David Alciatore ("Dr. Dave") **ILLUSTRATED PRINCIPLES**

"Throw – Part X: the big picture"

***Note**: Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, and technical proofs (TP) can be accessed and viewed online at **billiards.colostate.edu**. The reference numbers used in the article help you locate the resources on the website. If you have a slow or inconvenient Internet connection, you might want to view the resources from a CD-ROM or DVD. See the website for details.*

This is the tenth article in my series dealing with "throw" and English effects. So far, I've looked at basic terminology, examples of where throw can help you or hurt you in game situations, the effects of cut angle and speed, the effects of follow and draw, spin-induced throw, the difference between inside and outside English, the combination of spin- and cut-induced throw effects, and spin transfer. If you want to refer back to any of my past articles, they are all available on my website (**billiards.colostate.edu**). To refresh your memory, **throw** is change in the object ball direction due to sideways forces between the **cue ball (CB)** and **object ball (OB)** during impact. **NV 4.15, 4.16, 7.5, and 7.6** show examples of both **cut-induced throw** (**CIT**) and **spin-induced throw** (**SIT**). See the video demos and previous articles for more information.


normal video

NV 4.15 – Using throw to make a partially blocked shot
NV 4.16 – Over-cutting a cut shot to compensate for throw
NV 7.5 – Frozen ball throw
NV 7.6 – Frozen cue-ball throw

This month I want to step back a little from the throw focus a little and look at the "bigger picture" concerning English. **Diagram 1** illustrates all of the effects that come into play when using English (sidespin). When you strike the cue ball (CB) off center, the CB *squirts* away from the aiming line (see **NV 4.13** and **NV A.17**). In other words, it doesn't go where the stick is aiming. The amount of squirt varies a lot with the amount of tip offset from center and a little with shot speed. The CB also *swerves* (curves) on its way to the OB (see **NV 4.14** and **NV 7.12**). The amount of swerve depends on cue stick elevation, shot speed, and distance between the CB and object ball (OB). Finally, the OB gets *thrown* off the impact line (AKA "line of centers") on its way to the target (see **NV 4.15**, **NV 4.16**, and **NV A.21**). As we have seen in the last nine articles, the amount of throw varies with cut angle, speed, top/bottom spin, and the amount and type of English. If you don't compensate your aim for squirt, swerve, and throw when playing pool (either consciously or sub-consciously), you will never be a great player.

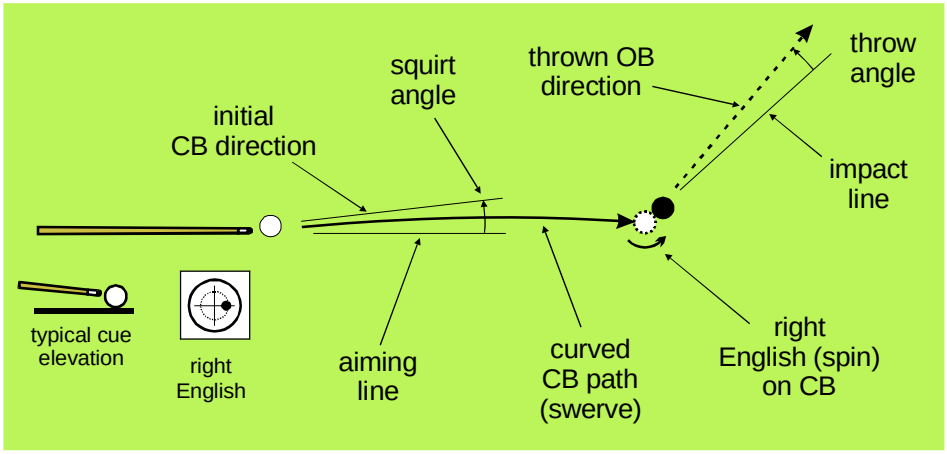

Diagram 1 English effects


normal video

NV 4.13 – Squirt due to high speed English
NV 4.14 – English curve due to an elevated cue
NV 4.15 – Using throw to make a partially blocked shot
NV 4.16 – Over-cutting a cut shot to compensate for throw
NV 7.12 – Small-curve massé shot
NV A.17 – English deflection (squirt) vs. speed
NV A.21 – Bank shot using throw and spin transfer

Fortunately, the amount of squirt for a given cue stick is fairly predictable for most shots. Also, there are some aiming techniques you can use to help compensate your aim for squirt. The most widely known is called *back-band English (BHE)*, also known as the "aim and pivot" method. **Diagram 2** shows how the method works. First, **Diagram 2a** shows what happens if you don't compensate for squirt ... the CB doesn't go where the cue stick is aiming. To correct for this, you can first aim the shot by lining up the tip at the center of the CB (see **Diagram 2b**). Then you pivot the cue stick on your bridge the amount necessary to achieve the desired amount of English. If the bridge pivot point is in the right place for the given cue stick and amount of tip offset, the amount of pivot can exactly cancel the amount of squirt, and the CB will head in the desired direction (see **Diagram 2c**). That's the good news. The bad news is that every cue stick has a different natural pivot point. Also, the required pivot point location might not be at a comfortable bridge length for you, and the point might not be in the exact same place for every type of shot.

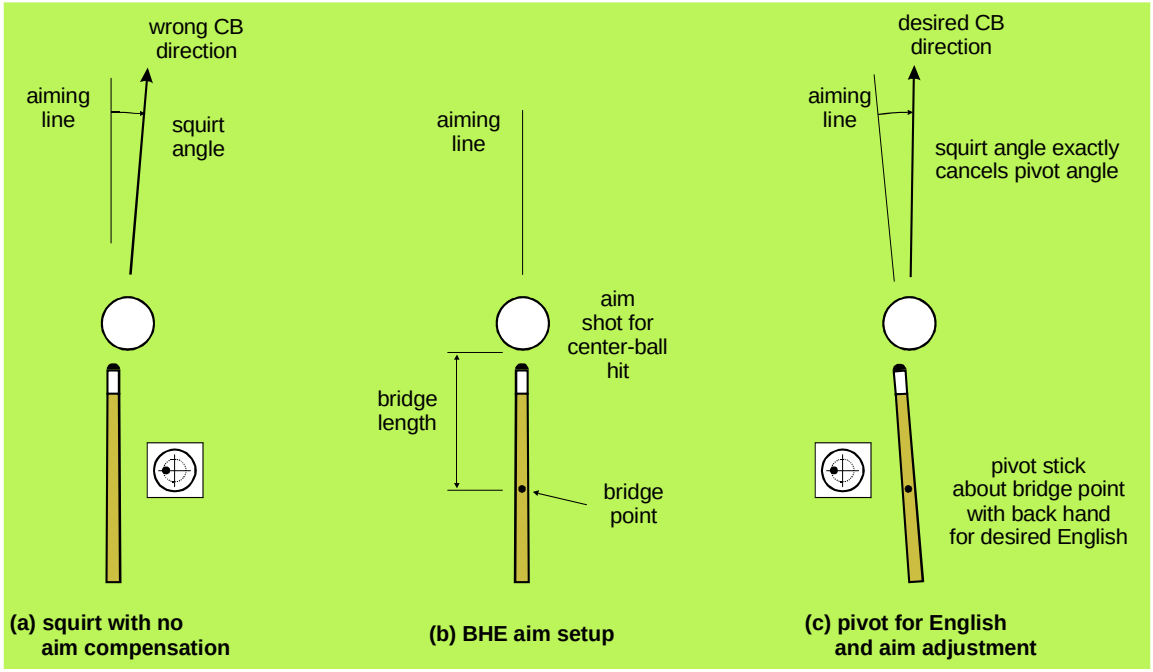

Diagram 2 BHE "aim and pivot" squirt compensation method

Low-squirt (AKA "low deflection") cues can require an extremely large bridge length to use BHE aim compensation. Some people actually recommend *front-hand English (FHE)* compensation instead for low-squirt cues. With FHE, you keep the grip hand stationary while you move your bridge hand left or right. If the distance from your grip hand to your bridge happens to match the natural pivot distance for the stick, again the amount of pivot will exactly cancel the squirt ... theoretically.

If you want more information on the BHE method, see Bob Jewett's October '02 article (a link to Bob's articles can be found at the bottom of the "Instructional Articles" section of my website). For a detailed explanation and demonstrations by Colin Colenso, see **NV A.19**. If you want to see some experimental data for squirt amounts and natural pivot point distances for various popular cues, see the "deflection/squirt" link under "Platinum Billiards" in the "Links" area of my website.


normal video

NV A.19 – Colin Colenso's back-hand-English saga (for squirt compensation)

Another problem with BHE and FHE aim compensation is that swerve and throw are not taken into consideration. Therefore, the methods will not work well for all tip offsets, shot speeds, cue stick elevations, and distances between the CB and OB. Now, if the CB and OB are not too far apart and if fast shot speed is used, swerve is not as much a factor (e.g., see **NV A.19**). Sometimes, the faster speed also helps reduce the amount of throw and make it more predictable (see my September '06, December '06, and February '07 articles).

Another thing you can do to help minimize the effects of swerve is to keep the cue stick as horizontal as possible (i.e., almost touching the rail). But as shown in **TP A.3**, if the cue stick extends over a rail, it is always elevated a little, and with English will come swerve. The other thing you can do is practice a lot to get an intuitive feel for the amount of swerve for all types of shots (various amounts of English, various cue stick elevations, various speeds, various distances between the CB and OB) on various types and conditions of cloth. If you must have

cue stick elevation for a given shot (e.g., to reach over an obstacle ball with an elevated bridge), you should avoid English if at all possible (unless a masse shot is required). Also, any time you elevate the cue stick, and you plan to not use English, you should be very careful to make sure the cue tip hits the vertical centerline of the CB. You should consider focusing on the CB contact point during your final stroke (see the stroke "best practices" document in the "Instructor and Student resources" section of my website). Unintentional English can be a real shot killer, especially when the cue stick is elevated.


technical proof

TP A.3 – Minimum cue stick elevation required for a head-spot-to-foot-spot center-ball-hit shot

The last effect to consider is throw. Actually, we have been "considering" this effect in the last nine articles. As we have seen, the amount of throw varies with cut angle, speed, top/bottom spin, and the amount and type of English.

With new, clean, and smooth balls, the amount of throw will be less as compared to other ball conditions. An exception is when a chalk smudge happens to appear exactly at the contact point between the CB and OB. In this case, the amount of throw will be much greater than normal. This effect is called "cling" (AKA "kick" or "skid"). The frequency of cling (excessive throw) will usually be worse with old, dirty, and/or rough balls. Also, on cloth that is new, thin, and slick, cling might occur more often, because chalk smudges on the CB might tend to wear off less easily. What might make this effect even more noticeable is if the balls also happen to be new, clean, and/or polished (e.g., which might often be the case with televised tournament conditions). Because the amount of throw is less with these ball conditions, when cling does occur, it can be strikingly noticeable. Anytime you see chalk smudges on the CB, you should wipe them off (or ask for a referee to wipe them off if you are in the middle of a tournament game). We have enough reasons to miss shots as it is without having to worry about excessive and unpredictable throw due to cling.

Because the amount of CIT or SIT can vary with ball conditions, and because cling is always a possibility, many players prefer to use outside English (OE) on many cut shots. As described and illustrated in my January '07 article, throw can be reduced and even eliminated if a "gearing" amount of OE is used for a given cut angle. So if you are good a judging the amount of "gearing" OE, this might be a good approach for you. Unfortunately, OE isn't always an appropriate choice for a given shot. The main purpose for English, after all, is to position the CB for the next shot (e.g., see **NV 4.25**). Often we don't have the luxury to be able to use OE on every shot. If the CB will hit a rail, the English will affect where the CB will go, and usually we need it to go in certain directions (e.g., towards good position for the next shot).


normal video

NV 4.25 – Positioning the cue ball at all spots on the table from an easy side-pocket shot

Even for near straight-in (i.e., very small cut angle) shots, some players recommend using a touch of OE. The potential problem with center-ball hits (where you aim the cue tip at the vertical centerline of the CB) is if you are off a little to the left, the OB will be thrown a little to the right, and if you are a little off to the right, the OB will be thrown a little to the left (ignoring squirt and swerve effects). Some people think it is better to aim slightly to one side of center (on the OE side) so the amount of throw will be less and in a predictable direction.

There are several exceptions to the rule when using OE. If there is a large distance between the CB and OB, squirt and swerve become significant factors, so less or no English might be better in these cases. Thin cuts shots is another area for caution. With thin cuts, aiming precision is key, so English and the associated squirt and swerve are too risky. If your aim is way off due to squirt or swerve, no amount of OE will help you make a thin cut.

Concerning cling, it is important to know that it should not happen very often. Therefore, maybe you shouldn't think about it too much, unless the balls appear to be covered with chalk smudges ... in which case, you should think about it a lot. In general, the more bad things you worry about, the more likely you are of missing a shot. Just use whatever English you need on the shot and aim to compensate for squirt, swerve, and a normal amount of throw. Now, if OE is acceptable for a shot, consider using it because it can reduce and even eliminate throw. If OE is not appropriate, then so be it ... use whatever the shot requires. Now if your aim compensation is good and your stroke is perfect and you miss a shot because of "cling," just chalk it up to "bad luck." It won't happen often. The reality is: you can't totally avoid it; although, you can keep the balls clean (especially the CB) to help reduce its frequency.

Concerning use of OE, if you are not good with squirt and swerve compensation or correctly judging the amount of OE required for each cut angle to achieve throw-less "gearing" action (see my January '07 article), then OE might not be the best approach for you. Maybe you should consider using English less often (i.e., only when you absolutely need it) instead, especially if you are a beginner or intermediate player. All of the topics in this article, especially the use of OE, have been heavily debated on the BD CCB online discussion forum lately. There is rarely a strong consensus on the conclusions. Therefore, you should take everything in this article with a grain or two of salt.

I hope you've been enjoying my series of articles on throw and English effects. Next month, I'll conclude my series by summarizing all of the useful information from the last ten articles. Hopefully, this summary will help you pull everything together and maybe even help you at the table during practice and play.

Good luck with your game,
Dr. Dave

PS: I know other authors and I tend to use a lot of terminology (e.g., squirt, throw, cling, stun, impact line, 30 degree rule, etc.), and I know not all readers are totally familiar with these terms. If you ever come across a word or phrase you don't fully understand, please refer to the glossary in my book. For convenience, an electronic copy is posted online in the "Instructor and Student Resources" section of my website.

Dr. Dave is a mechanical engineering professor at Colorado State University in Fort Collins, CO. He is also author of the book, DVD, and CD-ROM: "The Illustrated Principles of Pool and Billiards."