# COMPARATIVE CHARACTERISTICS OF MALE AND FEMALE HANDBALL: PHYSIOLOGICAL, TECHNICAL AND TACTICAL PERSPECTIVES

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**Abstract:** *The present study* focuses on the identification and analysis of selected gender-related differences in handball, emphasizing physiological capacities, technical execution, and tactical organization during competitive activity. The research is based on a qualitative synthesis of specialized scientific literature combined with systematic observation of male and female handball matches at national and international level.
*Methodology:* The applied methodology aims to identify characteristic features and trends specific to each gender. The research applies a qualitative analytical approach based on several complementary methods. The collected information is subjected to comparative analysis focusing on physical demands, technical execution, and tactical organization of play. The methodological framework does not seek to establish performance superiority but rather to identify characteristic features specific to male and female handball.
*Results:* The analysis outlines clear distinctions in the manifestation of physical abilities, game intensity, and technical behavior which are largely influenced by biological and physiological characteristics. Men's handball is usually associated with higher physical demands, explosive actions and rapid transitions between phases of the game. In contrast, women's handball demonstrates a stronger orientation towards technical precision, structured tactical patterns and collective coordination. Psychological demands in handball are high and span from the motivation to achieve the goals, to the activation in the implementation of actions, the focus on the game play, the player's self-confidence the cohesion of the collective team game and the ability to make the right decision at the right time.
*Conclusion:* The identified characteristics highlight the importance of differentiated training models and competition strategies adapted to the specific requirements of each gender. These findings highlight the need for gender-specific approaches in the design of training and competition preparation. From a practical point of view, the recognition of these differences can contribute to improved training efficiency, optimized results and sustainable development of handball as a modern team sport. The conclusions obtained can be useful in planning the teaching and training process and the development of handball as an elite sport.
**Keywords:** handball, gender differences, competitive activity, tactics, performance analysis.

## 1. INTRODUCTION

Handball represents a high-intensity team sport that integrates physical conditioning, technical proficiency, and tactical decision-making within a rapidly changing competitive environment (Wagner et al., 2019; Michalsik et al., 2023). Handball is established as a dynamic and continuously developing sport that occupies a significant place both in the calendar of major international competitions and in educational and training programs for children and young people worldwide. Like all other sports, the development of handball is closely linked to the application of modern scientific achievements in the fields of training methodology, sports medicine, and education.

Performance in contemporary handball is determined by the interaction of multiple factors, including strength, speed, endurance, coordination, and game intelligence, which together shape the structure of competitive activity (Bompa & Buzzichelli, 2019; Haugen et al., 2021).

Strong competition at a high level encourages the constant search for and implementation of innovative approaches to the game. As a result, a noticeable increase in game intensity can be observed, leading to greater speed, dynamics, and emotional tension during matches. Modern handball is characterized by extremely high demands on players' physical fitness, as well as on the improvement of their speed, strength, and technical skills. All game actions, both in offense and defense, are performed at maximum speed and with a high level of concentration.

Alongside collective actions, individual player performances also play an important role. Personal initiative, creativity, and the ability to make quick decisions contribute both to the creation of scoring opportunities and to their successful realization in decisive moments of the game.

In recent years, scientific interest has increasingly focused on gender-related characteristics in sport, particularly regarding their influence on performance structure and training methodology (Rousanoglou et al., 2021; Nikolaidis & Ingebrigtsen, 2020). Biological and physiological distinctions between men and women inevitably affect the execution of motor actions, game tempo, and tactical solutions, especially in high-intensity team sports such as handball (Gorostiaga et al., 2006; Hermassi et al., 2021).

In handball, these differences are reflected not only in individual performance indicators but also in team organization and strategic approaches adopted during competition (Manchado et al., 2020; Póvoas et al., 2022). Understanding such specificities is essential for the effective planning of training processes and the development of performance-oriented competitive strategies tailored to the demands of male and female players (Luteberget & Spencer, 2019).

One of the main distinguishing features of handball is its clearly expressed collective nature. Success in the game largely depends on the coordination and synchronization of players in executing group and team tactical interactions. Effective team organization in both defense and attack is a key factor in achieving positive results.

Psychological tactics are developed through a theoretical framework that elevates theoretical intervention in handball, such as setting specific goals and achieving them.

## 2. MATERIALS AND METHODS

The aim of the present study is to analyze selected differences between male and female handball players by examining the physiological, technical and tactical aspects of competitive activity. Goal setting can function as a strategy to increase motivation, focus attention, build confidence and promote effective decision-making. The approach to the goals, their characteristics and the time to achieve them will be limiting factors or facilitators, taking into account the complexity and strength of this strategy.

The research applies a qualitative analytical approach based on several complementary methods commonly used in performance analysis of team sports (Wagner et al., 2019; Michalsik et al., 2023). A comprehensive review of peer-reviewed scientific publications related to handball performance and gender differences in sport was conducted, with particular attention to recent studies addressing match demands and tactical behavior (Nikolaidis & Ingebrigtsen, 2020; Póvoas et al., 2022).

In addition, systematic observation of competitive matches from elite male and female handball championships was carried out, following established observational principles in sport performance research (Luteberget & Spencer, 2019). The collected information was subjected to comparative analysis focusing on physical demands, technical execution, and tactical organization of play.

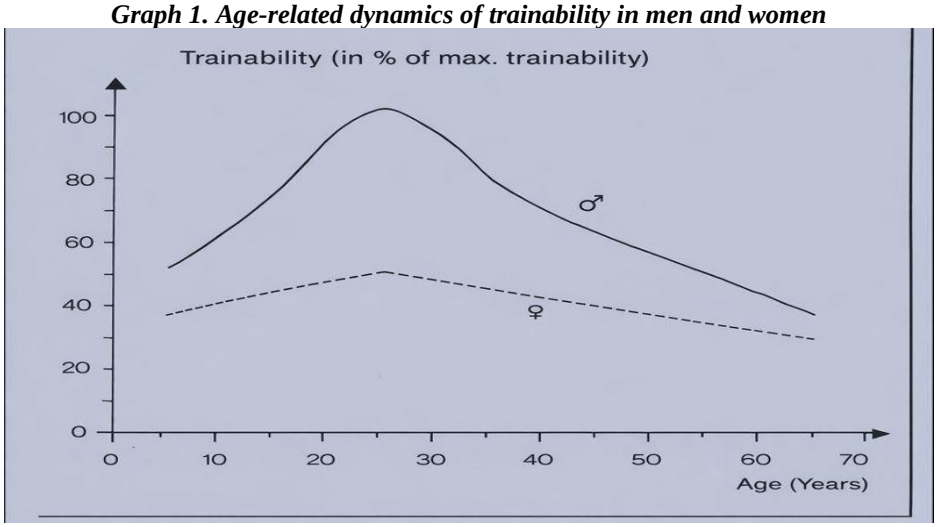
The methodological framework does not seek to establish performance superiority but rather to identify characteristic features specific to male and female handball, in line with contemporary approaches to gender-sensitive sport analysis (Rousanoglou et al., 2021). The information is selected and presented in a comparative analysis focused on the physical demands, technical execution and tactical organization of the game.

## 3. RESULTS

In this study, one of the components is to track how the body's ability adapts to training loads and how it changes with age in both sexes. The visualization in Graph 1 shows a comparison of speed abilities by age and sex, measured by running time (sprint) in boys and girls.

What the axes show: X-axis (horizontal): Age (in years); Y-axis (vertical): Training capacity (percentage of maximum).

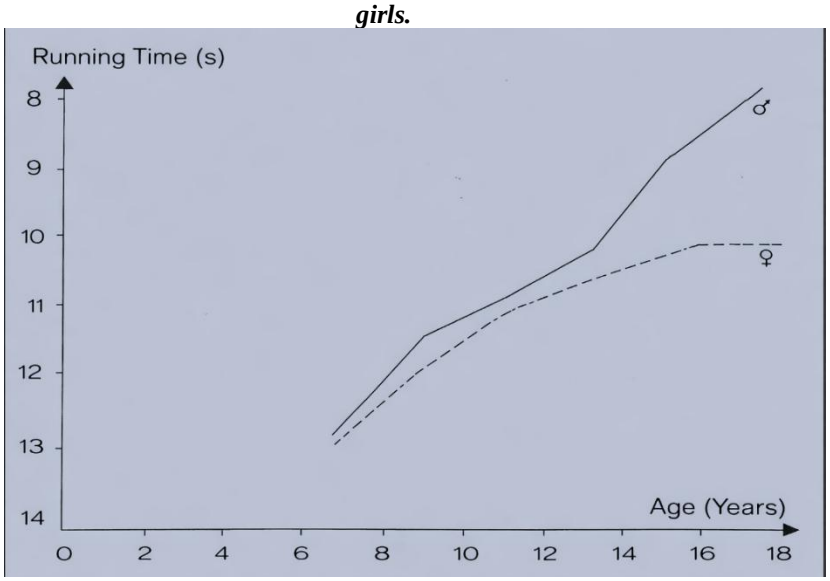
***Graph 1. Age-related dynamics of trainability in men and women***




Source: The author

What do the lines mean?
Solid line + symbol ♂ → Men
Dashed line + symbol ♀ → Women
Key interpretations
***In men:***
Exercise capacity increases sharply in adolescence;
It peaks around 20–25 years of age;
It then gradually decreases, but remains relatively high until middle age.
***In women***:
Exercise capacity is lower in absolute terms;
The peak is more moderate and earlier;
The decline with age is smoother, but the level remains lower compared to men.
***Chart 2 is presented for illustration purposes of:***
sensitive periods for speed development;
gender-related differences in adaptation;
the need for a differentiated training approach in adolescents.
What the graph shows
Y-axis: execution time (in seconds). The axis is reversed - lower values (higher) indicate better speed.
X-axis: age (approximately 7–18 years).

***Graph 2. This is an age-sex comparison graph of speed abilities, measured by running (sprint) time, in boys and girls.***




Source: The author

On the graph we can see the following:
Until early puberty (approximately 10–11 years)
Differences between boys and girls are minimal;
Speed development is comparable;
After the onset of puberty
Boys experience a sharp improvement in speed;
Girls experience a slower and more limited improvement.
At the end of adolescence the difference between the sexes becomes clearly pronounced. The reasons are:
hormonal changes (testosterone);
increased muscle mass;
greater potential for strength-speed adaptations.
In the context of handball, the figure explains why:
***In men's handball, the following dominate:***
fast counterattacks;

explosive changes of direction;
high pace of transitions.
***In women's handball, the emphasis is more on:***
positional attack;
technical precision;
tactical coordination.
The comparative analysis outlines the presence of distinct characteristics in male and female handball.
*Male* players typically exhibit higher levels of maximal strength, speed, and explosive power, contributing to increased game intensity, frequent physical contacts, and a higher prevalence of long-range shots and fast transitions between defense and attack.
*Female* handball, by contrast, is characterized by a greater emphasis on technical accuracy, coordinated team actions, and structured tactical behavior. Attacking phases often involve prolonged ball circulation and collective combinations, while defensive organization relies more heavily on positioning and anticipation. These differences reflect divergent approaches to game management rather than differences in overall competitive quality. Both male and female handball demonstrate high tactical complexity and performance efficiency.

***Table 1. Comparative characteristics of male and female handball***

| ASPECT | MALE HANDBALL | FEMALE HANDBALL |
|---|---|---|
| Physical demands | High maximal strength and power | Moderate strength, higher coordination |
| Game intensity | High tempo, explosive actions | Controlled tempo, structured play |
| Technical execution | Emphasis on power shots | Emphasis on precision and accuracy |
| Tactical organization | Individual breakthroughs, fast transitions | Collective combinations, positional play |

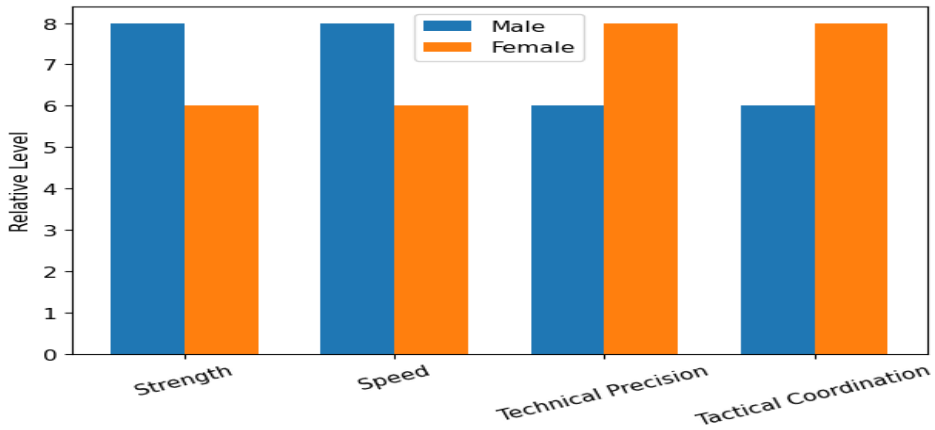
Source: The author

**We have identified the following observations in competitors during official matches:**

- during responsible matches they seek and expect professional expertise and skills from the coach and referees
- they can't sometimes differentiate between fair comment and personal criticism
- women teams need and often expect more support and information from outside (bench)
- great differences in the behavior and the reactions after the match in relation to men
- review and judge the result and the consequences of their performance on the effects in their sphere, their role, their job and their friends

Figure 1 Illustrates the age-related dynamics of trainability in male and female athletes, demonstrating distinct peaks and adaptation patterns influenced by biological and physiological factors. The figure clearly visualizes - Strength, Speed, Technical precision, Tactical coordination.

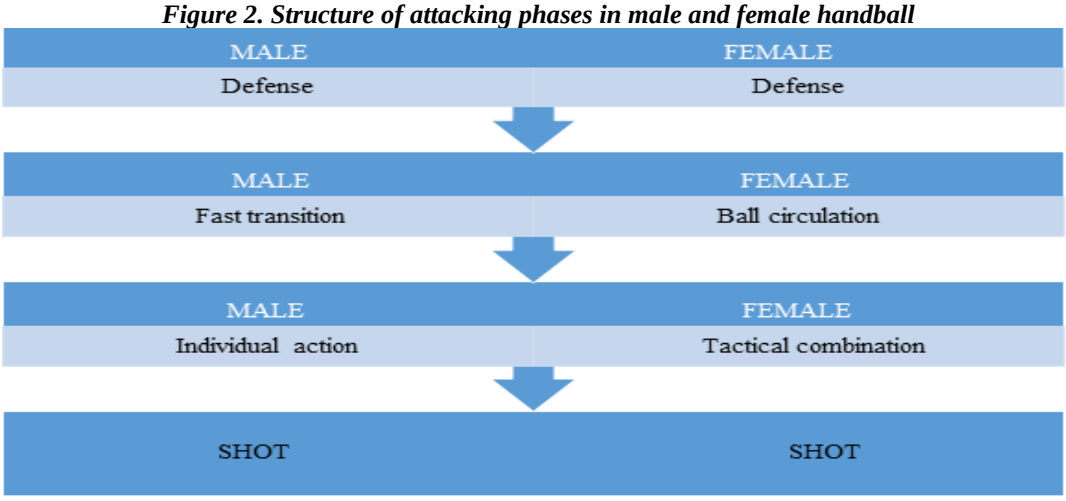
***Figure 1. Dominant performance characteristics in male and female handball***




Source: The author

Men – higher values in strength & speed: ♂ → boys/men
Women – higher values in technical precision & coordination:♀ → girls/women
Figure 2 clearly distinguishes the following:
• The more direct, explosive pattern in men
• The more combinatorial and structured pattern in women

***Figure 2. Structure of attacking phases in male and female handball***




Source: The author

**4. DISCUSSION**

Consequences of hormonal development in male and female handball players – Analysis of Table 2:
The table presents the main biological and morphological differences between men and women resulting from hormonal development, which have a significant impact on sports capabilities in handball.
1. Hormonal development In men, a significant increase in testosterone is observed, which is a major factor for the greater development of muscle mass, strength and explosiveness. In women, estrogen dominates, which favors a higher percentage of fat tissue and more limited muscle growth.
In handball, this leads to:
greater shooting power and contact resistance in men;
better coordination and economy of movements in women.
2. Anthropometric differences
Men are characterized by: greater height; longer limbs; better leverage conditions; longer stride length.
Women have: smaller height; shorter limbs; less favorable leverage conditions; shorter stride.

- In terms of play:
- men have an advantage in shooting from distance, blocking and contact fighting;
- women compensate with faster changes of direction, technique and tactical discipline.

3. Muscle development
In men:significant muscle hypertrophy is observed; muscle mass makes up about 40–50% of body mass; lower percentage of fat tissue; strong development of limb muscles.
In women: muscle mass is about 60–75% of that in men; approximately two times lower relative share of the muscular system to body mass compared to men.

***Table 2. Consequences of Hormonal Development***

| **MORPHOFUNCTIONAL CHARACTERISTICS** | **MEN** | **WOMEN** |
|---|---|---|
| **Hormonal development** | **Large increase of testosterone** | **Large increase of estrogen** |
| **Anthropometric differences** | Taller size; larger extremities;; better conditions of lever; larger length of one's stride (step) | Smaller size; smaller extremities; less leverage; shorter length of one's stride (step) |
| **Muscular development** | Large muscular hypertrophy;<br>Great increase of muscles; | Approximately 65%-70% of men's muscles; |

| | | |
|---|---|---|
| | Less proportion of fatty tissue;<br>45% to 55% proportion of muscular system of skeleton in relation to the body weight, applied to the extremities | double of proportion of muscular system of skeleton in relation to the (body) weight applied to the extremities. |

Source: The author

***Practical significance for handball:***

- men have higher absolute strength and power;
- women rely more on endurance, technique and collective play.

***Summary***

The differences described in the table are the result of natural hormonal and morphological features, and not from the training process itself. They determine a different style of play in men's and women's handball and require a specific approach to preparation, tactics and workload.

The Table 3 systematizes the main components of sports preparation into three interrelated domains: physical condition, technical and tactical condition, and psychological condition. Physical condition includes fundamental motor qualities that form the basis for effective performance. Technical and tactical condition reflects the application of physical abilities through individual and group skills, as well as perception and decision-making processes. Psychological condition influences concentration, motivation, and social behavior, which are essential for performance stability and success.

***Table 3. Fundamental Spheres, which are Decisive Factors of Performance in Handball***

| **Physical Condition** | **Tactical and Technique Condition** | **Psychological Condition** |
|---|---|---|
| Strength | skills | mental capacity and ability to concentrate |
| Endurance | group tactics | social behaviour |
| Speed | individual technique and tactical movement processes | aggressive behaviour<br>motivation |
| Coordination | group tactical basic capacities | social behaviour |
| Ability | perception characteristics;<br>decision making ability | reactions to the social sphere |

Source: The author

## 5. CONCLUSION

The analysis confirms that male and female handball exhibit clearly distinguishable characteristics in terms of physical demands, technical execution, and tactical organization. These differences are primarily shaped by anatomical and physiological factors and significantly influence the structure and dynamics of competitive activity. The identified characteristics imply the need for a differentiated approach in the planning of training programs and competitive strategies for men and women. Accounting for gender-specific demands may enhance training effectiveness, support performance optimization, and contribute to the sustainable development of handball as a contemporary team sport.

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