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The Effect of Swimming on Some Muscular Parameters in the Training of the Medical Students Members of the Handball Team

Paul BUSE[1],
Luminita GEORGESCU[2]

[1] Asisstant PhD, University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania, paul.buse@umfcd.ro
[2] Professor PhD, University of Pitesti, Romania.

Abstract: The game of handball gradually developed into a very fast and demanding sport, with continuous changes in regulation. Speed force, especially found in the form of detente, is a fundamental quality for handball players, especially for players who shoot at goal. The main objective of the game of handball in offensive mode is to score as many goals as possible preceded by dribbling, passing and throwing at goal, while defensively blocks and steals of throws must be carried out. All these actions are based on high-level muscular parameters, acquired through a training directed and conducted according to the specific requirements of the dynamic game of intense physical stresses with rhythm breaks. In this regard, in order to support the handball players, in our research we have introduced swimming sessions within the training programs, both preparatory and pre-competitive and competitive. Purpose: Through this research we have tried to highlight the effects of swimming practice as a complementary sport in the training of amateur handball players and to support the technicians who draw up the training programs in order to increase sports performances and to decrease the risk of injury or physical exhaustion. Methods: This research was conducted on twenty amateur athletes handball players, aged between 19 and 25 years, being divided into two equal groups, with ten students for each group. The subjects were tested and evaluated using the Myotest PRO device in the Jump Plyometry test, through initial and intermediate testing after the preparatory stage and final testing after the competition stage. Results: after comparing the results obtained, the two groups, group 1 and group 2, an evolution is observed on average of 14% for the parameters measured at the end of the preparatory period, and of approximately 5% for the end of the competitive period, for group 1, while the values for group 2, of control, have stagnated or recorded a slight decrease in the pre-competitive and competitive stages.

Keywords: *handball player; swimming; Jump Plyometry; plyometrics.*

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1. Introduction

It is known that the game of handball requires an aerobic capacity at maximum values with direct involvement on the handball game, especially on the endurance and the frequent changes of rhythm. The game of handball gradually developed into a very fast and demanding sport, with continuous changes of regulation, thus, depending on the speed regime, especially in the form of the detent of the jump, is a fundamental quality for handball players, especially for players who shoot at goal. Athletes are forced to face the ever-increased demands imposed by the evolution of sports technique and tactics in high performance handball (Buse, Georgescu, Pitigoi et al., 2022). A coherent integrated training with higher indices of physical development and a high level of knowledge of the game will lead to performance at the level of international requirements, which requires players rapid reactions to the opponents actions (Barbu & Stoica, 2020). Unfortunately, in Romania, a lot of coaches use outdated equipment (Cosma et al., 2021), and it is difficult to compete on the same level with those who monitor performance with modern technology. The performance on the throw at goal is often considered the key to success in handball (Van den Tillaar & Ettema, 2004), with the maximum isometric power studied in the laboratory for both men and women (Gorostiaga et al., 2006). In a study conducted by Chelly et al., (2010), it is emphasized the importance of the lower limbs in achieving sports performances in the game of handball.

Swimming began as a sports discipline, practiced in physical education lectures, as a recreational sport, competitive means, relaxation activity, means of recovery in sports effort, but more often it is recommended as a therapeutic means in different diseases. Some studies in the field predict immersion in cold water as having a positive effect on the recovery or performance of sports is subsequent (Eston & Peters, 1999; Marsh & Sleivert, 1999; Hayashi et al., 2004).

After reviewing the literature and a meta-analysis, Cormier et al., (2020) found that immersion with cold water is beneficial for a neuromuscular recovery and fatigue 24 hours after training in team sports. Another systematic review of scientific articles, conducted by Wilcock et al., (2006), presents us that hydrotherapy used in a variety of ways is used in post-effort recovery that, the method of recovery, the human circle responding to immersion in water with cardiac changes, peripheral resistance, and blood flow, as well as changes after plyometric exercises.

A study from the International Journal of Sports Medicine found that athletes who enter the pool for a moderate swim, during a day of recovery (without specific training), were later able to train more and

increase those sports performances compared to those who have not practiced swimming (Shaffer, 2021). Thus, the swimming sessions held 10 hours after the intense specific effort have positive effects on the subsequent, functional sports performance, reporting an increase in performance compared to a natural, passive recovery (Lum et al., 2010). Thus, Buse, Georgescu, Paunescu et al., (2022), considers that the entire instructive-educational process is carried out at an increasing level, everything related to the biomechanics of movement, the biological substrate, the possibilities of adaptation, and a faster and efficient recovery after efforts specific to handball.

2. Problem Statement

Handball is considered a sport in which contact with the opponent is found, but the emphasis is placed on throwing, frequent and repeated sprints, pushes, kicks and jams (Gorostiaga et al., 2006). Researchers such as Gorostiaga et al. (2005) and Rannou et al. (2001), believe that handball players to be successful athletes must have both anaerobic and aerobic, well-developed abilities, anaerobic and aerobic. Visnapuu & Jurimae, (2007), considers that some basic characteristics such as height, weight, body mass index and specific upper limb, are important while Chelly et al. (2010) argue that for great performance, strength and strength are required for the upper part as well as for the muscles of the limbs. In order to make the most of the technical and tactical qualities, throughout the handball game, a high level of development of motor skills is required (Michalsik et al., 2013). According to Michalsik, (2018), we believe that the physical demands of the handball game are based on muscle strength and strength, speed, anaerobic capacity, as well as aerobic strength and resistance. Our approach was oriented in the direction of coming to the support of medical students who, due to the busy curricular curriculum, cannot participate throughout the year in specific trainings in handball. They must cope with a short-term preparation, with numerous intense efforts and qualification matches at the regional university center. In the face study we investigated the muscular parameters of the lower limbs such as: height, time of contact, reactivity and stiffness.

3. Research Questions

Current research is focused on exploring and identifying how swimming is actuated as a complementary port in the preparation of handball players. Knowing the dimensions of the positive effect on the body, we could intervene on the training of medical students playing

handball players, facilitating centralized training for limited periods and with intense efforts with swimming sessions. We have hypothesized that medical handball players who participate in a period of intense training, and benefit from swimming sessions in a complementary way, can obtain outstanding sports performances.

4. Research Methods

4.1. Participants

For the present research were co-opted the students of handball players, members of the representative team of UMF "Carol Davila", being divided into two groups of 10 with 5 boys and 5 girls on each group. For the experiment group, the average values of the basic dimensions are represented by height 177.8 cm, age 21.7 years and a weight of 67.8 kg, and for the control group these dimensions are relatively similar, with an age of 178.4 cm, age of 21.9 years and a weight of 71.6 kg. All subjects were previously informed of the possible risks and beneficial, as they voluntarily participated in this research, without obligations, being informed that they can withdraw at any time.

4.2. Materials

In this study we used the Myotest PRO device, a technology for analysis and interpretation of motion, based on acceleration measurement, successfully used in both sports and medical applications. The test can be carried out directly in the training room, not being conditioned by laboratory equipment, having incorporated a computer analysis software. This device can store information about one or more subjects, also allowing a direct comparison of the results recorded. For this study, jump plyometric was used, the following parameters being evaluated: the height of the jump, the time it has contact with the floor between repetitions, reactivity and stiffness. In this study we chose to emphasize the contractile characteristics of the lower limbs. The values measured in this way we believe provide sufficient information about the quality of the detachment from the soil, which in the end can positively influence the sports performance (Păunescu et al., 2013).

4.3. Procedure

This study was conducted on 20 students staggered into two groups of ten students each (five boys and five girls), who participated in the test simultaneously with a difference of maximum 2 min. Throughout the research, compliance with the ethical rules regarding the subjects was

ensured, as they participated voluntarily and without obligations, being able to withdraw at any time, all data remain confidential and the participants anonymous. An initial test was applied for both groups, after which followed a normal training program of 4 months with 2-3 workouts per week depending on the study program, in addition, throughout this period, the experiment group entered the swimming pool 1-2 times a week, on days without training. After this period, the intermediate testing was performed, followed by a pre-competitive and competitive period of 6 weeks, totaling 4 to 5 activities per week depending on the competitive calendar; n this period the experimental group entered the swimming pool at least 3 times a week but necessarily 20 minutes after intense efforts. At the end of this period, the final testing was conducted, 18-20 hours after the last training, to be sure that previously all the players engaged in the same type of activity.

The objective of the test is to measure the contractile and intermuscular coordination properties of the flies at the level of the lower limbs. The test begins on the sound signal produced by the myotest apparatus by a jump followed by five jumps performed as quickly as possible, to be as small as possible and the height of the jump to be l a value as high as possible.

Each subject performed three attempts with the best result recorded.

5. Results and discussions

5.1. Results

Below we present the results obtained, at the testing with the Myotest PRO device, for the two groups of students.

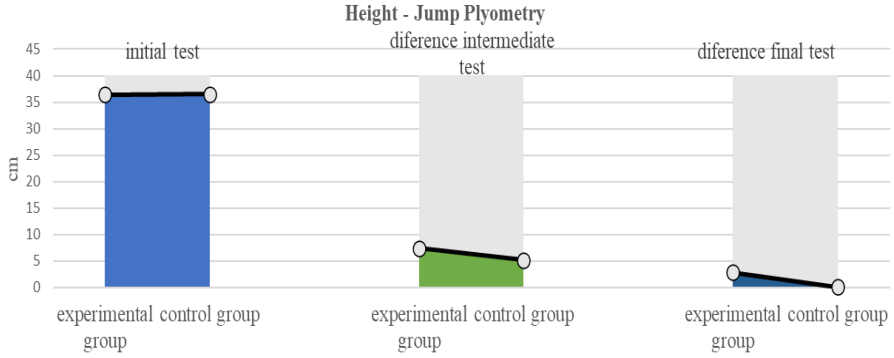

Figure 1. Graphical representation of the medi values for the two groups in the three tests, the height test – Jump Plyometry
Source: Author's own conception

As seen in Figure 1, for both groups, after the initial test, approximately the same average value is recorded, with an advantage light of 0.08 cm for the control group. At the end of the preparatory stage, which coincides with the intermediate testing, the average difference in progress of the experiment group has an evolution of 7.4 cm while for the control group, which does not benefit from swimming sessions, there is an increase of 5 cm. In the final test, which corresponds to the end of the competitive period the control group does not benefit from significant progress while the experiment group makes a progress of about 3 cm.

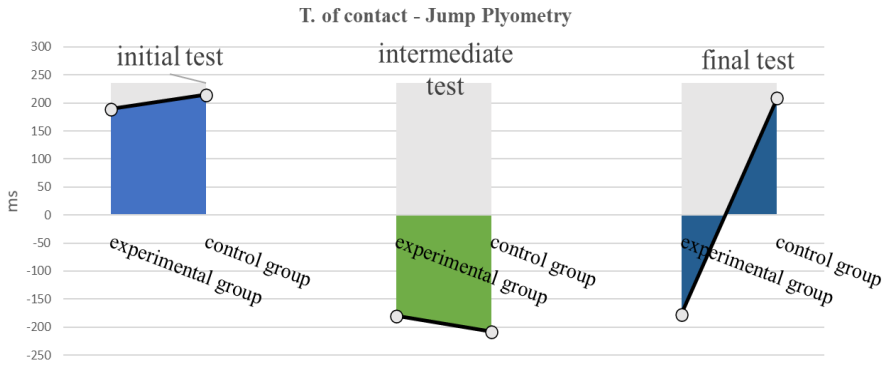

Figure 2. Graphical representation of the medi values for the two groups in the three tests, T. of contact – Jump Plyometry
Source: Author's own conception

From Figure 2, it can be seen that for both groups, experiment and control, in the intermediate test there is a decrease in the time of contact with the ground, which shows a positive evolution in the preparation, at the same time with an average value of – 9.6 ms, almost double for the experiment group compared to the control group. At the end of the competition stage, coinciding with the final testing, the downward trend of the average ground contact value for the experiment group continues, while for the control group, increased values of the average contact with the ground are recorded. It is worth mentioning that a positive development in the preparation means a decrease in the time of contact with the ground.

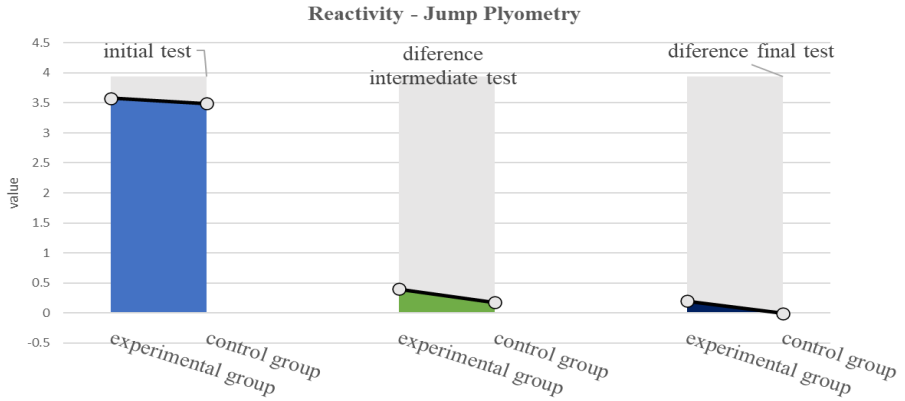

Figure 3. Graphical representation of the medi values for the two groups in the three tests, reactivity – Jump Plyometry
Source: Author's own conception

From Figure 3 in the initial testing there is a small difference of 0.09 in favor of the control group, and in the intermediate testing there is an increase of 0.4 units for the experiment group while for the control group there is an increase of only 0.1-unit. At the end of the competitive period, coinciding with the final test, progress is continued for the experiment group by 0.1 while for the control group there is a decrease compared to the intermediate testing.

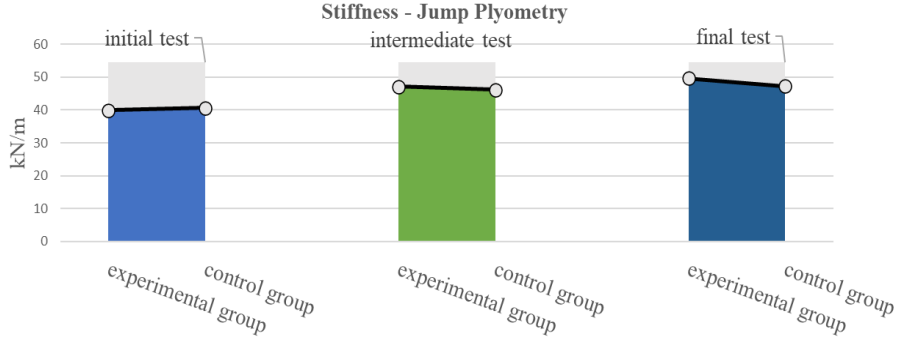

Figure 4. Graphical representation of the medi values for the two groups in the three tests, stiffness – Jump Plyometry
Source: Author's own conception

From the graph above (figure 4) it can be seen that, for both groups, after the initial testing, it is started from the same values in the mean, with a slight advantage for the control group by 0.65 kN/m. At the end of the

preparatory period, both groups have an evolution of the average values, more by about 2 kN/m for the experiment group, reaching that at the final evaluation, after the competitive period, the average value of the experiment group increases by 2.42 kN/m while for the control group there is an evolution of only 1 kN/m.

5.2. Discussions

The results of our research provided useful information with significant differences for the two research groups depending on the preparation periods. To execute the technical-tactical procedures with increased efficiency, it is necessary for the athletes to have a coordination and a muscular explosion developed at a higher level, properly manifested throughout the duration of a bilateral game. Handball, by its specificity, involves the development of the game actions in high speed, time limit and space, as well as a high consumption of energy from the athletes (Ghermănescu et al., 1983). Introduction in the training programs of some swimming session, in a complementary way, for the training of medical students and handball players, has the effect of improving the effort capacity in different aspects, being the fact that the body adapts more easily or to specific efforts when the athlete's working potency is higher.

In the case of students who have benefited from swimming elements in the training program, a major difference is observed during the period when intense efforts are being re-established. In the process of swimming training, the athlete improves his physical qualities (strength, resistance, speed) (Sayfutdinova & Garipova, 2016). All the experts recognize that the swim is the best and the most complete form of exercise existing, acting on all the muscles of the body (Sevastyanova & Garipova, 2017), unlike other activities i sport (Whitten, 1994). Swimming can contribute to the increase of the pulmonary capacity, to the improvement of the breath control, to improve the power, to tone the flies and to improve the ionises physical condition (Cadman, 2019). During the swimming sessions, the muscles develop qualitatively, but they relax and de-stress. Just 45 minutes of swimming in the pool contributes to improving the blood supply to the brain, balancing the processes of excitation and inhibition of the central nervous system, accelerating metabolic processes and relieves fatigue (Kaun & Garipova, 2017).

There is no doubt, however, that this research has certain limits, such as the students and this study and butter in are relatively small number, but we must take into account that the handball team is made up of both field players and a goalkeeper, who has been excluded from our study, and

the entire team has 14 components. Access, high costs and lack of pools can be a further hindrance to what they want to achieve. Finally, in view of the development of research, we believe that other methods and techniques of research can be used in approaching the note as a complementary sport in the training of athletes.

Finally, we mention that this research is part of the doctoral studies and complies with all the norms of ethics in accordance with the principles enshrined in the Helsinki Declaration, which was approved within IOSUD – University of Pitesti.

6. Conclusions

The study explored the hypothesis according to which medical handball players who participate in a period of intense training, and benefit from swimming sessions in a complementary way, can obtain outstanding sports performances. Thus, the swimming practiced in a complementary way in the preparation of medical students and necessarily performed for 20 minutes after intense efforts, there is an increase in average of the parameters in the preparatory period by about 14%, and in the pre-competitive period and i compete, with 5%. For the group of students who did not benefit from swimming sessions during the period of intense efforts, some parameters stagnated, and others recorded slight decreases.

Our research is the result of an ambitious approach, meant to demonstrate the place and role of swimming in the training of amateur students who participate in sports competitions in general and handball in particular, in relation to the short period of training and the intense effort to which they are subjected.

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