
Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, technical proofs (TP), and all past articles are available online at billiards.colostate.edu. Reference numbers used in the articles help you locate the resources on the website.

I recently posted a series of YouTube videos ([NV L.6](#), [NV L.8](#), and [NV L.10](#)) that bust many myths and misconceptions concerning the performance of soft and hard tips (see **Image 1**). In this column, I summarize the main points from the videos. First, here are some basic facts concerning tip hardness effects, all justified on the “[cue tip hardness effects](#)” resource page at billiards.colostate.edu:

- A hard tip lasts longer and holds its shape better over time, in general.
- Tip hardness (within the typical range) should not have a direct effect on the amount of spin that can be applied.
- The amount of spin is limited by the tip offset that creates a miscue.
- A soft tip will give the cue stick a softer “feel” (less impact in grip hand) and have a different sound than a hard tip. Some people prefer some sounds and “feels” more than others.
- Tip hardness (in a typical range) has no practical effect on cue ball (CB) deflection (squirt).
- Soft tips can become harder with use.
- A softer tip tends to hold chalk better than a harder tip (especially a phenolic tip), so if one does not chalk properly or carefully, a soft tip might offer an advantage.
- Because a softer tip compresses more during a hit, a softer tip will leave bigger chalk marks on the CB, which can cause more-frequent cling/skid/kick (bad hits).
- The shorter a tip is cut (or worn down with use and shaping), the harder it will play.
- If a tip is not scuffed (either with a tool or with frequent chalking with a traditional abrasive chalk), it will not hold chalk very well, and miscues will be more likely. A harder tip might require more attention in this regard.
- A harder tip has a slightly better hit efficiency (energy transfer) than a softer tip. This will result in slightly more CB speed for a given stroke speed. This can provide a slight advantage for draw shots, where, where slightly more CB speed will retain slightly more backspin on the way to the object ball (OB).
- If you play in a league that does not allow jump cues, having a harder tip on your playing cue will make it easier to jump the ball (especially if the cue is light).
- If a soft tip is also dense and heavy, it will create more CB deflection.

The biggest myth busted by the video series is:

MYTH: A softer tip can put more spin on the cue ball!

As I clearly demonstrate in the videos, this myth is simply false!



[Image 1](#) Tip Hardness Video Series

A softer tip does have less hit efficiency (i.e., more cue speed is required to get the same CB speed) and a different feel/sound (a softer tip typically dampens the impact a little and the force of the hit isn't felt as strongly); but when the CB is hit with a given tip offset, and the CB is given the desired speed, there is no difference in spin between a soft and hard tip. The quality of spin (i.e., the spin-speed ratio) delivered to the CB depends only on the tip contact-point offset from center. The physics of this is very clear. If anybody doubts this, they should do a careful and objective experiment (like in my videos) to compare any tips they think would produce different results. For those who have math and physics backgrounds and are interested, the physics showing how the spin-to-speed ratio depends only on tip offset from center, even when accounting for tip efficiency, can be found in online technical proof [TP A.30](#). For a given tip offset from center, the force between the tip and CB imparts both speed (translation) and spin (rotation) by the same proportion at all cue speeds and for all tip types (although, both the CB speed and spin will be slightly less at the same proportion for softer tips due to the slightly lower hit efficiency or energy transfer).

For a given stroke, because a softer tip will deliver slightly less speed to the CB, slightly more backspin will wear off on the way to the OB with a draw shot and more sidespin will wear off on the way to the cushion with a sidespin shot (especially on slow and sticky cloth with slower shot speed). These effects might make it seem like a softer tip is applying less spin to the CB. On the other hand, if the CB is struck at or below center, where the CB slides over the cloth, drag action effectively intensifies sidespin, in which case a softer tip might seem to be applying more spin to the CB. But again, when doing tip comparisons with equal CB speeds, there is no difference in the amount of spin that is imparted for a given tip offset.

Some people think that because a soft tip stays in contact with the CB slightly longer, a soft tip can apply more spin. However, it is more likely that a hard tip has a better chance to impart more spin (for a given CB speed). During contact, the tip stays on the CB as the ball rotates some, so the final tip offset as the tip leaves the ball is slightly larger than when the tip first hits the ball. A softer tip, with the longer contact time, will be farther off center at the end than a harder tip with the same starting offset. If both tips can only hold to a certain point of offset (at the miscue limit), and you start your shot so the miscue point is barely reached at the end of contact, the average offset and resulting amount of spin will be larger for the harder tip; although, the difference is too small to be important over a typical tip hardness range. A "late" or "partial" miscue occurs when the tip contacts the CB inside the miscue limit but goes outside the miscue limit during the ride on the ball during contact. An example of this occurred during the testing of the soft tip at the 9:35 point in [NV L.6](#).

Contact time is still extremely small with both a soft and hard tip: close to a thousandth of a second (0.001 s). Assuming the CB speed is the same in all comparisons, even though the peak force will be different (more with the shorter contact time), the amount of momentum (linear and angular) transferred to the CB will still be the same (because the "impulse" or integral of force over contact time is the same in both cases). Because the CB doesn't move much (translation or spin) during the extremely small contact time, the only significant factor is the tip contact point at impact.

It is possible that a hard tip, especially if it is not holding chalk very well, will have a miscue limit closer to the center than a soft tip that is holding chalk well. However, if you chalk properly before every shot, and keep the tip properly maintained, there should be no difference in the miscue limit for soft vs. hard tips. A soft tip does compress more on the CB, creating a larger contact patch on the ball, but this would provide a benefit only if the tip is not chalked well. In other words, if a harder tip is not holding chalk well or is not chalked properly, the smaller contact patch could increase the chances for the contact patch to slip during the hit. But for a given shot, a smaller contact patch will result in larger contact pressure (force per area) over the smaller area, which could help the chalk particles dig into the tip and CB surfaces better.

Psychology also plays an important role. If one thinks a hard tip can't hit as far out on the ball (even if it can), one might tend to hit with less tip offset from center, which will result in less spin. The mind is a powerful thing. Also, people tend to believe what they want to believe, regardless of facts or logical reasoning; so if somebody really wants to believe that a softer tip applies more spin, that is what they will believe.

Here's the **bottom line**: Based on the info and videos on the "[cue tip hardness effects](#)" resource page at billiards.colostate.edu, it doesn't really matter much what tip hardness you choose. If you think your choice is the best for you, and you like the way it sounds or "feels," you will probably play better with it. Although, in general, a hard tip does offer slight advantages. A typical hard playing-cue tip (but not a break cue phenolic tip) can apply as much (if not more) spin than a soft tip. If you still don't believe me, watch online videos [NV L.6](#), [NV L.8](#), and [NV L.10](#) for clear demonstrations and visual proof.

Good luck with your game,
Dr. Dave



[NV L.6](#) – Cue Tip Contact Myth-Busting Truths in Super Slow Motion
[NV L.8](#) – Can a SOFTER TIP Put MORE SPIN on the Ball? — MYTHBUSTING Answers
[NV L.10](#) – A Fun CHALLENGE DRILL to Test Your DRAW QUALITY ... and SOFT VS. HARD TIP Comparison



[TP A.30](#) – The effects of cue tip offset, cue weight, and cue speed on cue ball speed and spin

PS:

- I know other authors and I tend to use lots of terminology, and I know not all readers are totally familiar with these terms. If you ever come across a word or phrase you do not fully understand, please refer to the [online glossary](#) at billiards.colostate.edu.

Dr. Dave is a PBI Master Instructor, Dean of the Billiard University, and author of the book: [The Illustrated Principles of Pool and Billiards](#) and numerous instructional DVD series, all available at: DrDaveBilliards.com.