ELONGATION PROPERTIES OF TENNIS STRINGS

FOR TENNIS PLAYERS THE BASIS OF CONSISTENT PERFORMANCE DEPENDS ON THE ELONGATION PROPERTIES OF THE RACQUET STRINGS.

HERE WE ASSESS THE PERFORMANCE OF TENNIS STRINGS ON THE BASIS OF THEIR ELONGATION PROPERTIES.

A test procedure has been developed (Ref 1) which for each type of racquet string, identifies three types of elongation that affect playing performance. The test involves tensioning the string to 44 lbs (an arbitrary minimum string tension), increasing the tension to 66 lbs (an arbitrary maximum string tension) and finally to 88 lbs, which again is an arbitrary tension the strings may be subjected to by ball contact.

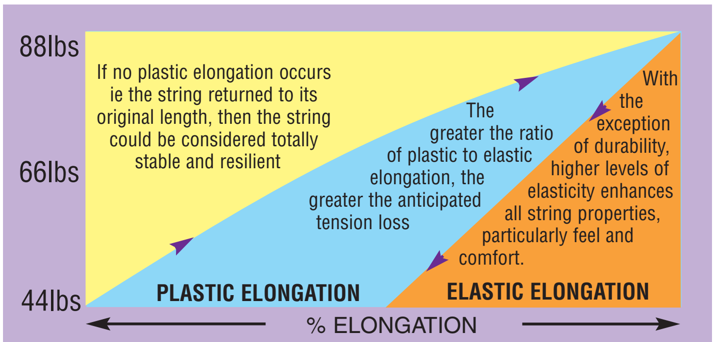

FIGURE 1: Outline of new test

When the tension is eased back to 44 lbs, three types of elongation are clearly identified (Fig 1), namely:

- TOTAL ELONGATION BETWEEN 44 AND 88 lbs.
- PLASTIC ELONGATION OR PERMANENT STRETCH THAT HAS OCCURRED.
- REMAINING ELASTIC ELONGATION AFTER THE STRING HAS BEEN TENSIONED.

The ***higher*** the elastic elongation, the greater the feel and comfort felt by the player. The ***lower*** the elastic elongation, the stiffer the string will be, thereby feeling less responsive to the player. The higher the ratio of elastic to plastic elongation, the lower the tension loss will be incurred to the string during play. Conversely, the lower the ratio of elastic to plastic elongation, the higher the tension loss will be incurred.

As it has been scientifically proved that NEITHER STRING MATERIAL, STRING CONSTRUCTION NOR STRING TENSION (Ref 2) HAVE A SIGNIFICANT EFFECT ON THE POWER with which the ball can be launched from the racquet face, it becomes obvious that the two most important string properties are 'feel' and 'resistance' to tension loss (ie string stability).

Ball power is dependent upon racquet weight, frame stiffness and swing weight combined with the player's strength and playing technique and it is only in extreme cases such as when a very light and stiff racquet is used, with very stiff strings, that a marginal effect on power will be noticeable.

String durability, being the amount of playing time before string breakage, as opposed to string stability, increases with the use of stiffer strings because they move less and thus notch less. Also, the lower the coefficient of friction of the string surface, the greater the durability.

It has also been scientifically established what all top players have always known (Ref 3), that string tension determines the angle of the ball launched from the string bed, and this is the basis around which every player should build his stroke reproduction, ie constant response.

Therefore, it follows that if loss of string tension occurs during play, the angle of ball trajectory will also change and playing consistency will be affected.

For example, consider low to high baseline groundstrokes played with the same mid plus racquet strung at 60 lbs and then 50 lbs giving a launch angle of 10^{o} and 6^{o} respectively (Figs 2 and 3) it is apparent that the higher launch angle achieved with 60 lbs tension not only provides a greater margin of safety for the ball to clear the net but also gives more opportunity to impart top spin for control.

The angle of ball launch is of less significance when the ball is hit above net height, eg serve, high volleys and high bouncing baseline balls.

Similarly, string tension is also less significant for those strokes played with an open racquet face, eg slice, as the player can open or close the racquet face slightly to compensate for the angle of ball launch.

What is vitally important however, is that the string tension of the racquet around which the player has built his game, is maintained at that level during play until either breakage occurs or the racquet is changed before unacceptable tension loss occurs.

There are four main types of tennis racquet strings universally used, ie Natural Gut, Polyester, Aramid and Composite Reinforced Nylon and the elongation properties for a wide range of commerically available types are shown on Page 4.

On Page 5, the predicted performance is compared to established products.

Ref 1: Private correspondence F. Timmer, Stringway, Holland
Ref 2: USRSA Publication 'Racquet Tech' Sept 2000. Professors R. Cross and H. Brody, Universities of Sydney and Pennsylvania respectively
Ref 3: USRA publication 'Racquet Tech' Sept 2000