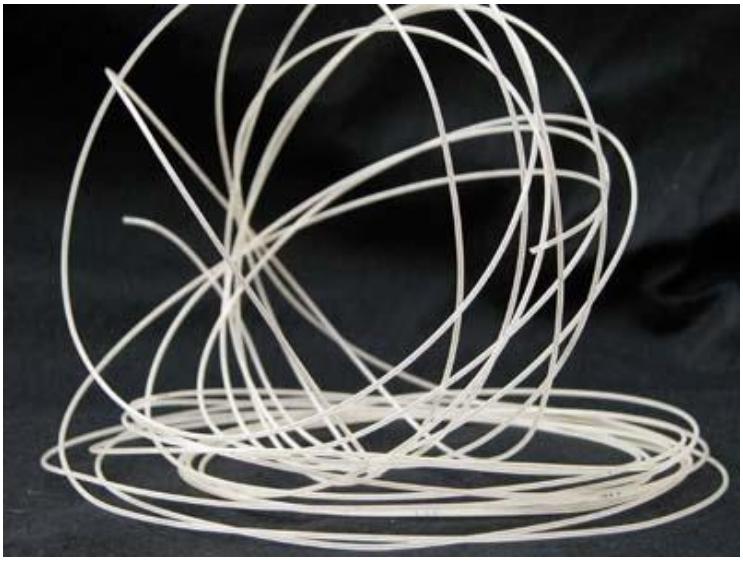
STRINGS

Although players may focus on getting the best racket frame they can, it will rarely make contact with the ball. It's the interlaced pattern of string that does that, and so it plays an important role (albeit in combination with the racket frame) in determining the outcome of the shot.

During a typical shot, the strings impact the ball with such force that both deform extensively, yet within 5 milliseconds (5 thousandths of a second) the strings have recovered their original shape and the ball has left the strings (the ball continues to vibrate for a short time afterwards).



Although the ball is made of rubber, it loses a lot of energy that is put into it during collision with the strings (you can see the principle of energy loss by letting a ball drop onto a surface and noting that it doesn't bounce up to its original height – the difference between drop height and rebound height represents the energy lost).

Tennis strings return much more energy (around 90-95%), which explains why the accepted principle is that looser strings generate faster shots. By loosening the strings, they deform more and store more energy (and so less is stored in the ball).

That means that less energy is lost during impact and the ball leaves the strings faster.

Modern strings are made from a variety of materials, each of which has different properties. Natural gut is the most elastic (i.e. will stretch the most for a given load) of these, while Kevlar is the stiffest of the most commonly-available strings.

Nylon and polyester strings' stiffness lies between those of gut and Kevlar. Strings are also available in a range of diameters (or gauge), from 19 (thinnest – 1.00-1.10 mm) to 15 (thickest – 1.41-1.50 mm), with half-sizes carrying the suffix 'L'.

Most players string their rackets at tensions of 23-32 kgf (50-70 lbs). This is greater than was possible in wood rackets, which were prone to warping under the load. It is the stiffness of the string bed rather than the actual string tension that is important.

For any string tension, string bed stiffness varies inversely with racket frame size. This is because the same load applied perpendicular to the string will deflect a longer string more, and it is this deflection that determines string bed stiffness.

Strings tend to lose tension over time, and so rackets need to be re-strung if the original playing properties are to be retained. Players may notice an increase in power over time as the string bed stiffness decreases.

In addition to performance, the choice of strings may be based on several factors, including durability and cost. From a scientific perspective, stiffer strings will generate larger impact forces (as the strings deflect less in absorbing the momentum of the ball).