

# BACK SCATTER

## The ingredients for an unbeatable squash shot

In four-walled racket sports such as squash, one type of shot reigns supreme: the nick. It occurs when a player hits the 4-centimeter ball to the right-angled spot where the wall of the court meets the floor. Instead of ricocheting off the surfaces in a way that allows the opposing player to potentially return it, the ball hits the wall and the floor nearly simultaneously and then simply rolls along the floor. The player who pulls off the nick shot is guaranteed to win the point.

A group led by Roberto Zenit at Brown University in Providence, Rhode Island, used a pressurized-air cannon and a high-speed camera to investigate the mechanics of the nick shot. The researchers captured footage of the shot under varying conditions, including different ball types, speeds, and temperatures. As the image illustrates, the unique shot occurs when the ball hits the wall ever so slightly above where it meets the floor. (Successive frames in the image were captured 1 millisecond apart.)

With those observational data, Zenit and his team constructed a mathematical model of the nick shot. They determined that the key to the shot is the slight downward roll of the ball that occurs after it hits the wall and deforms. If the ball is still rolling along the wall when it collides with the floor, that new contact point induces a torque that cancels out the roll and brings the ball's vertical velocity to zero. But because the ball still has energy stored from its deformation, it decompresses and rebounds from the wall solely in the horizontal direction.

Zenit and his team say that along with helping squash players achieve the nick shot more easily—a warm ball is best, and players should fully extend their arm when swinging—their modeling of the shot could lead to better designs for shock-absorbing dampers. (M. Ravisankar et al., *Proc. Natl. Acad. Sci. USA* **122**, e2505715122, 2025; image courtesy of the Zenit Research Lab/Brown University.) —RD

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