
Note: Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, and technical proofs (TP) can be accessed and viewed online at www.engr.colostate.edu/pool. The reference numbers used in the article (e.g., NV 2.2) help you locate the resources on the website. If you have a slow or inconvenient Internet connection, you might want to view the resources offline using a CD-ROM. See the website for details.

This is the sixth article in a series dealing with draw shot principles and techniques. In the last five months, we explored some of the basic physics of draw shots, compared various aiming systems for predicting the path of the cue ball, looked in detail into the trisect aiming system, studied some real examples where all of this knowledge can pay off in game situations, and summarized some recommended “best practices” for good draw technique. In this article, we will look at a practice drill that might help you further develop and improve your draw shot technique.

Diagram 1 shows a drill you might find useful ... I call it “Dr. Dave’s Draw Drill.” The object ball (OB) is located in the center of the table and the cue ball (CB) is located half way between the OB and the lower left corner pocket. The goal is to pocket the OB in the upper right corner pocket, while controlling the amount of draw on the CB. For the drill, you try each of the five shots shown, five times each. With the **STOP** shots (slow and fast), the desired target location for the CB is position A. The targets for the other shots are positions B for the **SHORT** draw, C for the **MEDIUM** draw, and D (the corner pocket) for the **LONG** draw. Before beginning the drill, make sure your cue tip is well shaped (nickel or dime radius) and textured (so it will hold chalk), and make sure you chalk before each shot. For all shots, you should try for a centerline hit on the CB (i.e., hit the CB on the vertical axis). For each shot, you (and/or a helper) will need to keep track of where the OB and CB go and observe any unintentional English on the CB. An Aramith red dot CB (like the pros use on TV) or any ball with markings is recommended to help you visualize any CB sidespin after OB impact.

You can use a tape measure to lay out the shot. Lay it diagonally across the table between the far corner pockets. Mark the OB location (the middle point on the table) and the CB location with two white, self-adhesive, hole-reinforcement labels (i.e., the little white “donuts” available at any office or school supply store) so you can easily and repeatedly re-spot the CB and OB. Once the donuts are placed carefully, it is a good idea to tap the balls in place by striking down with a spare ball to make small indentations in the cloth. This will help ensure that the CB and OB are placed in exactly the same spots for each attempt.

As a side note, the same drill could also be used for follow shots, where the desired CB target locations would be at mirror image positions on the other side of the table (along the same diagonal).

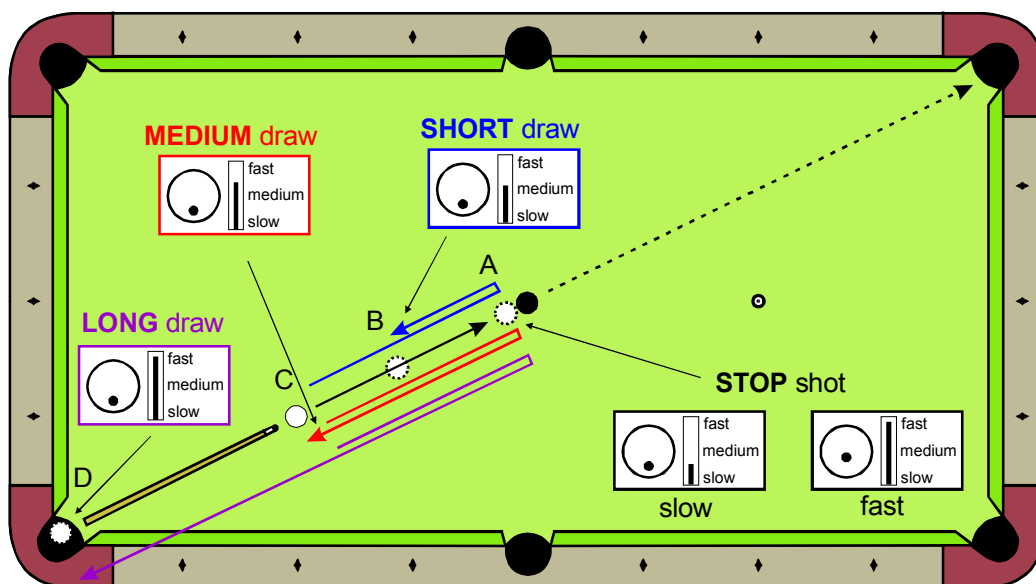


Diagram 1 Dr. Dave's draw drill

Table 1 shows some example data for the drill. Diagram 1 and a blank copy of Table 1 are available in the "Instructor and Student Resources" section of my website if you want to print copies for your own use over time. Table 2 summarizes what all of the letters mean. For each attempt of each shot, you record whether or not the OB is pocketed, where the CB ends up relative to the target, and whether or not the CB had any observable English. An attempt gets a score of 1 if the OB is pocketed and if the CB ends up within the specified distance of the desired target; otherwise, the score is 0 for the attempt. The five attempt scores are added across the row for each type of shot and tabulated down the final column for a total score for the drill.

Here are some examples of how to interpret the data in Table 1 based on the information in Table 2:

- In the fourth attempt of the slow STOP shot, the OB missed the pocket the right (R), the CB (Y) was within 1-2 inches of the desired target (position "A"), and left English was observed on the CB. Because the OB was not pocketed, the score is 0 for that attempt.
- In the fourth attempt of the fast STOP shot, the OB was pocketed and no English was observed on the CB (C), but the CB ended up past the target (G = long), so the score is 0.
- In the second attempt of the SHORT draw shot, the OB was pocketed and no English was observed on the CB (C), but the CB ended up long (G) and left (L) of the desired target (i.e., it was farther than 2-4 inches away from position B).
- In the fifth attempt of the LONG draw shot, the OB was pocketed and the CB was on target (i.e., it ended up in the pocket at position "D"), so the attempt gets a score of 1 even though left English was observed on the CB.

Any miscues, as with the fourth attempt of the LONG draw shot, receive a score of 0. Miscues can result from hitting the CB too low and/or having a poorly shaped, textured, or chalked tip. If you have trouble visualizing the post-impact spin on the CB (e.g., because no or very little English was applied), just mark the attempt as "C" (no English). Not surprisingly, the sub total score for the slow STOP shot (4) is the highest of the five shot types. The total score for all five attempts of all five shots is 13 out of a possible 25. If you prefer a 100-scale score, multiply the total by 4 (e.g., 13 out of 25 is equivalent to 52 out of 100).

Table 1 Dr. Dave's Draw Drill example results

shot	result	attempt					score subtotal
		1	2	3	4	5	
slow STOP	OB	P	P	P	R	P	4
	CB	Y	Y	Y	Y	Y	
	English	C	C	C	L	C	
	score	1	1	1	0	1	
fast STOP	OB	P	P	L	P	P	3
	CB	Y	Y	S, R	G	Y	
	English	C	C	L	C	L	
	score	1	1	0	0	1	
SHORT draw	OB	P	P	P	P	P	3
	CB	S	G, L	Y	Y	Y	
	English	R	C	L	C	C	
	score	0	0	1	1	1	
MEDIUM draw	OB	P	R	P	P	L	2
	CB	S, L	Y	Y	Y	G	
	English	C	R	C	L	L	
	score	0	0	1	1	0	
LONG draw	OB	P	L	R		P	1
	CB	S, L	R	L	miscue	Y	
	English	C	L	R		L	
	score	0	0	0	0	1	
						total:	13

Table 2 Legend for Table 1

<u>OB result</u> P: pocketed the ball L: missed the pocket left R: missed the pocket right	<u>English</u> C: center-line hit on the vertical axis of the CB (i.e., no English) L: left English R: right English
<u>CB result</u> Y: within desired distance from target S: short of target G: long (past target) L: left of target R: right of target	<u>score</u> 1: OB pocketed (P) and CB on target (Y) 0: OB not pocketed (L or R) or CB off target
<u>CB target definitions</u>	
STOP shot: within 1-2 inches of position A	MEDIUM draw: within 3-5 inches of position C
SHORT draw: within 2-4 inches of position B	LONG draw: in the pocket (position D)

The LONG draw shot can be quite a challenge, even for top players. If you can score a 5 in this category consistently, you probably don't need Dr. Dave's drill. The LONG draw shot first requires that enough draw action be applied to the CB (i.e., the CB must be hit low enough with enough speed) to achieve the target distance. Also, the CB must be struck close to its vertical

axis; otherwise, squirt and throw effects will come into play. Finally, your aiming line must be true (i.e., the CB must hit the OB squarely). To accomplish all of this consistently, you must have an excellent stroke.

The drill can be useful for many purposes. First of all, it provides practice for various stop and draw shots, helping you develop a feel for the required amount of speed and cue tip offset (i.e., the amount you hit the CB off center) for different shots. Secondly, you can use the drill score to monitor your progress over time, from week to week or month to month by keeping track of your scores (and even plotting them on a graph if you are an analytical kind of person). The score can also be used as a challenge to you and your friends to see who can score the highest. Thirdly, the drill might help you develop a better understanding of the effects of and relationships between shot speed, squirt and throw. If you are not familiar with these terms, you might want to refer to a good book (I recommend "The Illustrated Principles of Pool and Billiards," although, this is a biased and impartial recommendation) and/or view some of the resources on my website (e.g., video demos, online threaded discussion topics, glossary, etc.). Finally, concerning purposes for the drill, if any trends are evident in your tabulated data, you might be able to identify possible flaws in your fundamentals. For example:

- If the OB misses the pocket consistently to one side, you might have a problem with aiming, cue tip alignment, or your stroke (e.g., steering follow-through).
- If the OB misses the pocket consistently to one side only at higher speeds, you might be tensing up your grip or rushing the transition between your final back swing and forward swing with higher speed shots.
- If the CB is consistently short of the target, you are obviously not getting enough draw action, and you need to contact the CB lower and/or increase your stick speed.
- If the CB target proximity or English results seem kind of random, you obviously have a problem with consistency. If this is the case, you probably need to strengthen your fundamentals and/or just practice more.

Hopefully, the challenge of the drill will help you get excited about practicing more. Obviously, it might be helpful to have an experienced and qualified instructor work with you to help diagnose potential problems and work on possible fixes, depending on what your results show.

Other observations that can be made from the sample data in Table 1 include:

- The CB had left (L) English more often than right (R). Obviously, this indicates the CB was being hit left of the vertical centerline. This could indicate an alignment or stroke flaw.
- Notice that with the fourth attempt of the slow STOP shot, the OB missed right and left English was observed on the CB. The explanation for this is that there is more swerve (English curve) and throw (spin-induced) at low speed. Both effects would tend to deflect the OB to the right.
- For the higher speed shots, the OB error direction (e.g., left) seems to be in the same direction as the CB English (e.g., left). An obvious explanation for this is that squirt (CB deflection) is a dominant factor at higher speed (i.e. more significant than swerve and throw effects).

If any data were inconsistent with the conclusions in the 2nd and 3rd bullets above (e.g., if the OB missed left of the pocket with left English on the CB at slow speed, or if the OB misses left of the pocket with right English on the CB at higher speeds), this would indicate serious flaws with alignment, aiming, and/or stroke fundamentals. If you see such trends, you might want to seek out a qualified and experienced instructor for help.

CB English and the proximity to the CB target can be better indicators of potential flaws than whether or not you pocketed the OB. The OB can be pocketed even with a far-from-perfect hit on

the CB if aiming errors and English effects (squirt, swerve, and/or throw) tend to cancel for a shot. Also, the OB can “cheat the pocket” (i.e., be off center a little) and still go in. Therefore, the CB target and English indicators are useful, whether or not the OB is pocketed. You might have a consistently straight stroke, but if you unintentionally and consistently hit the CB off center or off the aiming line, you won’t generally have good results. If you see any trends with the CB target and English data, you might want to adjust your head alignment to better visualize the aiming line and intended cue-tip-CB contact point.

It is important to note that you will get the maximum benefit from this or any other drill only if you have solid fundamentals (stance, grip, bridge, and stroke). Please refer to last month’s article if you want some recommendations and advice on how to improve your stroke fundamentals. Some of the basics are described and demonstrated in **NV 2.2**, **2.5**, **2.6**, and **3.3**.



NV 2.2 – Close-up of the grip during a good stroke

NV 2.5 – A good stroke

NV 2.6 – Steering follow-through

NV 3.3 – Addressing the ball and taking your stance

If you are interested in additional drills to help you practice and improve your draw technique, more can be found in the “Student and Instructor Resources” section of my website, where I have a link to some excellent drills Bob Jewett has available online.

I hope you are enjoying my series of articles on draw shot physics, aiming, and technique. I hope you have been able to put some of the information to good use in your game. Next month, I’ll conclude the series by looking at “tips of English” and how it is used (and sometimes misused) to describe various amounts of draw.

Good luck with your game,
Dr. Dave

PS:

- If you want to refer back to any of my previous articles and resources, you can access them online at www.engr.colostate.edu/pool.

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