UNIVERSITATEA „BABEŞ-BOLYAI”
CLUJ-NAPOCA
FACULTATEA DE EDUCAŢIE FIZICĂ ŞI SPORT
ŞCOALA DOCTORALĂ DE EDUCAȚIE FIZICĂ ȘI SPORT

THE BENEFITS OF PHYSICAL EXERCISES CARRIED OUT IN THE AQUATIC ENVIRONMENT FOR 10-11 YEAR-OLD PLAYING TENNIS

Conducător de doctorat:
Conf. Univ. Dr. Habil. Dan Monea

Student-doctorand:
Miron Florin

Cluj – Napoca
2024

TABLE OF CONTENT

List of figures ……...v
List of tables ……..xii
List of abbreviations ……...xviii
The importance and actuality of the theme ……...1
Elements of novelty and originality ……2
Introduction ……3
PART I ……7
THEORETICAL FOUNDATION OF THE RESEARCH THEME ……7
CHAPTER 1. CHARACTERISTICS OF 10-11 YEAR OLD TENNIS PLAYERS ……7
The evolution of tennis players from an age perspective ……7
1.2 Model of the 10-11 year old player ……8
CHAPTER 2. ……11
CONCEPTS REGARDING COORDINATIVE CAPACITIES ……...11
2.1. Generalities ……11
2.2. Characteristics of coordination ability ……12
2.3. Coordination specific to the game of tennis ……14
CHAPTER 3. ……16
MOTOR SKILLS ……..16
3.1. Concepts of motor skills ……16
3.2. Elements of motor structure ……17
3.3. Motor capacity ……18
3.4. Performance and motor intelligence ……...19
3.5. Biomotor potential ……..19
CHAPTER 4. ……22
OPTIMIZING SPECIFIC CAPACITY FOR SPORTS PERFORMANCE ……..22
4.1. Continuous improvement of selection strategies ……22
4.2. Considerable increase in workload in training ……24
4.3. The connection between the training methodology and the competition requirements …….25
4.4. Increasing the intensity of effort in training ……26
CHAPTER 5. ……27

SPORTS TRAINING IN THE AQUATIC ENVIRONMENT ……27
5.1. Physical training in the aquatic environment ……..27
5.2. Development of running technique in the aquatic environment ……29
5.3. The benefits of physical exercises carried out in the aquatic environment ……30
PART II ……33
PRELIMINARY RESEARCH ON THE TRAINING OF TENNIS PLAYERS BY MEANS CARRIED OUT IN THE AQUATIC ENVIRONMENT ……33
CHAPTER 6. ……33
ASSESSMENT OF MOTOR SKILLS IN THE GAME OF TENNIS ……33
6.1. Introduction ……33
6.2. The purpose of preliminary research ……..33
6.3. The objectives of the preliminary research ……34
6.4. Research hypotheses ……...34
6.5. Materials and methods ……35
6.6. Results ……49
6.7. Discussions ……77
6.8. Conclusions ……80
PART III ……81
PERSONAL RESEARCH ON THE IMPLEMENTATION OF WATER TRAINING IN TENNIS TRAINING ……...81
CHAPTER 7. ……81
INCREASING THE SPORTS PERFORMANCE OF JUNIORS IN THE GAME OF TENNIS THROUGH TRAINING IN THE AQUATIC ENVIRONMENT ……81
7.1. Research premises ……..81
7.2. The purpose of the research ……82
7.3. Research objectives ……82
7.4. Research hypotheses ……...83
7.5. Materials and methods ……84
7.6. Research results ……102
7.7. Discussions ……...190
7.8. Conclusions ……..200

7.9. General conclusions …………………………………………………………………..203
Bibliography ………………………………………………………………………………207

Abstract:

The thesis is structured in three parts:

1. The theoretical foundation of the research topic.

2. Preliminary research on the training of tennis players by means carried out in the aquatic environment in tennis training.

3. Personal research on the implementation of training in the aquatic environment.

Tennis is the sport in which elegance, dynamism and emotional states combine harmoniously, contributing considerably to the development and maturation of man on a sporting and social level. It is considered one of the most complex sports and at the same time the most demanding. It requires balance control, eye-brain-limb coordination, quickness, speed of thought, speed of reaction and movement, endurance, and a strange combination of caution and abandon that we call courage.

The theoretical-practical knowledge in relation to the game of tennis proves that this sport has evolved significantly in terms of the effort and speed of the technical-tactical actions it involves, and therefore I consider it imperative to improve and develop the effort capacity and movement speed.

The objective of the experimental research is to highlight the effect of physical exercises specific to the game of tennis, carried out in the aquatic environment to optimize the effort capacity of the players practicing this sport on the physiological parameters of the tennis players.

Twenty 10-11-year-old tennis players were involved in the training program, who took an initial and a final evaluation, with the aim of identifying the advantages of the means used. Exercises for the development of movement speed and acceleration should be planned and performed during the general training periods and during the development periods for children and juniors.

The impact of such an intervention program in the aquatic environment is a multilateral one, having benefits on optimizing performance capacity, maintaining an optimal state of health, preventing joints injuries and opening new opportunities for children practicing the game of tennis.

The identification and selection of modern technical-tactical and physical training methods and means used in water tennis training, which can constitute fundamental benchmarks for the scientific management of training in training lessons and competitions, is one of the important objectives of experimental research.

Scientific originality:

A novelty element of this experimental research is represented by the implementation in the training program of tennis players in the aquatic environment the exercises from other sports branches, such as swimming, gymnastics and athletics.

Physical activity in the aquatic environment enjoys the advantages offered by hydromechanics, which facilitate the movement of body segments - an action that, in some situations, can be difficult to achieve on land. In the context of fluid physics, the phenomenon of buoyancy, also known as Archimedes' principle, contributes significantly to the mitigation of gravitational effects on objects immersed in aquatic environments. This buoyant force causes a decrease in the apparent weight of an object in proportion to its depth of immersion, resulting in a considerable reduction in the mechanical stresses imposed on the joints and musculoskeletal structure.

The intervention program is a bold attempt to weave and combine exercises from different sports, in a non-specific and totally different environment, in order to improve performances and results, looking in the perspective, without necessarily aiming at great current performances in the short term, which could bring disappointments, create certain barriers or even lead to the abandonment of sports activities.

The judicious intercession of conventional means with the "unconventional" adapted (in which practical executions are doubled by the permanent cerebral demand, where the intervention of some new stimuli requires the ability of attention forcing the player to overachiever thus inducing adaptations of performance capacity) must be an essential requirement of current preparation and an essential concern of the specialist in the motor field.

The modern tennis is characterized by the restructuring of training content in the context of great performance of nowadays sports. Latterly, tennis implies a specific background of players' skills, which includes, first of all, a multifaceted training, the manifestation of a great level of creation, tactical inventiveness that can only be expressed by individuals who have reached a high level of technical, physical and psychological abilities.

The significance of physical training is unanimously acknowledged, as it is the support of the players' activity, which can use their technical-tactical and psychological possibilities during training sessions and competitions.

Under these circumstances, the need to apply "unconventional" training methods and create appropriate drills to positively influence the performance capability is, from our point of view, an essential preoccupation of the motricity specialist. Current performance training cannot be anchored in definitive template shapes.

The theoretical foundation of the researched theme

Chapter 1. Characteristics of 10-11-year-old tennis players

Chapter 2. Concepts regarding coordinative capacities

Chapter 3. Motor skills

Chapter 4. Optimizing the ability specific to sports performance

Chapter 5. Sports training in the aquatic environment

II. The second part includes the preliminary research - it starts from the premise that the optimization of training and contest modeling in the tennis game at the performance level can be achieved with the help of modern technical-tactical training methods and means, which can constitute fundamental landmarks of scientific management of preparation in training lessons and in competitions.

The purpose of the preliminary research - consists in improving the motor qualities speed, strength and coordination capacity of tennis players. The subjects of the group participated in physical activities carried out both in the aquatic environment and in the terrestrial environment.

The objectives of the preliminary research –

• Identifying the benefits of tennis training in the aquatic environment on the improvement of specific motor qualities, such as (speed of reaction or execution or movement, or return, repetition, general and intersegmental coordination capacity, rhythm, tempo, balance, speed, mobility joint and muscle flexibility;

• Studying the impact of water tennis training on the body of tennis players participating in the research in order to determine other similar programs

• Analyzing the effects of training in the aquatic environment from the perspective of long-term combination with specific training in the tennis game

The conclusions of the preliminary research – The use of actuation systems in the aquatic environment represents a method that can be integrated into the conventional training of the tennis

player, giving it complexity and attractiveness, their use ensures new biomechanical dimensions to the practice due to the characteristics of the aquatic environment.

The development of the driving qualities of force - power in the aquatic environment have undergone obvious changes with significant differences, a result that determines the use of this method in some subsequent programs.

The value of this research highlights effectiveness and efficiency through unconventional training systems adapted and highlights the role of effort capacity development in the sports training process.

III. Personal research on the implementation of aquatic training in tennis training

Objectives of fundamental research:

The objective of the fundamental research is to evaluate the effect of a protocol dedicated to the development of motor skills in special conditions using means of action from the aquatic environment. They focus on improving the performance of motor skills and sports performance between 10 and 11 years. In addition, our study aims to achieve the following objectives:

• improvement of the specific hitting force (right and backhand shots), for this purpose, development methods were integrated in slightly difficult working conditions using medicine balls both in a specific environment and in the aquatic environment

• development of motor skills specific to the game of tennis (general and intersegmental coordination capacity, rhythm, tempo, balance, speed, joint mobility and muscle suppleness;

• optimization of performance capacity;

• accustoming tennis players to tasks of great difficulty;

• developing the players' ability to find quick and effective solutions in different game situations.

Research hypotheses:

Starting from the consideration that the optimization of sports training in current field tennis is conditioned by the level of effort capacity and motor qualities, we will organize (carry out) an experiment that will confirm/invalidate the hypothesis according to which the integration in training of some adapted tennis-specific motor structures (carried out) in the aquatic environment will have the effect of optimizing the effort capacity of the 10 - 11-year-old tennis player and will induce increases in physiological parameters; Physical training in the aquatic

environment can have a positive impact on the improvement and progress of tennis players by developing motor skills, speed, strength and endurance.

Tests applied in experimental research:

Anthropometric tests: height, weight, chest circumference, span of athletes.

Physical tests targeting the motor qualities of strength and speed.

Technical Tests: Outside Service Test, T Service Test, Average Forehand Down the Line, Forehand Diagonal, Backhand Down the Line, Backhand Diagonal, Both 1st and 2nd Serves .

Physiological tests: during the experiment, systolic blood pressure increased at the final assessment in both participant groups, both participant groups experienced an increase in mean diastolic blood pressure, resting respiratory rate decreased on average, respiratory rate during exercise and at rest, the experimental group recorded a significant decrease in respiratory frequency at rest and during exertion; the evolution of the experimental group saw a significant increase in vital capacity.

Technology used in the research: Freelap System for automatic timing of tests applied in the experiment, Agile-Shop V3 System for timing the tests within the experimental research, classic materials, for evaluating the motor quality of the force, such as the medicine ball, Polar H10 is a high-quality heart rate monitor performance, designed to provide accurate real-time heart rate data. Cosmed K5 spirometer for respiratory function assessment and speedometer (sports radar) for recording ball speed.

The conclusions of the experimental research:

From the point of view of the results obtained:

• the results confirm that in the anthropometric tests there were no statistically significant differences between the two groups, even if there were improvements in these parameters.

• in the physical tests aimed at strength and speed, statistically significant differences were recorded in 7 of the 9 specific tests:

• the test of throwing the medicine ball with both hands at work, to improve the athletes' performance in terms of the force and speed of the ball when hitting the right hand, as well as to

increase the length of throwing the medicine ball with two hands on the right; developing their speed and agility in the 10-meter sprint, average

• at the hexagon test, the fan test, the added step test

• In the technical tests, the results do not indicate a statistically significant difference between the two groups.

Keywords: tennis, aquatic environment, performance, effort capacity, coordination abilities, unconventional drills, motor abilities, physiological prameters;