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EXPERIMENTAL APPROACH REGARDING INVESTIGATION LEVEL OF GENERAL PHYSICAL TRAINING FOR TENNIS PLAYERS AGED 13 TO 14 YEARS

PANAIT LIVIU[1], DUŢĂ DANIEL[1], NEGREA VALENTIN[1]

Abstract
*Purpose.*Evolution sports performance in general and tennis in particular, has led to a great deal of domain experts to conclude that physical training has an important place in training athletes. Purpose was testing a target group and later to achieve implementation of new principles for achieving general physical training and developing models suscceptibile to be individualized for the main dimensions of the physicl demands with the introduction of novelty in the balance physical training.
*Methods.*Tests were conducted on a group of eight advanced tennis players aged 13-14 years, engaged in the sport performance of 5 to 8 years, using a number of measurements, samples and tests used by the Romanian Tennis Federation.
As results we found that scattering is very high in some tests, because the group is not homogeneous, coefficient of variability values indicating this, but we have many tests that indicate a scattering medium homogeneous or homogeneous group.
*Conclusion.*Specific research effort playing tennis dimensions allows us to conclude that the most important physical qualities are those that are involved with the technical and tactical importance for increasing the efficiency of game players and become operational targets teaching or instructional objectives.
Key words: motor skills, sport performance, evaluation, tennis.

Introduction

Tennis became a sport in which executions of high technical skill levels are not enough to ensure success. Dynamic game of tennis requires a great general physical training, condition for ensuring consistency of performance that must be addressed to somatic features of the body and specific effort. Their variety is found in the actual game on court, and how to adapt and apply them in concrete terms of the game depends on individual characteristics of the players. "(...) From a technical and tactical point of view, good game, nice and valuable, of the big winners is the creation of their unique personalities, some genuine talents who manage to turn any action in virtuoso performance in terms of sports"(Moise, Moise , 1999).
Driving education concept in tennis is given by its presence as one of the main specific objectives of the educational process (Bollettieri,1999). What is of particular interest in terms of methodological knowledge for the game of tennis is the size indices of other driving qualities, what changes they undergo and the relation between them (Cristea, Nastase, 1979). Driving qualities defined by some authors qualities of movements, were studied in human motor capacity analysis. Sport, regardless which, usually requires all four basic motor skills: speed, strength, endurance and skill (Dragnea et. al., 2006), but in different proportions. Coordination, agility, speed and power are considered by most tennis coaches as the most important components that players should focus their training efforts. These are followed by resistance, flexibility, strength, response time and dynamic balance.
Optimizing indexes manifestation of the physical qualities necessary if we want the players to get faster, to withstand long periods of time, be agile to easily execute those "breakings of pace" to reach the ball or surprise opponent by technical and tactical unexpected executions. The only way that can stimulate quality improvements necessary for a player to become better is the subject of strength and power training.
Either they are better trained or have a genetic endowment; top tennis players are becoming more robust and powerful. As a result, the game become faster and can now be said that it is characterized by a marked and permanent aggression in hitting the ball. Base line game became a real battle to win control of the point in order to complete a more advanced position in the field. Without proper physical training, getting in best position to the ball and hitting the ball as you may need cannot be successful.
Current players, the ATP top ranked, are almost perfect athletes with a well illustrated and smooth muscles, with higher indexes of speed, stamina, strength, skills and specific qualities necessary to tennis game.
These superior indexes of driving factors qualities of tennis players, lead to a spectacular sport that delight us for many years now.
Preliminary experimental approach motivation
Strength or fast display of strength is a factor in

[1] "Ovidius" University, Faculty of Physical Education and Sport, Department of Physical Education, Sport and Physical Therapy, Constanta, ROMANIA
E-mail address: li76viu@yahoo.com, dutadaniel_78@yahoo.com, negreavali@yahoo.com

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making quick movements. During training and matches, their duration and environmental factors (temperature, wind and rain) can vary greatly. To overcome these factors, players must improve their strength, so that increased muscle strength of muscle contraction to be able to accelerate growth and rapid performance of an item or technique and at the same time will also increase resistance and mental toughness.

The lack of authentic information on operational strategies focused on continued growth of fitness.

One of the experiences was participating as a coordinator coach at the European Team Championships under 14 years of age, and we concluded that the potential of Romanian players exists, but the difference between us, Romanians, and European tennis great forces is made only at mental level.

Also we are looking forward to implementation of new principles for achieving general fitness training and developing models susceptible to be individualized for the main dimensions of physical demands.

Novelty of the research

This experimental approach is part of the author's forthcoming doctoral thesis entitled "Contributions to optimize general physical preparation (GPP) of tennis players, aged 13-14 years", and that will bring the novelty balanced introduction to physical preparation of tennis players in the operational models future workouts.

Material and Methods

The aim of experimental investigations:

Rethinking and restructuring strategies instruments in accordance with the characteristics and trends of the game played in the most important tennis competitions, promote thinking by objectives in achieving physical training.

Objectives

In this research we aimed to achieve the following major objectives:

• Presenting performance tennis player profile and game design;
• Study of the structure of the game driving and functional applications to identify distinct dimensions of GPP ;
• Establish specific physical playing tennis skills to be educated in the experimental group;
• Establish working group;
• Measuring and testing general physical preparation - initial phase.

Assumptions experimental investigations

1. If we rethink and restructure the physical dimensions as structural benchmarks game model practiced by high performance tennis players aged 13-14, then we can accurately determine training objectives of specific physical training and sports performances increase.
2. Based on a new sports training model will improve the game model and performance tennis player model at the age of 13-14 years.

Target group

In order to verify the level of tennis players motor qualities development we have opted for athletes of School Sports Club - Sports High School Constanta, prepared by Professor Ene Nicusor, coach Daniel Dragu and the author Liviu Panait.

The group is composed of eight tennis players aged 13-14 years, engaged in the business performance of 5-8 years, advanced athletes, who participated in a relatively large number of official competitions.

Methods of investigation used

1. Method of bibliographic information
2. Observation method - observation ITF (International Tennis Federation) sheet

In the organization of this study we have started from the observation sheet of global talented players developed by International Tennis Federation (ITF) that, personally, we have adapted it to the needs of mainstream athletes. This sheet can be used both in the training lessons and test matches and in official competitions. From all ITF adapted observation data, we were interested in physical factors only as shown in Table 1.

Table 1. Athletes observation sheet

Player name: _____Date of birth:_____
Coach name: _____Club or school:_____
Evaluation date: _____
1 = week, 2 = sub average, 3 = average, 4 = good, 5 = excelent

Physical factors (where possible, based on tests)					
Coordination	1	2	3	4	5
Speed reaction	1	2	3	4	5
Speed repetition	1	2	3	4	5
Agility	1	2	3	4	5
Power	1	2	3	4	5
Strenght	1	2	3	4	5
Balance	1	2	3	4	5
Mobility	1	2	3	4	5

Resistance	1	2	3	4	5
Speed (general)	1	2	3	4	5
Speed (tennis specific)	1	2	3	4	5
Throw	1	2	3	4	5
Catch	1	2	3	4	5
Vision	1	2	3	4	5
Total physical evaluation	**1**	**2**	**3**	**4**	**5**

3. Method of control samples and standards

For this method we have chosen a number of measurements, samples and tests used by the Romanian Tennis Federation in evaluating athletes, trials and tests which include:

Vameval test - is a field test that assesses maximal aerobic capacity (VO2max) and maximal aerobic speed (VAM or vVO2max);

Speed (5m, 10m, and 20m) – a test that looks at the travel speed on short distances of 5 m, 10 m and 20 m;

Squat jump (cm) - test seeks to assess explosive strength in the legs. Recorded jump (height) is performed using "OPTOJUMP Next". Starting position is standing with feet shoulder-width apart, knees flexed at 90 ° (to be maintained this position one second before jumping) and hands on hips;

Counter movement jump (cm) - proof follows evaluating explosive elastic power in the legs. Recorded jump is performed using "OPTOJUMP Next". Starting position is standing with feet shoulder-width apart and hands on hips. Athlete is doing a semi-flexible then performs a high jump;

Free jump (cm) - the test aims at assessing the elastic explosive strength in the legs. Recorded jump is performed using "OPTOJUMP Next". Athlete is performing a high jump from standing position, semi-flexible, without requiring a starting position or other movement. Hands can help to execute a jump as high as athlete can;

60" plyometric (cm) - test seeks to assess the resistance force of the legs. Athlete must carry for 1 minute as many jumps bound (free jump). Recorded jump is performed using "OPTOJUMP Next" and calculates total power and maintain or decrease power rate throughout the minute it takes to sample;

Right hand strength (kg) and left hand strength (kg) – both tests are aiming to assess muscle strength in the hands with dynamometer;

Abdomen strength (rep) - test seeks to assess abdominal muscle strength. Lying on the ground with the feet bended but still on the ground, and hands on the chest, the athlete needs to perform during one minute, as many lifting of the torso to an angle of 90 °. The return of the trunk is carried out until the shoulders hit the ground;

Reaction time (sec) – the test uses TReactionCO program to measure simple and complex reaction time, using a software and a suitable keyboard. At the end of each test, the program displays the results and calculates the arithmetic mean, maximum and minimum value;

Hexagon (sec) - test seeks to assess speed and agility, and the ability of the athlete to start, stop and balance in a series of very fast moves on short distances, starting and comeback in all directions of travel. The hexagon is made of six sides of 61 cm and an angle of 120 ° between them. The athlete has to jump outside each side of the hexagon and return immediately, every time at start point;

Speed endurance 6 x 20 + 20m (%) - test 6 x 20 + 20 meters, is a field test easy to apply and interpret, which aims to evaluate the anaerobic lactacid capacity. Materials needed: roulette, chalk, and clock. Measure and design two lines at a distance of 20 meters. Athletes have to be equipped with appropriate footwear field (hard or clay) which shall be identified, so that the adhesion to the ground to be optimal. Run the test: after a specific heating prior athlete must complete the race distance of 20 m, roundtrip. This is repeated six times, pause between repetitions is 20″;

Added step (sec) - test aims at assessing the added step movement speed and the ability to stop and change direction. Athlete is starting from the middle of the base line, facing the net, running a race with added step to the line corridor that reaches with the foot and then as fast as possible with same added steps to the opposite lane line and return to the starting point;

Fan (sec) - trial aims to evaluate specific travel speed of tennis game, coordination and the ability to accelerate and stop, in different directions and positions. The athlete must sprint to gather and sit at a starting point, each of the five balls on the land;

Back mobility (cm) - from standing with feet together and peaks at the edge test device (digital avant flexometre), the athlete achieves a maximum forward bending of the spine to maintain this position for three seconds;

Right shoulder mobility (degrees) and left shoulder mobility (degrees) - starting position for this tests: athlete supine with the upper limb in abduction to 90° (the whole test) on the arm forearm flexion to 90°, elbow support outside surface. Action: athlete running internal and external rotation of the shoulder, shoulder blade remaining attached to the supporting surface. Is measured using the goniometer, cumulative, the entire range of motion. The amplitude of motion can be assessed as follows: 160 ° - 170 ° very well, 150 ° - 160 ° good, below 150 ° insufficient;

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Forward throw (m) - trial runs with 3 kg medicine ball and aims at assessing the strength of throwing the ball with two hands overhead;
Forehand (m) and backhand (m) – test trial runs with 3 kg medicine ball and watches the ball roll force evaluation with two hands: from both sides of the body (forehand and backhand).

4. Method of analysis and interpretation of results
Tests values recorded population survey was characterized by estimating central tendency, embodied in statistical parameters as mean and standard deviation, given by the expression M±DS. Then the coefficient of variability was calculated and noted with CV%.

Hypothesys
If we rethink and restructure the physical dimensions as structural benchmarks game model practiced by high performance tennis players aged 13 to 14 years, then we can accurately determine training objectives specific physical training and sports performances increase.
Based on a new sports training model we will improve the game model and model performance tennis player at the age of 13-14 years.

Results

Note that all tests were given on the same day and were ultimately very tiring. As shown in Table 2, scattering is very high in some tests because the group is not homogeneous, coefficient of variation values indicating this, but we have many tests that indicate a scattering medium homogeneous or homogeneous group. Thus, the first test of the experimental group recorded a mean M±DS = 13.50±1.603 km / h, the sample was quite difficult, athletes must run in conditions where you have to be careful at the beep tone and the space that allows continue running. The results of coefficient of variation for speed test (sprint) of 5m, 10m, and 20m, show that they are a homogenous group - a great variability.
For jumping test we can observe coefficients of variability indicating a very good homogeneity as CMJ test with CV% = 9.875, and samples with good homogeneity like SQJ with CV% = 13.512, FJ with CV% = 14.734, or 60"plyometric with CV% = 12.945. Strength tests show that athletes are less homogeneous which indicates less attention in the preparation of training in these skills driving. Note that test abdomen group is characterized by the coefficient of variation to be very weak.In the specific speed tests AS and F, those with changes of direction, the experiment group succeeds very good homogeneity values. Back mobility test shows some figures on which to reflect. An average M ± SD = 1.412 ±1.016 and a CV% = 71.954 reveals a very low cohesiveness.
Last tests (AI, FH, BK), the throw tests, reveals a weak muscle training at arms and uniformity of the group is very poor.

Table 2. Initial Testing

Masculine subjects n=8

Tests (unit)	**M±DS**	**CV %**
Vameval test (km/h)	13,500±1,603	11,874
Speed 5 m (sec)	1,242±0,027	2,173
Speed 10 m (sec)	2,120±0,057	2,688
Speed 20 m (sec)	3,618±0,201	5,555
Squat jump (cm)	24,325±3,287	13,512
Counter movement jump (cm)	25,650±2,533	9,875
Free jump (cm)	31,375±4,623	14,734
60" plyometric (cm)	18,563±2,403	12,945
Right hand strength (kg)	30,960±6,208	20,051
Left hand strength (kg)	28,125±7,518	26,730
Abdomen strength (rep)	44,500±17,151	38,541
Reaction time (sec)	447,25±38,358	8,576
Hexagon (sec)	10,462±2,321	22,185
Speed endurance 6 x 20 + 20m (%)	4,025±0,339	8,422
Added step (sec)	6,948±0,440	6,332
Fan (sec)	18,676±0,778	4,165
Back mobility (cm)	1,412±1,016	71,954
Right shoulder mobility (degrees)	114,875±6,577	5,725
Left shoulder mobility (degrees)	11,750±11,949	10,692
Forward throw (m)	5,375±1,505	28,000
Forehand (m)	7,475±1,777	23,772
Backhand (m)	6,975±1,682	24,114

M, average; DS, standard deviation; CV, variability coefficient; n, number of subjects.

Discussion

Currently the sport of tennis practiced by the most valuable athletes in the world is identified with a number of features and development trends to be known and put into practice especially at the right time. This paper is justified because of genuine information on operational strategies focused on continued growth and performance capacity in the absence of authentic instruments measuring general physical training objective parameters. Another point of view is that this paper is justified by the fact that puts in discussion the essential dimensions of general physical training specific to technical and tactical actions that guarantee performance of players playing at the same time, and provides objective measurement tools for this dimensions.

In this study, sprint abilities were found to be good predictors of tennis performance. These results are in good agreement with previous findings on advanced prepubescent male tennis players (13–14 years old), which indicated that physical performance tests in this group of young athletes do predict their ability to play tennis at a competitive level (Girard, Millet, 2009). In the same study, Girard and Millet (2009), found greater values for vertical power ability (CMJ) than in this study which indicated that physical performance tests in this group of young athletes may not predict their ability to play tennis at a competitive level, or it may be a possible source of injuries. For the VO2max, Girard et al. (2006) reported that peak VO2max was higher during an intermittent racket test compared with an incremental test performed on a treadmill like in this study, probably due to the involvement of upper body muscles required for the simulated ball hitting action. All other specific effort dimensions will be taken in discussion in future studies.

Conclusions

After making bibliography synthesis and preliminary study conducted to identify general driving skills of the game of tennis, and then tested the initial experiment group, we have established the following conclusions:

1. Research of specific effort dimensions used in the game of tennis allows us to conclude that the most important physical qualities are those that are involved during technical and tactical game actions for increasing players efficiency in the game. According to these new findings these are: starting speed, speed over short distances (5-20 m), agility and speed coordination, endurance explosive effort, explosive legs power with and without arm help, explosive arm force and medicinal ball speed in flight of the ball from standing position throw, cardio respiratory capacity, strength of segments (abdomen, legs, arms), joint mobility (back, right shoulder, left shoulder).

2. All these physical qualities mentioned above can become didactic targets or operational instructional objectives. These objectives observable and measurable entail setting of element content, instructional strategies and assessment tools of quality and efficient training process. In turn these content and instruction nal strategies can be converted into training programs to ensure instructional objectives set.

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