THE INFLUENCE OF SPECIFIC TRAINING OF A TENNIS PLAYER ON THE MGM PARAMETERS

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Abstract:

The paper presents the influence of a personalized training on the energetic and control parameters of a junior female tennis player. The energetic and control parameters are determined using the MGM platform. The collected date revealed improvements of some parameters, but also decreases in other parameters

Keywords: energetic parameters, control parameters, MGM test

1. Introduction

The coaches and athletes have searched and are still looking for information that may lead to the development and exploitation of the individual potential, in order to achieve the best performance in sport.

In order to optimize the performance in sport it is important to survey the control and energetic parameters and to choose the proper training program that will ensure their improvement.

Together with the control and energetic parameters, it is important to survey some psychological parameters, such as:

- The concentration ability during competition and before the competitional stage;
- The motivation;
- The emotional balance;
- The self confidence;
- The self improvement;
- The competitiveness spirit.

Due to the fact that each sport has its own specific, it is important to realize that a tennis player might lose all his mental and energetical resources, because there is no time limit in such competitions and the effort dosage is hard to achieve.

2. Tests for tennis player's psiho-motric assessment

The psiho-motric assessment of a tennis player is very important for an objective analysis and for conducting a proper training customized for each athlete. It is also of maximum importance to take into account the age, the sex and the personality of each tennis player.

Many tests had tried to reveal the psiho-motric abilities and to measure the talent in tennis. Lacourse and Young (1995) have developed tests that assess the physical skills, the coordination, the agility, which have been completed with psychological tests in order to find a way to express the talent in tennis.

The neuromuscular control was the subject of many studies conducted by Ivancevic (2011), Catanescu (2009). They have tried to elaborate a mathematical model for the neuromuscular control, in order to express it more accurate, neglecting the qualitative aspect and taking into account only the quantitative one.

Carlested (2007) has used sensors that transmit instantaneously the information to computers, in order to point out the factors that are influencing the tennis player.

3. The MGM testing description

The MGM test consists of carrying out of three series of 15 vertical jumps, with the attainment of maximum height and a minimum time of ground contact (Mereuta, 2010). The vertical jumps are carried out on both feet, on the right leg and on the left, while a computer collects data from a special

carpet which has pressure sensors. The energetic parameters are shown in table 1, together with their significance.

Table 1 Energetic parameters

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Average unit power (UP)	$PU = \frac{\frac{g}{8} \cdot \sum_{i=1}^{10} Ta_i^2}{\sum_{i=1}^{10} (Ta_i + Ts_i)}$	The average unit power (PU) or the jumps on both legs, on the right and the left leg, offers information about the conditional training, about the force - velocity as motrical qualities, measuring the power ratio to body mass.
Average flying height (FH)		The average flying height (FH) provides information on the force
Repetition rate (V_rep)		The repetition rate (V_rep) provides information on the velocity, mainly the force-velocity ratio.

T_{ai} is the flying time for the jump "i", T_{si} is the contact ground time for the jump "i".

The control parameters provide information about the quality of the flying phase control or about the quality of the body's preparation phase for the ground contact. The control parameters are shown in table 2, together with their significance.

Table 2 – Control parameters

s		
Energy variation coefficient (EVC)	$EVC = \frac{StDev(Ta_i)}{\frac{\sum_{i=1}^{10} Ta_i}{10}} \cdot 100$	EVC provides information about the control state of the energy resources during unspecific motion.
Structural variation coefficient (SVC)	$SVC = \frac{StDev(Ts_i)}{\frac{\sum_{i=1}^{10} Ts_i}{10}} \cdot 100$	SVC provides information about the athlete's capacity of controlling the ground contact.

T_{ai} is the flying time for the jump "i", T_{si} is the contact ground time for the jump "i".

In the experiment attended a junior female tennis player, of 10 years old, with parental agreement on test. The protocol has been explained to the tennis player and she was tested in two situations. The first test aims to establish the initial state of preparation. Then, she has been subject to a specific training, and at the end of it was again tested to assess progress.

4. The training program

The initial test revealed that there is an imbalance in preparation, with excess of speed and lack of force. The energy asymmetry showed improved quality for the right leg, with percentage differences 12.98 %. After initial testing, a customized training program has been implemented. That training program included 3 customized programs per week for 4 weeks (table 3), as follows:

Table 3 – Customized training programs

Program no.1	The fundamental part of the training: - 50 m slope running, medium intensity, pause – walk to the place of departure - 10 times, - 5 x 30m, maximum intensity, 3 minutes rest.
Program no.2	The fundamental part of the training: - 15m running on the stairs – 5 times; - 5-speed jumps on the left foot; - 80m launched running – 10 times.
Program no.3	The fundamental part of the training:

- 5 x 50m leap steps running;
- 5 x 100m knees up running;
- 5 x 50 m leap steps running;
- 5 x 100m launched running.

5. Results and discussions

After the training period, the female tennis player was tested again, and the results are shown in table 4.

Table 4 – MGM energetical and control parameters

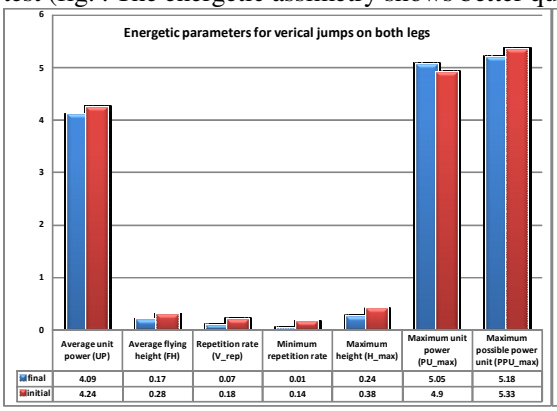
	final	initial	final	initial	final	initial
Average unit power (UP)	4.09	4.24	2.31	2.38	2.27	2.69
Average flying height (FH)	0.17	0.28	0.06	0.13	0.06	0.16
Repetition rate (V_rep)	0.07	0.18	0.08	0.23	0.09	0.23
Minimum repetition rate	0.01	0.14	0.01	0.21	0.01	0.19
Maximum height (H_max)	0.24	0.38	0.12	0.18	0.13	0.21
Maximum unit power (PU_max)	5.05	4.9	3.4	2.96	3.66	3.15
Maximum possible power unit (PPU_max)	5.18	5.33	3.62	2.99	3.74	3.41
Energy variation coefficient (EVC)	49.51	92.01	66.44	108.83	78.61	103.16
Structural variation coefficient (SVC)	7.83	15.72	10.36	7.86	6.97	14.84

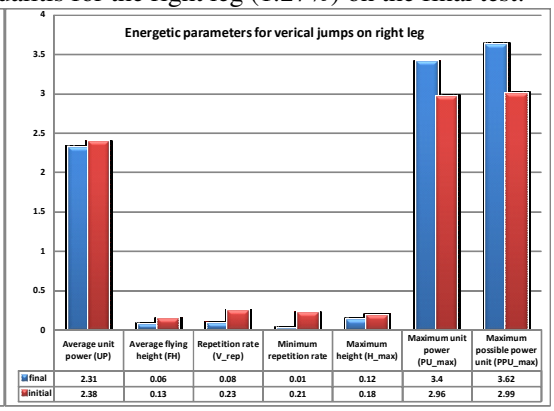
We have noticed that the maximum height is degreasing for all vertical jumps, while the maximum unit power is increasing for all jumps (fig.1). It is noticeable that the average flying height is 73.68% of maximum height for the vertical jumps ob both legs, 72.22% of the maximum height on right leg and 76.19% of the maximum height on left leg, at the final test.

The maximum possible unit power is increasing for vertical jumps on right and left leg, but decreasing for vertical jumps on both legs.

The repetition rate provides information on the effort highlighting how quickly the excitation and inhibition processes of nerve cells are succeeding, on the one hand and the processes of contraction and relaxation of muscles, on the other hand. The average value of the parameter values reveals poor velocity abilities, for initial and final test, with a small improvement at the final test, after the customized training.

The average unit power and the average flying height are decreasing, but the force velocity ratio (-0,5) reveals a small unbalance in training, with excess velocity and lack of force (of 12.27%), for the final test (fig. . The energetic assimetry shows better qualitis for the right leg (1.27%) on the final test.





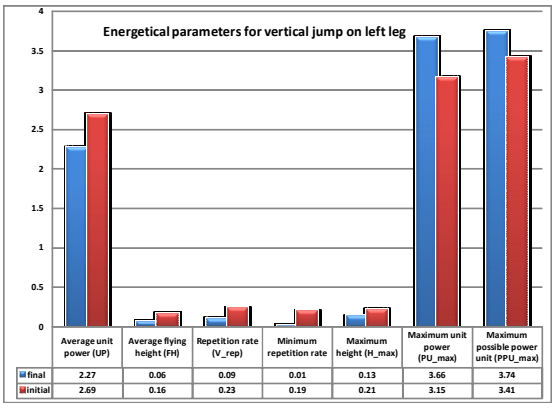


Fig.1 Energetic parameters

The energy variation coefficient (EVC) provides information about the ability of controlling the energy resources, emphasizing automation movements in the sense of control over the phases of completion of movements at high speeds. The energy variation coefficient is increasing for all vertical jumps (fig. 2)

The structural variation coefficient (SVC) refers to the ability to control the ground contact preparation, the contact with the opponent, with the ball, and the preparation and catching the launched objects. High values of the parameter, over optimum from literature (3-3.5) for all jumping reveal a lack of control of the female tennis player during ground contact, which can be extended to other types of contacts: with tennis ball, with opponent. The athlete does not anticipate the contact phases; does not catch well, it's rigid, and is dropping objects. A better behavior is registered for the left leg (fig.2).

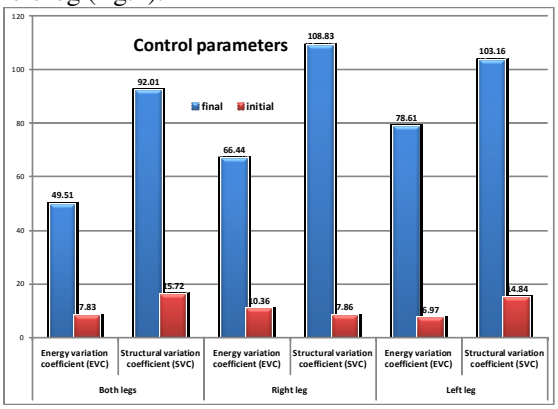


Fig. 2 Control parameters

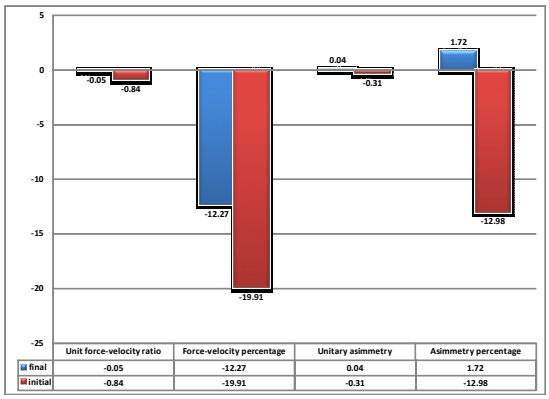


Fig.3. Power asymmetries

6. Conclusions

The MGM test revealed that the training process must be customized in order to improve some motrical abilities of an athlete. Even if not all parameters have been improved for the female tennis player, further training programs might do for other parameters.

For the young female tennis player we didn't get better results, but important is the fact that she has improved her's relative parameters, with respect to maximum values, for the final test.

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