The Exercise Technique Column provides detailed explanations of proper exercise technique to optimize performance and safety.

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The Sumo Deadlift

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ABSTRACT

THE SUMO DEADLIFT IS A COMMON VARIATION OF THE DEADLIFT USED IN POWERLIFTING COMPETITIONS. THE EXERCISE USES EXTENSION OF THE BACK, HIPS, AND KNEES IN UNISON TO LIFT A LOADED BARBELL FROM THE GROUND TO A FULLY ERECT STANDING POSITION. THIS COLUMN OFFERS A DETAILED DESCRIPTION OF PROPER SUMO DEADLIFTING TECHNIQUE. A VIDEO ABSTRACT DESCRIBING THIS ARTICLE CAN BE FOUND IN SUPPLEMENTAL DIGITAL CONTENT 1, HTTP://LINKS.LWW.COM/SCJ/A204.

INTRODUCTION

In the sport of powerlifting, the deadlift is one of the 3 skilled lifts tested in competition. It is also commonly used in strength-based sport training as well. It is described by the International Powerlifting Federation Technical Rules Book (http://www.powerlifting-ipf.com/fileadmin/ipf/data/rules/technical-rules/english/2015_V2_IPF_Technical_Rules_Book_2015_classic_rules_in_back_section.pdf) as a full body compound exercise used to lift a barbell from the floor to a standing erect position. In powerlifting, 2 deadlift variations, the conventional deadlift (CDL) and sumo deadlift (SDL) are used in competition. Of these 2 variations, the SDL is only described vaguely in the literature and often lacks specific detail on its technical execution. Given the increased risk for injury in powerlifting, because of the testing of maximal loads being the very nature of the sport, proper exercise technique, and coaching should be established.

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CHOOSING A VARIATION

For athletes such as powerlifters, there are a few factors to consider when choosing which deadlift variation to use. Factors such as anthropometrics, mobility, muscular activity, and injury history should be assessed to choose which variation is best suited for the athlete to achieve the heaviest lift possible in competition. Anthropometrically, it is suggested by Hales that athletes with elongated arms should use the CDL and those with shorter arms would be better suited to use the SDL (6). Those with average arm lengths are suited to use both variations. Arm segment lengths are defined as short by being less than or long by being greater than 38% of total body height (2).

Another consideration the athlete should consider is flexibility and mobility. The SDL requires greater hip mobility than the CDL to properly get into the starting position; therefore, athletes with reduced hip flexibility should choose the CDL over the SDL. Muscular activity should also be considered when choosing a deadlift variation for training programs and achieving maximal strength. Both the SDL and CDL generate similar amounts of large hip extensor moments (3,4). However, the SDL recruits greater quadriceps and knee moments than the CDL in addition to the hip extensor moments. Therefore, athletes seeking to limit excessive quadriceps activity should choose the CDL over the SDL.

Table 1
Advantages and disadvantages for the sumo deadlift and conventional deadlift broken down by biomechanics, anthropometrics, and injury history

Sumo versus conventional deadlift advantages and disadvantages		
Style	**Advantage**	**Disadvantage**
Sumo deadlift		
Biomechanics	Shorter range of motion (1,3,11); less total work needed to complete lift; less lumbar load shear (1); greater quadriceps activity (4)	Requires greater hip mobility; more time spent in the acceleration phase (3)
Anthropometrics	May be advantageous to athletes with shorter arms (6)	Not advantageous to athletes with longer arms (6)
Injury history	May benefit those with lumbar spine injuries	May not suit athletes with hip injuries
Conventional deadlift		
Biomechanics	Generally performed at a high velocity (3); may be more applicable to traditional sport skills	Requires greater work to complete lift (1,3,11); causes greater lumbar load shear (1)
Anthropometrics	May be advantageous to athletes with longer arms (6)	Not advantageous to athletes with shorter arms (6)
Injury history	May be better suited for athletes with knee or hip injuries	May not be suited for athletes with lumbar spine injuries

An athlete's individual injury history also needs to be assessed when selecting a deadlift variation. Because of the excessive trunk lean in the CDL increasing vertebral joint load shear, the SDL may be better suited for athletes with previous spine injuries (1,3,10). The deadlift has often been used in postsurgery ACL rehabilitation because of the co-contraction of the quadriceps and hamstrings (13,14). Because of the greater involvement of the hamstrings over the quadriceps, the CDL may be a better option in the early stages of ACL reconstruction therapy (3,4,10). Athletes with restricted hip mobility due to previous injuries should favor the CDL over the SDL because of the need for greater hip flexibility to properly perform the SDL.

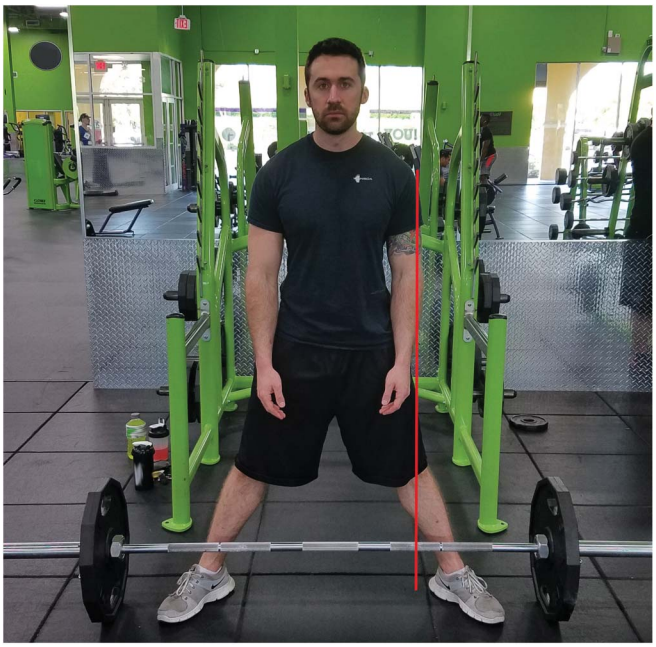

Figure 1. Approaching the bar: The athlete should approach the bar placed in front of him/her with the feet placed outside shoulder width with the midfoot placed laterally to the line created by the humeral head (noted by the red line).

To summarize, when selecting a deadlift variation, anthropometrics, flexibility, muscular activity, and previous injuries should be taken into consideration for each individual athlete. Athletes with elongated arms, limited hip mobility, training calls for less quadriceps activity, or previous knee or hip injuries should lean toward choosing the CDL. Those with shorter arms, above average hip mobility, a need for greater quadriceps recruitment, or suffer from back pain or previous vertebral injuries should favor the SDL over the CDL for training and competition. However, powerlifting athletes should feel open to exploring both

Figure 2. Foot placement: The midfoot should be in line with the bar with the feet turned outward at approximately 40–45° with the shins in a near vertical position.

Figure 3. The sumo deadlift starting position: The scapulae should be in line with the bar and the hips should be higher than the knees, trunk approximately at 45°. The spine should maintain slight lordosis and the chest should be out and proud with the head and eyes forward.

variations in their out-of-competition training to find which variation works best for them. Table 1 highlights these advantages and disadvantages.

TYPE OF EXERCISE

The SDL is a compound exercise involving extension of the knees, hips, and back in unison (3,4,6,10,12). It is a full body strength exercise where the athlete lifts the barbell from the floor to pelvic height, with the body standing in a fully erect position. The deadlift is used in powerlifting as one of the 3 skilled lifts performed during a competition. The SDL or CDL may be used in competition. Strength-based athletes such as football players, wrestlers, rugby players, and weightlifters may benefit from this exercise as well.

MUSCLES INVOLVED

The direct musculature involved with the SDL includes the erector spinae (iliocostalis, longissimus, and spinalis), iliocostalis lumborum, gluteus maximus, hamstrings (bicep femoris, semimembranosus, and semitendinosus), and quadriceps (rectus femoris, vastus lateralis, vastus medialis, and vastus intermedius). Stabilizer muscles include the rectus abdominis, external obliques, trapezius, latissimus dorsi, gastrocnemius, and the tibialis anterior (4,7,11,12).

BENEFITS OF THE EXERCISE

The SDL is a compound movement that can promote an athlete's total body strength. Powerlifters have the choice to use the SDL variation in completions. Powerlifters who wish to increase quadriceps development with exercises outside the squat may benefit from using the SDL during out-of-competition training (4). However, technique specificity should become more of a priority as they approach competition (5). Athletes involved in sports that require strong or rapid back, hip, or knee extension would also benefit from this movement. The SDL often requires less work to perform when compared with the CDL because of the shorter range of motion that is created by the reduced bar to lumbar

Figure 4. Body position as the bar passes the knees: The knees, hips, and back should continue to extend simultaneously. The bar should maintain contact with the anterior portion of the athlete's legs until lift completion.

moment arm and the wider stance associated with the SDL (3,12).

EXERCISE TECHNIQUE

Starting position–preparation. Before starting, the athlete or coach should ensure that a standard barbell is being used to create consistency in exercise technique. The bar should be positioned on the floor in front of the athlete. Once the proper barbell setup is positioned on the floor, the athlete should assume a stance with the feet placed outside the shoulder width. Specifically, the midfoot should be placed laterally to the line created by the humeral head (Figure 1). Actual foot width may vary to some degree based on the athlete's anthropometrics and mobility. The midfoot should be in line with the bar with the feet turned outward at approximately 40–45° with the shins in a near vertical position (Figure 2).

After the athlete has properly placed his/her feet diagonally, they should then actively squat down and grip the bar. The knees should be in line with the second and third toes of the foot. The arms should hang straight down directly between the knees with the hands gripping the bar in a double overhand (hands pronated), alternated (one hand pronated, the other supinated), or hook grip (hands pronated with fingers over thumb).

Once the athlete's feet are properly set and the bar gripped correctly, the athlete may set into the starting position by shifting the hips back while maintaining an upright trunk position approximately at or less than 45°. The hips should be positioned slightly higher than the knees, and the spine should be arched in slight lordosis opposing lumbar spine flexion. Excessive lordosis or kyphosis should be avoided. The shoulders should be positioned slightly in front of the bar with the scapulae in line vertically with the bar. The latissimus dorsi should then be actively engaged while simultaneously externally rotating the femurs, driving the knees outward.

Before initiating the movement, the athlete should take a deep breath to "brace" the abdominal wall for lumbar support and isometrically contract the trunk muscles. This can be achieved by drawing air in through a large breath into the diaphragm. If the athlete is breathing correctly, this can be observed by a distended abdomen. The athlete should be cued to "fill the belt and hold it" to reinforce that both the abdominals and erectors are braced properly.

Finally, the athlete should be cued to sit back, keep his/her chest forward and open with the head facing forward all while pulling the "slack" out of the

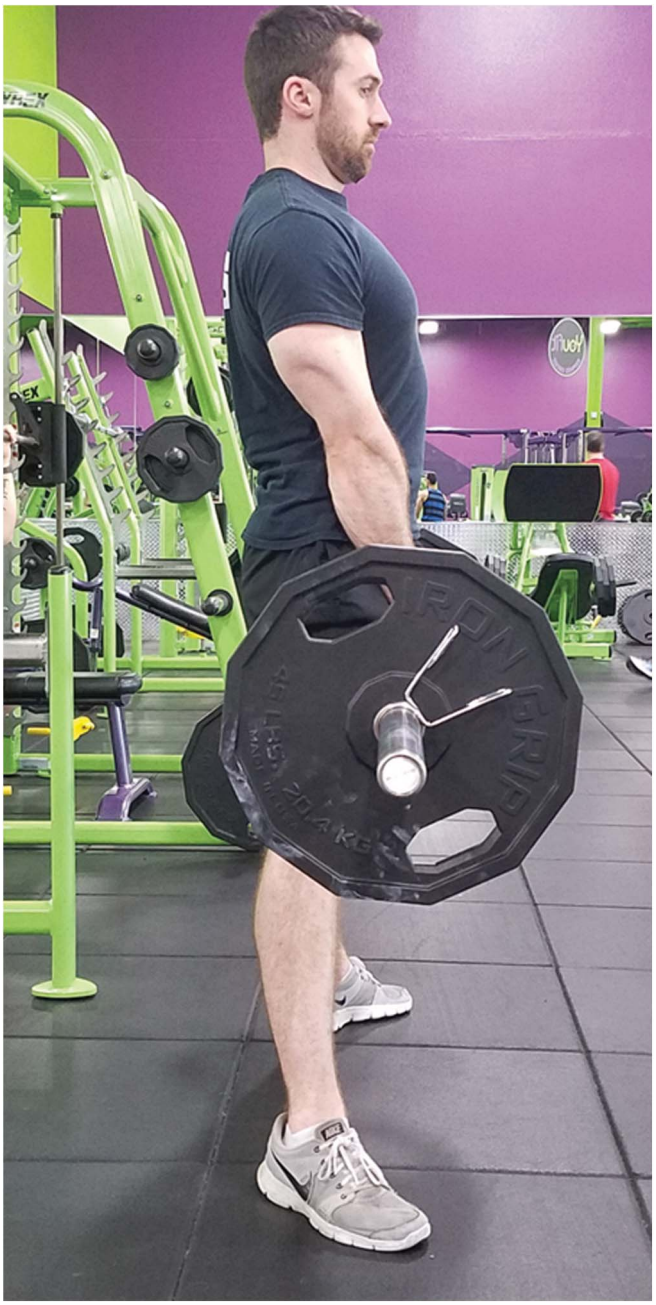

Figure 5. "Lock out"; lift completion: The knees, hips, and back are fully extended avoiding excessive hyperextension of the back.

bar. Hyperextension of the spine should be avoided when keeping the chest up. The cue of "proud chest" may help to avoid this. This will put the athlete in the proper starting position with correct spinal column support and hip height position. In addition, the athlete will be placed in a "tight" body position that will allow the bar to move in the most vertical path possible (Figure 3).

Execution—pulling to the knees. Just before starting the SDL movement, the athlete should isometrically contract the quadriceps, gluteus muscle group, latissimus dorsi, and back extensors. Abdominal tension and bracing should also be maintained.

To initiate the start of the movement, the athlete should simultaneously begin extension of the knees, hips, and back. Cues should focus on "driving the feet into the ground" and "pushing the feet apart." The knees should continue to be driven outward with femoral external rotation to oppose knee valgus and change in vertical shank angles as the bar leaves the floor and approaches the knees. The bar should "drag" along the anterior portion of the shin to minimize the length of the hip-to-bar moment arm. The body position as the bar reaches the knee can be seen in Figure 4.

Pulling from the knees to lockout. As the bar reaches knee height, forceful hip extension should occur to drive the hips into the bar by contracting the gluteus muscles. The cue "hips forward" as the bar passes the knees will assist the athlete in performing this at the correct time. The bar should continue to "drag the body" by staying in close contact with the anterior portion of the thigh. Simultaneously, the knees should continue to extend until full extension is reached. The hips should come to full extension either at the same time as knee extension is achieved or slightly after. Once the back, hips, and knees are all fully extended, "lock out" is achieved and the lift is considered completed (Figure 5). Excessive lock out resulting in hyperextension of the spine should be avoided.

Table 2 provides a quick checklist guide for coaches to reference in regard to proper technique for performance of the SDL.

COMMON ERRORS

The athlete may start the movement with the bar too far away from the body. This may result in increased hip-to-bar moment arm length and excessive forward trunk lean. This can often be seen in a "counter movement" during the start of the SDL,

Table 2
Technique checklist for the setup, concentric portions, and eccentric portions of the sumo deadlift

Technique checklist
Setup
✓Olympic style barbell and plates are being used
✓Feet are placed outside shoulder width
✓Feet are rotated outward at 40–45°
✓Bar is gripped with a double overhand, alternated, or hook grip
✓Hips are positioned higher than the knees and trunk is at or less than 45°
✓Scapulae are in line with the bar
✓Spine is arched in slight lordosis
✓Chest is open and "proud"
✓Head facing forward
✓Athlete is properly braced
Concentric execution
✓Simultaneous knee, hip, and back extension
✓Knees are continually pushed outward
✓Spine is kept rigid and opposing flexion
✓Hips are rapidly pushed toward the bar as it passes the knees
✓Head is kept facing forward
✓Bar maintains contact with the body throughout the execution
Lock out
✓Athlete has fully extended his/her knees, hips, and back
✓Head is kept facing forward
✓Excessive hyperextension of the back has not occurred
Eccentric lowering of the bar
✓Athlete continues to grip the bar until it reaches the floor
✓Actively squats down to lower the bar
✓Bar continues to maintain contact with the anterior portion of the body
✓Spinal rigidity and slight lumbar lordosis is maintained
✓Once the bar reaches the floor the movement is then ended

where the athlete will begin to lift the bar, slightly lean back forward, then re-extending the spine continuing to executing the movement. This may be corrected by ensuring that the scapulae are in line with the bar.

The athlete may begin the movement with the hips positioned too low or too high. This may result in greater muscular recruitment of the low back and increased stress on the lumbar spine (hips too high). It may also cause decreased strength by increasing activity of the quadriceps and reducing activity of the hamstrings (hips too low). This can also be the result of not executing triple extension of the knees, hips, and back simultaneously.

The athlete may not keep the bar close to or in contact with the body throughout the movement. This can cause increased vertebral load sheer by increasing the hip-to-bar moment arm length.

The athletes grip can fail because of fatigue or lack of grip strength. This will result in an incomplete lift and can be possibly dangerous. This can be avoided by reducing the weight until the athlete has the proper grip strength needed to handle higher loads or by using lifting straps.

The athlete's knees can "collapse" in knee valgus causing decreased vertical shank angles. This decrease in shank angle during the execution of the movement can cause the knees to "get in the way" of the bar, reducing velocity and resulting in incorrect SDL technique. This can be avoided by keeping the knees pushed outward and by additional strengthening of the gluteus medius.

The athlete may lose spinal position and rigidity at some point during the SDL movement. This can put the athlete in compromising positions and result in injury. Strengthening of the spinal extensors and the latissimus dorsi may help to oppose this error. A reduction in weight may be necessary until the athlete obtains the proper strength needed to perform the lift correctly and safely.

The athlete may hyperextend his/her neck at the onset of the SDL when pulling the weight off of the floor. This can cause a loss of tension in the erector spinae and lead to neck pain or injury. This may be corrected by cueing the athlete to keep their chest open and "proud" and by ensuring they keep their head and eye's facing directly forward.

Table 3 offers a reference for common errors, causes for errors, and corrections for errors.

Failures when performing the SDL that occur off the floor are the most

Table 3
A reference for common errors, causes for the errors, and ways to correct the errors

Common errors		
Error	**Cause**	**Correction**
Countermovement of the trunk at the start of lift	Bar is positioned too far away from the body	Ensure scapulae are in line with the bar before execution
Hips incorrectly positioned at the start of the lift	Hips positioned either too high or too low during the setup	Ensure that hips are above the knees and the trunk is at or less than 45°
Bar is not kept in contract with the anterior portion of the body	Starting bar position is too far away from the athlete; athlete is leaning forward during execution	Position bar over the midfoot close to the athlete's shins; ensure knee, hip, and back extension occur simultaneously; cue athlete to "sit back on heels" during execution
Athlete drops the bar during execution	Improper grip; weak grip; use of a load greater than the athlete's ability	Consider using an alternating or hook grip; use lifting straps; reduce load
Knees collapsing in valgus into the bar	Athlete is not keeping knees pushed outward; weak hip abductors	Cue athlete to "push knees out" during execution; perform additional hip abduction exercises to increase strength
Loss of spinal rigidity	Weak spinal extensors and support; use of a load greater than the athlete's ability	Perform additional spine extensor and latissimus dorsi exercises; reduce load
Hyperextension of the neck	Improper cueing or starting position; athlete is looking upward	Ensure that the athlete's chest is open and in a "proud" position; ensure the athlete's head is facing directly forward

common and often due to either a lack of strength or by positioning the hips too low. This can be addressed by ensuring that the hips are positioned at the correct height. Additional exercises such as deficit deadlifts may assist the athlete with increasing off the floor strength. Deficit deadlifts are performed by having the athlete stand on an elevated platform or blocks with the weight still placed on the floor. This will increase the total range of motion of the SDL by increasing the length the bar has to travel before reaching "lock out."

Failures that occur as the bar passes the knees and through lockout are less common but may still occur. Failures at this point are often due to a lack of hip extensors strength. This may be addressed through additional direct gluteal training or through exercises such as "pin pull deadlifts" or "block pull deadlifts" where the athlete trains the upper portion of the SDL by deadlifting the bar from a heightened position.

PRACTICAL APPLICATIONS

The SDL can be used in year round training cycles with the repetitions and intensities determined by the needs of the athlete and mesocycle goals. The SDL may also be used interchangeably with the CDL depending on the specific muscular needs of the athlete's training program. Powerlifters specifically, should begin to train with the deadlift variation they plan to use in competition in the weeks before competing. Whether it be the SDL or CDL, specificity should be what determines the variation used in the mesocycle leading into a competition (5).

The SDL may also have merit in a rehabilitation program for patients suffering from low back pain (LBP). Although the CDL has been used to decrease pain and increase functionality in those who suffer from LBP, Escamilla et al. reported similar back extensor and trunk-muscle activity between the SDL and CDL (4,8,9). It is possible that the SDL may produce similar results in regard to LBP as the CDL. In addition, the SDL may be a safer option to the CDL for those suffering from LBP, because of the reduction in L4/L5 lumbar load sheer reported by Cholewicki et al. (1). This is likely the result of the more vertical trunk position of the SDL (1). However, more data on the SDL needs to be collected to support that practical benefit.

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