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# The Power Clean and Power Snatch From the Knee

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## ABSTRACT

THE POWER CLEAN AND POWER SNATCH FROM THE KNEE CAN BE USED IN THE TEACHING PROGRESSION OF THE CLEAN AND SNATCH EXERCISES BECAUSE THEY EMPHASIZE POSITIONAL STRENGTH DURING THE TRANSITION PHASE, USE THE DOUBLE KNEE BEND TECHNIQUE, AND TRAIN THE TRIPLE EXTENSION OF THE HIP, KNEE, AND ANKLE JOINTS.

## INTRODUCTION

Exercises that involve high rates of force development (RFD), such as the clean and snatch, are beneficial for improving an athlete's physical preparedness (9,11,12,14–17,22,26,36). Additionally, previous research has demonstrated that weightlifters produce greater peak force, higher velocities, and peak power in comparison to powerlifters (22). Acknowledging these

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findings, weightlifting movements and their derivatives are popular resistance training exercises that are prescribed by many strength and conditioning practitioners. The transferability of the full clean and snatch hinges on proper movement execution. Incidence of injury may increase if the technique is not refined or revisited during the training year (8). To decrease the complexity of the movement and reinforce proper technique, weightlifting derivatives used to teach the full weightlifting movement can also be used in training (3–6,31–33).

## TYPE OF EXERCISE

The power clean from the knee (CK) and power snatch from the knee (SK) weightlifting derivatives are complex multijoint exercises that can be used to train lower-body muscular power and strength at key positions during the transition into the peak power position and the subsequent triple extension of the hip, knee, and ankle joints. Concurrently, these exercises also provide the athlete with an opportunity to enhance

their ability to complete the catch phase using movements that are less complex than the full clean and snatch. The CK and SK may be performed from a static position off of technique blocks or with the bar lowered to a hang position at the knee.

## MUSCLES INVOLVED

The CK and SK involve muscles that have been previously described during similar weightlifting movements (3–7,32,33).

1. Static stability in the starting position
  - Erector spinae group (iliocostalis, longissimus, and spinalis), rectus abdominis, transverse abdominis, external obliques, internal obliques, quadratus lumborum, triceps brachii (long head), deltoid, subscapularis, latissimus dorsi, brachioradialis, trapezius, splenius capitis, splenius cervicis, infraspinatus, serratus posterior inferior, rhomboid major, rhomboid minor, and the supraspinatus.
2. Transition, second pull, and catch phases of the CK and SK

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- Upper extremities: trapezius, splenius capitis, splenius cervicis, levator scapulae, rhomboid minor, rhomboid major, serratus posterior superior, posterior deltoid, teres minor, teres major, erector spinae group (iliocostalis, longissimus, and spinalis), rectus abdominis, transverse abdominis, external obliques, and internal obliques.
- Lower extremities: quadriceps group (rectus femoris, vastus lateralis, vastus medialis, and vastus intermedius), gluteus maximus, hamstrings group (biceps femoris, semimembranosus, and semitendinosus), gastrocnemius, soleus, tibialis posterior, flexor digitorum, peroneus longus, and the peroneus brevis.

### BENEFITS OF THE EXERCISE

The CK and SK weightlifting derivatives are skill-transfer exercises that strength coaches can prescribe to improve their athlete's development of weightlifting movements. Initially, the CK and SK aid in the strengthening of the musculature used during the execution of the full weightlifting movements. In addition, these movements allow the athlete to focus on a proper transition into the peak power position and the triple extension of the hips, knees, and ankles, while also providing the additional stimulus of culminating the lift with the catch phase. Furthermore, these derivatives can serve as transitional exercises in learning the full weightlifting movements by integrating previously described partial movement derivatives (3–6,10,32,33). As such, the CK and SK accompany the short-to-long principle, or partial to full range of motion, approach to training the full weightlifting movements.

In the practical setting, the CK and SK involve both eccentric and concentric muscle actions that allow the athlete to efficiently transition into the proper peak power position and accelerate the bar using a full-body triple extension movement while eliminating the added stress of properly pulling the weight from the floor. For this reason,

the CK and SK can be used as teaching tools to progress the technique of an athlete into the full lifts. In addition, these exercises can also be used to enhance the RFD and resultant competitive preparedness through mechanical specificity. Specifically, commonalities exist between an athlete's position in this lift and common sporting movements (e.g., shot put, jump shot, tennis serve, max velocity sprinting, and bobsled start) (29). In theory, the static start of these movements may allow for a large transfer of training effect in athletes who are required to produce high RFD and power from a static starting position (e.g., sprinters in track and field and American football linemen).

Finally, the CK and SK could theoretically be used as potentiating modalities because of the creation of high RFD during the movements. Previous research has incorporated weightlifting derivatives into strength-power potentiating complexes (1,23–25). Because of the decreased range of motion and ability to overload the triple extension movement, the CK and SK may be used as part of a strength-power potentiating complex.

### STARTING POSITION

- In preparation to perform either the CK or SK, technique boxes or the safety bars of a squat rack should be placed so that the bar is at the appropriate height relative to the athlete's anthropometrics. Specifically, the bar should be positioned directly in front of, but not touching, the patella just above the proximal attachment of the patellar tendon.
- After the bar has been positioned properly, the athlete should address the bar with his or her feet approximately hip width apart. The bar should be positioned above the mid-foot, and the athlete's toes should be pointing slightly outward to maintain consistent foot positioning with other weightlifting derivatives (3–6,32,33).
- Following foot placement, the athlete should properly position his or her hands on the bar. The appropriate hand placement will be based on

whether the athlete is performing the clean or snatch variation (10). The "hook grip" (fingers over thumb) should be used for both the CK and SK exercises to prevent grip being a limiting factor of performance. Because loads in excess of a maximum clean or snatch may be used during the CK and SK, respectively, athletes may consider the use of lifting straps.

- Following the acquisition of proper hand and grip placement, the athlete should flex forward at the hip while creating a normal lordotic curve in the lumbar spine by isometrically contracting the erector spinae musculature to "raise" the chest. Concurrently, the athlete should flex the knee until a slight stretch in the hamstring is felt. The athlete's shins should be vertical and perpendicular to the floor while his or her shoulders should be positioned ahead of the bar (Figure 1).
- The athlete should then be cued to internally rotate his or her shoulders and "turn his or her elbows out" to ensure that a stable arm position exists for the active pulling portion of the CK and SK. This will assist in preventing the elbow joint from prematurely bending (flexing) during the pulling phase of the exercises.
- The athlete should be instructed to "sit on his or her heels" in the starting position to maximize his or her ability to produce the greatest possible forces through the platform during the initiation and continuation of the lift. This cue will also allow the athlete to maintain the correct foot pressure during the transition to the peak power position and also allow greater control and improved bar speed.

### TRANSITION TO THE PEAK POWER POSITION

- Before initiating the CK or SK from the static starting position, the athlete should create a "tight" torso by developing tension in the muscles of the midsection by inhaling deeply. The athlete should also maintain the lordotic curvature of his or her lumbar spine to maintain the appropriate hip angle to maximize the force produced into the platform.



Figure 1. Starting positions for the power clean from the knee (left) and the power snatch from the knee (right). Note that the starting position of the athlete may vary slightly based on the athlete's anthropometrics.

- After achieving the set starting position, the athlete should initiate the CK and SK by engaging his or her hamstrings, glutes, and erector spinae muscles to begin to move the bar vertically.
- During the transition phase of the CK and SK, the athlete must transition the bar to the peak power position (4,13,21) to maximize the force and power produced during the later second pull phase of the movement. The transition of the bar from the starting position to the peak power position is accomplished by the athlete by extending his or her back while simultaneously moving the hips and knees forward at the same instant and

tempo. At this point, the athlete should be moving into a dorsiflexed position at the ankle joint.

- During the transition phase to the peak power position, the path of the bar should always be moving vertically "up and into" the body.
- The bar should remain as close as possible to the body without touching the thighs until reaching the peak power position (Figure 2). This will allow the athlete to continue to accelerate the bar without additional frictional influences.

#### THE SECOND PULL

- The second pull phase of the CK and SK begins when the athlete reaches

the power position. As the athlete transitions to the power position, he or she should use the momentum created during the first pull to build up the intensity into an explosive pull.

- Upon reaching the power position, the bar should make a "brushing" contact with the thighs before the triple extension movement occurs. The athlete should continue to engage his or her erector spinae musculature and keep his or her elbows extended and externally rotated to prevent early bending (flexing) of the elbows during the pull.
- At this point, the athlete should perform the triple extension movement by explosively extending his or her



Figure 2. Power positions for the power clean from the knee (left) and the power snatch from the knee (right). Note that the position of the barbell may vary slightly based on the athlete's anthropometrics.

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hips, knees, and ankles. Simultaneously, the athlete should shrug their shoulders to maximize barbell velocity (Figure 3).

- In addition to the shrug, the athlete should be taught to slightly flex the wrists to keep the barbell close to his or her body.
- Following the pull, the athlete should control the bar's descent to the mid-thigh position. The athlete can then either lower the bar onto the technique boxes or power rack or lower the bar to the hang position at the knee in preparation for the next repetition.

### **THE CATCH FOR THE POWER CLEAN FROM THE KNEE**

- Once the full triple extension and shrug have been executed, the elbows should “break” (bend/flex). The athlete should be cued to “lead with the elbows” to further elevate the bar as a continuation of the second pull.
- The athlete should then be instructed to aggressively drive the elbows forward and up “through the bar.” The athlete should rotate his or her elbows around the bar from a vertical position (above the bar) into a horizontal position (in front of the bar).
- During the rotation of the elbows, the coach should direct the athlete to “relax” his or her grip, which will

allow greater flexibility of the wrists when receiving the weight on his or her shoulders.

- Simultaneously, the athlete should flex the knees or “drop” into a quarter squat position to receive the weight as it lands on his or her shoulders (Figure 4). During the descent, the athlete's feet may leave the ground and move slightly outward to create a more comfortable and stable position to receive the bar.
- The shoulders of the athlete should make contact with the bar at the same moment the bar changes from ascension to descension to avoid the bar “crashing” on his or her shoulders. The proper timing of this chain of events is to prevent the accumulation of unnecessary stress on the body.
- When receiving the bar, or “catching the bar,” the athlete should maintain a contracted and braced midsection to provide optimal control of the weight and prevent an injury that could occur through a deviated trunk angle.
- While in the catch position, the athlete should continue to flex the knees while activating his or her quadriceps, hamstrings, and gluteal muscles to apply vertical forces to bring the descension of the bar to a halt. The athlete should then return to an upright position completing the lift.
- To properly return the barbell to the technique boxes or rack, the athlete

should drop the elbows and maintain an isometric contraction of the midsection and posterior musculature to avoid any unnecessary anterior pelvic tilt as the bar descends to the mid-thigh position. The athlete can then either lower the bar onto the technique boxes or power rack or lower the bar to the hang position at the knee in preparation for the next repetition.

- Before initiating the next repetition, the athlete should fully return to the starting position as displayed in Figure 1.

### **THE CATCH FOR THE POWER SNATCH FROM THE KNEE**

- After the completion of the triple extension movement and once the shrug has been executed, the elbows should “break” (bend/flex). The athlete should be cued to “lead with the elbows” to further elevate the bar as a continuation of the second pull.
- The athlete should then be instructed to rotate the hands and elbows “around the bar.” The elbows should appear to rotate from a vertical position above the bar into a position that is below the bar.
- Simultaneously, the athlete should flex the knees or “drop” into a quarter squat position (Figure 4).
- The athlete's feet may leave the ground during the “drop” and move



Figure 3. The second pull of the power clean from the knee (left) and the power snatch from the knee (right).



Figure 4. The catch of the power clean from the knee (left) and the power snatch from the knee (right).

slightly outward to a more comfortable and stable position.

- At this point, the athlete should maintain contact with the platform through the whole foot. This will allow for improved control in the reception and recovery during this transitory phase.
- The athlete should press up until the elbows are locked in full extension. The athlete can be cued to “push through the bar” or “pull the bar apart” to maintain this extended position.
- Just as described in the catch for the CK, the athlete should attempt to attain the receiving position just as the bar changes direction from ascension to descension to avoid the bar “crashing” onto them.
- When receiving the bar, or “catching the bar,” the athlete should maintain a contracted and braced midsection to provide optimal control of the weight and prevent an injury that could occur through a deviated trunk angle.
- While maintaining this position with the weight overhead, the athlete should have continued knee flexion while applying vertical forces until the descent of the bar has stopped. Once in control, the athlete should then ascend into an upright position completing the lift.

- To return the barbell to the technique boxes or power rack, the athlete should allow the weight to descend in a controlled motion from overhead to the midhigh position. During this process, the athlete should continue to maintain an isometric contraction of the midsection and posterior musculature to avoid any unnecessary anterior pelvic tilt as the bar descends to the midhigh position. The athlete can then either lower the bar onto the technique boxes or power rack or lower the bar to the hang position at the knee in preparation for the next repetition.
- Before initiating the next repetition, the athlete should fully return to the starting position as seen in Figure 1.

#### COMMON MISTAKES OF THE POWER CLEAN AND POWER SNATCH FROM THE KNEE

The transfer of the training stimulus produced by the CK and SK hinges on proper movement execution. Moreover, if technique is not reinforced during the training year, the incidence of injuries may increase (8).

- The athlete may begin the movement without his or her shoulders retracted and a rounded back, which

may result in an improper transition to the peak power position and may place excess stress on the athlete’s lower back.

- The athlete may not shift to a fully upright position with the shoulders, hips, and midfoot in line before beginning the second pull, causing the chest and shoulders to remain ahead of the bar.
- The athlete may not allow the hips and knees to shift forward once the barbell passes the knees (transition phase) as a result of the athlete pulling forward rather than vertically.
- The athlete may begin the second pull phase too early. Specifically, the athlete will begin the second pull by performing the triple extension motion when the bar is visually too low on the athlete’s thigh. This would result in the athlete not properly reaching the necessary power position for maximum force production.
- The athlete may “dip” (i.e., drop under the bar) before completing the triple extension movement.
- The athlete may push his or her hips too far forward during the transition and second pull instead of continuing to drive vertically through the midfoot, likely resulting in a looping of the bar away from the athlete’s body.

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- The athlete may transition his or her body weight to his or her forefoot too early, likely resulting in the improper vertical transference of force through the midfoot before the triple extension movement during the second pull.
- Premature elbow flexion may prevent maximum transference of generated force to the bar before the second pull.
- The athlete may not complete the full triple extension movement of the hips, knees, and ankles, ultimately preventing maximum vertical force production.
- The athlete may complete the shrugging motion before the full triple extension movement.
- The athlete may not aggressively shrug at the top of the second pull, which may prevent maximum bar velocity. Although failing to aggressively shrug at the top of the second pull may not impact lower-body power development, it may impact the transfer of the pulling technique of the CK and SK.
- During the CK, the athlete may not elevate the elbows and upper arms high enough during the catch, resulting in the weight resting on the wrists and elbows instead of the shoulders.
- During the CK, the athlete may lean forward during the catch, causing rounding of the thoracic spine, which would lead to greater weight distribution on the toes and unwanted pressure on the wrists and elbows.
- During the SK, the athlete may not keep his or her elbows “locked” during the catch, which may result in having to perform a partial press to regain complete extension.
- During the SK, the athlete may fail to “push the head forward,” which would result in the weight being slightly ahead of the torso. This would prevent the athlete from being able to maintain the barbell in an overhead position.
- During the SK, the athlete may allow the barbell to travel too far behind his or her head, which may prevent him or her from stabilizing the load in the correct position.

### PRACTICAL APPLICATION

The CK and SK weightlifting variations are resistance training exercises that can be used in most blocks of training. Like other weightlifting derivatives, the CK and SK are primarily used to enhance RFD, power development, and explosive speed during the triple extension movement. The CK and SK to a lesser extent may be used to overload the triple extension movement; however, other weightlifting derivatives may be more effective as an overload stimulus (31). Practitioners should be aware that the method of performing the CK and SK may change the training stimulus experienced by the athlete. Specifically, if the CK or SK were performed from training blocks or a power rack, the completion of the exercise may require greater RFD because the athlete would have to overcome the inertia of the training load from a dead-stop position. This variation of the CK and SK may present more benefits to athletes who perform an explosive movement with RFD from a static starting position (e.g., sprinters in track and field and American football linemen). In contrast, a CK or SK performed from the knee without the assistance of training blocks or a power rack could theoretically require greater positional strength in the initial starting position. This variation of the CK or SK may be appropriate for athletes with sufficient levels of strength.

Practitioners may consider implementing the CK and SK into maximal strength and strength-power training blocks, where the primary goals are to enhance maximal force output and RFD. These types of training blocks typically use reduced volumes ( $3 \times 5$  to  $3 \times 3$ ) and heavier training loads (2,27,28). Previous research suggests that the training loads for the CK and SK will likely be lower than that of the power clean and power snatch from the floor (19). However, athletes may be able to use loads comparable to those used with the hang power clean (18,20,30,35), considering the similar displacement of the load. It should be

noted that the CK and SK do not include a countermovement that is characteristic of the hang power clean or hang power snatch, and thus, there may not be as much preactivation of the hamstrings. During a maximal strength or strength-power training block, the CK and SK can also be used to reinforce technique before transitioning to future training blocks in which the full weightlifting movements may be prescribed.

The CK and SK exercises may also be used during speed-strength or explosive speed training blocks. The primary goal in speed-strength or explosive speed training blocks is to enhance peak power output. Because the CK and SK require the bar to be “turned over,” they are speed-dependent movements that require a higher level of technical proficiency compared with other partial movements (31,34). The primary sets and repetitions that would be used with these exercises would be, for example, 3 sets of 5 repetitions during a speed-strength block and even lower for explosive speed blocks ( $3 \times 3$ ,  $3 \times 2$ , and  $2 \times 2$ ) (2,27,28). A paucity of research on the optimal load for peak power production during the CK and SK exists. Thus, practitioners must consider the loading recommendations based on previous studies that have examined similar weightlifting derivatives to make evidence-based decisions on loading for the CK and SK. As previously mentioned, it is likely that the loads used during the CK and SK may be comparable to those of the hang power clean and hang power snatch. Previous research has suggested that the optimal load of the lifter plus bar system during the hang power clean occurs at approximately 70–80% 1 repetition maximum (RM) (18,20), whereas other studies indicated that greatest peak power of the lifter plus bar system occurred at 65% 1RM (30,35). Because of the similarities of the CK and SK to the hang power clean and hang power snatch, it is likely that similar loads may be prescribed with modifications for athlete proficiency and strength as needed. Weaker or less

technically proficient athletes should focus on improving peak power through lighter loads, whereas heavier loads may be prescribed for a stronger, more technically proficient athlete.

The technique and application discussed in this article should serve as baseline information for those interested in performing and implementing the CK and SK exercises. The CK and SK may be used in the teaching progression of the clean and snatch exercises because they emphasize positional strength during the transition phase, use the double knee bend technique, and train the triple extension of the hip, knee, and ankle joints. Only general recommendations may be made on how best to implement the CK and SK exercises because of the limited amount of current research. Future research should consider examining the loading effects on performance variables during the CK and SK so that more specific recommendations can be made.

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