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TENNIS RACKET STRING TENSION AND ITS DURABILITY. CASE STUDY

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ABSTRACT. In junior tennis, the objectives and the content of training for 15-16 year old players is, according to Doboşi & Baciu (2004), mainly oriented towards elements like physical development, the increase of effort capacity of the body in submaximal and maximal efforts, development of specific skills of the limbs and hit involved segments, the improvement of preparation mechanisms for the main technical elements or the improvement of the tactical content of the main technical elements. This research is aiming a secondary aspect of junior tennis, and that is the identification and monitoring of the tennis racket's characteristics while using different stringing tensions. Our attention was oriented towards a characteristic of tennis, and that is the financial cost of practicing this sport: coach, trainer, court, equipment and so on.

Keywords: sports, tennis, junior, strings, tension, durability.

REZUMAT. ***Studiu de caz. Tensiunea cordajului rachetei de tenis şi durabilitatea acestuia.*** În tenisul de câmp practicat la nivelul juniorilor de 15-16 ani, obiectivele şi conţinutul pregătirii pe factorii antrenamentului, conform Doboşi & Baciu (2004), au ca direcţii dezvoltarea fizică armonioasă, creşterea capacităţii de efort a organismului la eforturi submaximale şi maximale, dezvoltarea la parametri superiori a îndemânării specifice la nivelul segmentelor de primă importanţă pentru deplasarea şi lovirea mingii, perfecţionarea mecanismelor de preparaţie a procedeelor tehnice sau perfecţionarea la parametrii crescuţi de eficienţă a conţinutului tactic al procedeelor tehnice de bază. Am acordat o atenţie specială unui aspect secundar al performanţei în tenisul de câmp, această cercetare îndreptându-se spre identificarea şi monitorizarea caracteristicilor rachetei de tenis odată cu variaţia tensiunii cordajului. În plus, am vizat şi o caracteristică importantă a tenisului de câmp şi anume costurile ridicate ale practicării acestui sport: antrenor, teren de joc, echipament.

Cuvinte-cheie: sport, tenis, junior, cordaj, tensiune, durabilitate.

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Introduction

This article is a starting point to a more comprehensive and complex research, linked to the tennis equipment with a specific orientation of tennis rackets, cordage types, the variations of tensions that can be used and also the variations of the connection.

As a starting point, in our research in tennis, we made a case study oriented to the identification and the monitoring characteristics of the tennis racket with the tension variation of the cordage (Table 1). In addition, we targeted a characteristic of tennis the high costs of playing this game: coach, tennis courts, equipment.

In an interview from 2009, Andrei Novăceanu, the general manager of Babolat Romania affirms: „Stringing is very important, it is the factor that can influence the performance of the racket. The tension is also important, because every type of stringing has got certain characteristics: there are very flexible stringings (multifilament) which offer strength and comfort, and there are rigid or inflexible stringings (monofilament) produced from polymers, which give durability. The tension of a racket influences, again, all the characteristics of the stringing. A softly stringed racket offers speed and comfort, but there is no control. A hard connected racket doesn't offer speed, but it offers control. In this situation, we have the lack of comfort due to the fact that the vibrations of the stringing with the impact of the ball are transmitted to the frame, further reaching the joints of the player, and creating health issues and discomfort" (Open Tennis, 2009).

Table 1. Stringing types and their characteristics

Diameter stringing	Elasticity	Durability	Spin	Feel	Comfort
Thin	+	-	+	+	+
Thick	-	+	-	-	-

Professional tennis players Dacian Craciun and Gabriel Moraru who have spoken in the same interview, mentioned above said the followings:

D.C. (308 ATP): „I'm changing the tension according to the balls, temperature and altitude. I have got many rackets in my termobag, with different tensions. In Bucharest, usually, I am playing with a tension of 27 kg. Anyway, I break a string during almost every game" (Open Tennis, 2009).

G.M. (264 ATP): „I have got a 300 pieces contract each year... I never use them. I use one per day. If I do not break them, I cut them. I like to have my stringing „fresh". I like my stringing to be rigid, so-called „wiry" at 22-20/23-21,

so quite soft. At competitions, I do it every day. I have got rackets with „normal" tension and 1 or 2 rockets with other tensions in my termobag. If I know there will be a rainy weather, I prepare my rackets to be softer, if there will be very hot, I use a harder stringing, 24-25. At Quito (Ecuador's capital, situated at 2.850 m high, n. r.), I had my racket's stringing at 30. I've never had a tension like that, even though I had to pay attention not to hit the ball over the wall" (Open Tennis, 2009).

Hypotheses (or Objectives)

Our intension was to identify how the player perceives the tension modification of the rocket's stringing. We presumed that a bigger tension of the rocket's stringing (26 kg) will reduce the number of the player's mistakes, the length of the balls sent by the player will decrease, which is not good in every situation. Regarding less tensioned stringing (22 kg), we were expecting to have bigger length of the hits, higher speed of the ball, and also a bigger number of unforced mistakes. We were expecting that the player will consider the medium tensioned stringing to be the most comfortable and the most suitable for the player's adaptation to the requirements of the game, from the efficiency point of view.

We were also interested in the durability of the stringing, in the approximate number of hits that the wire resists until it breaks. We hypothesized that tension can influence the lasting of this component.

Materials and Methods

For this study, we used three Head GrapheneXT MPA rockets, which we stringed with Pro's Pro, Synthetic 130 stringing, 130 with three different tensions (22kg, 24kg and 26kg).

During the experiment, our subject (N. G., 15 years old) participated at a strength measuring squeezing test, at the upper right arm, and after that during the training sessions the number of the approximate hits were registered using the three tennis rockets involved in the experiment. In order to determine the intensity of the effort, the heart rate of the subject was monitored.

Results

We calculated that a basket with 60 balls runs out in 2' 30'' (2 minutes and 30 seconds) while playing, in average the gathering of the balls takes about 4' 30'', so the whole cycle takes at about 7'. There are 480 hit balls in one training hour.

Regarding to the isolated game, we mention that the heart rate of the subject was at the average of 164 beats per minute (BPM) at the end of the effort, and after the active break, representing the gathering of the balls, the heart rate was 124 BPM, thus, it results an incomplete recovery.

While exchanging the balls („tied game") we estimated a number of 960 beats/ hour of game, we measured a 172 BPM medium heart rate, and a medium heart rate of 128 BPM after passive breaks of 5'.

Table 2. Advantages and disadvantages of stringing types

Tension stringing	Strength	Control	Durability	Feel	Comfort
Soft	+	-	+	+	+
Medium	-	+	/	-	+
Tensioned	-	+	-	-	-

During the servings, we approximated 200 hits/ hour. The strength of the subject's skilful arm was of 85 kg. The stringed rocket with 22 kg tension resisted approximately at 2190 hits, the one stringed with a tension of 24 kg resisted at approximately 1915 hits, while the rocket stringed with 26 kg resisted at approximately 1500 hits. While playing, the player was questioned about the control, comfort and the „feeling" of the rocket and the efficiency factors of the subject's hits were empirically evaluated.

Table 2 presents the advantages and disadvantages of every stringing tension type.

Conclusions

By analysing the results, we can conclude that the main myths regarding the durability and the efficiency of the rockets depending on the used tension were confirmed. In future studies, we will approach other factors which can influence the durability of the stringing and the quality of the game: the environmental temperature, the type of the used strings, the type of the stringing, the atmospheric pressure, the speed of execution of the hits, the printed effects on the balls, the physical strength of other parts of the body involved in hitting the ball, etc.

Linked to the possible financial economy, we can say that in the case of a sportsman who plays over 30-40 hours/month, a sensible economy can be made by using a less tensioned stringing, in the disfavour of a tensioned one with the price of the controlled ball being perceived by the player as weaker.

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