

MINISTRY OF EDUCATION
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BUCHAREST

Ph.D. Thesis Summary

CONTRIBUTIONS REGARDING PHYSICAL PREPARATION IN U16
JUNIOR TENNIS PLAYERS

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This topic, of physical preparation, is observed from a different point of view, using economic instruments, in analyzing the results of the subjects involved in the study.

The thesis is structured in three parts

- The theoretical part includes studies and a general image of physical training in the world and particularly in Romania
- The second part includes a study that is analyzing the preparation of selected Romanian tennis players U16, competing at a national level
- The third part is analyzing the specific physical preparation of Portuguese junior tennis players

The first part outlines the theoretical part of the thesis. The first chapter includes the most relevant studies regarding the physical training of the U16 junior tennis players, followed by the existing literature analysis at a national and international stage. The second chapter describes the capacity of performance and the particularities of adolescents aged 14-16 and the third one provides information about motor capacity and exercise capacity. Furthermore, there are indications about the technique and tactics of tennis but also about the methodology of physical training in tennis. The last chapter reveals the conclusions of the theoretical part.

Conclusions drawn from part 1

- starting with U16 there might be a significant change in the height and weight that can decrease the player's performance
- there is a deficit in discovering the new talents
- there is a lack of sponsors for junior players
- starting with U16 trainers should consider planning the tournaments for the entire year
- in match situations, women have been shown to have a higher heart rate than men

- physical performance seems to improve inconsistently during adolescence
- especially in tennis, reaction time, quickness of the first step, speed over short distances, ability to change direction quickly, and lateral movement are important determinants of performance
- tennis players spend about 48% of their time moving sideways

The second part is the preliminary research in the physical training of the U16 tennis players. The purpose of this preliminary research was to determine the level of physical training of the players participating in the competitions within the internal competitive calendar. Objectives of the preliminary research:

- knowledge of the value of motor indexes, which are in line with the age but also with the level of training of the subjects
- to emphasize the development of motor skills in order for the subjects to improve
- write down the thematic content of physical training lessons, so that the intensity, number of repetitions, frequency, duration, and composition of training cycles can be determined.
- establishing conditions for verifying subjects' adaptation to the specific effort density;
- testing in order to know the fitness level of the subjects involved in the research.

Preliminary research hypotheses

- The evaluation and improvement of physical test results can contribute to the improvement of overall tennis preparation.
- The use of an appropriate training program according to the needs of 14-16-year-old girls and boys can increase the level of tennis performance.

Research methods:

- Bibliographical study method
- The method of conversation
- Protocol method
- Recording method
- Test method
- Preliminary experiment method
- Statistical-mathematical method
- Graphical method

Preliminary research subjects

The subjects of the preliminary research are athletes registered within the clubs A.C.S. Brasov and A.S.-Bucharest. They were divided into two groups: 16 girls and 16 boys.

Stages of the preliminary study:

- Between May 2019 and June 2019 the structuring and composition of the preliminary research plan took place;
- Between July - October 2019 -the evaluation took place and the results were recorded on July 20 in Bucharest

- June 20-July 19, 2019, the training performed by the subjects was followed up;
- October 2019 analysis and interpretation of the data from a statistical-mathematical point of view;
- conclusions of the preliminary research.

Conclusions drawn from part 2

The preliminary research has drawn significant conclusions regarding the relationship between training, physical test results, and the position of players in the national rankings.

Analysis and statistical-mathematical interpretation carried out by Pearson correlation between ranking (performance/position) and morphological parameters show that if athletes have a larger stature (in this case the value is $P > 0.006$), and lower body weight are more likely to occupy a better place in the national ranking considered as a moderate correlation.

Interpretation of the results obtained for the speed showed that:

- a lower-ranked player in the national ranking will also have a weaker time in the 5m-10m dash. The correlation in this event is a low one(0.426- 0.522)
 - In the 20m distance run, lower-ranked players have weaker times (above 0.760), compared to the higher-ranked players. The average correlation shows that this correlation is high.
 - Regarding the mean correlation between ranking position and 30 m dash, shows that the higher the ranking position, the higher the time obtained (lower between 0.603 and 0.462).
- The correlation for each physical test has been interpreted.

High correlations were observed in 20 m sprinting and flexion and extension in the elbow joint. When comparing the results, obtained by subjects according to their gender, it was observed that the development of motor skills at U16 level of boys is superior compared to girls in all tests performed, with statistically significant differences only in some tests. It was found that the higher-ranked players performed better in the physical tests.

The third part, is the final research in physical training of the U16 tennis players. The aim of this research was to improve the physical training of juniors in the U16 category through a physical training program called Pliospecific, adapted for the 14-16 age category in order to improve the efficiency of movement in the tennis field.

Objectives of the final research:

- Improving the agility of U16 tennis players;
- Improving the movement speed of tennis players in the U16 category;
- Increasing speed capacity in muscular endurance in the U16 category;
- Improving mobility of the spinal and hip joints in the anterior plane of the body for tennis players in the U16 category;
- Optimization of lower limb strength of U16 tennis players

- Improving speed in different directions specific to the game of tennis;
- Improving linear speed over short distances,
- Optimizing the performance of tennis players in the U16 category;
- Improving the position of U16 players in the overall ranking

Final research hypotheses:

- Pliospecific training can help improve the agility of U16 junior players.
- Improving the level of fitness through Pliospecific training can lead to improved overall performance and national/international ranking of U16 tennis players.

Final research subjects:

Forty-eight male subjects between 14 and 16 years old participated in this research, the control group contained 23 subjects and the experimental group, 25 subjects.

Research methods:

- Observation method
- Recording method
- Conversation method
- Protocol method
- Test method
- Experimental method
- Test method
- Counterfactual impact assessment techniques

Stages of the final research:

- Setting the objectives of the experimental research.
- Identify the system to be used for the evaluation of the final research subjects.
- Identification of participating subjects, experimental research.
- Staging of the period required to conduct the final research.
- Scheduling and planning of the experiment in accordance with the preparation stages and competition timetable.
- Initial and final evaluation of research subjects.
- Implementation of the training program.
- Recording, tabulating, analyzing, and interpreting the results obtained.
- Analysis of the comparative results between the experimental and control groups.
- Analysis of the results of the counterfactual impact analysis.
- Conclusions resulting from the final research.

Conclusions drawn from part 3

Therefore, the empirical results of the research-validated exclusively on the experimental group led to the following:

- Hypothesis IP2 that Pliospecific training led to improved agility of U16 junior players is partially validated.

- Partially validates hypothesis IP3 that Pliospecific training led to improved speed of U16 junior players
- Fully validates IP4 that Pliospecific training contributes to improved endurance speed
- Fully validates IP5 that Pliospecific training helps improve mobility of U16 junior players
- Fully validates IP6 that Pliospecific training has contributed to improving the strength of U16 junior players
- Partially validates PII that Pliospecific training led to improved overall player performance by increasing the share of matches won

The results of the counterfactual impact analysis showed a statistically significant net impact of plyospecific training on agility, endurance speed and player performance, improving the results of the T test, Edgren both STG and DR tests, as well as the average number of lateral movements and the average number of forward movements, the results of the 6x20m test and the percentage of matches won. Importantly, a potential impact of plyospecific training on speed, mobility and strength indicators was invalidated.

General conclusions

According to the latest publications in the literature, significant changes in height and average body weight of subjects occur at the age of 14-15 years. Because of this, there are small imbalances and a decrease in performance.

After the age of 16 a rebalancing takes place, so adequate physical training is essential during this period when major changes take place, especially in male subjects.

According to the first research, most girls' physical test results in this age group are significantly lower than those of boys. According to the pilot study, high-ranked players perform better in physical tests, which has been confirmed in other samples from recent studies.

The main hypotheses from the main research were partially confirmed, proving that Pliospecific training has partially proven its contribution to the development of the overall performance of tennis players, but also to the improvement of agility and speed of U16 junior players.

It proved its overall contribution to improving the endurance speed, mobility and strength of U16 junior players.

Better agility on the court means better movement during the game, contributing to improved agility and performance but also to improved specific motor skills, which overall contribute to a more efficient tennis game.

Counterfactual impact analysis revealed a statistically significant impact of Pliospecific training on agility, endurance speed, and player performance.

For the tennis game of the participants in the experiment, the content and evaluation of the intervention plan resulted in a more specific efficient movement and better endurance speed on the court, so that players could cope with the many changes of direction in a match.

Adequate physical, technical and psychological training contributes positively to the growth and development process of adolescents.

An accurate diagnosis of the physical capacities and the level of training of juniors is the first step towards improving the means of training.

