# ANALYSIS METHODS OF GENERAL AND SPECIFIC PHYSICAL TRAINING AT THE LEVEL OF SENIOR HANDBALLISTS FROM THE NATIONAL FEMALE LEAGUE

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**Abstract**

*Aim.* In women's handball, general physical fitness serves as the foundation for achieving a high level of performance. The significant fluctuations in performance, at the national level, can be attributed to the lack of consistency in physical training. Irregular efforts lead to a lack of consistency in the approach to matches and can negatively affect the health of the players

*Material and methods.* The study aims to provide valuable information to serve as a foundation for optimizing physical training strategies and, implicitly, improving the performance of women's handball teams. We used the testing method to determine the subjects' physical fitness and objective individual performance in general and specific motor ability.

*Results.* We applied 4 motor tests approved by the Romanian Handball Federation to the senior women from 10 sports clubs in the national handball league of Romania.

As can be seen in table no. 4, the senior women in the National Handball League record an average of 175.76±4.89 when measuring the waist and 71.67±6.14 when measuring the weight.

The players' waist and girth have low variability and nearly symmetrical distributions, indicating high consistency in these measurements within the sample.

*Conclusions* Physical preparation is an essential element of the training program of female handball players. Both coaches and athletes recognize the importance of physical training in team performance in sports competitions. This suggests that there is a shared awareness of the crucial role that physical fitness plays in achieving desired results in senior level handball.

*Keywords:* Handball, senior, general and specific physical training.

## Introduction

Women's handball has evolved spectacularly over recent decades, becoming an arena where agility, strength, and endurance are the keys to success. Physical preparation has thus become a crucial component in achieving top performances at both national and international levels. There is an ongoing focus on exploring the role of general and specific physical training in the context of women's handball at the senior team level and its impact on performance capacity. (Cunniffe, Proctor, Baker & Davies, 2009; Michalsik, Madsen & Aagaard, 2014).

The French women's handball team has solidified its reputation through a meticulous approach to specific physical training. By focusing on throwing techniques and defensive movements, France has managed to dominate international competitions, demonstrating that specific physical preparation can be the key to success during critical moments of a match. However, there are also examples that highlight the negative effects of inadequate or inconsistent physical training. Teams that fail to give sufficient attention to general and specific physical preparation may experience a decline in performance and an increased susceptibility to injuries.

Significant fluctuations in performance at the national level can be attributed to a lack of consistency in physical preparation. Irregular efforts lead to a lack of consistency in approaching matches and can negatively affect the health of the players.

Elements such as throwing technique, fast lateral movements and anticipation are emphasized. By integrating specific handball drills into training, players become more efficient in performing match-specific tasks. (Bompa, 2014)

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Physical preparation in women's handball at the senior team level is a determining factor in achieving remarkable performances. Integrating a solid general physical preparation, along with a rigorous focus on the specific aspects of the sport, can create a strong foundation for success (Dellaserra, Gao & Ransdell, 2014).

Positive examples highlight that teams investing in the physical development of their players tend to distance themselves and reach the heights of performance, while counterexamples emphasize the risks associated with neglecting this essential aspect (Cross, 1999). Thus, continuous investment in physical training programs becomes not only a necessity but also an essential strategy for teams aspiring to excellence in women's handball at the global level.

**Methods**

Current data on male and female elite and subelite players indicate that, speed, strength, and jumping abilities have an impact on performance (Jensen, Jacobsen, Hetland & Tveit, 1997).

Conducting larger investigations into the variables that affect performance among junior elite handball players is necessitated by the fact that there are very few studies on the anthropometry, speed, strength, and jumping abilities of these players. (Mohamed et al., 2009)

Anthropometric characteristics, such as body size, body mass, body mass index, and body fat percentage, play a highly important role when discussing sport success and results. (Van den Tillaar & Ettema, 2004)

The study aims to provide valuable information that will serve as a foundation for optimizing physical training strategies and, consequently, improving the performance of women's handball teams.

Research hypotheses - Identifying the physical training level of senior female handball players will lead to the acquisition of valid information for developing a training methodology for the wings.

We used the testing method to determine the physical preparation of the subjects and their individual performances, assessed through general and specific motor abilities. The measurement was carried out using tests employed by the Romanian Handball Federation to determine the physical parameters of handball players. These included 4 tests:

- *Handball throw*
  For this test, the athlete stands facing the throwing direction. The foot opposite the throwing arm is placed forward, with the ball held at chest level. The throw is performed with support from the ground. The distance of the ball throw is measured in meters.

- *5x3m sprint*
  Starting from a standing position, at an individual signal, the athlete performs a sprint back and forth over a distance of 3 meters, repeated 5 times. The stopwatch starts when the athlete lifts their foot and stops upon crossing the finish line. During the execution, the athlete must touch the finish line at each turn.dribling.

- *Slalom between cones over a distance of 30*
  Over a distance of 30 meters, a cone is placed every 10 meters. Starting from a standing position, at the athlete's discretion, the athlete begins dribbling the ball and goes around each cone, either to the right or left. The stopwatch starts when the athlete lifts their foot and stops upon crossing the finish line. The time is measured in seconds.

- *30m sprint*
  The test measures running speed. Starting from a standing position, at the athlete's discretion, the athlete sprints over a distance of 30 meters. The stopwatch starts when the athlete lifts their foot and stops upon crossing the finish line. The time is measured in seconds.

- The anthropometric measurements considered in the observational experiment were height and weight, regarded as primary indicators of somatic development.
1. *Height (cm)* – or stature, is a genetically conditioned index measured between the vertex and the plantar plane using a stadiometer. The subject stands with their back against a wall; the vertex is marked with a set square: one side of the square is applied to the vertex, and the right angle is placed against the wall. Generally, height provides a good characterization of an individual's development and serves as the baseline for referencing all other anthropometric measurements.
2. *Weight (kg)* – measured using a medical scale, is a controllable index that can be influenced by various exogenous factors such as rational nutrition, lifestyle, and educational factors.

The research was conducted in multiple stages, as shown in Table 1, with each stage dedicated to collecting relevant data from the two target groups.

During the period of June 2023 to August 2023, the group of senior handball players and the coaches of the teams they represent were involved, to ensure the most comprehensive participation possible.

During the same period, motor tests approved by the Romanian Handball Federation were administered. The subjects from the two teams submitted the results of the motor assessments at the end of July 2023.

The motor tests were conducted on 200 athletes from 10 teams competing in the National Handball League.

**Results**

*Preliminary Research Stages*

The stages of the research were divided according to the data presented in Table 1:

Table 1. The stages of the research

| Stage | Period | Activities |
|---|---|---|
| I | 01.05.2023-10.05.2023 | Development and application of pilot questionnaires |
| II | 10.05.2023-15.05.2023 | Elaboration of final questionnaires |
| III | 16.05.2023-30.05.2023 | Establishing the research subjects |
| IV | 01.06.2023-31.08.2023 | Application of questionnaires and application of motor tests |
| V | 01.09.2023-30.11.2023 | Data collection and information processing |
| VII | 01.12.2023-15.03.2024 | Analysis and interpretation of the collected data |
| VIII | 16.03.2024-01.07.2024 | Drafting the progress report III |

I applied 4 motor tests approved by the Romanian Handball Federation to senior players from 10 sports clubs in the National Handball League of Romania. Since there are no reference values for these tests, I analyzed the group average as well as a comparative analysis of the SCM Craiova team's level and the average values obtained by athletes in the National Handball League. The testing was conducted in July 2023. The teams' squads consisted of 20 athletes each.

Table 2. Anthropometric Indicators - National League (n=200)

| (n=200) | Height | Weight | Wingspan |
|---|---|---|---|
| M ±DS | 175,76±4,89 | 71,67±6,14 | 179,39±5,91 |
| CV% | 2,78 | 8,57 | 3,29 |
| Median | 176 | 71 | 180 |
| Skewness coefficient | -0,048 | 0,109 | -0,103 |

As shown in Table 2, senior players in the National Handball League have an average of 175.76±4.89 for waist measurement and 71.67±6.14 for weight.

The waist and wingspan of the players have low variability and nearly symmetrical distributions, indicating high consistency in these measurements within the sample.

Weight shows moderate variability and a slight positive skew, indicating greater diversity in the players' weight compared to waist and wingspan.

The data are generally well-distributed, with median values close to the means and small coefficients of variation, indicating homogeneity within the sample regarding the analyzed physical measurements.

By comparing the indicators obtained by the athletes in our study with those from the 2020 study published by Farley et al., we observe that the anthropometric indices fall within the values calculated by the mentioned authors.

Table 3. Anthropometric Indicators – Comparative Table

| | The National League of Romania (n=200) | Farley et al. (2020) (n=652) |
|---|---|---|
| | **M ± DS** | |
| Height | 175,76±4,89 | 172±6,2 |
| Weight | 71,67±6,14 | 68,6±9,7 |
| Wingspan | 179,39±5,91 | - |

As mentioned, I assessed the physical training level of the senior players participating in the National League during the 2023-2024 season using 4 tests approved by the Romanian Handball Federation (FRH). The results of the statistical analysis are presented in Table 4.

For the 30m running test, the senior players achieved a group average of 4.98±0.32 seconds. The skewness of the individual values is normal, which allows us to apply the "t" test to check for the difference in means between the National League and the athletes from SCM Craiova.

In the 5x3m test, the athletes from the 10 teams achieved an average of 4.65±0.33 seconds, with a small spread of individual values, as reflected by the coefficient of variation, indicating a homogeneous group.

Table 4. Motor Indicators - National League *(n=200)*

| *(n=200)* | *30m (s)* | *5x3m (s)* | *30m Slalom Dribbling (s)* | *Ball Throw (m)* |
|---|---|---|---|---|
| *M ± DS* | 4,98±0,32 | 4,65±0,33 | 7,71±0,39 | 49,79±3,68 |
| *CV%* | 6,5 | 7,29 | 5,07 | 7,39 |
| *Median* | 4,92 | 4,7 | 7,8 | 50 |
| *Skewness coefficient* | 0,19 | -0,16 | -0,24 | -0,05 |

After completing the 30m slalom dribbling test, the national level players achieved an average of 7.71±0.39 seconds, with very high group homogeneity.

In the fourth test for assessing the physical training of the athletes in the National League, we observe from Table 4 a group average of 49.79±3.68 meters. The group is statistically homogeneous, with low dispersion of individual values.

Following the statistical analysis of the motor test results for 200 senior handball players from the National League, the following aspects can be highlighted:

- The close proximity of the mean and median for each test suggests that most players achieved similar results in each test, indicating uniformity in the level of physical training.
- The moderate standard deviations for each test reflect a reasonable variation in the players' performances, which can be attributed to the diversity of skills and physical abilities among the athletes.
- The relatively low coefficients of variation (Cv%) for most tests indicate coherence and consistency in the measurement results, meaning that the results are not extremely dispersed within the sample.
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The results of this statistical analysis suggest that the handball players in the sample have comparable and relatively consistent performance levels in the motor tests, reflecting balanced physical training within the National Handball League.

Table 5. Comparative Results of Anthropometric Indicators

|  |  | *M ± DS* | *t* | *p* | *w2* | *Es* |
|---|---|---|---|---|---|---|
| *Height* | SCM Craiova | *175,37±6,0* | 0,28 | >0.05 | -0.004 | 0.08 |
|  | NationalLeague | *175,76±4,89* |  |  |  |  |
| *Weight* | SCM Craiova | *71,1±8,03* | 0.31 | >0.05 | -0.004 | 0.09 |
|  | National League | *71,67±6,15* |  |  |  |  |
| *Wingspan* | SCM Craiova | *177,2±8,20* | 1.16 | >0.05 | 0.002 | 0.36 |
|  | National League | *179,39±5,91* |  |  |  |  |

Legend: t= Student's t test; p= significance level; w2=omega squared; Es=effect size

Based on the results of the statistical analysis for the height parameter, from Table 6, it is observed that there are no significant differences between SCM Craiova and the National League regarding the players' height. The small values of the mean difference and omega², along with those for the effect size (Es), indicate a similarity between the two groups in this specific physical characteristic.

Tabel 6. Comparative results of motor indicators

|  |  | *M ± DS* | *t* | *p* | $\omega^2$ | *Es* |
|---|---|---|---|---|---|---|
| *30m (sec)* | SCM Craiova | *5,09±0,35* | 1.3 | >0.05 | 0.003 | -0.33 |
|  | National league | *4,98±0,32* |  |  |  |  |
| *5x3m (sec)* | SCM Craiova | *4,53±0,36* | 1.35 | >0.05 | 0.004 | 0.33 |
|  | National league | *4,65±0,34* |  |  |  |  |
| *dribbling through the gallows 30m (sec)* | SCM Craiova | *7,66±0,41* | 0.43 | >0.05 | -0.004 | 0.1 |
|  | National league | *7,71±0,39* |  |  |  |  |
| *Throwing the ball (m)* | SCM Craiova | *50,1±4,09* | 0.33 | >0.05 | -0.004 | -0.09 |
|  | National league | *49,79±3,68* |  |  |  |  |

In Table 6, we can observe the statistically processed results for a comparative study between SCM Craiova and the athletes from 10 teams in the National Handball League.

The average time for the 30-meter sprint is slightly higher for the athletes from SCM Craiova (5.09 seconds) compared to the athletes from the National League (4.98 seconds), suggesting that, on average, the players from SCM Craiova are a little slower over this distance. The standard deviation is similar for both groups, indicating comparable variability in the individual performances of the athletes in this test.

The insignificant value of the t-test indicates that the variations observed in the 30-meter sprint times between the athletes from SCM Craiova and those from the National League are of the same level.

The value of $\omega^2$ supports the conclusion that the differences between the groups are insignificant.

The effect size of -0.33 indicates a small to moderate difference between the performances of the two groups, with the athletes from SCM Craiova tending to be slightly slower. A negative effect size value indicates that the reference group (SCM Craiova) performs worse compared to the comparison group (National League).

The average time for the 5x3 meter sprint is slightly lower for the athletes from SCM Craiova (4.53 seconds) compared to the athletes from the National League (4.65 seconds), suggesting that, on average, the players from SCM Craiova are a little faster over this distance. The standard deviation is similar for both groups, indicating comparable variability in the individual performances of the athletes in this test.

The t value of 1.35 is below the significance threshold, indicating that the observed difference in means is not statistically significant, a conclusion further supported by the value of the $\omega^2$ index (0.004).

A positive value of the effect size indicates that the reference group (SCM Craiova) performs slightly better compared to the comparison group (National League).

The average time for the 30-meter dribbling through cones is slightly lower for the athletes from SCM Craiova (7.66 seconds) compared to the athletes from the National League (7.71 seconds), suggesting that, on average, the players from SCM Craiova are slightly faster in this test. The standard deviation is similar for both groups, indicating comparable variability in the individual performances of the athletes in this test.

The value obtained by applying the Student's t-test indicates that the difference in 30-meter dribbling times between the two groups is not statistically significant. This is further supported by the value of the $\omega^2$ index, with the performance of the two groups being similar.

It can be observed that the average distance for the ball throw is slightly greater for the athletes from SCM Craiova (50.1 meters) compared to the athletes from the National League (49.7 meters). The standard deviation is similar for both groups, indicating comparable variability in the individual performances of the athletes in this test.

Both the t-test value and the $\omega^2$ index value demonstrate the equal performance of the two groups subjected to statistical comparison.

The effect size of -0.09 indicates a very small difference between the performances of the two groups, with the athletes from the National League having a slight tendency to throw the ball a little further. A negative effect size value indicates that the reference group (SCM Craiova) performs slightly worse compared to the comparison group (National League), but this difference is negligible.

### Discussions and Conclusions

Physical training is an essential component of the training program for handball players. Both coaches and athletes recognize the importance of physical preparation in the performance of teams in sports competitions.

This suggests that there is a shared awareness of the crucial role physical preparation plays in achieving the desired results in senior-level handball.

The process of assessing the level of physical preparation is a vital element in the efficient management of training programs. Through regular evaluations, coaches can identify the strengths and weaknesses of the players, allowing them to adjust the training program accordingly. This aspect contributes to optimizing both individual and team performance.

Although there is significant dedication to physical preparation, certain challenges in the effective implementation of training programs are also identified. These include the proper management of financial and material resources, the continuous motivation of the players, and the adaptation of training programs to account for the individual and collective needs of the team.

The analysis of the results highlights the importance of physical preparation in the context of sports performance at the senior level in women's handball. A detailed understanding of the relevant aspects of physical preparation can serve as a foundation for developing and implementing effective training programs aimed at maximizing the athletic potential of the players and leading to top performances in future competitions.

Both the coaches and, especially, the athletes feel the need for individualized physical preparation at this level of performance, aimed at maximizing the existing motor potential and leading to spectacular team results.

Although the results of the motor tests show comparable performances between SCM Craiova and the National League, SCM Craiova can take additional measures to improve both general and specific physical conditioning. Scheduling intense training sessions focused on individualizing physical preparation according to the needs of each athlete can help reduce even the minimal differences observed.

To reach the top of the teams in the National League, SCM Craiova could continuously analyze and compare their physical preparation level with that of the top teams. Adopting best practices and customizing training to meet the individual needs of the athletes can ensure continuous progress and superior performances.

Implementing specialized training to improve the motor qualities specific to handball, along with continuous analysis and adaptation of physical preparation programs, can help SCM Craiova reduce the minor performance differences compared to the teams in the National League. Adopting best practices and customizing training to meet the individual needs of the athletes are essential to achieving superior performances and positioning the team at the top of the national league teams.

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