Introduction

The recent popularity of the Olympic lifts within the fitness industry has added a new dimension to many training programs. The increased use of highly technical exercises requires adequate preparation on behalf of the client from a musculoskeletal standpoint, as well as a greater degree of instructor competence to properly teach the lifts. Clearly a weekend workshop is insufficient instruction for an individual to safely teach these types of skill-based lifts. Therefore, personal trainers who want to employ these exercises will find it beneficial to pursue additional training so that they can properly instruct them. Unlike a traditional strength exercise like a military press, the Olympic lifts are velocity based and increase neuromuscular and musculoskeletal requirements. Trainers must be familiar with proper teaching cues as the movements are complex, fast and place significant stress on the body. The Olympic lifts certainly require a given level of expertise and physical capability to execute in safe manner, but most fitness enthusiasts seem eager to take on the challenge. This is evident by simply spending five minutes on YouTube, which quickly identifies the potential problems associated with poor instruction and lifting form. Key areas for concern (also common sites for injury associated with faulty form) include the shoulder joints, rotator cuff, spine and lower back musculature.

In the Olympics there are two lifts; the snatch and the clean and jerk. There are multiple lifting variations, or methods, that can be used within competition. For example, following a complete clean from the floor, the jerk portion of the movement may be legally completed in a power jerk or split jerk position. Outside of Olympic competition there exists a wide array of movements used in support of the competitive exercises as well as application in sports performance. Numerous assistives also have merit in support of this style of training, some of which also have variations, but again are technical in nature and require adequate preparation for safe use in a program.

Traditional lifts in some cases will form the foundational components of Olympic weightlifting. Due to the technical nature of the Olympic lifts individuals should first develop adequate muscular fitness before attempting the movements. Inadequate stability, muscle imbalances and poor ROM become magnified during ballistic training and should be accounted for before clearance into an Olympic training program. It is suggested a foundational program be employed prior to engaging explosive movements. The traditional deadlift and front squat exercises must be mastered among clients before Olympic weightlifting is considered as they resemble the stable version of the first pull from the floor and the clean receive. For advanced lifters attempting to perform the snatch, the overhead squat is a pre-requisite exercise. For any individual considering Olympic weight lifting there are some relevant musculoskeletal ‘check points’ for safe clearance into the movement progressions.

1) Does the individual have pelvic stability? Lack of flexibility in the hips and lower back (particularly the hamstring and gluteal musculature) will compromise pelvic position during lifts from the floor. Likewise a posteriorly rotated pelvis during squatting exercises needs to be corrected before receives are considered.

2) Does the individual maintain adequate latissimus dorsi and triceps ROM? Individual assessment is not as relevant as a combined capability. For instance, latissimus dorsi
ROM in the sagittal plane is further challenged under a flexed hip and shoulder. Individuals that are assessed in the frontal plane may not demonstrate accurate limitations in either muscle group. An ability to rack and maintain the position during a full ROM front squat clearly demonstrates one’s mechanical readiness for Olympic receives.

3) *Does the individual have adequate trunk stability to receive ballistic loads?* Both the clean and jerk exercises as well as the snatch place significant demands on trunk stabilizers. Individuals commonly engage faulty stability couples, via over-activation of the hip flexors and erector spinae, inhibiting proper activation of the inner unit (diaphragm, pelvic floor, transverse abdominis (TVA), multifidus and posterior internal obliques). Inadequate stability is relevant for both concentric and eccentric movement but is primarily exploited during eccentric actions (receives). This is evident by spinal flexion and scapular protraction for bar control.

The assistive lifts mentioned earlier are also commonly considered prerequisites to performing the more complex Olympic lifts. Certain sequence mastery makes sense in the development of technique and readiness of the musculoskeletal and neuromuscular systems. For instance, the military press will precede the push press, which in turn develops foundational movement efficiency for the jerk exercises. Likewise clean pulls, high pulls, and high receives from the hang position can precede floor-pulled versions. Once an individual has mastered the rudimentary components, the techniques may progress into full ROM movements.

**Developing a Base – Fundamental Pulling Technique**

Once a client is cleared for Olympic movements and has established requisite capabilities, the first step to engaging the power clean is mastery of basic pulling technique. Most instructors will teach the clean using the hang position above the knee before descending to pull from the floor. When the exercise starts from the floor the chance for failure along the kinetic chain is increased as the demands to control both the body and the bar require a coordinated series of sequential actions to occur correctly. Personal trainers should understand that lifting resistance from the floor to the chest (or higher) is not innate from a biomechanical perspective. In fact, the client’s biomechanical efficiency and technique usually determine success in the maximal lifts; not necessarily their strength or power. Therefore emphasis should be placed on technique, not the load.

Basic pulling technique from the floor is generally addressed as a series of phases:

- **Starting Position**
- **First Pull (Liftoff)**
- **Scoop**
- **Second Pull (Jump Phase or Triple Extension)**
- **Pull-Under and Catch**
- **Recovery**

**Addressing the bar**

A hook grip is most effective in the performance of the Olympic lifts. The hook grip involves wrapping the index and middle fingers around the thumb, which is placed directly against the bar in a “hook-like” position. The other fingers assist the index and middle fingers which maintain tight contact with the thumb. This grip is believed to add about 10% to the possible load lifted during any pulling action. If this causes discomfort or irritation to the thumb, athletic tape can be used to mitigate the friction. Furthermore, lifting straps can also be used to optimize pulling forces through the fingers, while allowing individuals with smaller hands to keep contact with the bar during repetitive lifting. However, lifting straps can reduce relative hand strength and make the release of a missed repetition hazardous when performing snatches.

**The First Pull**

The starting position and first pull (or liftoff phase) may look relatively similar to the deadlift to the untrained eye, but they are certainly not identical. Elite powerlifters (not Olympic weightlifters) deadlift extreme weight by wearing footwear with a minimal or no heel, standing with their shins tight to the bar, and they keep their balance towards their heels. The lifter simply needs to keep their torso as erect as possible, using the hips, thighs and trunk to “stand up with the weight.” A common error is to suggest the bar should be dragged across the shins – this is blatantly incorrect based on simple physics. An individual trying to perform a clean from the floor cannot replicate a deadlifter’s technique as he or she will have trouble accelerating the bar with efficient vertical displacement as well as difficulty fixing the barbell in the receive position. The clean from the floor and the vertical jump have many similarities as both aim to move mass directly opposite gravitational pull. Deadlift technique creates an inability to forcefully jump in a coordinated vertical movement as the resistance is the heels driven through – but during the Olympic lifts the participant must drive off the ball of the feet. This identifies the clear difference between an explosive act of an athletic nature, compared to an act of moving heavy resistance.

For the starting position there are obviously individual variances based on anthropometrics, but it is generally suggested to place the feet about hip-width apart and align the bar over the meta-tarsal phalangeal (MTP) joints before squatting down to place the hands over the bar. The MTP joints are generally located under the distal aspect of the shoelaces, or inline with the base of the big toe. Novice lifters will often stay too tight to the barbell so that it starts directly above the ankle joint, and end up rubbing the bar against their shins. Likewise, a tendency exists to gain mechanical advantage by starting with a wider stance to preferentially access the gluteals. Keeping the heels under the hips can lead to the greatest vertical displacement of the barbell as this position takes full advantage of the length of the femur during knee and hip extension to produce greater torque. Unfortunately, tightness in the hamstrings and lower back create limitations to the start position, as it will lead to the participant using a wider stance (heels outside of the hips).

During the first pull, the lifter will pull through the fingers using a neutral wrist position, and the barbell will slightly move towards the mid-upper shins. Again it must be understood that the lifter should not intentionally attempt to pull the bar toward the shins, nor make contact with the shins. Contact demonstrates an error in center of mass alignment. The arms serve as an anchor to the torso; therefore, the elbows should be fully extended and remain over the barbell. As the latissimus dorsi contracts with the scapulae retracted, the bar will naturally arc backward to a minimal degree towards the center of gravity. This presents clearly when using bar tracking software; after which, the bar should move in a straight vertical fashion with no deviation back into the sagittal plane. During the pull, the hips and knees are extended simulta-
The Second Pull

The scoop is performed as the bar surpasses the height of the knees by thrusting the hips forward slightly and rapidly re-flexing the knees and ankles while keeping the bar tight to the thighs. The knees will now be almost directly under the barbell, and the weight will be transitioned towards the front of the feet. This gets the lifter into the “power position” which should essentially look like they are ready to jump with a barbell in their hands. During all of these movements the barbell still travels solely in a vertical fashion.

The Second Pull

The second pull is initiated from the power position with explosive triple extension of the ankles, knees and hips. Just previous to this explosive upward movement the barbell may make contact with the mid or upper thighs depending on the participant’s arm length. A common error is to bounce the bar outward rather than “drive it” upward vertically with the shrug. The maximum effort explosive jump is primarily driven by force from the lower body, with simultaneous explosive shrugging action engaged by the upper trapezius. The arms should still remain fully extended at this point. A common error in the second pull is attempting to pull with the arms, visible by arm flexion and forward shoulders.

Once full vertical extension and shoulder elevation has been performed, the bar will be accelerating beyond gravitational pull; the lifter should now rapidly flex the elbows and abduct the shoulders to pull the body under the bar. Just consider this simple fact: it is much easier to pull the body under a significant load, than pull significant load up to a higher point. The feet may leave the floor for a quick moment during this phase (due to rapid hip flexion), but this pull-under action can only be engaged while the feet are in contact with the floor. If the pull-under technique is coupled with adequately rapid hip and knee flexion, the lifter will end in a position under the barbell for a successful receive. The recovery phase involves the lifter securing the load in position on the shoulders (clean) and standing up with the weight. Common errors at the receive position include slow elbows (shoulder flexion), uneven shoulder and hip flexion, and the bar location too far out in front of the body rather than in close proximity - common of inadequate or untimely shrugging or bouncing the bar outward.

Safety Considerations:
Spotters and Failed Repetitions

Collars should always be used to secure the weight plates in position during the lift. Spotters on the other hand, should not be used as both the spotter and the lifter could be severely injured. Rather, the lifter needs to be taught how to fall. It is the lifter’s responsibility to safely drop a barbell that is out of position during a failed attempt. Again, since rubber weight should be utilized over an accommodating floor during performance of the Olympic lifts, dropping the bar from an overhead or shoulder position should not be an issue.

During a power clean receive attempt where the bar has significantly migrated into the sagittal plane, the barbell should be dropped in front of the body. During a deep squat clean with the bar moving backward however, it is best to not attempt a save. It is recommended to drop the hips backward while pushing the bar forward, which will place the lifter in a seated position with the barbell on the ground out in front of the body. Finally, missing a repetition during performance of the split jerk requires the lifter to drop the barbell out in front of the body from an overhead position.

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NCSF Mobile App Adds Max HR Calculators

Determining Heart Rate Max is necessary to accurately identify an exerciser’s relative training zones for improved cardiorespiratory fitness or for competitive event preparation. Heart rates correlate to oxygen uptake during aerobic exercise and therefore aerobic activities above 50% of VO2max can be used to set exercise training zones. As the heart becomes more conditioned it can perform the same workload using less beats, explaining why elite competitors actually experience a decline in Maximal Heart Rate.

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Start Position:

- The feet are placed between hip- and the shoulder-width apart with the toes pointed forward.
- The bar should start near the distal aspect of the shoelaces, or 1-3 inches from the shins.
- A pronated hook grip should be used, placing the hands on the bar slightly wider than shoulder-width, outside of the knees while flexing in front of the bar to attain a position where the hips are slightly higher than the knees.
- The shoulders should be slightly in front of the barbell while the elbows are fully extended and pointed (rotated) outwards so that they are directly over the barbell.
- The lifter’s weight should be balanced slightly towards the balls of the feet, but the heels remain in contact with the floor.
- The shoulder blades should be retracted, the trapezius relaxed, the chest elevated, the back flat or slightly arched, and the head held in a neutral position; maintaining a forward gaze.

1. The First Pull (Liftoff):

- The hips and knees are extended simultaneously to pull the bar from the floor; as this occurs the lifter’s balance should be shifted from the balls of the feet to a mid-foot position.
- Again, the bar will lightly sweep towards the shins as it comes off the floor; once this occurs it should follow a purely vertical trajectory.

2. The Scoop:

- A flat back must be maintained and the torso angle (in relation to the floor) must remain constant, meaning the shoulders and hips should rise at the same pace.
- During the clean, novice lifters commonly make the mistake of extending the knees faster than the hips, thus reducing the torso angle and affecting the transition into the scoop.
- The elbows remain fully extended and the shoulders will be over or slightly in front of the bar.
- The knees almost completely straighten, but still maintain a slight bend as the bar rises past the knees; here the hips will finish elevating the bar until it reaches a low-to-mid thigh position.

- As the bar reaches the low-to-mid thigh position (a) the hips are driven toward the bar, and (b) the knees are dropped under the bar to create the “scoop” position; this requires rapid and simultaneous re-flexion of the ankles, knees, and hips.
- The balance should be redirected back to the balls of the feet to prepare for a rapid jumping action.
- The back remains flat, the shoulders remain over the bar, and the elbows remain fully extended.
- During a clean, the scoop phase will usually cause the bar to contact the mid or upper thighs.

The Power Clean
3. The Second Pull (Jump or Triple Extension Phase)

- From this “power position” created by the scoop, the lifter will now execute an explosive vertical jump by extending the hips and knees and plantar-flexing the ankles; all while keeping the bar tight to the body.
- The shoulders should remain over the bar with the elbows fully extended as long as possible.
- At the top of the pull, as the lower body reaches full extension, the lifter must fully activate the trapezius by rapidly shrugging the shoulders.
- When the shoulders reach their highest elevation, the elbows are quickly flexed and rotated forward to start pulling the body under the bar.
- As with the snatch, the torso may slightly hyperextend and the feet may lose contact with the floor; again this lack of contact must be minimized.

4. Pull-Under and Catch (Rack)

- The pull-under phase should begin before the barbell fully loses its upward momentum by quickly flexing and rotating the elbows forward while rapidly flexing the hips and knees.
- Remember: the decent phase is accelerated by pulling against the bar with the feet on the floor; it is not a free fall.
- As the elbows are quickly driven forward and under the barbell, the wrists are extended and the shoulders are raised to cushion the landing/racking of the bar across the deltoids and clavicles.

- During a power clean, the catch is attained in a quarter-squat position.
- In this catch position:
  - The torso in nearly erect; a flat back and elevated chest are maintained.
  - The shoulders are slightly in front of the hips.
  - The elbows are lifted so that the upper arms are parallel to the floor.
  - The head is maintained in a neutral position and the feet are flat on the floor.

5. Recovery

- After gaining postural control and balance in the quarter-squat position, the lifter will “push down against the floor” to facilitate fluid and coordinated extension of the hips and knees and to attain a fully-erect standing position.
- The elbows and chest must remain elevated to keep the bar in the racked position.
- The recovery phase is complete when the lifter has stood up straight with the barbell stabilized.

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