

STUDY ON IMPROVEMENT OF EDUCATION OF THE BALANCE METHOD IN TENNIS

A. MOSOI¹ C. BARNA²
B. GUGU-GRAMMATOPOL³

Abstract: *The preparing process of the biggest champions became a scientific activity, of a complex variety. The balance education is one of the major preoccupations of the coach for improving the tennis game. We propose in this study that by using psychomotor counseling we detect the adequate and personalized method of equilibrium education in tennis, as a result of testing with a measurement instrument which uses visual feedback in real time. The testing was conducted on the equilibrium platform, and the final results were verified by the athletic performance obtained at the national tennis championship. After the experiment, the athlete which made the object of our study, improved her personal results and rose in national rankings from position 23 to position 14.*

Key words: *dynamic balance, tennis, body posture, movement.*

1. Introduction

Tennis is a sport of continuous movement, where dynamic balance is required. It is important that the coach observes if the player maintains a straight line, from the head down. This will allow a high balanced status during a point. When a top player is in the most difficult situation, his concern is to maintain a balanced position of the body, to play a good hit. The center of gravity is described as the point in which the body is the most

balanced. During a tennis point, the center of gravity of a player can move in different points. The body lies, the player loses its balance, slowing the movements and preventing the achievement of other movements. Research in tennis competitions has shown that loss of balance while hitting the ball is the cause of 80% of all errors [4]. Balance training has become important in achieving specific-area training targets by the player. It mustn't be neglected, but seen just as important as technical aspects and physical

¹ Drd. University of Psychology and Education Sciences of Bukarest.

² Dep. of Theory and Individual Sports, *Transilvania* University of Braşov.

³ Dep. of Gymnastics & Dance, Kapodistrian University of Athens.

and psychological indicators. Optimum balance in striking the ball will bring efficiency in hits and a higher level of the play, that can lead to the desired performance.

2. Manifestation of balance in tennis

Balance is the capacity to maintain the stability, the permanent status, which can be static or dynamic. Alexe D. describes the balance: *“like a basic condition of the humans, for the initiation, continuation and the movement control which involves a high precision of the move of each segment of the body”*. [1]. After Bompa T. *“during the training, the athlete react to various stimulus of which one of them are more predictable than the others. The information is collected from the training process, and it has a physiological, biochemical, social psychological, and methodological nature.* [2]. One of the most important aspects in becoming a good tennis is being in the right position for hitting the ball. The way the body works and the strikes work are two different areas. The body has its own direction, responsibility and obligation, while the strike has its own purpose. The two sides must act independently. Balance is the ability of humans to understand and control their spatial body position. Body posture is controlled by control sensitive-sensory systems: vestibular-cochlear, taste, visual, feel and self-receptive. [4].

Other authors speak of balance in terms of central stability. Elliot B. said *“central stability is about someone able to maintain dynamic control of their position depending on movement functional tasks. Central muscles encapsulate the lumbar, pelvic, and hip regions and operates synergy in the kinetic chain and plays an important role in producing/ reducing force, as well as supplying stability during functional movements.”* [3].

The principle of balance action, according to body position [5].

Area of action 1: head and neck vertebrae (cervical vertebrae), to the 5th thoracic vertebra.

Area of action 2: 5th -12th thoracic vertebrae, down to the lower part of the spine and hips: lumbar vertebrae, sacrum and coccyx bone

Area of action 3: lower spine and lower limbs.

Area of action 4: shoulders, scapula, upper limbs.

The parts, although mentioned separately, work as a functional unit. The muscle chain that assures hitting movement contains muscles that balance the scapula sideways. These muscles are part of the scapular belt and the humerus adductor muscles, elbow extensors, fingers and carpal flexors. [6]. The coordinated movement of each muscle as part of the biomechanical chain is important in obtaining quality movement. Like in the most sportive moves, tennis moves start from easy to hard. Running, throwing and jumping, are basic parts in tennis and should be learned and practiced during the career of a player by different means, in order to provide the best results throughout a game.

Area of action 3 (lower spine and limbs) pay an essential role. The energy produced in this area is usually transferred to an upper-body zone. Correct training for this area is very important because this muscle group is the energy core for many tennis-specific moves.

Balance training has become important in achieving specific-area training targets by the player. It mustn't be neglected, but seen just as important as technical aspects and physical and psychological indicators [7]. Optimum balance in striking the ball will bring efficiency in hits and a higher level of the play, that can lead to the desired performance.

3. The aim of the research

This experiment aims to detect the education method of balance in the tennis game with a measuring instrument that uses visual feedback in real time.

Experiment objective

Improving the balance of the game, using real-time visual feedback stimulus type.

Research hypotheses

We believe that the results of performance in tennis can be improved by educating balance using visual feedback in real time.

Material and methods

- Balance platform with strain gauges, made in the laboratory of biomotricity of the Faculty of Sports of Transilvania University of Brasov, under the license of Onlinesolution SRL
- The results obtained in the national championship.

Experimental subject and venue

- athlete: C.S. 16 years old, national ranking: 23th place (before experiment):
- balance measurement was performed in the laboratory of biomotricity of the Faculty of Physical Education and Mountain Sports, of Transilvania University of Brasov
- Drills were conducted on the tennis field of Brasov's Dinamo Sports Club.

Experiment description

The purpose is evaluating tennis balance with a real-time feedback-providing instrument. Testing balance control aptitudes was done using a strain gauges, created at the University of Transilvania in Brasov, under Onlinesolution S.R.L. license.

This system called "Balance Platform" is used to offer visual feedback of static and dynamic movement balance. The system uses a force measuring platform and specific software that indicates the distribution of static weight and active weight transfer. Testing one's balance with eyes both open and shut allows the evaluation of performance in assuring body posture and identification of the system responsible for the balance distribution. We present in the below image the platform balance.

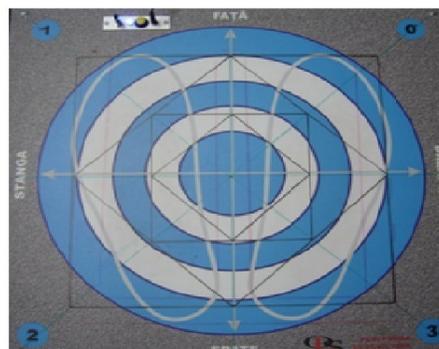


Fig.1. Platform Balance

The subject is put on the platform, in the standing position, assuring that the center of weight is centered, to eliminate eventual eccentric settlement.

The test starts by showing a cross-shaped marks on the screen above the platform's virtual center. When the subject is ready, execution commences and a light spot shows up which marks their weigh-center position.

There are 4 work observation phases, 20 seconds each:

- pause, viewing an outer point (wall)
- the moment of the fixating on the point
- losing contact with the balance point in the screen
- maintaining a certain point on the screen, leading the subject back to equilibrium (balance)

4. Results

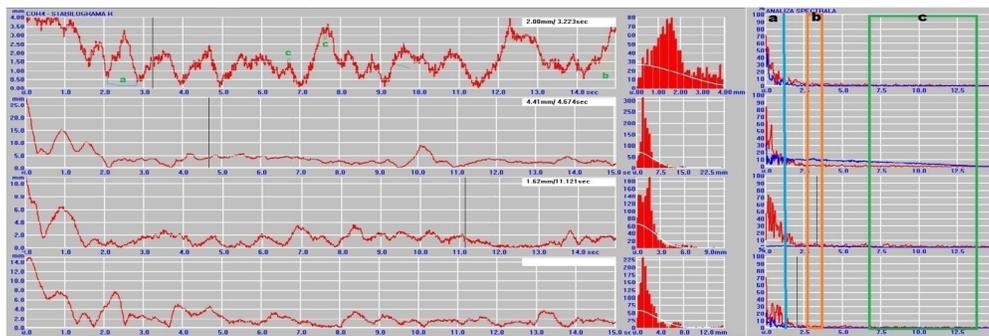


Fig.2. *Stabilograma balance measurements and spectral analysis*

The graphic shows stabilizing time. To better understand the graphs (each phase has one graph), we have a spectral analysis in the right side, which is broken down in 3 components:

- long variation (1 sec) – conscious time source (blue)
- reaction-limit variation (200 m) (orange)
- short variation (100 ms) (green)

The interpretation of results:

- when the athlete has a visual feedback, the approach of tasks is made step by step
- every new situation is perceived with a high level of anxiety(see the fourth and fifty graphics)
- in the same time with getting used to the situation, the level of balance improves

- persons learn rapidly but they do not become stable
- for adjust the self-reception, it uses the visual feedback.

After this research it can be said that the sportive's level of balance is given by the sportive perception about information. An important role in achieving dynamic balance control is visual feedback, because the subject constantly gets info about the body centre of gravity, according to the platforms virtual centre. Judging from the researches, in part where it existed one stimulus, the sportive ended the task with good performances, but if there existed two stimulus or more, the level of balance was affected because of body feedback absence.

Final results

After training to educate psychomotor balance method visual feedback in real time, results have improved athlete by winning the 9th position in the Romanian Tennis Federation rankings, namely the date of the test, the athlete ranked in the top 23, and after carrying out our experiment occupies 14th place.

5. Conclusions

1. Enlightenment the dynamic balance to the tennis player, depending on the type of learning (visual or proprioceptive), can guide the player towards new forms of expression and adaptation to new situations.
2. Training and measuring the balance on the platform must be seen as an additional mean of preparation, an extremely important part of great performance.
3. In our experiment, testing the platform on balance, good results were obtained when the sport was given visual feedback to the task to which he was subjected. Based on this information, the athlete has trained as recommended, the results have improved considerably.
4. Any new situation on the body, brings stress and the resolution differences of this type of stress is given by the every person's ability of adaptation in a new situation.
5. The immediate feedback is very useful for the trainings improvement, for models of repetitive movements in different sports.
6. Even if every athlete moves in a certain way compared to the other sportive, taking into account the flexibility, the

force, the training mode, there can take place a performance improvement based on a repetitive training, with a correspondent feedback, taking into consideration the sportive's necessities, which means a personalized training.

7. The simulation training must be seen as an additional preparation, an extremely important aspect of high performance.

Recommendations in training of the athlete:

- Training must be done with visual stimulus
- Use colored milestones as benchmarcks
- Mark the impact areas using different colors

Suggestions

As a result of increased efficiency of information and transfer of useful information in real time, we recommend using the platform to measure and balance training on balance tennis players.

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