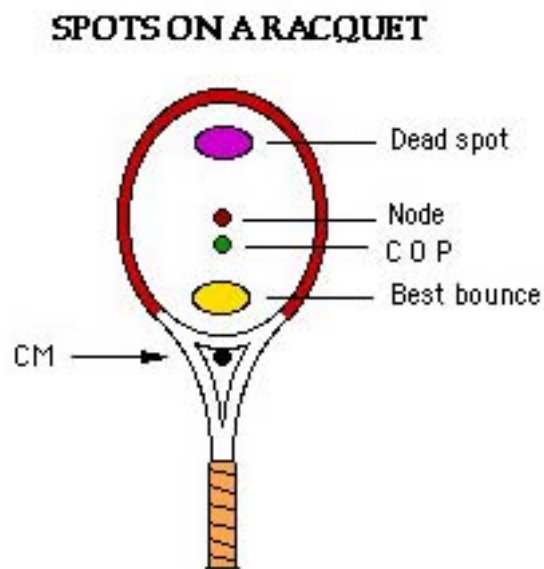


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Word count: 422

“What are the sweet spots on a tennis racquet  
and how they affect the height of a bounced  
ball?”

On the face of the tennis racquet, there are several points that are important to players; these are the center of percussion, and the vibration node and the sweet spot. All the cases, in a way, refer or are the sweet spot.

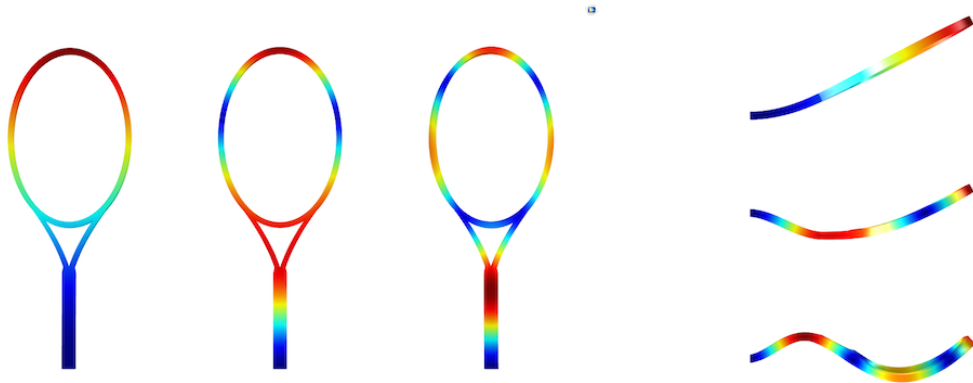


### **Sweet Spot:**

If a ball impacts at the sweet spot, the force transmitted to the hand is sufficiently small that the player is almost unaware that the impact has occurred.. The sweet spot is a vibration node, located near the center of the strings. Another potential sweet spot is the center of percussion (COP).

### **Vibration Node:**

The vibrations nodes are defined as the points that never move when a wave is passing through them. Because of a wave created by the impact of a ball hitting a racket, the racket will, in turn, begin to oscillate and vibrate. This is show in the model below:

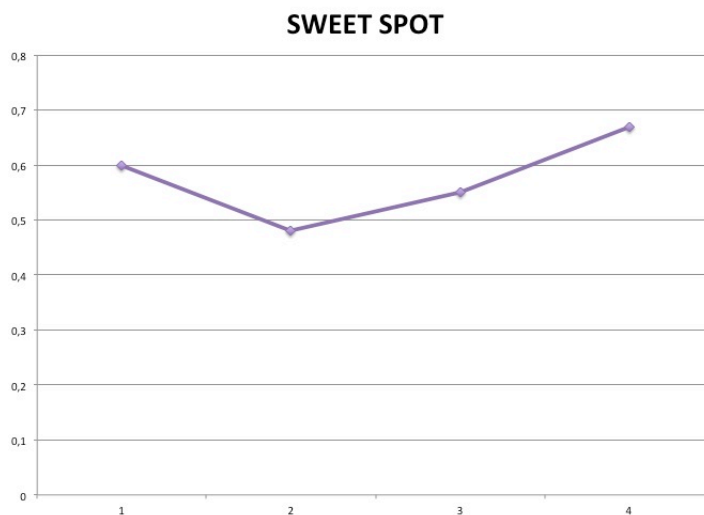


The primary vibration node cannot be the sweet spot as it is located at the grip. The second vibration mode, meanwhile, has two spots: one at the grip and one on the strings close to the frame head. The second one is considered the sweet spot. Any player that hits the ball at this point will feel almost no vibration during impact.

### Center of Percussion:

The other sweet spot is called the center of percussion (COP). The two forces are equal and opposite for an impact at the COP, with the result that there is then no net force on the hand or forearm. This means that there is no sudden jarring of the arm for an impact at the COP.

### Experiment:



**Error:**

As it is possible to observe, there is a range of error in this experiment. This is due for diverse reasons. First, the strength in which the ball was thrown was not exactly the same in all the cases. Furthermore, measuring the height of a ball does not a precise answer. Also, the ball used was not new, which also impacts on the height it bounces back. Finally, the location in which the ball hit the racquet was not exactly the same in all cases.

**Conclusion:**

After this experiment it is possible to conclude that the sweet spot generates the biggest height for a ball when it bounces in the racquet. However, it is not ensured that the location will give the strongest speed. Last but not least, all the factors that interfered in the calculation of the height of the ball also harmed the efficiency and reliability of the research made.

<http://www.physics.usyd.edu.au/~cross/tennis.html>

<https://www.comsol.com/blogs/the-physics-of-tennis-racket-sweet-spots/>