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Original article

OPTIMIZATION OF PHYSICAL PERFORMANCE OF SENIOR HANDBALL PLAYERS THROUGH THE IMPLEMENTATION OF THE INNOVATIVE DIGITAL WALL SYSTEM

OLAR VLAD MIRCEA[1], MELENCO IONEL[2]

Abstract

Handball is a dynamic and ever-expanding sport with increasingly demanding physical requirements, necessitating careful and personalized training. This study aims to analyze the impact of digital technologies on the performance of senior handball players, particularly regarding the development of strength and speed. Modern handball requires not only speed but also physical endurance, the ability to change direction quickly, and throwing power, underscoring the importance of specific training. The use of digital technologies, such as the Digital Wall system, allows coaches to monitor athletes' progress in real-time and adjust training sessions according to individual needs.

The research is divided into two studies. Study 1 focuses on the implementation of a six-month training program for an experimental group of players from a men's handball team in Division A, aiming to evaluate the psychomotor reactions of athletes to technology-assisted training. Study 2 aims to develop a personalized training program based on a detailed analysis of performance data, applied throughout a competitive season.

The methodology includes physical fitness assessment tests, such as health tests, fitness tests, jump tests, and strength tests, all designed to provide an overview of the players' physical capabilities. The results obtained will be compared to determine the effectiveness of the technological intervention and its impact on athletic performance.

Estimated results suggest that the use of digital technologies can significantly enhance training efficiency and individual athletes' performances. The study will contribute to the development of innovative training methods, offering promising perspectives for the future of performance sports training. The conclusions will be published in specialized journals and presented at international conferences, aiming to optimize training programs for handball teams and other athletes from various disciplines.

Keywords: Handball, Digital Wall, Performance sport.

Introduction

Handball is a sport that is continuously developing and enjoys considerable popularity among young people worldwide. Its spectacle is increasing, and experts in the field are concerned with finding and implementing new training methods.

Currently, modern handball is characterized by a fast and sustained pace, which requires considerable effort from the players. In addition to execution speed, movement, and reaction time, athletes must possess specific physical endurance, agility, the ability to change direction quickly, and overall mobility to perform the most complex movements. Additionally, throwing and penetration strength are essential in performance handball. Handball is an intensely contact sport that emphasizes running, jumping, sprinting, throwing, striking, blocking, and pushing (Chelly, Souhaiel, Hermassi, Souhail, Shephard, Roy, 2010). Jumping ability is a fundamental quality in performance handball. Jumping ability is the capacity of the neuromuscular system to overcome resistance with the highest contraction speed (Mihăilă, Stănculescu, Simion, 2011).

The level of play has evolved significantly in terms of quality—specifically, the development of motor skills and technical execution—as well as in terms of spectacle (Cazan, 2018). This implies the necessity of developing specific physical capacities, such as strength, speed, endurance, and agility, all of which are essential for success in elite competitions. The implementation of innovative and individualized training methods thus becomes crucial to ensure that athletes are prepared to face these challenges. Digital technologies have revolutionized all fields today; therefore, in performance sports, their use will allow for the optimization of training methods. In recent years, the use of innovative systems, such as real-time feedback technologies, sensor-assisted training, and video analysis platforms, has become increasingly common in performance sports (Halson, 2014). This technological revolution not only enhances training efficiency but also contributes to reducing the risk of injuries and optimizing recovery.

It is important for coaches to assess the physical fitness level of athletes in the most informative and precise manner possible (Vyacheslav, 2021). Digital technologies allow us to record and view concrete and accurate data about the athletes we train in real time. Biometric monitoring systems, real-time data analysis, and personalized training based on artificial intelligence and advanced algorithms enable precise and rapid adaptation to the individual needs of athletes (Turner &

[1] Faculty of Physical Education, Ovidius University of Constanta, No.124, Romania; Corresponding author: vlad_me96@yahoo.com;
[2] Faculty of Physical Education, Ovidius University of Constanta, No.124, Romania.

Stewart, 2013). The innovative Digital Wall system consists of a digital mirror, a wooden panel, and a platform, which allows us to combine reality with virtual reality to receive real-time data about athletes and conduct physical training activities that can be adjusted according to the characteristics of each athlete. In elite performance, everything is individualized, allowing each athlete's uniqueness to shine in all its value (Melenco, 2007). Whenever possible, we must be creative and keep the athlete active in their sport (Georgescu, 2021). The intervention of digital technology in training facilitates this process. It is important to innovate, as we can create new training methods. Over the past few decades, research in the field of sports performance has made significant progress. Studies have demonstrated the importance of specific and personalized training, tailored to the needs of each athlete, in improving performance parameters such as strength and speed (Bompa & Haff, 2009).

Sports performance is high at all levels; every coach seeks to achieve perfection in the training process for the athlete they work with, driven by the desire to surprise and surpass their opponents (Georgescu), 2023). In performance handball, every coach aims to achieve the best possible results with their athletes, and this is not possible without continuous training. In elite performance, the small details make the difference between victory and defeat. Strength and speed are two essential qualities in modern handball, being crucial for achieving high performance. The intensity of training must be adjusted according to the profile of each athlete to prevent injuries or overtraining.

Methods

The physical training of teams and players is an essential condition for achieving superior performances, shaping athletes capable of successfully meeting competitive demands at both national and international levels. In the field of performance handball, there has been a significant increase in the physical demands placed on athletes. Modern handball is a fast-paced game characterized by the exceptional athletic performances of the players who practice it (Cazan, 2018).

Strength and speed are two fundamental motor qualities in modern handball, with their level of development being a decisive factor in differentiating performance athletes and the results achieved by teams. The modern game unfolds at a very fast pace, with penetration actions and intense contacts being constant throughout a match. Thus, coaches place great emphasis on the physical training of performance athletes in order to achieve notable results in the shortest time possible.

The need to identify a new, more efficient training model that contributes to the improvement of strength and speed in senior handball players was the main reason for conducting this study. In this context, we will focus on developing a specific training program aimed at increasing the strength and speed of senior handball players. In Study 1, we will develop a training program that will be applied to an experimental group consisting of athletes from a men's handball team in Division A. The program will be implemented over a period of six months. We will assess the subjects' reactions both in terms of psychomotor skills and their adaptability to training sessions that incorporate digital technology. Additionally, we will survey athletes and coaches regarding the feasibility of implementing training programs based on digital technologies to enhance individual and team performance. The fundamental research (Study 2) will focus on developing a personalized training program by position within a national league team, implementing it, and conducting a long-term evaluation (12 months), covering one competitive season. The annual training plan will include all phases (preparatory, transition, pre-competitive, and competitive) and will consist of exercises based on digital technologies. To make necessary adjustments according to the specifics of each position and the individual characteristics of the players, we will modify training parameters and methodologies based on data provided by the selected software.

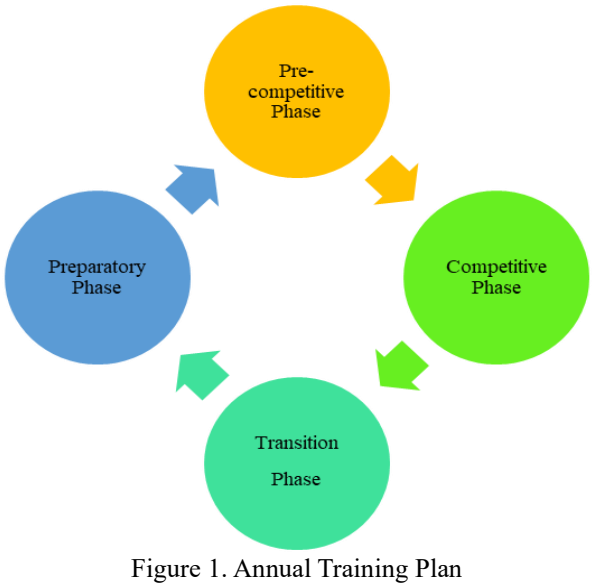

Figure 1. Annual Training Plan

The proposed research is experimental in nature, focusing on the use and evaluation of digital technologies in performance sports training. It involves experimental studies and detailed analyses to obtain solid data and scientific evidence regarding the effectiveness of these technologies.

The objectives of the research are:

- Identifying specific bibliographic studies on the topic to obtain relevant and valid data on the current state of knowledge.
- Identifying and selecting existing innovative technologies that can be used to improve strength and speed in handball training.
- Developing personalized training methodologies based on data recorded by the selected innovative systems.
- Implementing the innovative systems and evaluating their effectiveness in the training of the CSM Constanța team.
- Analyzing the impact of using innovative systems on sports performance in official matches.
- Publishing the research results in specialized scientific journals and presenting them at international conferences to contribute to the development of the field of performance sports.

Both in the preliminary research and in the fundamental research, we will conduct a series of tests using the innovative *Digital Wall system:*

1. Health Test – This test consists of seven exercises that provide information about various aspects of physical fitness:
   - BMI – Body Mass Index
   - Static Balance (maintaining balance on both feet for 30 seconds with eyes open and 30 seconds with eyes closed)
   - Chair Squats for 30 seconds (to assess lower limb strength)
   - Elbow Flexion with Dumbbell for 30 seconds (to assess upper limb strength using dumbbells while seated)
   - 2-Minute Speed Run (to assess lower limb strength and endurance)
   - Standing Lateral Raises (to evaluate upper limb mobility)
   - High-Knee Walking (to assess agility)
2. Fitness Test – This consists of 5 different exercises:
   - 3 Squats
   - 30 Seconds of Balance (15 seconds on the right foot, 15 seconds on the left foot)
   - Push-Ups for 30 seconds
   - Vertical Jump from a Standstill using both feet
   - Running in Place for 30 seconds (the number of steps is measured)
3. Jump Test:
   - A vertical jump using both feet, a jump on the preferred foot, and a jump on the non-preferred foot. The parameters monitored are: jump height, jump speed, strength and power, and flight time.
4. Arm Flexion Test with Weights (Bicep Curl Test):
   - The number of repetitions performed with the maximum weight will be measured.
   - The test will be conducted in front of the Digital Wall system.
5. Deadlift Test:
   - The person lifts a weighted bar from the ground to hip level, keeping the back straight and the knees slightly bent.

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The research in Study 2 will involve the following stages:

- Developing a detailed training program that incorporates software from the digital systems identified as effective in the preliminary study. The Digital Wall system allows for the creation of an individualized training program for each athlete, providing the coach with real-time data on their progress, thus enabling adjustments in real time.
- Implementing the program throughout an entire competitive season, with constant monitoring of progress and adjusting the digital technology intervention according to the specifics of each position.
- Recording and interpreting feedback from players and coaches to evaluate perceptions of the program's effectiveness and adaptability, as well as to make any necessary adjustments.
- Measuring and evaluating performance indicators before, during, and after the implementation of the program to determine the effectiveness of the intervention in developing strength and speed among handball players.

After conducting the tests, we will compare the initial and final results. Processing and interpreting these results will allow us to determine the effectiveness of the digital technology intervention and its potential advantages in training methodology.

Conclusions

We aim to highlight the impact of digital technology on the performance of senior handball players. Additionally, we want to improve the efficiency and quality of training through the implementation of devices for monitoring strength and speed. The research will also outline new directions for the future development of technologies in sports training, offering promising perspectives for innovation and research in the field. The results of the research will be used to optimize the training programs of handball teams as well as other athletes from various sports.

References

Bompa T.O. & Haff G.G. (2009). *Periodization: Theory and Methodology of Training*. Human Kinetics. Leeds.

Cazan, F. (2018). *Aprofundare într-o ramură sportivă – Pregătirea fizică specifică în handbal"*. Editura Universitaria Craiova.

Cazan, F. (2018). *Metodica jocurilor sportive – Handbal – Metodica dezvoltării calităților motrice.* Editura Universitaria Craiova.

Chelly, M., Hermassi, S., Shephard, R. (2010). Relationships between Power and Strength of the Upper and Lower Limb Muscles and Throwing Velocity in Male Handball Players. *Journal of Strength and Conditioning Research*.

Georgescu A. (2023). *Eficientizarea pregătirii tehnice a copiilor de 9-10 ani la atletism.* București, teză de doctorat, nepublicată.

Georgescu, A. (2021). *Fundamente științifice ale jocurilor sportive, handbal și handbal pe plajă, recuperare și reeducare motrică.* Ovidius University Press, ISBN 978-606-060-044-2.

Halson S. L. (2014). Monitoring training load to understand fatigue in athletes. *Sports medicine* (Auckland, N.Z.), 44 Suppl 2(Suppl 2), S139–S147.https://doi.org/10.1007/s40279-014-0253-z.

Melenco, I. (2007). *Pregătirea diferențiată în jocul de fotbal.* Ovidius University Press.

Mihăilă, I., Stănculescu, G., Gheorghe, S. (2011). *Antrenamentul sportiv – Concept sistematic.* Ovidius University Press

Turner A.N., Stewart P.F. (2013). Repeat sprint ability. *Strength Condit J.* 2013;35(1):37–41.

Vyacheslav, L., Valeria, T., Fedir, T., Pavlo, P., Stanislav, I., Natalia, P. (2021). Use of innovative technical means to increase the training process effectiveness in handball. *Journal of Physical Education and Sport.*

https://www.physiomed.ro/product/d-wall/