
Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, and technical proofs (TP), and all of my past articles, can be accessed and viewed online at billiards.colostate.edu. The reference numbers used in my articles will 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. Details can be found online at: dr-dave-billiards.com.

This is my second article in a series dealing with the important topics of aiming, alignment, and sighting. Last month, we focused on aiming concepts. This month, we'll focus on visual alignment (i.e., where you place your eyes to best visualize the line of a shot).

Where you place your eyes, and whether or not you do so consistently for a given type of shot, is probably one of the most important elements of successful pool playing. This topic certainly doesn't get the attention it deserves in most instructional books and videos. **Diagram 1** illustrates quite graphically the importance of eye placement relative to the cue. In all three photographs, the shot is lined up straight into the pocket, as is clear in Diagram 1b, where the vision is centered properly. Diagrams 1a and 1c show what happens when the eyes are not properly aligned with the cue. With your vision shifted to the left (see Diagram 1a), the tip will appear to be slightly to the right of center-ball, and the cue will appear to point off-line to the left. With your vision shifted to the right (see Diagram 1c), the tip will appear to be slightly to the left of center-ball, and the cue will appear to point off-line to the right. **Diagram 2** shows how the tip position can be perceived to be off center. The perception error will be less when the tip is closer to the CB (see Diagram 2a), and will be greater when the cue tip is farther from the CB (see Diagram 2b). Tip placement inaccuracy can result in unintentional English, which can cause you to miss shots (for more info, see squirt, swerve, and throw in the [FAQ section of my website](#)). An important lesson to be taken from Diagram 2 is to position the cue tip close to the CB when aiming and sighting. This will minimize tip placement errors when your visual alignment is off.



Diagram 1 Changes in visual perception with head position

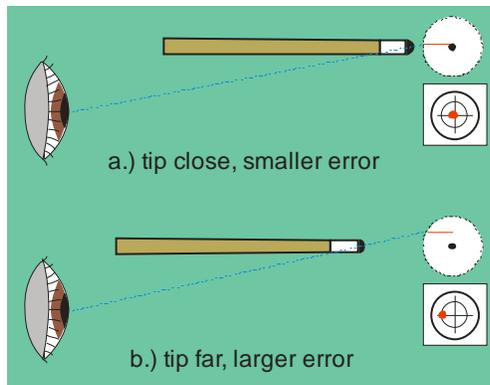


Diagram 2 Tip position perception errors

Diagram 3 illustrates the effects improper visual alignment has on aiming a straight, center-ball shot. With your vision centered (see Diagram 1b), the tip appears centered (as it is), and the line of the cue is perceived properly (straight). The result (Diagram 3b) is a perfectly straight shot with no English, assuming your stroke is accurate. With your vision shifted to the left slightly (see Diagram 1a), because the cue tip will appear to be slightly to the right of center-ball, and the cue will appear to be pointing off-line to the left slightly, you will typically compensate in the opposite directions as shown in Diagram 3a. There will be a slight amount of unintentional left English, and the CB will go to the right of target, sending the OB to the left. With your vision shifted to the right slightly (see Diagram 1c), because the cue tip will appear to be slightly to the left of center-ball, and the cue will appear to be pointing off-line to the right slightly, you will typically compensate as shown in Diagram 3c. There will be a slight amount of unintentional right English and the CB will go to the left of target, sending the OB to the right.

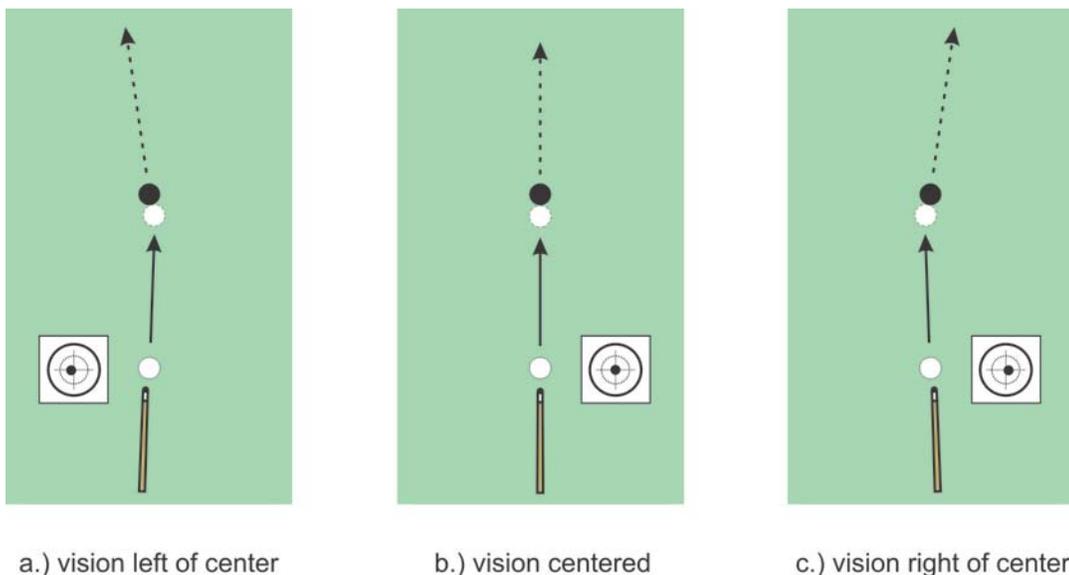


Diagram 3 Results of head alignment errors

Human vision is not a simple matter. Each of our eyes sees a different “picture” of a shot. The photos in Diagrams 1a and 1c are examples of how these “pictures” might be different. The straight line of the cue is perceived to be at different angles due to the perspective provided by each eye. This effect is called parallax. Our brains amazingly fuse these two images into one, creating a single perception of reality (e.g., Diagram 1b). This is called binocular or stereoscopic vision. To see the effects of parallax and stereoscopic vision, line up a straight-in shot at a table (as in Diagram 1b) and get into your stance, aiming to pocket the ball. While holding your head and the cue still, close each eye separately. You will see how each eye “picture” is very different from your perception of the combined “shot picture.” This effect, called parallax, is what enables us to visualize distances and angles at the table (i.e., parallax provides depth perception). And as we saw above, it can also cause aiming perception issues.

The topic of eye dominance often comes up on the online pool forums. Some people think everybody has a dominant eye and that it is important for the cue to be positioned in a certain place relative to the dominant eye. Others think eye dominance is of little importance or relevance concerning how people aim. I personally think too much attention is given to this topic. Even if the brain somehow favors the image from one eye over the other, it is not clear whether or not this is important in how the brain fuses the stereoscopic information into a single perception of the shot. If you are interested in learning more about this topic, see the [“eyes and vision” – “dominant eye” FAQ page](#) on my website.

Regardless of your eye dominance beliefs, it is very important to have your head in the right position to perceive a shot properly. I call this position your **vision center**. It is the head and eye alignment, relative to the cue, that allows you to see a center-ball, straight-in shot as straight, with the tip appearing to be at the center of the CB. A good drill for finding your vision center is to set up a long straight-in shot like the one in Diagram 1b. Mark the CB and OB positions with self-adhesive hole reinforcements (AKA, a “little white donuts”) to make it easy to repeat the shot. Then hit a set of ten or more stop shots. If the CB has no sidespin after hitting the OB, and if the OB enters the center of the pocket consistently, then your vision center is probably aligned well. If, on the other hand, you miss several of the shots and a pattern is evident (e.g., most of the misses were on the same side and with the same direction of unintentional sidespin), then you are probably not aligned to your vision center. In this case, shifting your head should help. From Diagram 3, if the CB frequently goes to the right of target, causing the OB to go left of the pocket, your vision is probably too far left, and you need to move your head to the right slightly. Try another set of stop shots with the new head position to see if there is improvement. If you are instead consistently missing the CB target to the left, with the OB missing the pocket to the right, try shifting your head to the left. After you find the alignment that results in the most accuracy (i.e., no CB spin, and OB in the center of the pocket), you will have found your **vision center**. When you are done, take mental notes concerning how your stance and head position feel and/or where your nose or chin is relative to the cue. Even better, use a camera (still or video) to document your discovery.

On a personal note, I recently determined that while setting up for elevated shots (especially jump shots), my head must have been aligned a little to the left of my vision center. I came to this conclusion because, during a practice session, I realized that I missed most of the shots in the same direction (CB to the right, sending the OB to the left of target). Now that I’m more careful with aligning my vision on elevated shots, I’m also more accurate and consistent. If you haven’t done the “vision center” drill yet, give it a try. And start paying more attention to your visual alignment. You might be surprised by the results.

Diagram 4 shows several different possibilities for where your eyes might be located relative to the line of the shot (the blue line). With a centered visual alignment (Diagram 4a), the eyes are equidistant from the line of the shot. The face is square to the shot and the cue is directly beneath the chin. Diagram 4b shows an off-center alignment. The face is still square, but one eye is closer to the shot line than the other. One potential problem with this is that the parallax effect is asymmetric. Each eye is seeing a different perspective of the line of the cue, and this can also change with focus distance (per the different angles formed by the dashed lines). Also, the perceived tip position relative to CB center could be off, per the effect in Diagram 2. Eye dominance might also affect stereoscopic perception; although, how the brain processes visual information is not totally understood. Having said all of this, an off-center alignment might be necessary for some people to achieve stance and neck comfort.

Diagram 4c shows an alignment with one eye directly over the line of the shot. This would obviously be the best approach if vision in the other eye is severely impaired (e.g., blind or patched). This alignment might also be appropriate if you have extreme ocular dominance and can ignore the parallax from the other eye. When trying to sight along a straight line, it can sometimes seem like a burden rather than a benefit to have two eyes instead of one. With one eye, it is obvious where to place it to sight straight down a line. However, the binocular (stereoscopic) vision that comes with two eyes provides useful depth perception that one eye cannot provide by itself. For this reason, two eyes are definitely better than one.

Diagram 4d shows a centered, but non-square visual alignment. Due to stance and comfort issues, this is more common than one might think; although, the angle might not be as large as that shown in the diagram. One potential problem with a non-square alignment is that the effective horizontal position of the back eye relative to the front eye changes (see the red double arrow) with focus distance (see the different sets of dashed black lines). This could cause parallax perception and aiming errors when shooting shots at different distances.

Based on the effects described in this article, it seems like a square, centered alignment (Diagram 4a) is the preferred approach. This certainly seems to be the most common alignment for many pro pool players and most snooker players (where exact shot aim and alignment is more critical). Richard Kranicki makes a strong case for a centered alignment in his book: "Answers To A Pool Player's Prayers," which covers visual alignment issues quite well. However, some people will not be able to comfortably create a centered and square visual alignment. If your stance and head position are not comfortable, they probably won't be very effective and might cause strain, stiffness, or even injury. Some combination of Diagrams 4b and 4c might be necessary, even if a centered and square alignment is better. Regardless of which alignment you choose, as long as you are consistent, your brain can learn to compensate for any perception issues. With enough practice, any visual alignment can be made to work.

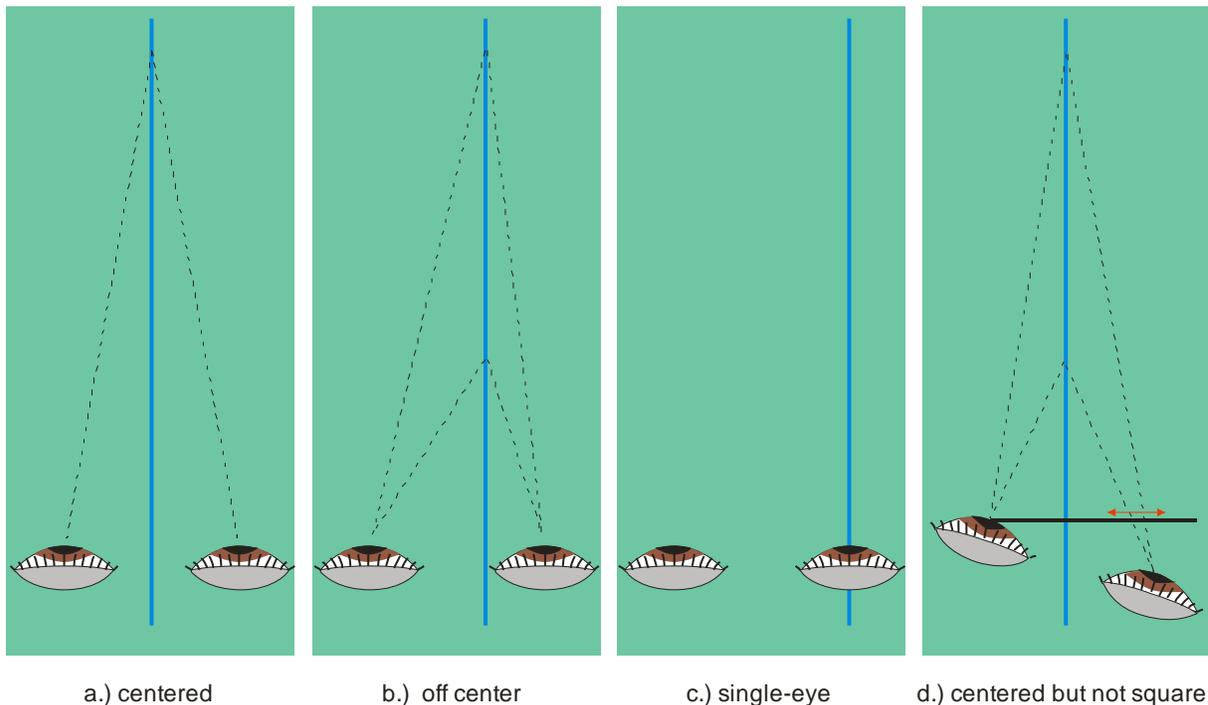


Diagram 4 Visual alignment possibilities

Many pro pool players and most snooker players have a very low stance, with their chins being very close to, or even touching, the cue. This can be helpful for several reasons. For one, it makes it easier to be consistent with your visual alignment. With the chin so close to the cue, it is easier to see (or even feel) whether or not you are off to one side or the other. Also, you are sighting more along the cue, similar to a marksman looking down the barrel of a gun. Finally, with a low stance, there is less eye movement between the CB and the OB while checking the tip position and aiming line. Note that with a low stance, it helps to use an open bridge or longer bridge length to allow you to see more of the cue (for more info, see my [December '08 article](#) and [NV B.96](#)).



normal video

[NV B.96](#) – Grip and bridge technique and advice

I hope you enjoy and benefit from my series of articles dealing with aiming, alignment, and sighting. For more information and resources related to visual alignment, see [“finding the center of the cue ball”](#) and [“vision center”](#) on the [“eyes and vision” page](#) in the [FAQ section of my website](#). Next month, we’ll look at different approaches to sighting different types of shots.

Good luck with your game,
Dr. Dave

PS:

- I know other authors and I tend to use lots of terminology (e.g., squirt, throw, stun, ball-hit fraction, 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 [online glossary](#) on my website.
- I want to thank Jim Valasina. He graciously proof-reads my articles every month to help find errors and make suggestions. My article quality is better as a result of his efforts. Thanks again Jim!

Dr. Dave is author of the book, DVD, and CD-ROM: “[The Illustrated Principles of Pool and Billiards](#),” the DVD Series: “[The Video Encyclopedia of Pool Shots](#),” and the DVD: “[High-speed Video Magic](#).”