Olympic Weightliftng: Jerk Mechanics

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This document discusses the fundamental mechanics of the split jerk that is performed in Olympic Weightlifting.

The mechanics of the jerk are specifically designed to provide maximum support for the weakest link in the process (namely, the shoulder joint) by setting up a strong vertical column of bone to support the weight overhead. The key to successfully jerking heavy weights that cannot be driven very far off the shoulder platform is to learn to quickly and stably set up this vertical column of bone support in a relatively deep split position (easier said than done).

In discussing the jerk, we will divide the complete movement up into five different focus areas:

1) the Standing Rack Position
2) Torso Rigidity
3) the Dip
4) the Drive
5) the Finish

1. The Rack

The bar is supported solidly on top of the shoulder platform, not supported by the arms. The bar should be positioned well back and on top of the shoulders and clavicles. In fact, the bar actually presses into the front of the throat. The idea here is that the bar should **rest on top of the spine** in order to **minimize the torque** that the bar exerts on the spine. Of course, it is impossible to actually center the bar over the spine, but we try to get the bar back as far as possible without cutting off our breathing. The hands should not grip the bar tightly since this will tend to pull the bar forward and down off of the shoulder platform.

Consider the position of the elbows. If the elbows are too low and positioned at your side, then this decreases the area of the shoulder platform in addition to decreasing the stability of the shoulder platform (not good). However, novices often adopt this low elbows position because they are under the misconception that the arms assist with the jerk drive and the low elbows position is obviously advantageous for pressing. On the other hand, if the elbows are very high and very forward, it does create a big stable shoulder platform, but this position prevents your arms and shoulders from driving your body correctly under the bar (not good). The optimal position for the elbows is in between these two extreme cases. Generally speaking, the elbows should be as low and wide as possible without adversely affecting the size and stability of the shoulder platform that supports the weight. To reiterate, strength and stability of the shoulder platform cannot be compromised.

2. Torso Rigidity

Throughout the dip and the drive, your torso (spine + pelvis) must remain **completely rigid** and **completely vertical** to provide a solid foundation for transferring leg drive to the bar. Any deviation from a **completely rigid** and **completely vertical** torso will result in a loss of vertical power that is transferred to the bar. **Visualize** – your torso is a **thick, rigid, completely vertical, telephone pole** that the bar is resting on. Torso rigidity is maintained by engaging all of the torso's supporting muscles and by using hydraulics (taking and holding a breath to pressurize your torso as you push against your abdominal muscles and belt). Especially important are the supporting muscles of the upper back, i.e., those muscles that can put backward curvature in your upper back and prevent the upper back from rounding forward and letting the weight slip off of the shoulder platform.

The torso (spine + pelvis) must remain completely vertical (no leaning forward) during the dip and the drive. Any buckling of the torso, or forward inclination of the torso, or misalignment between the pelvis and spine will result in a loss of vertical power that is transferred to the bar.

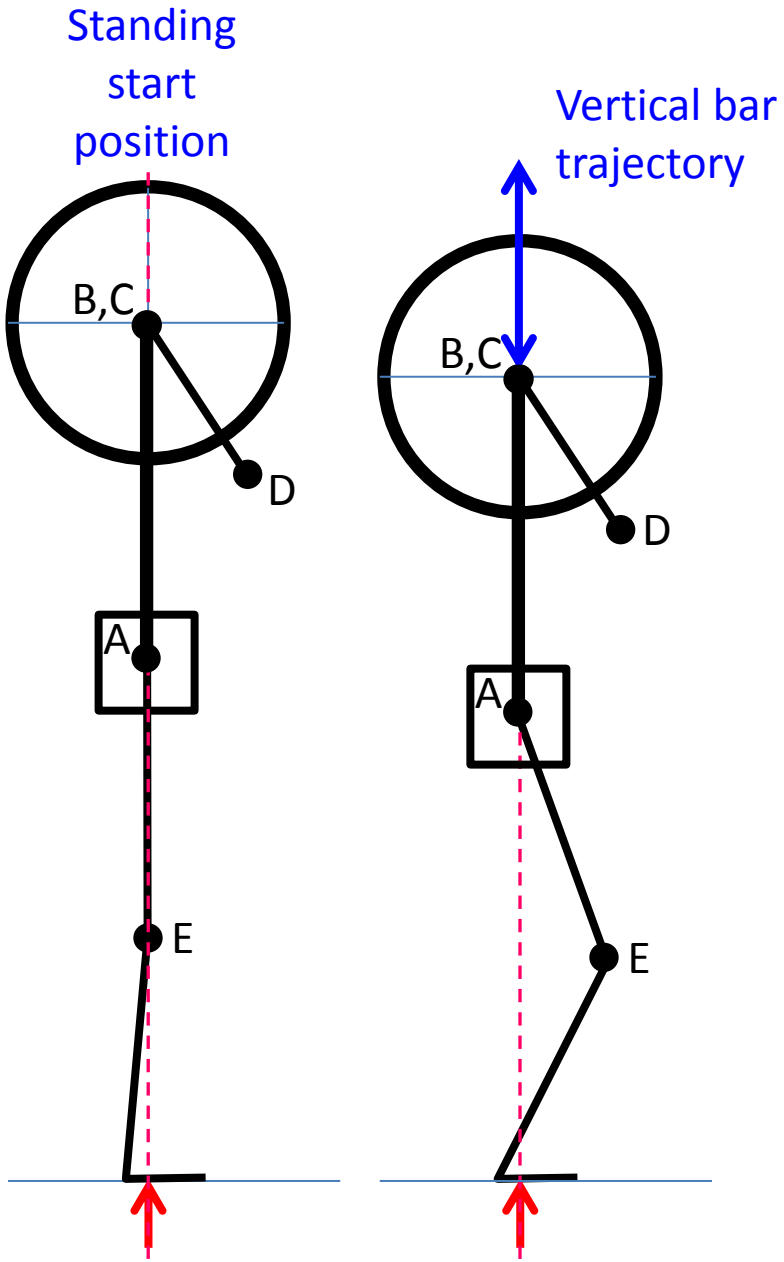
Very Important - Throughout the dip and the drive, the weight should be positioned **over the front of the heel bones**, **not the balls of the feet**. The natural or intuitive tendency is for the lifter to stand with the racked weight so that the weight passes through the balls of the feet; instead, the lifter should make a conscious effort to rock backward slightly so that the weight passes through the **front of the heel bones** and this is maintained throughout the dip and the drive.

3. The Dip

During the dip, the torso must remain **completely rigid** and **completely vertical** and the weight must be kept centered over the front of the heel bones; consequently, the dip must occur by **bending the knees**, **not flexing the hip joint**. **The hips should not be allowed to move backward during the dip**; rather **the hips drop straight down when the lifter bends the knees**. During the dip, **the pelvis is kept completely vertical and not allowed to rotate forward at all**.

The dip should be relatively **shallow**. If the torso and pelvis are correctly kept vertical and the dip is performed by bending the knees (not flexing the hip joint) and the weight is kept positioned over the heels, then the lifter can only dip a short distance before reaching the point of diminishing return where mechanical advantage is lost. Again, throughout the dip and the drive, the weight is positioned **over the front of the heel bones**, **not the balls of the feet** and the **pelvis is kept completely vertical** (you would think that this is very import based on the number of times that I reiterate this point).

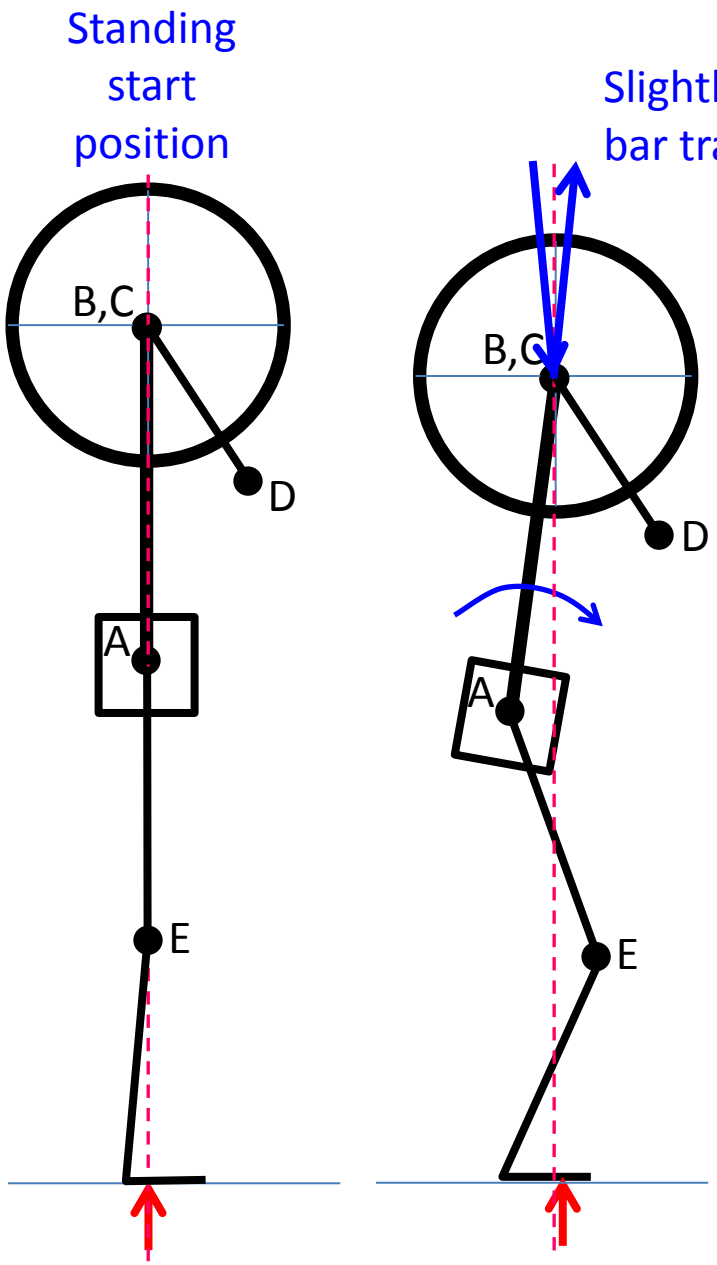
Aside: I see many beginners that dip all the way to the level of a quarter front squat or even lower. This depth is only possible if you incorrectly flex at the hips, allowing your hips to travel backward, your pelvis to rotate forward, your torso to lean forward, and the weight to shift to the balls of your feet. Admittedly, this incorrect dip is great if your objective is to drive a relatively light weight high enough to touch the ceiling, but it is very counterproductive if your objective is to drive a very heavy weight precisely upward to the height of your forehead.



Correct dip

- Vertical pelvis, vertical spine
- Hips drop straight down
- Weight on front of heel bones
- Heavily loaded quads with maximum stretch reflex
- Results in vertical bar trajectory during the drive (no forward component to the bar trajectory)
- During the vertical drive, the head has to rock back to allow vertical bar trajectory to clear the chin

A) Hip joint, B) shoulder joint, C) wrists, D) elbows, E) knees



Common faulty dip

- Hips move backward during the dip,
- Torso (pelvis + spine) rotates forward during the dip,
- Weight transfer to the balls of feet,
- Results in a slightly forward bar trajectory during both the dip and the drive
- This faulty dip is exhibited by most beginners due to their familiarity with a seemingly similar movement, namely jumping

A) Hip joint, B) shoulder joint, C) wrists, D) elbows, E) knees

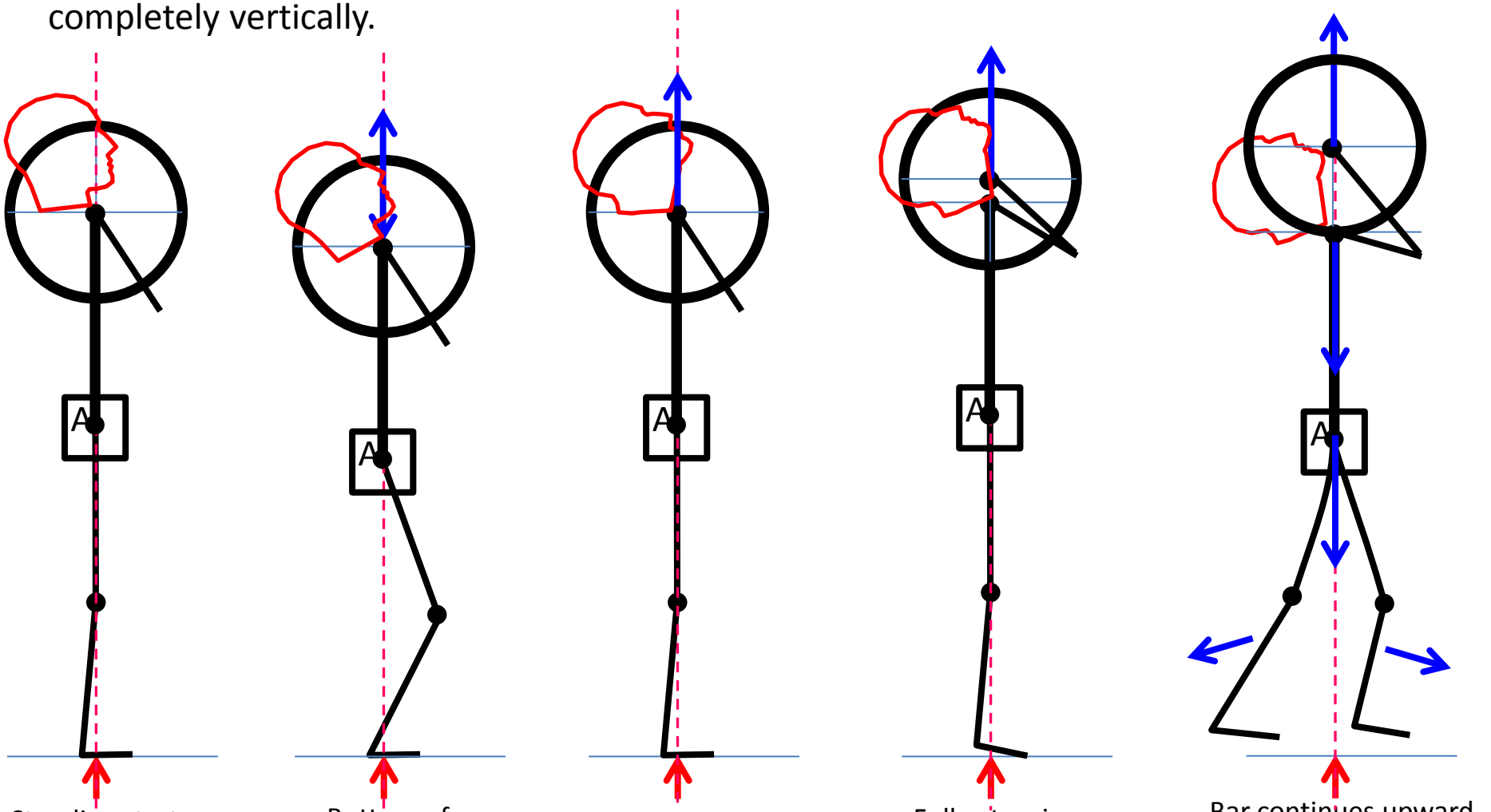
4. The Drive

The dip is arrested and reversed by explosive contraction of the quads. **The drive must be completely vertical**. The legs drive the rigid vertical torso straight upwards into the bar, in turn, causing the bar to go straight up. Beginners have a strong tendency to incorrectly drive the bar slightly forward (probably out of fear of hitting their chin with the bar). However, almost all missed jerks are lost forward, so we want to avoid any forward component of the jerk drive. The drive should result in complete vertical extension. However, if you correctly keep the weight centered on the front of your heel bones, then you are not able to get much ankle extension at all (i.e., the heels barely rise off the floor) but this is completely acceptable.)

Stretch Reflex:
In the jerk dip and drive, we use the **stretch reflex** to its full advantage. The shallow dip should be performed as fast as possible, but without losing contact with the bar and without losing tension in the quads. So, you cannot dip any faster than the rate that gravity causes the bar to fall. In order to make maximum use of the stretch reflex, you have to dip rapidly, but the muscle stretching (quads and glutes) must occur under tension, so the dip is a controlled, fast dip with tension in the quads and with all the torso supporting muscles engaged. When we hit the bottom of the dip, the legs fire immediately and violently, driving the rigid, pressurized torso vertically into the bar.
Visualize – you are attempting "to bend the bar" when you hit the bottom of the dip and initiate the jerk drive.

Management of the head and neck during the dip and drive:

If you drive the bar in a perfectly vertical direction, the head must rotate backward to allow the bar to pass the chin (otherwise the bar is driven straight into the chin). If we don't see the head rock backward, then the lifter obviously did not drive the weight completely vertically.



Standing start position

Bottom of the dip

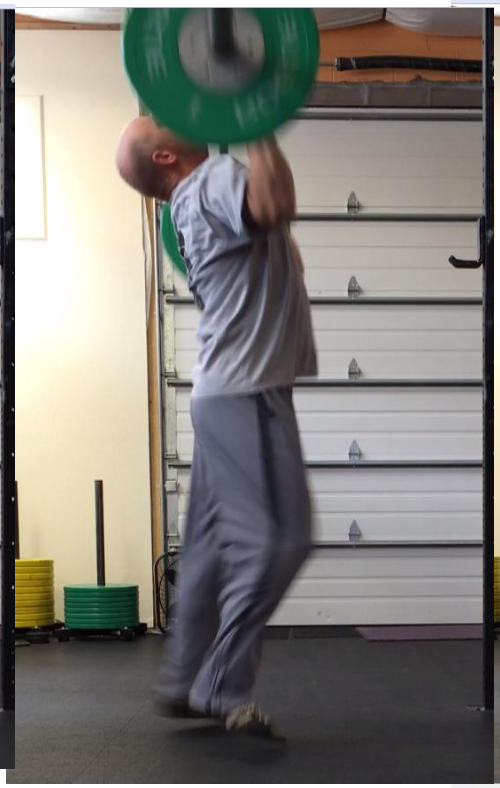
Full extension, Bar leaves shoulders

Bar continues upward, Arms drive torso down, Legs split fore and aft

Note the lifter's head position as the bar leaves the shoulder platform and passes the face

Near the top of the jerk drive, but not yet at complete extension. Note the head has already begun to rotate backwards.

Just after complete extension, the bar has now left the shoulder platform. Note the legs are already starting to split.



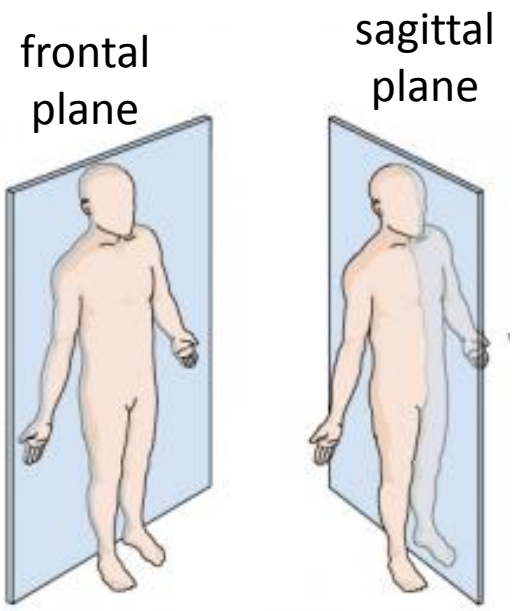
Bar is at chin height, and the lifter is actively driving himself downward. Note the head has reached maximum rotation to allow the bar to pass the chin.

Bar has cleared the chin, and the head will now begin to snap forward into alignment

5. The Finish

As the lifter hits maximum vertical extension and maximum bar speed, the lifter immediately stops driving the bar upward and instead begins driving himself underneath the bar as the bar continues upward on its own. The shift from driving the bar upwards to driving one's self downward is quite seamless, and occurs because the lifter simultaneously unlocks his legs and uses his arms and shoulders to push his body **straight downward**, underneath the bar.

As the arms and shoulders drive the lifter downward, the pressing motion of the arms should take place more in the frontal plane than in the sagittal plane (see figure). In other words, we don't want the elbows to loop forward during the pressing motion because this trajectory makes it more difficult to for the shoulder joint to achieve a solid set at lockout. Instead, we want the elbows to travel more in the frontal plane (think of pushing your arms up and out to the sides). This frontal plane trajectory provides the shortest stroke to lockout and it facilitates a good shoulder set at lockout.



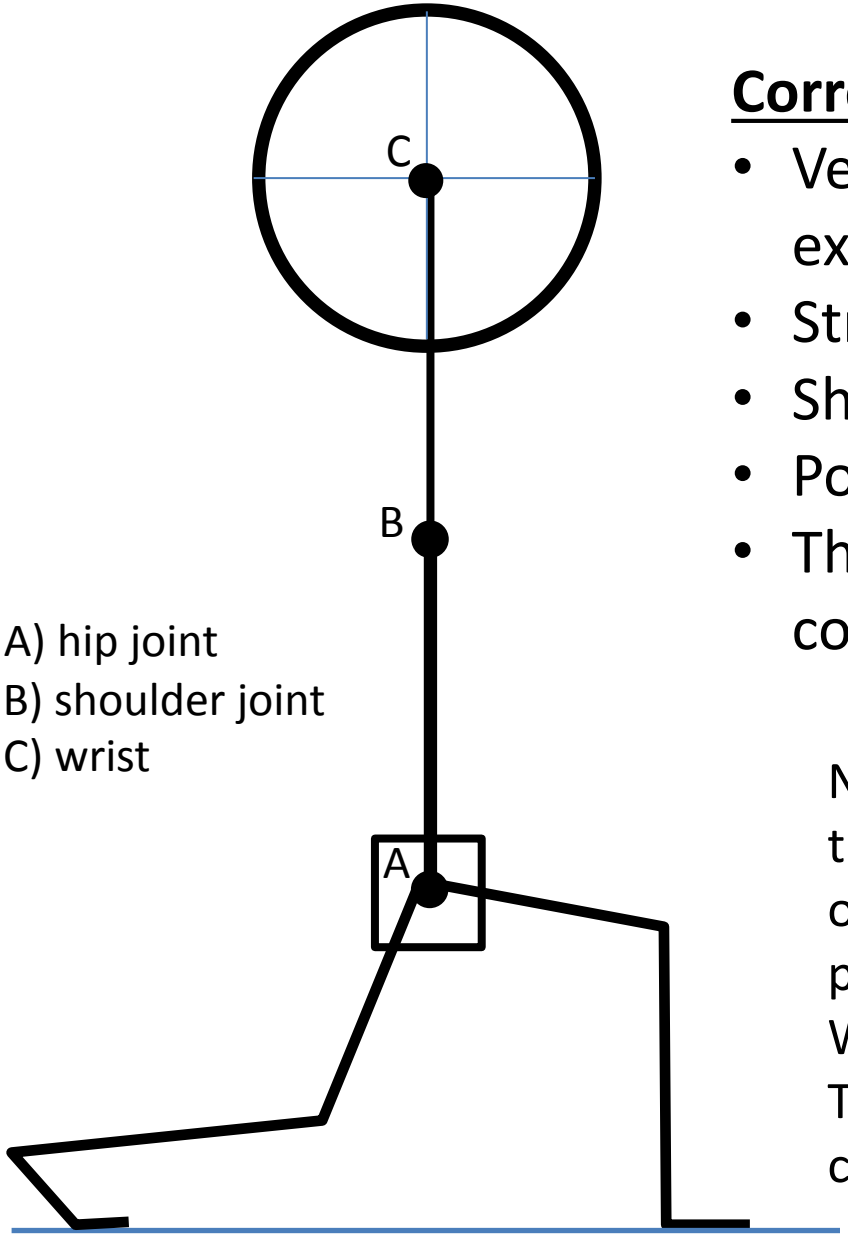
It is during the finish that proper psychological preparation can make or break the lift. We have to mentally commit to the idea that we will drive ourselves straight downward to "whatever depth is necessary" in order to get a complete, crisp lockout underneath the weight (easier said than done). If we are unable to achieve this level of commitment/confidence, then the jerk usually fails because of one of two reasons:

1) the lifter simply fails to drive himself low enough to achieve a complete lockout, or
2) the lifter drives himself slightly backwards instead of straight down (instinctively a much safer position from which to bail out of the lift that he already anticipates missing).

Note that it is possible to miss a jerk simply because the lifter does not drive the weight high enough off the shoulders (especially after fatigue from a really difficult clean), but it is far more common for the jerk to be missed due to lack of commitment (i.e., not wanting to put yourself in harm's way, completely underneath the bar) even though the bar is actually driven high enough off the shoulders.

So, we have stated that at maximum vertical extension and maximum bar speed, the lifter immediately shifts from driving the bar upwards to driving himself downwards. We further stated that the lifter drives himself **straight downward** to **whatever depth is necessary** to get a complete, crisp lockout underneath the bar.

Now let us consider the details of this 'lockout position' that we are driving ourselves down into.
We will refer to this position as the **catch position**.
The essential features of the correct catch position are illustrated in the next slide.



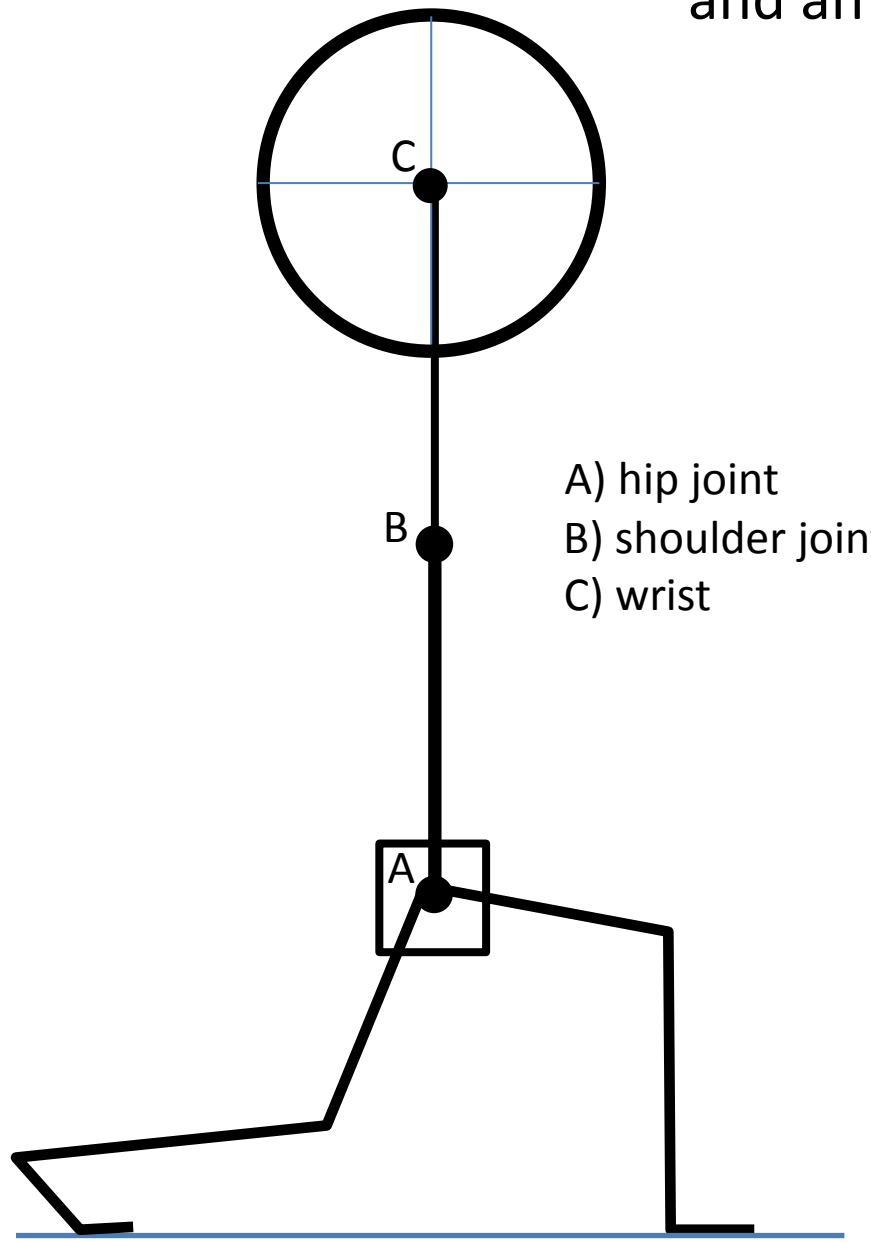
A) hip joint
B) shoulder joint
C) wrist

Correct catch position

- Vertical pelvis, facilitated by limiting the extension of the rear leg,
- Straight, vertical spine,
- Shoulder joint completely opened (180°),
- Points A,B,C are vertically stacked,
- The bar has very strong vertical bone column support between points A,B,C

Note that we are purposefully compromising the supporting leverage position of the legs in order to increase the supporting leverage position of the spine/shoulder/arm complex. Why? Because the shoulder is the weak link. The much stronger legs can handle the compromised leverage position.

Comparison of the idealized ‘stick figure’ catch position and an actual lifter’s catch position



A) hip joint
B) shoulder joint
C) wrist

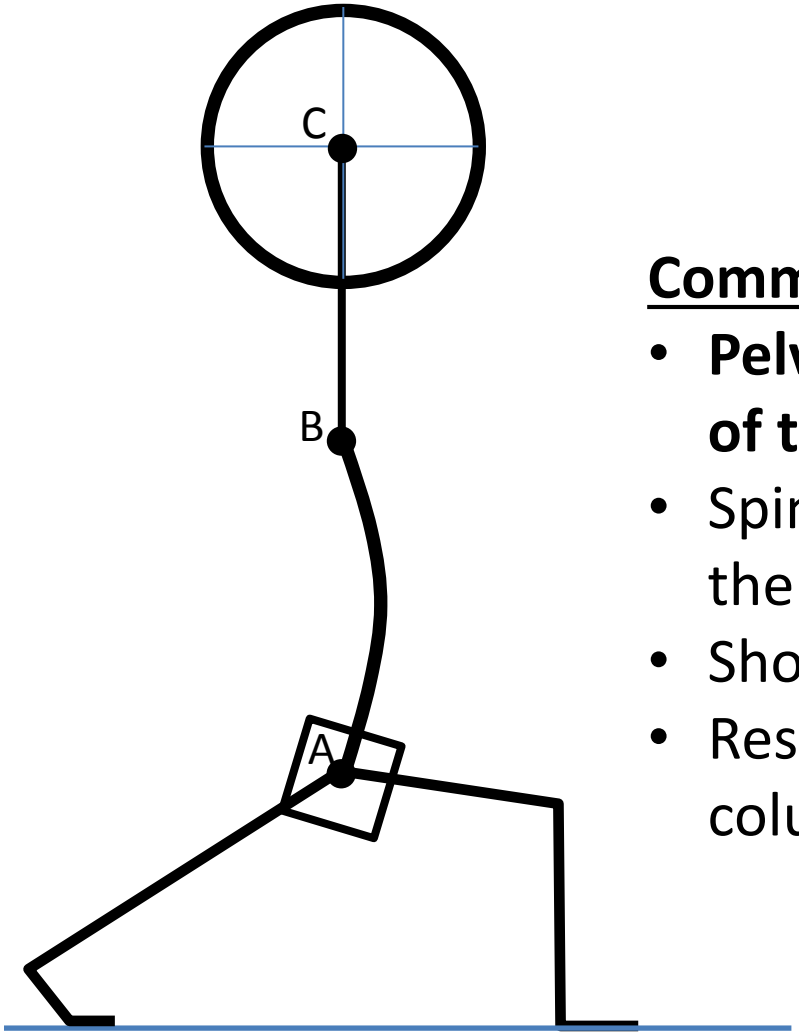
It is important to realize that the process of achieving the correct catch position depends on a chain of events that starts with the rear leg position and progresses upwards:

1) By limiting the extension of the rear leg, we are able to keep our pelvis upright (vertical).
2) If our pelvis is kept vertical, then we can keep our spine straight and vertical.
3) Provided that we are able to open our shoulder joints completely, then we can establish a straight, vertical column of bone support that runs all the way from our hip joint to our wrists.
4) This vertical column of bone support allows us to stabilize the bar overhead with minimal stress on the shoulder muscles (the weak link in the chain).
5) Admittedly, the bent rear leg position increases the stress on the legs, but the legs are the strong link in the chain anyway and can handle the added stress.

Now lets consider the most common **faulty** catch position.
The faulty catch position is caused by the lifter's natural instinct to completely extend the rear leg which sets off the following chain of events:

1) Complete extension of the rear leg causes the pelvis to rotate forward (due to lack of hip extension flexibility)
2) The forward rotated pelvis causes the lumbar spine to incline forward
3) The remainder of the spine must bend backwards in order to get the shoulder joint positioned over the hip joint
4) The vertical arms are no longer precisely aligned with the spine
5) The entire column of support (from hips to wrists) is de-stabilized and requires much muscular effort to support the bar.

This faulty catch position is illustrated on the next page.



Common faulty catch position

- **Pelvis rotated forward due to extension of the rear leg**,
- Spine curves backwards to accommodate the rotated pelvis,
- Shoulder joint not completely opened
- Results in loss of strong vertical bone column support between points A,B,C

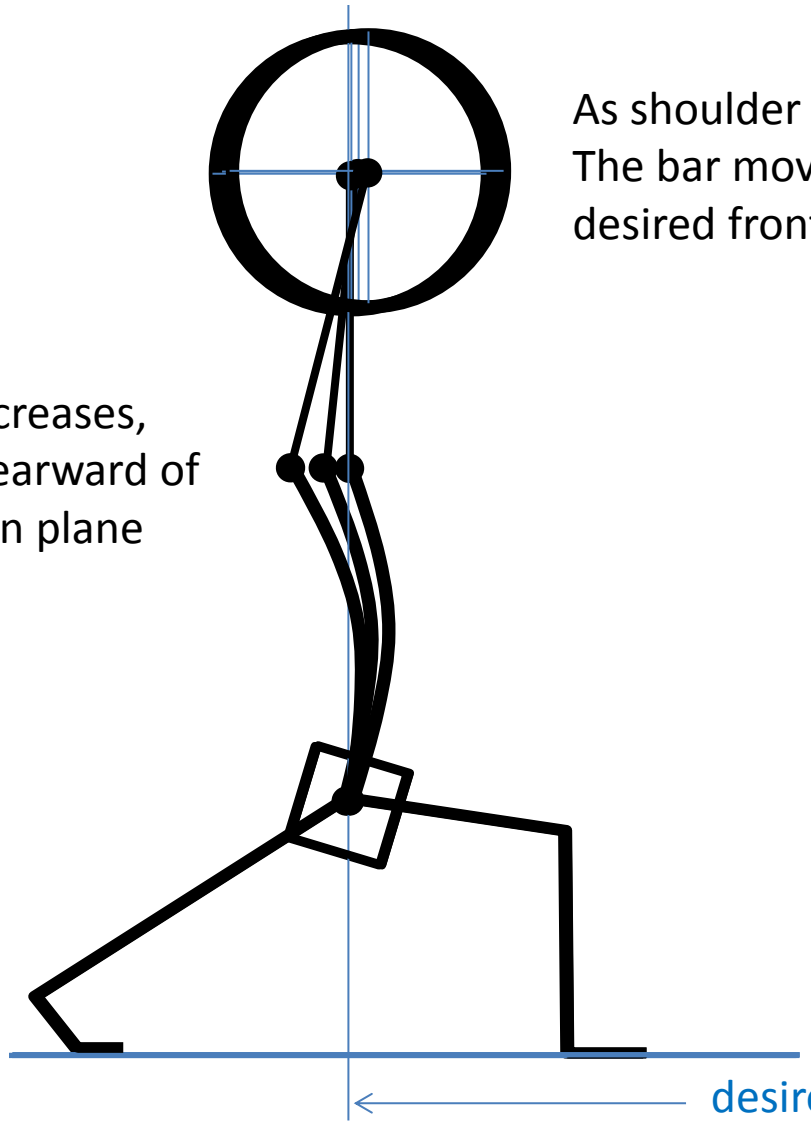
Note that most of us instinctively try to optimize the supporting leverage position of the legs (see above) even though it is detrimental to the supporting leverage position of the spine/shoulder/arm complex. Why? Because we have a lot of life experience at splitting without having to hold a heavy weight overhead, in which case we simply learn to optimize the position of the supporting legs (the position of the torso and arms are irrelevant).

Same faulty scenario as before, but the problem is exacerbated by shoulder mobility limitations of various degrees.

Most people fall somewhere in the above spectrum.

As shoulder mobility decreases, The bar moves forward of the desired frontal action plane

As shoulder mobility decreases, shoulders must move rearward of the desired frontal action plane



Putting it all together with Visualization:

After standing up from the clean, here is the sequence of visualizations and focus concepts that I use for the jerk. These work well for me, but you may have to develop your own visualizations and focus concepts that work best for you.

Setting up for the dip and drive…. be the "Telephone Pole"

1. Stand up tall and erect with the racked bar, and try to make it feel light.
2. While in the standing rack position, rock backward and make sure the weight passes through the front of your heels, not the balls of your feet.
3. Make one last quick attempt to remove any doubt and mentally commit to making the lift.
4. Take in a breath and use all of the torso supporting muscles to hydraulically pressurize the torso, especially the supporting muscles of the upper back.

Dip and Drive… attempt to "Bend the Bar"

1. Keep the pelvis completely vertical and keep the torso completely rigid and completely vertical while making a relatively shallow dip with your weight maintained on your heels, not allowing your hips to travel backward or your pelvis to rotate forward.
2. Explode with quads (enough to bend the bar), and follow thru with complete vertical extension

FINISH… "commit to putting yourself directly under the weight in the correct catch position"

1. Drive yourself straight down under the weight to **whatever depth is required** to achieve a complete and crisp lockout under the weight. Focus on maintaining a vertical pelvis in the catch position with the hips, shoulders and bar perfectly in vertical alignment.

Can we simplify things even further?

At this point, you should have an appreciation for the correct mechanics to be used in the jerk. But it is very difficult to keep all the fine points in mind while you are supporting a very heavy weight on your shoulder platform. So let's simplify the focus concepts down to something that we can actually handle, even under extreme duress. The simplified focus concept is "**Stay on your heels** & **keep the pelvis box completely vertical.**" If we can execute these two directives, then most of the other fine points of the jerk will naturally fall into place. In contrast, the quickest way to ensure that you violate many of the jerk's finer points is to allow your pelvis box to rotate forward or to allow your weight to shift to the balls of your feet, both of which cause a cascade of undesirable consequences.