study examines the appeal of national-level handball competitions in Indonesia for both men's and women's categories using a comparative descriptive quantitative design. The objective of the study is to analyze the characteristics of the competition more comprehensively, not limited to the final match results, through the use of per-match and time-based performance indicators in three multi-event editions: the 2016 PON IX Exhibition, 2021 PON XX, and 2024 PON XXI. A total sampling technique was applied involving all participating provincial teams (9 provinces and 34 scoring sheets in 2016; 7 provinces and 20 scoring sheets in 2021; and 10 provinces and 28 scoring sheets in 2024). Data were collected through analysis of official match scoring sheets and reorganized into five research indicators: Goals For/Match, Goals Against/Match, Goals Difference/Match, Goals For/Minute, and Goals Against/Minute. The analysis was conducted using a quantitative descriptive method by grouping data based on category and championship edition and calculating total and average scores. The results of this study indicate that the attractiveness of a competition is determined not only by the balance of match results but also by the intensity of the score, the tempo of the game, and the variation in performance between teams. High scoring productivity, fast tempo of the game, and large goal differences shape the character of the competition in each edition and reflect the dynamics of the development of national handball development. These findings emphasize the importance of a multidimensional approach in competition evaluation and have implications for sports policy, competition management, and athlete development.

AUTHORS' CONTRIBUTION

A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

Cites this Article	:	Lesmana, Irfan Benizar; Yudiana, Yunyun; Mahardika, Dhika Bayu; Nugroho, Setio. (2025). The Attractiveness of Indonesian Handball Competitions Based on Men's and Women's National-Level Multi-Event Games (A Statistical Analysis Study of the PON IX Exhibition 2016, PON XX 2021, and PON XXI 2024). **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 17(3), p.3437-3447

INTRODUCTION

Team sports studies in Indonesia still focus on the final match result and have not fully considered the intensity, tempo, and pressure dimensions of the game. Evaluations

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based on final scores fail to capture the complexity of handball, which is influenced by changes in tempo, rapid transitions, and situational pressure during a match (Prieto, Gómez, & Sampaio, 2015). Game intensity and pressure are directly related to the physical demands of athletes and the resulting quality of competition (Póvoas et al., 2014). The fast-paced and dynamic nature of handball demands an analytical approach that goes beyond the final match result (Ferrari, Sarmento, & Vaz, 2019). This situation emphasizes that the evaluation of team sports competitions requires a framework capable of reflecting the complexity of the game process as a whole.

As an amateur sport in Indonesia, the "Pekan Olahraga Nasional/PON" (national multievent) reflects the best preparation of the Indonesian handball team in preparing for competition. The appeal of national-level handball competitions in Indonesia has not been systematically analysed, so evaluations of competition quality tend to be normative. The lack of measurable statistical indicators makes it difficult to compare competition quality between championships (Ferrari et al., 2019). Match data-based analysis allows for objective measurements of offensive productivity and defensive effectiveness (Hlupić et al., 2015). This approach supports the development of evidence-based team sports (Popović et al., 2020). The use of match data as a basis for evaluation and coaching decisions is a crucial part of competition management.

The appeal of sports competitions requires indicators that reflect the tempo of play. Match-by-match statistics and time-based indicators have been shown to differentiate the character and quality of handball team performance (Saavedra et al., 2018; Prieto et al., 2015).

Previous studies have not integrated match-by-match and minute-by-minute indicators simultaneously to assess the attractiveness of men's and women's competitions. The separation of match results and time-based indicators results in a partial understanding of the nature of the competition (Prieto et al., 2015). Comparative studies across national championship editions using consistent statistical indicators are still limited. Inconsistent statistical approaches can potentially lead to biased performance interpretations (Ferrari et al., 2019; Kim & Lee, 2019). These conditions highlight the need for uniform and continuous recording and analysis of match statistics in national competitions.

METHODS

This study uses a comparative descriptive quantitative design to analyze the attractiveness of national handball competitions in the men's and women's categories based on match statistics indicators at the 2016 PON IX Exhibition, 2021 PON XX, and 2024 PON XXI. This design was chosen because it is appropriate to describe match performance patterns and compare the character of competitions between championship editions.

The research subjects included all provincial teams participating in the three editions of the championship, namely 9 Provinces and 34 Scoring Sheets at the 2016 PON IX Exhibition, 7 Provinces and 20 Scoring Sheets at PON XX 2021 and 10 Provinces and 28 Scoring Sheets at PON XXI 2024. The sampling technique used was total sampling with

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the aim of analyzing all available data without exception to ensure data representation and eliminate potential sample selection bias. The following are details of the population and sample in Table 1.1 of this study below:

Table 1.
Population and Research Sampling

No	Multievent	Women Team		Men Team		Total	
		Participant	Scoring Sheet	Participant	Scoring Sheet	Participant	Scoring Sheet
1	Eksebisi PON IX 2016	8 Province (4, 5, 6, 7, 8, 9, 10, 13)	15	9 Province (3, 4, 5, 6, 7, 8, 9, 10, 13)	19	9	34
2	PON XX 2021	6 Province (5, 6, 7, 8, 9, 11)	10	6 Province (5, 6, 7, 9, 11, 12)	10	7	20
3	PON XXI 2024	7 Province (1, 2, 3, 5, 6, 9, 12)	13	9 Province (1, 2, 5, 6, 7, 8, 9, 12, 13)	15	10	28

Based on Table 1, data were collected through document analysis in the form of official match scoring sheets. The recorded information included the number of matches, match results (win, loss, draw), total minutes played, number of goals scored, number of goals conceded, and goal difference for each provincial team. The research instrument was a statistical recapitulation sheet that reorganized the scoring sheet data into research indicators, namely Goals For/Match, Goals Against/Match, Goals Difference/Match, Goals For/Minute, and Goals Against/Minute. Data analysis was conducted descriptively and quantitatively by grouping data by category and championship edition, calculating the total and average goals per match and per minute, and presenting the results in comparative tables.

RESULTS AND DISCUSSION

Research findings in Table 2 present a match-based overview of men's and women's national multi-event events for the 2016–2024 period, including the Goals For/Match, Goals Against/Match, and Goals Difference/Match indicators. The full overview is provided in Table 2 below:

Table 2.
Statistical data Goals for, Goals Against, and Goals Difference in Handball Multievent 2016–2024

Province	Goals For/Match			Goals Against/Match			Goals Difference/Match		
	2016	2021	2024	2016	2021	2024	2016	2021	2024
1. Women's Team									
Prov.1			1			45			–44
Prov.2			21,75			27			–5,25
Prov.3			11			34			–23
Prov.4	26,67			29,67			–3		
Prov.5	26,40	19,75	29,25	13,60	15,75	12,75	12,80	4	16,50
Prov.6	27,20	20	26,40	14,20	16,75	17,20	13	3,25	9,20
Prov.7	14,67	13		24,67	17,50		–10	–4,50	
Prov.8	10	13		39,67	16		–29,67	–3	

	2016	2021	2024	2016	2021	2024	2016	2021	2024
Prov.9	31,75	21,50	38	11,75	19	15	20	2,50	23
Prov.10	20			18			2		
Prov.11		16,75			13			3,75	
Prov.12			25			34,33			-9,33
Prov.13	12			17,67			-5,67		
2. Men's Team									
Prov.1			16			45			-29
Prov.2			26			32,50			-6,50
Prov.3	3,75			21			-17,25		
Prov.4	17,25			4,50			12,75		
Prov.5	23,83	26,25	31,60	2	25,75	28,20	21,83	0,50	3,40
Prov.6	27,33	28,75	32,20	1,83	24,50	26	25,50	4,25	6,20
Prov.7	23,50	26,50	36	3,50	29,25	27,50	20	-2,75	8,50
Prov.8	19		33	4,25		33,33	14,75		-0,33
Prov.9	20,33	32,50	32,50	24	27	31,75	-3,67	5,50	0,75
Prov.10	19			20			-1		
Prov.11		27,50			36			-8,50	
Prov.12		17	29,33		23,50	23,33		-6,50	6
Prov.13	16,67		16,50	22,67		32	-6		-15,50

Source: Based on Competition Report 2016–2024

Overall, Table 2 shows that variations in Goals For/Match, Goals Against/Match, and Goals Difference/Match across participants and editions reflect changing competition dynamics over time. Differences in these indicator values indicate variations in offensive productivity, defensive quality, and the level of match outcome parity, reflecting the development and disparity of national handball development.

Table 3 presents a time-based overview with Goals For/Minute and Goals Against/Minute indicators, in the men's and women's categories in the national multi-event period 2016–2024. The following is a complete description in Table 3 below:

Table 3.
Statistical data Goals for, Goals Against and Goals Difference in Handball Multievent 2016-2024

PUTRI	Goals For/Minute			Goals Against/Minute		
	2016	2021	2024	2016	2021	2024
1. Women's Team						
Prov.1			60			1,33
Prov.2			2,76			2,22
Prov.3			5,45			1,76
Prov.4	1,88			1,69		
Prov.5	1,97	3,04	2,05	3,82	3,81	4,71
Prov.6	1,91	3	2,27	3,66	3,58	3,49
Prov.7	3,41	4,62		2,03	3,43	
Prov.8	5	4,62		1,26	3,75	
Prov.9	1,57	2,79	1,58	4,26	3,16	4
Prov.10	2,50			2,78		
Prov.11		3,58			4,62	
Prov.12			2,40			1,75
Prov.13	4,17			2,83		
2. Men's Team						
Prov.1			3,13			1,11
Prov.2			1,92			1,54
Prov.3	13,33			2,38		
Prov.4	2,90			11,11		

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Prov.5	2,10	2,29	1,58	25	2,33	1,77
Prov.6	1,83	2,09	1,55	27,27	2,45	1,92
Prov.7	2,13	2,26	1,46	14,29	2,05	1,91
Prov.8	2,63		1,52	11,76		1,50
Prov.9	2,46	1,85	1,62	2,08	2,22	1,65
Prov.10	2,63			2,50		
Prov.11		2,18			1,67	
Prov.12		3,53	1,70		2,55	2,14
Prov.13	3		3,03	2,21		1,56

Source: Based on Competition Report 2016-2024

The results in Table 3 show that game tempo and defensive pressure varied across participants and across championship editions. The relatively stable range of Goals For/Minute and Goals Against/Minute values across most provinces indicates consistent match intensity, while extreme values reflect specific match conditions, such as incomplete match time or differences in team competitive readiness. These findings confirm that time-based indicators are important for a more comprehensive understanding of the nature and appeal of handball competitions.

The Attraction of the Men's and Women's Competitions in Every Edition of the Multievent

In general, the attractiveness of the men's and women's competitions in each edition of the championship is reflected in the variation in scoring productivity and goal difference between participants. In the women's category, Province 9 recorded Goals For/Match of 31.75 (2016), 21.50 (2021), and 38 (2024) with Goals Difference/Match of 20, 2.50, and 23, respectively, indicating that the matches presented high attacking dynamics. In the men's category, Province 6 recorded Goals For/Match of 27.33, 28.75, and 32.20 with Goals Difference/Match of 25.50, 4.25, and 6.20, respectively, illustrating high-intensity competition. Negative data, such as Goals Difference/Match of -29 in Province 1 men's and -44 in Province 1 women's, still demonstrate regional involvement with a developing level of coaching. Goal productivity and scoring margin can be influenced by the quality of offensive execution, as winning teams tend to excel in fast-break, breakthrough, wing, and pivot goals, which statistically differentiate performance from losing teams (Bayram, Keskin, & Kirandi, 2021). In close matches, scoring dynamics also change when a player is excluded, as the opposing team typically improves its scoring performance when outnumbered, although the increase is not always as large as expected in a 2-minute situation (Prieto, Gómez, & Sampaio, 2015). Scoring variation between teams is also related to high physical demands, as players cover greater distances and pace during the offensive phase than during the defensive phase, so the intensity of tournament play can drive fluctuations in offensive productivity (Manchado, Pueo, Chirosa-Rios, & Tortosa-Martínez, 2021).

At the 2016 Exhibition, the attractiveness of the competition was demonstrated by the strong dominance of several provinces, for example, the 6 men's provinces with a margin of 25.50 and the 9 women's provinces with 20. At the 2021 PON, the attractiveness emerged from the increasing balance of match results, seen in the 5 men's provinces with a margin of 0.50 and the 6 women's provinces with 3.25. At the 2024 PON, the

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attractiveness of the competition was strengthened by the high volume of scores, such as the 3 men's provinces with 36 Goals For/Match and the 9 women's provinces with 38, although there were still provinces with negative margins reflecting the strengthening process of coaching. The large and small differences in goal margins in national competitions reflect variations in the level of dominance and performance balance that are common in multi-event events (Ferrari et al., 2019). This variation indicates changes in the character of the competition that can be observed through indicators of score productivity and the distribution of goal margins among participants (Prieto et al., 2015). The pattern of high scores and negative margins that consistently appear in one championship edition reflects the diversity of performance conditions and the competitive capacity of teams (Popović et al., 2020).

Competition Attraction Based on Goals For/Match in Each Multievent Edition

The appeal of competitions based on Goals For/Match is evident in their high offensive productivity. In the women's category, Province 5 recorded Goals For/Match of 26.40 (2016), 19.75 (2021), and 29.25 (2024), while Province 9 reached 38 in 2024. In the men's category, Province 7 increased from 23.50 (2016) to 36 (2024). Low scores, such as Province 1's women's score of 1, indicate involvement in regions that are in the early stages of development. High offensive productivity in handball competitions reflects the effectiveness of offensive strategies, as teams with a higher number of goals are generally able to utilize quick transitions, varied shooting zones, and more efficient attacking decision-making (Bayram, Keskin, & Kirandi, 2021). Low goal productivity does not necessarily reflect minimal participation but can indicate the developmental stage of development, as performance quality is strongly influenced by competition experience, training structure, and team tactical adaptations (Madou, 2020).

In 2016, offensive appeal was evident in the 9-girls provinces (31.75) and 6-girls provinces (27.33). In 2021, more provinces were in the 20-30 range, such as the 6-girls' provinces (28.75) and 5-girls' provinces (19.75). In 2024, an increase in offensive intensity was evident, demonstrated by the 3-girls' provinces (36) and 9-girls' provinces (38), making matches more attractive in terms of goal productivity. The high goal productivity of several provinces suggests that offensive effectiveness is largely determined by a team's ability to exploit game situations, as variation in shooting zones and successful offensive execution are key differentiating factors in increasing match scores (Baena-González et al., 2020). Elite handball matches are characterized by high-intensity intermittency that encourages more attacking actions and finishing situations (Madou, 2020).

Competition Attraction Based on Goals Against/Match in Each Multievent Edition

Goals Against/Match indicates game pressure and defensive quality. In the women's category, province 9 reduced goals conceded from 19 (2021) to 15 (2024), while province 5 recorded 12.75 in 2024. In the men's category, province 6 had 26 Goals Against/Match (2024) compared to province 1's 45. The high number of goals conceded still reflects fast-paced and open matches. Score productivity per match is a key indicator of game tempo and offensive capacity in competitive handball (Saavedra et al.,

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2018). The nature of handball competitions displays different game intensities according to the technical and tactical readiness of the participants (Michalsik & Aagaard, 2015).

In 2016, the difference in defensive quality was clear, for example, with 1.83 goals conceded for the men's province with 6 compared to 39.67 for the women's province with 8. In 2021, goals conceded varied more widely, with 27 goals conceded for the men's province, 9 and 16.75 for the women's province, with 6. In 2024, despite high goals conceded for certain provinces, data showed that attacking intensity remained the main attraction of the matches. Differences in goals conceded between teams reflect the quality of defensive organization and tactical defensive behavior, as positional coordination, pressure on the ball carrier, and collective response are crucial for successfully containing an opponent's attack (Tilp & Schrapf, 2015).

The Attraction of Competitions Based on Goal Difference/Match in Each Multievent Edition

Goal Difference/Match reflects the balance of match results. In the men's category, Province 5 recorded a difference of 0.50 (2021) and Province 9 recorded 0.75 (2024), indicating many close matches. In the women's category, Province 6 recorded a decrease in the difference from 13 (2016) to 9.20 (2024). Large negative differences, such as -44 in Province 1's women's category, still reflect the involvement of regions with varying levels of preparedness. Small goal differences in handball matches reflect the balance of performance between teams, as in tight matches, attack and defence effectiveness tend to be relatively equal, often leading to situational details determining the outcome (Prieto, Gómez, & Sampaio, 2016). Large negative goal differences still reflect the involvement of teams with varying levels of preparedness, as variations in experience, tactical quality, and game adaptation are common characteristics in handball competitions with diverse coaching backgrounds (Bayram, Keskin, & Kirandi, 2021).

In 2016, the goal difference was striking, with provinces with 6 men (25.50) and provinces with 9 women (20). In 2021, the goal difference was smaller in some provinces, with provinces with 5 men (0.50) and provinces with 6 women (3.25). In 2024, the difference widened again in some provinces, but still showed interesting variation in results. The widening of the goal difference was also related to changes in attacking strategy, as the use of certain tactical approaches, such as manipulating numerical superiority, can increase both the risk and the opportunity for a score difference to be created (Krahenbühl et al., 2021).

Competition Attraction Based on Goals For/Minute in Each Multievent Edition

Goals Per Minute indicates the tempo of the game. In the women's category, Province 5 recorded 1.97 (2016), 3.04 (2021), and 2.05 (2024), while Province 9 was at 1.57-1.58. In the men's category, Province 6 recorded 1.83, 2.09, and 1.55, respectively. Extreme values , such as 60 in Province 1 for women, indicate very short match conditions. Game tempo can be understood through the intensity of player activity, as movement profiles and average speeds on the pitch are influenced by position and playing time, which ultimately determine how often a team can build attacks and score goals per minute (Büchel et al.,

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2019). The majority of goals in women's handball occur when players are evenly matched, while differences in numerical conditions can alter the pattern of shooting opportunities and the rhythm of attacks (Cherobini Piovesan et al., 2020).

In 2016, the tempo variation was seen in the provinces with 8 girls (5) and 3 boys (13.33). In 2021, the tempo was more concentrated, for example, the provinces with 6 boys (2.09) and 5 girls (3.04). In 2024, most provinces were at a range of 1.5-4.0, indicating a stable and interesting game tempo.

Competition Attraction Based on Goals Against/Minute in Each Multievent Edition

Goals Against/Minute reflects defensive pressure. In the women's category, Province 9 recorded 4.26 (2016), 3.16 (2021), and 4 (2024), while Province 5 was at 3.82-4.71. In the men's category, Province 9 recorded 2.08, 2.22, and 1.65, respectively. High figures, such as 27.27 in the 2016 men's Province 6, indicate an early stage of competition with an unstable game structure. Variations in game tempo between teams reflect differences in physical demands and match activity structure, as handball is characterized by high-intensity, intermittent patterns that influence attack frequency and goal scoring opportunities (Michalsik & Aagaard, 2015). Concentrating tempo within a certain range indicates a stable match rhythm, given that manipulation of game format and contact intensity can alter physiological load and transition speed without disrupting the continuity of attack flow (Dello Iacono, Eliakim, & Meckel, 2018). A relatively stable game tempo is also related to the effectiveness of tactical organization, as consistent patterns of activity and collective decision-making contribute to an engaging and balanced match rhythm (Hassan, Mohamed, & Hassan, 2017).

In 2016, the difference in defensive pressure was significant, for example, between the 6 men's provinces (27.27) and the 9 women's provinces (4.26). In 2021, the Goals Against/Minute values were in a narrower range, with the 6 men's provinces (2.45) and the 5 women's provinces (3.81). In 2024, goals conceded per minute ranged from 1.1 to 4.7, indicating matches played under consistent and intense pressure. Differences in defensive pressure between teams can be understood through changes in defensive behavior and goalkeeper positioning, as modifications to the game situation affect the opponent's shooting zone and the frequency of successful attacks that result in goals conceded (Baena-González et al., 2020). A narrower range in goals conceded per minute indicates a more structured defensive organization, as the emphasis on controlling space, delaying the opponent's attack, and collective coordination are the primary focuses in managing the defensive phase (Bento, di Gilio, & Menezes, 2021).

CONCLUSION

This study shows that the attractiveness of national-level handball competitions in Indonesia, both in the men's and women's categories, can be comprehensively analyzed through quantitative performance indicators such as Goals For/Match, Goals Against/Match, Goals Difference/Match, Goals For/Minute, and Goals Against/Minute at the PON IX 2016, PON XX 2021, and PON XXI 2024 Exhibitions. The research findings

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indicate that the attractiveness of competitions is not solely determined by the balance of match results, but also by the intensity of the score, the tempo of the game, and the variation in skill levels between teams. High score productivity, fast tempo of the game, and large goal differences shape the character of different matches in each championship edition and reflect the dynamics of the development of national handball development. Analysis of quantitative performance indicators provides a more complete picture of the character of handball competitions because the integration of scores, tempo, and game pressure better represents the dynamics of performance than the assessment of the final result alone (Ferrari, Sarmento, & Vaz, 2019).

This study examines the attractiveness of national-level handball competitions in the men's and women's categories through an analysis of quantitative performance indicators, namely Goals For/Match, Goals Against/Match, Goals Difference/Match, Goals For/Minute, and Goals Against/Minute, at the PON IX 2016, PON XX 2021, and PON XXI 2024 Exhibitions. The results show that the attractiveness of the competition is not only determined by the balance of match results, but also by the intensity of the score, the tempo of the game, and the variation in performance between participants. Differences in the values of these indicators shape the diverse character of the matches in each edition of the championship and reflect the dynamics of the development of national handball development. This finding is in line with match analysis studies that confirm that the combination of indicators of results, tempo, and game pressure is more capable of describing the quality and attractiveness of team sports competitions than evaluations based solely on the final score (Ferrari, Sarmento, & Vaz, 2019).

The scientific contribution of this study lies in expanding the perspective of competitive attractiveness analysis from an outcome approach to a multidimensional approach based on match statistics. The use of per-match and per-minute indicators in the men's and women's categories provides a framework for understanding performance dynamics in national-level multi-event competitions. However, generalization of the study findings requires caution, given the limited data coverage, which only covers three championship editions and does not consider contextual variables such as match duration, tactical systems, athlete experience levels, and other situational factors. Therefore, the findings of this study represent performance patterns in the observed championships and cannot be generalized to the entire context of handball competitions in Indonesia. This multidimensional approach based on match statistics aligns with the team sports analysis literature that emphasizes the importance of integrating indicators of outcome, tempo, and game pressure to understand performance dynamics more contextually, while also requiring caution in generalizing the findings due to limited data coverage and situational variables (Ferrari, Sarmento, & Vaz, 2019).

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