

**SUMMARY OF THE DOCTORAL THESIS**

**TITLE OF THE THESIS: The impact of Tennis 10 on the motor skills development**

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**Introduction**

Tennis requires unique physical skills from the players and demands a specific set of physical skills and abilities in order to achieve high performance. The tennis player must be a complete athlete. One must start off from the fact that "the current professional game of tennis is characterized by great dynamism, quick thinking and ball action, precision, refinement in the technique and tactics, always offensive, played at the upper limit of human speed and endurance"<sup>1</sup>. It is effective not only for the physical development of children, but also for stimulating the self-trust, reaction speed, combining discipline with the freedom to improvise, technical rigor with imagination. It is a sport of surprise and precision, but more than that, of the joy to play.

Tennis 10 is the International Tennis Federation (ITF) component for the 10-year old and younger players, being focused on increasing the participation numbers for tennis and providing paths of development more adequate for younger players, including more adequate competitions.

A supporter of Tennis 10, Roger Federer admits that an important role in the fluid progress of his strokes and court movement was played by the fact that he started playing tennis with lighter balls, this way being able to have fun, and not feel the training fatigue or the desire to quit. It is much easier for children to play with lighter racquets and balls, says the winner of 16 Grand Slam titles. The ball does not bounce off the racquet uncontrollably. I started this way, and that is why I support Tennis 10.

Tennis 10 is the way in which tennis training and competitions can be presented best to the 10-year-old and younger children. The principles are very simple:

a) to offer the best conditions:

- adequate court size;
- slower balls;
- slower racquets.

b) to present adequate competitions:

- shorter competitions with more matches;
- singles and doubles matches;
- simple scoring systems;

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<sup>1</sup> Moise G.D., (2002), *Teoria tenisului modern*, vol. II, Ed. Printnet, Bucharest, p. 8

- to serve, to rally and to score right from the beginning.

The International Tennis Federation's Tennis 10 provides a solid development structure for the 10-year-old and younger children, using three color-coded stages. **The red ball** (75% more decompressed than a standard one): made of a foam or a special fiber, it is perfect for beginner children. **The orange ball** (50% more decompressed than a standard one): made of a fabric identical with the one the yellow ball is made (standard); it is faster and bounces higher than the red ball. **The green ball** (25% more decompressed than a standard one): it is very similar to the standard yellow ball, but somewhat slower and bounces less.

Through these stages it is created a series of development steps to allow the players to progress over the course of a competition career, taking into account their age, abilities and inclination toward competition. In this process, the size of the court, of the racquet, the speed of the ball and the duration of the match are gradually increased until the player is ready to play on a regular-sized court and use a yellow ball.

The aim of this research is to evaluate the impact that the use of the Tennis 10 coaching method has on the development of the motor skills that are specific to tennis, aiming to improve the children's training methods through the Tennis 10 method.

This research comprised three studies.

The "*Preliminary study regarding the perception of training by the tennis coaches*", tried to verify the following **hypotheses**: "coaches have different opinions regarding the tennis training for ages 7-10 and the introduction of the tennis 10 training method; the coaches perceive differently the introduction of the tennis 10 method". For the "*Preliminary study regarding the level of somatic-functional and motor development in 7-10 year-old children*" the following hypotheses were elaborated: "the level of somatic-functional and motor development is different in beginner children; the level of motor development in beginner children is below the RTF standards".

**The aim of the preliminary research** envisaged the knowledge of the coaches' conception regarding the introduction of the tennis 10 training method. **Research objectives**: determining the coaches' knowledge level in regards to the tennis 10 training method; identifying the way in which the coaches adopted the new training method for achieving top athletic performances; choosing a group of 56 children and assessing them through assessment challenges in order to know the development level in 7-10 year-old children; knowing the results of the somatic-functional and motor tests. **The research methods used were**: the bibliographical study method - to obtain the informative materials necessary for the theoretical, scientific and methodological basis of the studied theme; the inquiry method; the testing method, which comprised somatic measurements (height, weight, arm span, lower limb length, thoracic perimeter), motor challenges (speed running (5.10 m), agility (hexagon), coxal-femoral mobility, core lifting in a supine position with bended knees, medicinal ball throwing, fan-shape and side step). The challenges are divided into two groups, as follows: outside the tennis court, or general (speed running (5.10 m), agility (hexagon), coxal-femoral mobility, core lifting in a supine position with bended knees, and medicinal ball throwing), and in the tennis court, or specific (fan-shape and side step running), the effort capacity assessment test (Ruffier-Dickson), the statistical-mathematical method - transposing the measurement results into numerical data, the objectification of the phenomena being done through numbers, the graphical representation method - to emphasize the significance of the data

and to suggestively interpret the highlighted phenomena. The graphical representations allowed a synthesis of the data, offering the possibility of correctly visualizing the studied phenomena and the relations between them. For the "*Preliminary study regarding the perception of training by the tennis coaches*", **the research subjects** were 28 tennis coaches, aged between 20 and 69, working in Romanian tennis clubs, training groups of children. They were questioned in regards to their use of the Tennis 10 training method. For the "*Preliminary study regarding the level of somatic-functional and motor development in 7-10 year-old children*" the **research subjects** were 58 1st-4th grade children from the schools: "Constantin Platon", „Miron Costin", „Alexandru Ioan Cuza", "Gimnazială Nr. 10", "Spiru Haret" and "Ion Creangă", all from the city of Bacău.

At the end of the first study, the following conclusions can be drawn: the hypotheses stating that "***coaches have different opinions regarding the tennis training for ages 7-10 and the introduction of the tennis 10 training method; the coaches perceive differently the introduction of the tennis 10 method***" were confirmed.

As a conclusion, the RTF initiative to introduce the TENNIS 10s training method proves to be a necessity and a step forward in the evolution of modern tennis training, completing certain missing bits in regards to age appropriate means and materials, and makes the training more attractive to children.

At the end of the second study, the following conclusions can be drawn: ***the hypotheses stating that "the level of somatic-functional and motor development is different in beginner children; the level of motor development in beginner children is below the RTF standards" were confirmed.***

As a conclusion after the initial testing, it is necessary to conduct a research that would highlight the impact on the somatic-functional and motor development in children and to elaborate a training plan using the tennis 10 means and materials.

The third study, "*Study regarding personal contributions in regards to children's training using the Tennis 10 method*", tried to verify the following hypotheses: the use in children's training over a period of 8 months of the Tennis 10 method determines an increase in the motor development and effort adaptation capacity; the use of the Tennis 10 method determines an improvement in the motor skills that is better than the use of the classic method; the effort adaptation capacity is improved better in children using the Tennis 10 method than in the ones using the classic method; the use of the Tennis 10 method determines a motor development level in children that is closer to the RTF standards than the use of the classic method. The **group of research subjects**, aged between 7 and 9, were 56 children (31 boys and 25 girls) and were selected in 2013 from various Bacău schools. They were divided in two groups equal in number: experimental and control.

The research was conducted over a period of 8 months, between October 2, 2013, and May 28, 2014, and the training lessons were planned twice a week (on Monday and on Wednesday), between the 17.00-18.00 hours.

The research methods used were established according to the research objectives, as follows: the bibliographical study method - the theoretical documentation observed the analysis of the somatic-functional development that is specific to primary school age children.

The challenges and the measurements used in this research tried to assess the motor and functional development in children of this age. The analysis and interpretation

of the somatic development constitutes a very important action, because from the evolution of these processes one can deduce if the subject is within normal standards, knowing the changes producing in the body and are specific to sex and age. The measurements taken in different periods, stages, or at the beginning and end of certain activities show the variations in the evolution of each child, highlighting the dynamics of physical growth and development.

This research comprised the following tests and challenges: height, weight, arm span, lower limb length, thoracic perimeter. The **height** is measured in the standing position, with heels, buttocks and shoulders stuck to the stadiometer, chin in the chest so that the upper side of the external auditory conduct and the external angle of the eye to be horizontal; the **weight** is correctly measured with the subject being naked, preferably in the morning, on an empty stomach and bladder; the **arm span**, the span of the arms extended sideways, parallel to the floor, is the distance measured between the tips of the middle fingers; the **lower limb length** is measured from the anterior superior iliac spine to the medial malleolus; the **thoracic perimeter** is measured with a metric measuring tape placed in the back below the lower angle of the shoulder blades and in front below the areola, in men, and at the level where the fourth rib joins the sternum, in women; the values are recorded during rest, forced inspiration and expiration.

The motor challenges were: **speed running** (based on Tudor V.)<sup>2</sup>: the challenge assesses the speed on short distances, of 5 m and 10 m. The athlete starts at the signal and runs 5 or 10 meters at maximum speed. The recording of the running time is done using a timer. The challenge is performed twice, the best time being recorded; **hexagon** (based on Tudor V.)<sup>3</sup>: the challenge evaluates the speed and agility, but also the athlete's ability to start, stop and balance, in a series of very quick movements on short distances, starting and returning from all directions. The hexagon is made of six sides of 61 cm each, with an angle of 120° between them. The athlete must just outside each side of the hexagon and returning immediately each time at the starting point; **coxal-femoral mobility**: the subject stands on a 50 cm tall bench, with the tip of the toes on its edge. A line marked every centimeter is fixed with the marking 50 at the bench surface level, with the smaller markings upwards and the bigger ones downwards. The athlete bends his/her core forwards and his/her tiptoes try to go below the 50 mark of the line. The final position is maintained for three seconds; **core lifting in a supine position with bended knees**: the challenge tries to assess the abdominal muscle strength. In a supine position, soles on the floor and hands on the chest, the athlete must perform for one minute as many core lifts as possible at a 90° angle. The return of the core is performed until the shoulder blades touch the floor; **medicinal ball throwing**: the challenge is performed with a 1 kg medicinal ball and assesses the ball throwing strength using two hands: overhead forwards, forehand, backhand. The challenge is performed twice for each throw, the best result being recorded; **fan-shape** (based on Tudor V.)<sup>4</sup>: the challenge assesses the movement speed that is specific to the game, the coordination, but also the ability to accelerate and break on short distances, in various directions and positions. The athlete must sprint, pick and put down in the starting position each of the five balls, positioned in the court as in the following figure. The movement can be performed facing the running

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<sup>2</sup> Tudor. V., (2013), *Măsurare și evaluare în sport*, Ed. Discobolul, Bucharest, p. 155

<sup>3</sup> Tudor. V., (2013), *Măsurare și evaluare în sport*, Ed. Discobolul, Bucharest, p. 170

<sup>4</sup> Tudor. V., (2013), *Măsurare și evaluare în sport*, Ed. Discobolul, Bucharest, p. 153

direction, both during going and during returning, except during the retreat after picking up ball number 3, when the movements must be performed backing the point where the ball is but down; **side step**: the challenge assesses the movement speed during side stepping, and the ability to stop and change direction. The athlete, at the service line, facing the net, performs a side step run up to the doubles line that he/she touches with his/her foot, side step in the opposite direction up to the doubles line and coming back to the starting point.

**The Ruffier-Dickson test** (based on Cordun M.,)<sup>5</sup>. After a 5-6 minutes break in a sitting position, the pulse is recorded for 15 seconds, which, multiplied by 4 gives the constant P1 (break pulse); then 30 squats are performed in 45 seconds, after which the subject sits again in the initial position; the pulse is measured for 15 seconds between the seconds 0 - 15 post-effort, which multiplied by 4 gives the constant P2 (effort pulse); the subject remains in a sitting position for 1 minute and between the seconds 45 - 60 post-effort the pulse is recorded again for 15 seconds, which multiplied by 4 gives the constant P3 (cool-down pulse). The following formula is applied:  $[(p2-70) + 2(p3-p1)]/10$ .

In regards to the **comparative analysis of the results and progress recorded by the experimental and control groups for the general motor skills (the initial and final tests)**, during the challenge *speed run 5 m*, the experimental group recorded a progress of 0.12 s, while the control group recorded a progress of 0.04 s, indicating that the experimental group has made more progress than the control group by 0.08 s; during the challenge *speed run 10 m*, the experimental group recorded a progress of 0.32 s, while the control group recorded a progress of 0.20 s, indicating that the experimental group has made more progress than the control group by 0.12 s; during the *hexagon* challenge, the experimental group recorded a progress of 3.22 s, while the control group recorded a progress of 2.10 s, indicating that the experimental group has made more progress than the control group by 1.12 s; during the *spine mobility* challenge, the experimental group recorded a progress of 0.39, while the control group recorded a progress of 2.42, indicating that the experimental group has made more progress than the control group by 2.03; during the *core lifting in a supine position with bended knees* challenge, the experimental group recorded a progress of 3.17, while the control group recorded a progress of 1.92, indicating that the experimental group has made more progress than the control group by 1.25; during the *overhead ball throwing using both hands* challenge, the experimental group recorded a progress of 0.62 m, while the control group recorded a progress of 0.10 m, indicating that the experimental group has made more progress than the control group by 0.52 m; during the *backhand ball throwing using both hands* challenge, the experimental group recorded a progress of 0.63 m, while the control group recorded a progress of 0.31 m, indicating that the experimental group has made more progress than the control group by 0.32 m; during the *forehand ball throwing using both hands* challenge, the experimental group recorded a progress of 2.45 m, while the control group recorded a progress of 2.67 m, indicating that the experimental group has made more progress than the control group by 0.22 m.

In regards to the **comparative analysis of the results and progress recorded by the experimental and control groups for the fan-shape and side step challenges (the**

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<sup>5</sup> Cordun Mariana, (2009), *Kinantropometrie*, Ed. CD PRESS, Bucharest, p. 266.

*initial and final tests*), during the *fan-shape* challenge, the experimental group recorded a progress of 3.70 s, while the control group recorded a progress of 3.07 s, indicating that the experimental group has made more progress than the control group by 0.63 s; during the *side step* challenge, the experimental group recorded a progress of 0.44 s, while the control group recorded a progress of 0.31 s, indicating that the experimental group has made more progress than the control group by 0.13 s.

In regards to the *comparative analysis of the results and progress recorded by the experimental and control groups for the Ruffier-Dickson test (the initial and final tests)*, the experimental group recorded a progress of 3.91, while the control group recorded a progress of 2.13, indicating that the experimental group has made more progress than the control group by 1.78.

In regards to the *comparative analysis of the differences between the average values recorded by the experimental and control groups for the general motor skills and the RTF standard*, during the challenge *speed run 5 m*, in the case of the experimental group, there is a difference of 0.3568 in girls and 0.3868 in boys compared to the RTF standard, smaller than the one recorded by the control group, of 0.3907 in girls and 0.4207 in boys, showing that the experimental group had made more progress than the control group; during the challenge *speed run 10 m*, in the case of the experimental group, there is a difference of 0.4007 in girls and 0.4407 in boys compared to the RTF standard, smaller than the one recorded by the control group, of 0.4093 in girls and 0.4493 in boys, showing that the experimental group had made more progress than the control group; during the challenge *hexagon*, in the case of the experimental group, there is a difference of 4.1461 in girls and 4.7461 in boys compared to the RTF standard, smaller than the one recorded by the control group, of 5.1032 in girls and 5.7032 in boys, showing that the experimental group had made more progress than the control group; during the challenge *coxal-femoral mobility*, in the case of the control group, there is a difference of 4.39 compared to the RTF standard, higher than the one recorded by the control group, of 2.14, showing that the control group had made more progress than the experimental group; during the challenge *core lifting in a supine position with bended knees*, in the case of the experimental group, there is a difference of 0.0714 in girls and 6.0714 in boys compared to the RTF standard, smaller than the one recorded by the control group, of 0.5 in girls and 6.5 in boys, showing that the experimental group had made more progress than the control group.

In regards to the *comparative analysis of the differences between the average values recorded by the experimental and control groups for the specific motor skills and the RTF standard*, during the *fan-shape* challenge, in the case of the experimental group, there is a difference of 3.3096 in girls and 4.3096 in boys compared to the RTF standard, smaller than the one recorded by the control group, of 4.4907 in girls and 5.4907 in boys, showing that the experimental group had made more progress than the control group; during the *side step* challenge, in the case of the experimental group, there is a difference of 0.2443 in girls and 0.6443 in boys compared to the RTF standard, smaller than the one recorded by the control group, of 0.3357 in girls and 0.7357 in boys, showing that the experimental group had made more progress than the control group.

### **Conclusions of the experimental research:**

After the somatic assessments (height, weight, arm span, lower limb length, thoracic perimeter during inspiration, forced expiration and rest) that were applied to the two groups, experimental and control, it has been observed that there are differences between the final and initial average values, which highlight the progress of each group compared to the initial testing, the groups evolving from an anthropometric point of view.

After applying the skill tests (5m speed run, 10m speed run, hexagon, mobility, core lifting in a supine position with bended knees, overhead ball throwing using both hands, backhand ball throwing using both hands, forehand ball throwing using both hands), one can observe that the final average values have a positive dynamics, indicating a progress from the initial to the final testing, both for the experimental and the control group, both groups progressing skill-wise.

After testing the motor skills through the fan-shape and side step challenges, one can observe that there is a positive dynamic in regards to the arithmetical means recorded during the final test, compared to the initial one, which shows a progress of the motor skills in the tested subjects of both groups;

After assessing the effort adaptation capacity through the Ruffier-Dickson test, a positive progress has been observed in the final results, compared to the initial ones, which shows an improvement of the effort adaptation capacity in the subjects from both groups;

As a result of the statistical-mathematical analysis, using the t-test for dependent variables, one can say that within the experimental and control groups, the differences between the final and initial phase are statistically significant, the groups being homogeneous;

Following the statistical-mathematical analysis, using the comparative analysis and the t-test for independent variables, one can say that there are significant statistical differences between the average values recorded by the experimental group and the control group, as well as that the experimental method made more progress than the control group in all aspects, anthropometry, skills, motor, and effort adaptation capacity.

### **Conclusions of the general research:**

The modern tennis training demands new methods that would increase the effectiveness and shorten the tennis skills learning time. Such a method is TENNIS 10, which can be applied to children starting with the age of 7, no matter their level of somatic-functional and motor development. Applied during every training session, the TENNIS 10 method can lead to an improvement of the children's somatic-functional and motor skills, more than the classic training can do it. The implementation of this method in the Romanian training system can direct children and young people toward top performance in tennis.

The results of the four investigative endeavors have lead toward the following conclusions: coaches have different opinions regarding the tennis training for the ages 7-10 and the introduction of the tennis 10 training method; the coaches think that TENNIS 10 would be more effective than the classic training method, but not all of them have the courage to implement it; the level of motor development in beginner children is below the RTF standards; during the tests assessing speed on short distances it has been observed that 55.36% and 58.93% of the subjects recorded good results for the 5 m and 10 m speed

challenge; the use over a period of 8 months of the Tennis 10 method determines an increase in the motor development and effort adaptation capacity, a fact emphasized by the charts of the progress recorded by the experimental and control group during the motor tests; the use of the Tennis 10 method determines a motor development level that is closer to the RTF standards than the classic method; the results of this experimental study and their analysis indicate the fact that the level of motor development in beginner children is still below the RTF standards, however the results recorded by the experimental group are closer to the RTF standards than the ones recorded by the control group.

***Suggestions:***

Because more evidence is needed about the immediate and long term effects that the TENNIS 10 method could produce in regards the somatic-functional and motor development, as well as about a more effective learning of tennis, this method should be implemented in the training structure of as many Romanian tennis clubs as possible, and the results should be measured, shared and compared with the results from other clubs that use traditional methods, during special sessions organized locally or nationally, as well as in professional magazines. Also there should be more meetings organized between coaches, during which the TENNIS 10 method should be made known, under a theoretical and practical aspect, its results and effects, so that the coaches' thinking would change, thus allowing the implementation of this method during training.

Other two suggestions could be:

- to create a set of challenges and assessment standards for 7-10 year-old children and to present them to the RTF;
- to create a guide for the use of Tennis 10 in children's training.