

Do Players With High Swing Speeds Get an Extra Boost?

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One opinion often accepted as conventional wisdom is that modern golf balls used on the PGA Tour give an unfair distance advantage to players with very high swing speeds. The thinking is that golfers with very fast swing speeds (for example, 115+ mph) have gained a disproportionate amount of distance because modern golf balls only get "activated" when they're compressed at very high swing speeds. Another belief is that ball aerodynamics also result in disproportionately greater distance increase for those with very fast swing speeds.

Let's look at the physics, laboratory test results, and the actual PGA Tour driving distance results, to see what the *facts* really are.

What the Science Says:

In short, there is no extra distance "bonus" for high swing speeds. This is true for balls used on the PGA TOUR, and all others as well. In fact, distance does not even increase in a straight line (see **Figure 1**): there are diminishing returns at higher swing speeds - just the opposite of the popular misconception. To be sure, hitting the ball faster means it goes longer; it's just that you don't get quite as much bang-for-the-buck at the highest speeds.

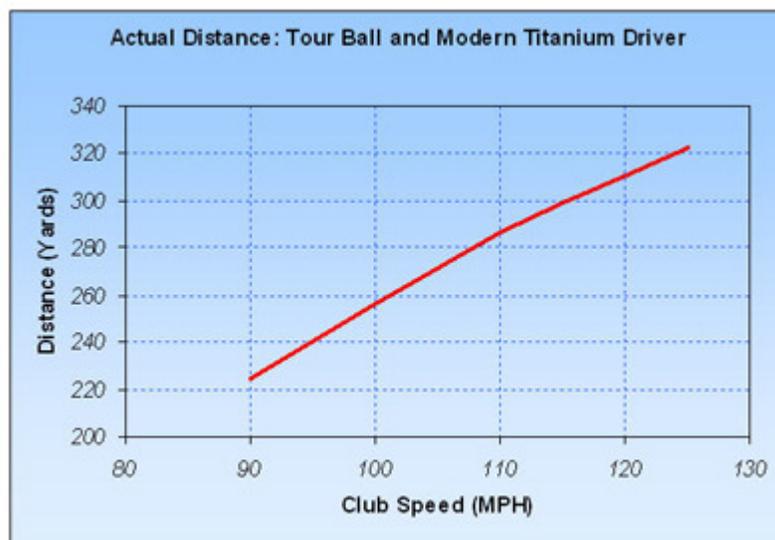


Figure 1

Why is that? Examining this, let's dispel the myth that balls only compress at Tiger Woods' speeds. In **Figure 3**, we see a golf ball (used extensively on the PGA TOUR as of this writing) hit at 89 MPH on the left, and at 120 MPH on the right. To be sure, the ball struck at 120 MPH does compress *more*, but the difference is nearly not as dramatic as folk wisdom seems to suggest.

Moreover, when a ball compress more, it actually becomes *less* efficient. To show this, the USGA tested the "coefficient of restitution" or COR (which measures how efficiently impact energy gets turned into ball speed) at speeds from 90 MPH (typical for a male amateur golfer) to well over 120 MPH (the fastest-swing PGA TOUR player averages less than 125).

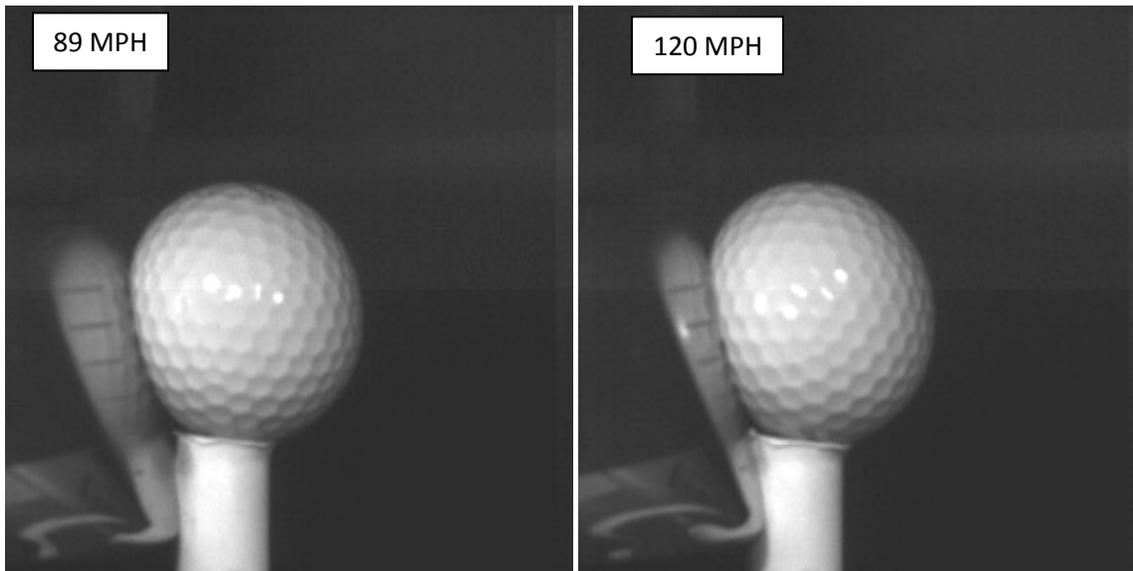
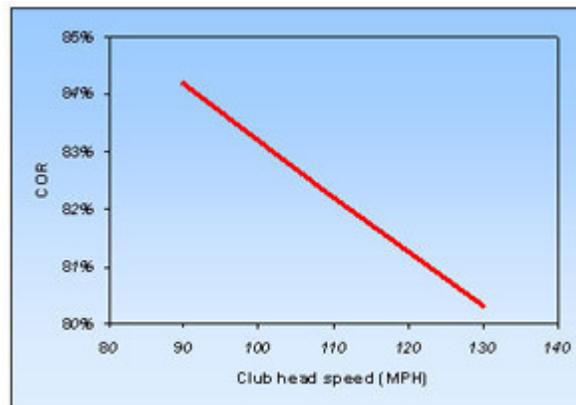


Figure 2

The result is that the COR for golf balls goes down as clubhead speed goes up (see Figure 3). Tests have proven repeatedly that the energy “boost” at tour-level speeds is a myth: balls are actually *less* effective at translating energy into distance at higher swing speeds.



COR: Tour ball, Modern Titanium Driver

Figure 3

After the ball leaves the club face, the combination of speed and trajectory angle, along with two aerodynamic forces - "lift" (which keeps the ball in the air) and "drag" (which slows the ball down) determines how far the ball will go.

The USGA has tested the aerodynamic properties of several *thousand* golf balls, including all models currently used on the PGA TOUR up to ball speeds more than 195 MPH. As scientists predict, both of these aerodynamic forces on the golf ball rise significantly with ball speed. Positive lift force, which makes the ball 'fly' increases with ball speed, though there is a limit to how much is helpful; too much makes the ball balloon. Unfortunately, drag force also increases dramatically with ball speed; drag is the enemy of ball distance, *especially* for golfers with fast swings.

All together, this explains why there are the diminishing returns with additional club speed seen in **Figure 1**.

What the Stats Say:

So, here's a question: regardless of what the science says *should* happen, what actually *has* happened on the PGA Tour?

Let's consider a couple of snapshots in time: In 2000, the most common ball used on Tour was a high-spinning wound ball based on technology that was decades old. By 2005 Tour players had entirely replaced the wound ball with the advanced multipiece "solid" balls used today. So, how did this change affect TOUR players with different swing speeds?

To answer the question, let's look at the one hundred TOUR players who were on the TOUR in both 2000 and 2005 (before and after the changeover to modern balls) and whose average driving distance was recorded in both 2000 and 2005 (courtesy: PGA TOUR website). For these players, the average distance increase was 11.6 yards. Now, if it was true that these new, high-tech balls were benefiting the longer hitters the most, we would obviously expect to see that they had the biggest distance increase. However, as the chart clearly shows, this just wasn't true.

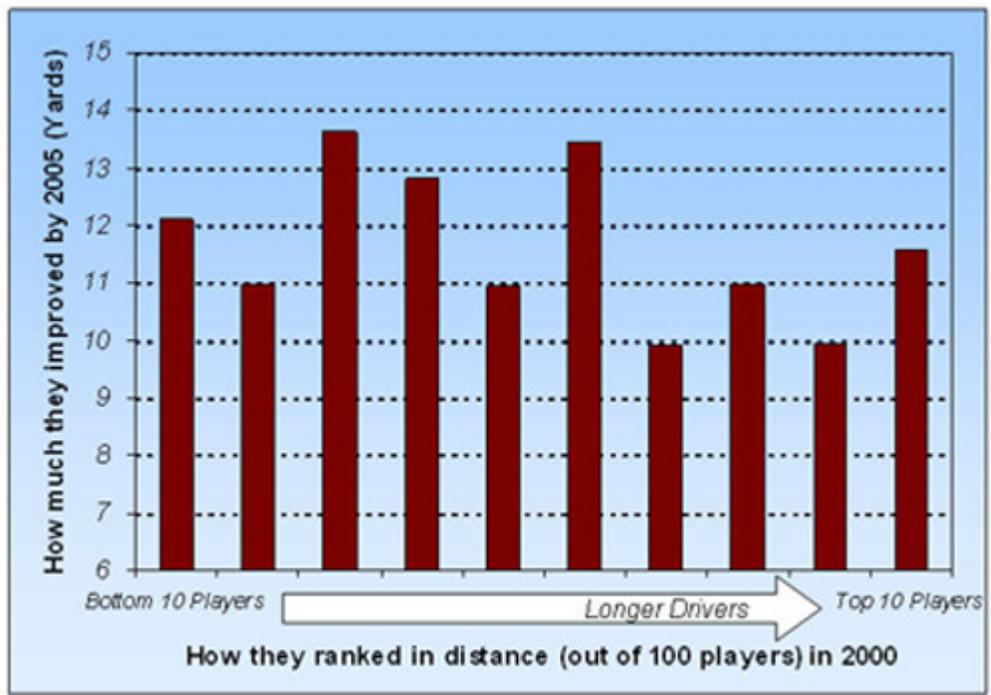


Figure 4

In **Figure 4**, we see how players ranked in distance back in 2000 (in groups of 10, so the ten shortest players are at the left, the ten longest at the right): the heights of the bars show how much they increased their distance. In fact, the longest players (in 2000) did *not* gain the most distance over that five-year period.

Note that in the time since 2005, average drive distance on the PGA TOUR has remained steady. In fact, in 2010 it was slightly less (287.3 yards) than in 2005 (288.4 yards).

Summing it all up: the physics, the experiments, and the actual distances from the PGA TOUR agree: the balls used on the TOUR today *do not* give an extra distance "boost" to the players with higher swing speeds.