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Original Article

Strategies for the optimization of the specific training of junior and specialized handballists in the extreme position

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Abstract.
Generally, the specific training of handball players, regardless of the level of performance, refers to the development of motor skills that are directly involved in the motor structure specific to the overall game of handball and the particular game position. Thus, specialists in the field are constantly looking for new ways to optimize specific training, which will lead to an increase in motor performances and the results of competitions.
The role and importance of handball players specialized in the extreme position gets in the context of the current game an increasing involvement in the game economy, often the extreme players being the main scorers of the team, but also those who contribute to the growth of sports performance. In this context, finding the most appropriate strategies to optimize the training of handball players specialized in the extreme position, is a main objective of all specialists, regardless of the level of performance. Carried out during a competitive year, the experiment took place at the level of a handball team participating in the National Junior Championship. This paper reports an intervention on players specialized in the extreme position at the level of junior handball team I during a competitive year with a series of action systems related to the technical–tactical content and the dynamics of the effort specific to the game, leading to streamlining of the activity. The actuation systems used during the research, lead to the achievement of the proposed objectives, and the hypotheses formulated are confirmed by numerical data in terms of superior results obtained in control tests, but especially by those obtained in competitions. The obtained results were processed and interpreted statistically and mathematically through a series of specific indicators, and the conclusions are for those who work at this level of performance and can act as a support in training players specialized in this game.
Keywords: Training, Motor skills, Extreme, Handball

Introduction

As a result of the rapid evolution of handball, specialists are motivated to research all aspects and problems related to the components of its training, which can be applied individually to players specialized in certain positions, the basic motor skills, and abilities of a team and game-specific athletes.

At all levels of performance handball, "the process of training handball players involves the optimal resolution of the relationship: physical training, technical–tactical training, psychological training" (Mihăilă I., 2004, p. 19), which can be transposed into the training of specialized players on the extreme post and involves a series of indications, landmarks of action that can be materialized in stages of a rational approach, such as selection of players by position (Bota, I., Bota, M., 1987, p. 131), general profile of the player by position (Balint , E., 2004, p. 31), and the model of the player specialized on lines (Abalașei, B., 2012, p. 141).

Consecrated works have become a benchmark for the training methodology and provide clear information on how to approach specialization on positions, which illustrate through means of action that are useful for specialized training of attack and defense phases and systems of the two game contexts (Ghermănescu KI, 1983, Cercel, P., 1984, Bota, I., Bota, M., 1987).

According to the authors Dragnea, A. and Mate-Teodorescu, S. (2002, p. 210), individualized training must be applied when the athlete's motor capacity, which is his response to training stimuli, is known. My professional experience and training theory have coordinated my searches to optimize training of certain positions, positions that require specific methods, as well as communication strategies and approaches to sports training with this investigative approach.

Due to the existence of the positions on which the components of a handball team evolve, it has been observed that each of them has certain requirements (motor, somatic). Depending on these particularities that the professional profile of the player must have, the appropriate training methods for achieving the proposed goal can be established (Sotiriu, R., 2000, pp. 44-45).

The ideal model of a player in the wing position, as a somatic representation, brings him closer to the anthropometric indices of speed runners. The waist should be smaller than in other players, and the body weight should be higher to cope with hard contacts with defenders. Optimal weight, which is expressed by a value of 1.05 for the ratio between waist and weight, is essential for sports performance. The opening of the palm must be

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large (21–24 cm), because the wing has to perform numerous technical procedures, including throwing at the goal, fencing, and passing, which requires holding the ball by grabbing. The scope must be large because the long arms help to execute specific throws at the goal from the end in which the aim is to increase the throwing angle (Ghermănescu, IK, Gogâltan, V., Jianu, E., Negulescu, I., 1983, p.161).

Materials and methods

This experimental study was conducted to improve the level of specific training of juniors I, who are specialized in the wing position, to increase their contribution to the over all game.

The use of a verified evaluation system was used to evaluate the level of physical training specific to the extreme position and facilitate the objective framework for analyzing the efficiency of the training strategy.

The experimental study took place between October 2017 and September 2018inthe following stages:

-stage I-October–November 2017-determination of the didactic design,

established the contents of the didactic strategy for the experimental group, and established the evaluation tests used;

-stage II-December 2017-established the subjects and setup the two types of groups forthe experiment, analyzed and interpreted the results of the initial evaluation, compared the results of the two categories of groups at the initial evaluation;

-stage III-11 December 2017–3 June 2018-conducted the experiment;

-stage IV-June–September 2018-analysis and interpretation of results, formulation of conclusions, and methodological recommendations.

The experiment took place between December 11, 2017 and June 3, 2018 in the city of Suceava with the first juniors from the High School with Sports Program Suceava who were specialized in the wing position.

This time period included the preparatory period (December 4, 2017 to January 26, 2018), the return (January 27, 2018 to March 10, 2018) and the final tournaments (semifinal: April 18–22, 2018 and final: June 2–3, 2018) for the championship 2017/2018, which was organized by the Romanian Handball Federation.

Results and discussion

As a good indicator of the athlete's freedom of movement, the mobility of the spine is of great importance for the handball player in the wing position. This is because all the movements made by it are made around the vertebral joints, especially in the case of jumping.

The muscular component is optimized, if the joint mobility does not allow movement with great amplitude to develop optimal mechanics for the success of an execution.

Our group of athletes improved their mobility of the spine by significantly increasing the forward bending distance from 4.92 ± 6.03 cm to 5.75 ± 5.81 cm (Chart 1). The progress was made was a result of the introduction of stretching in the program at the end of each workout.

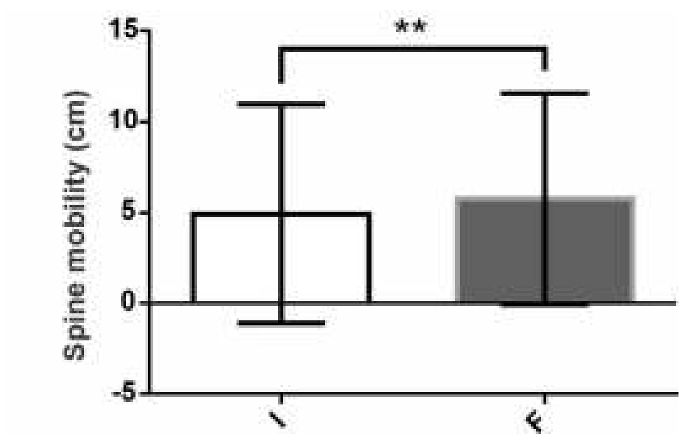
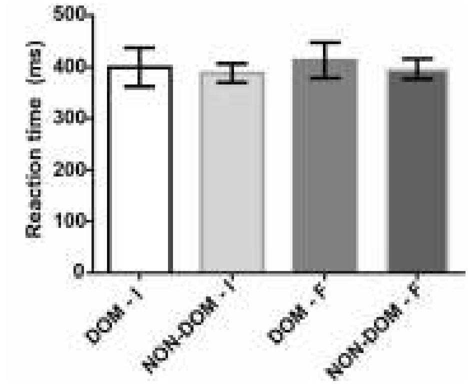


Chart 1. Change in the spine mobility values in the research subjects (** p<0.005)

Even if for handball players, the work of mobility is demanding and boring, getting used to various exercises can lead to improvements in quality.

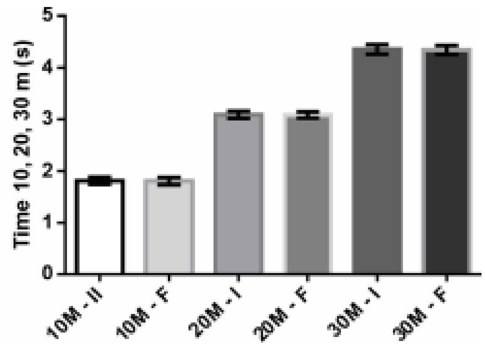
As a motor quality that is difficult to develop, the reaction speed was quantified without determining statistically significant changes. There were no significant differences between the two parts (dominant and non-dominant), although we did observe a better average reaction rate for the non-dominant part (graph 2) forboth evaluations: initially, the dominant part was399.8±37, 76 ms, compared to 388.2 ± 18.19 ms for the non-dominant, and at the end, the ratio was 412.8 ± 34.67 ms at 396.2 ± 19.77.



Graph 2. Change in reaction rate values in the research subjects (** p<0.005)

Training athletes by diversifying the means and using various types of stimuli (auditory, visual, etc.) is beneficial for their motor behavior during the game of handball (Michalsik, 2015).

Moreover, we found lower values for reaction speed at the final evaluation, a sign that there was a slight fatigue in the athletes after a busy season.



Graph 3. Change in travel speed values for the research subjects

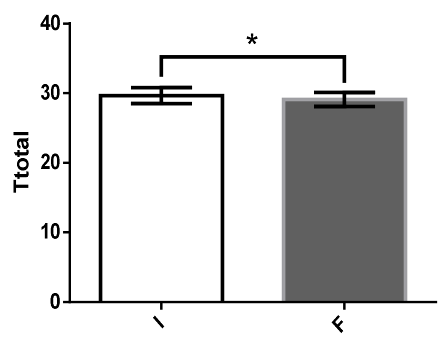
Speed is of high importance for the game of wings in handball, given that the tactics of the game require good speed and travel at longer distances compared to other positions in the team.

We chose to analyze the movement during short, medium, and long distances because a player that is specialized in this position does not sprint over distances greater than 30 m, and typically, his running is linear.

At the level of the three analyzed distances, no statistically significant differences were observed between the two moments of the evaluation. Obviously, there were significant differences between the times obtained for the10 m, 20 m, and 30 m (graph 3), but this analysis was not the subject of this study.

The values for the group of athletes were similar, and they obtained initial and final times of 1.81 ± 0.07 and 1.805 ± 0.07 for the10 m, 3.09 ± 0.07 s and 3.09 ± 0.06 for the 20 m and 4.35 ± 0.09 s and 4.34 ± 0.08 s for the30 m.

The fact that the speed of our athletes did not change in a statistically significant way shows that their muscle tone was maintained until the end of the championship.



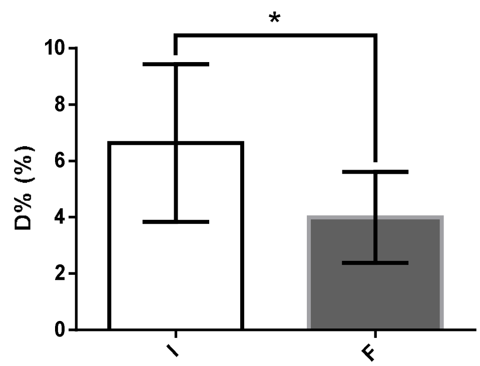
Graph 4. Modification of speed values in the resistance regime for the research subjects (* p<0.05)

The endurance speed provided two parameters: total travel time for140 m, round trip for20 m, and the percentage difference between the average of the times obtained and the best result.

The first (Total) reflects the athlete's ability to cover the distance followed in the shortest time, which was thus the speed but in the same direction with a change of direction. It may have a tendency towards agility, but the holding time was high.

Total improved significantly in the studied athletes, decreasing statistically significantly from 29.64 ± 1.16s initially to 29.09 ± 1.01s at the final. We noticed that 55% accounted for the progress of the group
Thus, an athlete with a low total Total may have well-developed strength and increased agility.

D% also decreased, which is a phenomenon that reflects the high anaerobic lactic acid capacity of the athletes at the end of the season. From 6.63 ± 2.80%, the percentage difference decreased to 3.99 ± 1.61% The change in D% indicated an adaptation of the analyzed extremes to the intense sustained effort that is required by the current game of handball. At the muscular level, the mechanisms to fight acidosis have adapted by increasing the buffer capacity to allow the muscle to work at maximum capacity under conditions where the level of lactic acid far exceeds the anaerobic threshold.

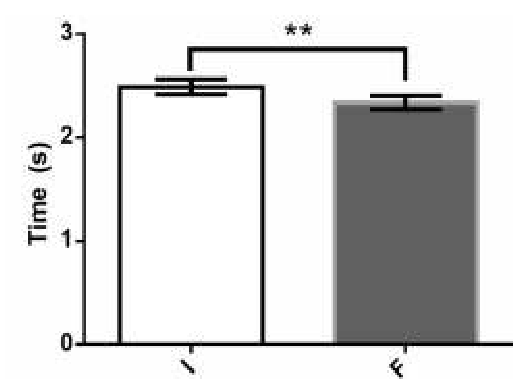


Graph 5. Change in anaerobic lactic acid capacity values of the research subjects (* p<0.05)

A successful handball player must have a high level of active mass and high capacity for anaerobic lactic acid effort (Ziv and Lidor, 2009).

Anaerobic endurance can be determined by various tests performed in the field or laboratory. One of the most used laboratory tests is the Wingate test, and following its application (depending on the recording possibilities of the cycle ergometer on which it is applied), data can be obtained, such as the maximum power developed, total mechanical work, power retention time maximum, and fatigue index.
A professional handball player has problems when it comes to speed and coordination and especially when the two are combined.

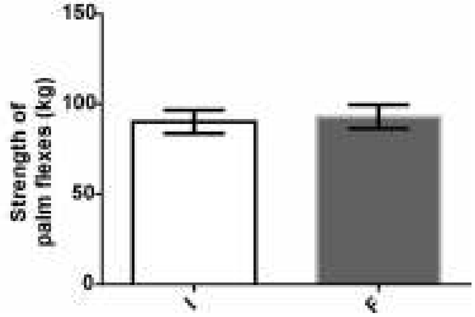
The agility of our group of athletes increased following the application of the training program, and they recorded 2.34 ± 0.06 s at the end for the 505 test compared to 2.49 ± 0.07 s at the beginning of the experimental study



Graph 6. Change in agility values in the research subjects (** p<0.005)

The change in the test results was due to the training program in which the athletes had a special program designed to improve coordination under various conditions and speed over short distances. We believe that the two combined provided development of agility in our athletes.

The strength of the palmar flexors did not show statistically significant changes with similar values between the two stages: 90.15 ± 6.54 kg initially and 92.87 ± 6.53 kg finally (Graph 7).

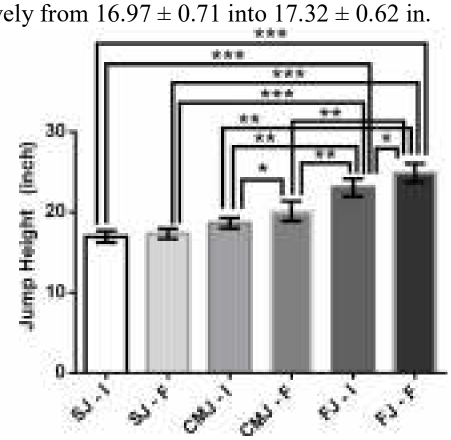


Graph 7. Changes in the forces of the palmar flexors in the research subjects (** p<0.005)

There is a correlation between the level of physical training and the strength of the palmar flexors (Nevill and Holder, 2000); thus, monitoring it during training can be beneficial for assessing the condition of players. Given that more work has been done with the ball in the training sessions, it is normal that the strength of the palm flexors did not develop. However, we do not ask what would have happened to the force of the palm flexors if they had worked with weights that had to be handled with the palm grip.

The explosive force of the lower limbs contributes considerably to the throwing force of handball players, especially when they aim to do so by jumping. The biomechanics of throwing the ball also involve the momentum given to the ball by the ground throughout all muscle groups used This is provided by acceleration by the muscles, and the more power, the harder it can be intercepted, rejected, or deflected by the opponent.

In our case, we observed several significant changes (graph 8). Between the initial and the final test, the explosive force of the lower limbs increased with statistically significant differences determined only at the level of CMJ and FJ. SJ changed positively from 16.97 ± 0.71 into 17.32 ± 0.62 in.

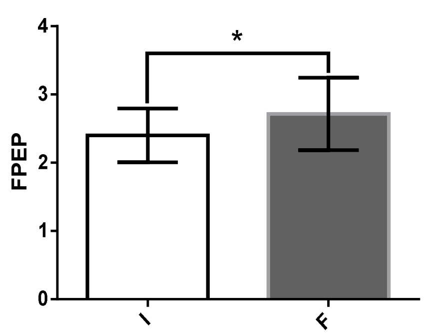


Graph 8. Change in explosive force in the research subjects (* p<0.05; ** p <0.005; *** p <0.0005)

The other two tests showed significant increases with 24.88 ± 1.15 for the free arm jump being the best value from the group, and this data series was superior to all other series.

The good tone of the athletes at the end of the championship, as confirmed by other evaluations, was also supported by the explosive force results. The height of jumps, which was evaluated with the most diverse, complex, portable, and expensive devices, is a clear indicator of the explosive force of the lower limbs. The diversity of measuring devices made it high difficult for us to compare the results, and provided errors for the assessment; most of the devices use height calculation algorithms that are based on physics.

One element of particular importance for a high vertical detachment height is the biomechanics of jumping.

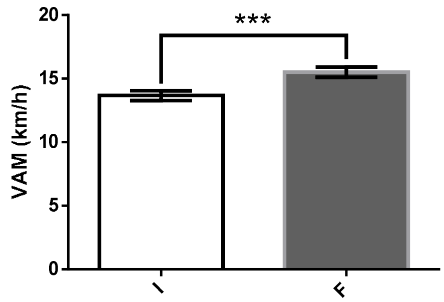


Graph 9. Change in the explosive power values in the research subjects (* p<0.05)

The reactivity of the lower limbs, given by the explosive power factor of the lower limbs, increased from 2.40 ± 0.39 initially to 2.72 ± 0.53 in the final test (Figure 9).

Thus, our athletes also improved their departure, whether it was vertical or in another direction. FPEP is an element proposed by Just Jump

The aerobic power of our group of athletes increased from 13.67 ± 0.40 km / h in the first evaluation to 15.52 ± 0.39 km / h. This increase implied an improved effort capacity for large volumes of work, and the athletes were able to maintain the game tempo throughout a game.



Graph 10. Change in aerobic power values in the research subjects(p<0.0005)***

In the literature, the maximum oxygen consumption (VO2max) is used to express aerobic endurance. We determined the maximum aerobic speed, but we could calculate VO2max based on the calculation formula: VO2max = VAM x 3.56 + 2.584 (Flouris et al, 2004).

Based on this calculation formula, we could estimate that the average VO2max of our group was 51.25 ml/kg/min initially and then increased to 57.83 ml/kg/min.

VO2max represents the largest ration of oxygen that is collected from the external environment, transported and used by the tissues, and its unit of measurement is ml/kg/min (Nunes et al, 2017).

Conclusions

The results for this experimental group for all evaluation tests show objective and rational arguments for the veracity of the first research hypothesis. Thus, it was confirmed that if the methodological direction of the specific training of the specialized players in the wing position respects the requirement of its differentiation according to the game tasks of the game station, then effective training strategies can be developed.

We considered that the efficiency of the training strategy and the usefulness of the action systems, used in the preparation of the extremes of the experimental team, is highlighted both at the level of the physical component and the technical–tactical one. Arguments that support this statement are the following.

Inclusion in a training program for mobility exercises and proper dosing leads to progress. High mobility reduces the risk of injury to the athlete when playing handball; reaction speed and travel speed does not improve significantly with the development of this motor quality being difficult to achieve; and endurance speed can be significantly improved by adapting athletes' muscles to this type of effort during the competition season. Significant changes were also observed in the agility of our team, and the athletes were much more skilled in changing the direction of preparation

The strength of our players improved with a significant increase in the height of the test jumps. The only exception was the squat jump, which was likely due to the specifics of the wing position.

Aerobic power increased significantly since this was the basis of the team's physical training.

The system of evaluation tests that we used in this study was determined to be viable for identifying the effects of independent variables (upon analysis of the individual elements of the teaching strategy implemented forthe experiment group) on the dependent variables in the study.

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