Coaching optimal technique in the snatch and the clean and jerk

Part I

Bob Takano, C.S.C.S.
Van Nuys, California

Authors' background:
The author is a graduate of Occidental College in Los Angeles. His experience includes 20 years as a competitive lifter, and 17 years as a weightlifting coach, working primarily, though not exclusively, with juniors (under 20 years of age). He served as a member of the United States Weightlifting Federation national coaching staff on a number of national teams including the National Sports Festival West, the Jr. Pan American Championships, the Jr. World's Championships, the Sweden Cup and the Simon Bolivar Invitational.

Although some form of "weightlifting" has been contested in each renewal of the modern Olympiad, it was not until 1920 that the competitive program was standardized by the then newly-formed International Weightlifting Federation (I.W.F.). The first program consisted of a triathlon comprised of the two-hands press, the two-hands snatch and the two-hands clean and jerk lifts. Two of these events were primarily dependent upon the athlete's ability to generate power while the one pure strength event (the press) was secondarily dependent upon an explosive efficient cleaning technique. With the exception of 1928 (when the program was expanded to include the one-hand snatch and opposite one-hand clean and jerk), the competitive program remained unchanged until the 1972 Munich I.W.F. congress when the press was voted out of competition. Thus, January 1, 1973 marked the entrance of the sport into the modern biathlonic era—on which the development of power was of paramount importance.

The point to be reinforced here is that weightlifting is a sport in which success is overwhelmingly dependent upon the abilities of its participants to generate prodigious amounts of power. The sport has 60 plus years of tradition and background in the development of explosive strength. Any athlete or coach interested in developing optimal power must look to the methods of the weightlifters for the most effective strategies in the training of explosive athleticism. The weightlifting community has done the majority of the groundwork for power training, and reinventing the wheel would only lead to a waste of valuable effort and energy.

Rationale for Developing Optimal Technique

While it has not been uncommon for many coaches in sports outside of weightlifting to incorporate the power clean in their training regimens in recent years, the fact remains that less than optimal technique has often been utilized and coached. Several unfortunate consequences will result from the utilization of poor technique and should be identified for those interested in the most effective means of developing athletic ability.

1. Incorrect technique creates greater possibilities for injuries. Optimal technique utilizes the athlete's particular leverages in the most advantageous patterns. Incorrect techniques will result in

Editor's Note: This two part article is geared specifically for the competitive, Olympic-style weightlifter. However, the techniques and teaching methods described can be essential to any strength and conditioning program. It is important for strength and conditioning professionals to determine for themselves how these techniques and procedures can best fit into their own programs.
positions that exert excessive strains and imbalances on certain muscles and connective structures.

2. Incorrect technique produces less than optimal power. With training time being at a premium for most athletes, the quality of training must be taken into serious consideration. Hypothetically, given two athletes of identical abilities training with identical weights on the same training program, the athlete with the most nearly correct technique will have generated the most power with the primary muscles.

3. Incorrect technique carries over to other athletic activities. Most coaches should understand that it is easier to convert a skilled running and jumping athlete into say, a volleyball player, than converting one who is not acquainted with the rudiments of good running and jumping technique. An athlete who performs the training lifts in a plantigrade posture (walking on the sole with the heel touching the ground) is reinforcing the utilization of motor patterns in the postural musculature for that particular stance. This carryover is detrimental to the development of postural neuromotor patterns for digitigrade (walking on the digits with the heel raised) activities.

General Considerations for All Technique Training

The following considerations should apply in all training, both for purposes of learning correct technique and to prevent unnecessary injury.

The information contained in this article should first be read and assimilated by a coach who should then convey this information to the athlete(s). The coach should be capable of presenting instructions in a manner that is not overly technical. Through the use of descriptions, pantomime, photos, videotapes or any other available means, the coach is the primary vector through which the learning of technique must take place.

Shoes: (Figure 1) Specialized weightlifting shoes are as necessary as correct footwear in any specialized athletic activity. They provide stability in the coronal (frontal) plane, incline the foot at the proper angle for optimal acceleration, allow for optimal balance with weights overhead and do a great deal toward alleviating knee injuries. Good lifting shoes should not inhibit ankle flexion, as the ankles are required to move through a complete range of movement during the execution of both lifts.

Wraps and belt: The use of wraps (especially knee wraps) has become popular with many trainees in the belief that they add additional support and thus increase the poundages that can be lifted. In the case of knee wraps, many athletes are fond of using long, elasticized wraps that are wound several times tightly around the joint. These actually restrict mobility, inhibit circulation, retard development of the connective structures and eventually form a fulcrum at the back of the knee that places unnecessary stress on the tendons and ligaments. The ideal weightlifting knee wrap should consist only of a thin elasticized “kneecap” that allows for maximum mobility and serves only to keep the joint warm. Wrist wraps are optional, but if they are used they should not in any way inhibit mobility of the wrist. A belt is also an optional item, and should be used only for the purpose of maintaining high intrathoracic pressures. In actuality an athlete can maximize training results by foregoing the use of a belt and providing isometric work for the thoracic musculature. If a belt is utilized, it should be cut to allow maneuverability during the jerk, meaning that it should only be of maximum width (four and a half inches) at the back and cut to a narrower width at the front with the taper fitting comfortably inferior to the rib cage.

Figure 1. Good lifting shoes will not inhibit ankle flexion.
Hook grip: (Figure 2) The hook grip is the most effective way of maximizing grip strength during pulling phases of the snatch and clean. It can, however, inhibit rapid arm movement and should be released during the turnover phases of the snatch and clean, and should not be used at all during the jerk.

Arched back: (Figure 3) In all phases of Olympic lifting an arched (concave) back posture should be employed. This can be taught by having the trainee protrude both the chest and abdomen. This posture must be learned early in training, and constantly emphasized until technique has been well established. The rigid torso will aid in effectively transmitting force from the legs and hips to the bar, as well as preventing collapse and loss of balance during the catch phases of the snatch, clean and jerk.

Blocks: (Figure 4) While not entirely necessary for the teaching of technique, they greatly facilitate the learning of the second pull and top pull phases. They should be of adjustable height.

Platform: A platform made of wood is highly desirable since it provides the optimal surface upon which to perform the lifts. Rugs and recently developed artificial, rubberized surfaces are often too gummy as foot movement during the lifts should be of a skimming nature. Unexpected traction can result in awkward squat positions that can lead to injuries. In addition, these surfaces can provide instability during the lifting of heavy weights. Concrete or similar hard surfaces do not provide enough cushioning, and will eventually lead to joint trauma after prolonged usage.

Focal point: The snatch and clean and jerk are all performed most effectively if the head is stabilized during much of each lift. This is best effected by training the eyes on a fixed point above standing eye level during certain phases of the lift.

Closed eyes: Early in the development of technique, kinesthesia can be improved by having the athlete perform some of the movements with the eyes closed. This forces the athlete to develop a "feel" that might previously have been lacking.

Low reps: Neural fatigue is a critical factor in the learning of technique. The correct movements cannot be performed unless the nervous system is relatively fresh. Sets of more than three repetitions will do little to develop technique. In addition, technical training should be performed at the beginning of the workout when the athlete is fresh.

Training weights: The weight to be used should be determined empirically by a supervising coach. Many athletes are anxious to use heavy weights and need to be inhibited from using weights that
cause technical flaws. The actual weights may vary from day to day depending upon the physical condition of the athlete, and adjustments should be made. On the other hand, athletes should not train with excessively light weights once technique has begun to stabilize since this will inhibit the development of balance and supportive musculature that can only come with heavier weights.

One-on-one coaching: It is almost impossible to coach the lifts with a large group, and the most effective means is to work one-on-one. In the long run, this will be the most effective use of time since proper initial instruction will later alleviate the costly time expenditure in correcting gross technical errors and will reduce the possibility of injury. This is primarily due to the individual idiosyncrasies of each athlete. Within certain limits, each individual’s technique must be customized.

Equipment
The following items should be considered basic necessities for the teaching of the olympic lifts.

1. A revolving olympic bar of standard dimensions (7 feet in length).
2. Plates of standard height (17.75 inches in diameter). Rubber bumpers are preferable since they will last longer; ride the bar better, and increase the life span of the platform.
3. A platform (preferably made of wood), will offer sure footing, eliminate stress injuries, and increase the life span of the plates. 8’x8’ is an adequate size.
4. Adjustable squat racks will allow for exercises that specialize in the jerk.

The following items may be considered optional, but will greatly facilitate the teaching of technique:

1. Adjustable blocks (which are in actuality several boxes of varying heights) enable the bar to be placed at optimal heights for learning the lifts.
2. Straps that attach the wrists to the bar will allow the trainee to perform assistance pulling movements when the grip has been fatigued.

The Jump (Power) Position
Jumping is a fundamental activity. With the advent of bipedalism as a primary means of human locomotion, the development of jumping ability has been an invaluable survival tool. Running, and particularly sprinting, is a series of one-legged jumps. Throwing is the residue of momentum developed by jumping ability. There are few athletic activities that are not crucially dependent upon an individual’s jumping ability.

Weightlifting is no exception. In state-sponsored weightlifting programs where promising youth are identified, vertical jumping ability is almost universally considered to be one of the most critical criteria for predicting future success. Modern training programs all emphasize the development of vertical and horizontal jumping ability as a major part of the regimen. As a result, weightlifters are prodigious jumpers. The World Championship Bulgarian National Team has a qualifying test that requires their athletes to jump up on to an adjustable platform set at nipple height from a standing start. Two of the members of our U.S. 1984 Olympic team were capable of leaping up on to a bench even with their clavicles. The obvious conclusion is that snatches and cleans and jerks and vertical jumping are a variation on a common theme: explosive power is generated which moves either an implement or the body with great speed.

Lifting weights, as well as all running and jumping movements, is vitally dependent upon the ability of the athlete to assume a posture that situates the body over the metatarsals, or the balls of the feet (Figure 5). For example, it is not uncommon to see many untrained, adolescent sprinters running with the head back and the trunk nearly upright. Only when they can be trained to keep the head level and the trunk inclined slightly forward can their sprint times be minimized. Accomplished basketball rebounders often force their opponents out of the play by subtly forcing them back off their optimal jumping posture and effectively inhibiting their jumping ability.

Weightlifters are athletes who are strong enough to take a heavy weight off the floor into an optimal jump or power position, while keeping the arms and torso rigid. When this takes place, the bar will generally be situated directly above the metatarsals, and at a height that brings the bar into contact with the

Figure 5. Position the body over the metatarsals.
upper two thirds of the front thigh (depending on grip-width, and limb-length to torso-length ratio), and the athlete will be prepared to generate an explosive snatch or clean pull. In the jerk, the lifter is simply jumping upward with the weight coming off the shoulders. In short, weightlifting is a jumping activity.

The Snatch--The Bottom Position

The snatch is best taught when a certain rational order is employed. This involves first teaching the low squat position as this will dictate hand and foot placement. The sequence progresses to the learning of the pull from the power position, the pull from the floor and then the learning of the total movement.

This section begins with a discussion of bottom position since this will determine grip width for the performance of the snatch. In essence, the bottom position requires the lifter to be able to sit in a flat-footed squat with the bar balanced at arm’s length overhead. The widths of the stance and the grip must be empirically determined based on the individual’s flexibility and limb length. The feet may be pointed straight ahead or slightly outward, again depending upon the individual’s flexibility. A flat-footed stance in catching the bar is absolutely vital and necessitates the use of adequate footwear. There is a possibility that an athlete might be incapable of assuming the bottom position, in spite of all of the prescribed stretching. In such a situation, it must be realized that the individual is simply not suited for the sport.

Stretching of the ankle, knee, hip and shoulder joints should precede the performance of any bottom position training.

A description of the bottom position can be broken down as follows: (Figure 6).

1. The lifter is sitting comfortably in a squat position with the feet flat on the floor. The bent knees should be protruding well ahead of the ankles.
2. The trunk should be upright or slightly inclined forward with the head erect.
3. The arms should be locked overhead with an effort being made to turn the elbows medially and a grip-width considerably wider than shoulder width. In larger athletes, a collar to collar grip is not uncommon. The bar should be slightly behind or even with a line extending directly up from the ears.

Exercises to learn the position

1. Overhead squat
3. Drop snatch: The lifter stands erect with the bar across the shoulders behind the neck and knees unlocked. The lifter then drops rapidly into the bottom position while simultaneously extending and locking the arms.

The Snatch--The Pull

Each sequence should be mastered before proceeding on to the next.

Apparatus: The barbell should be placed on blocks (Figure 7) so that the athlete can take the snatch grip width determined in the previous section, and assume the power position. (Note: in lieu of blocks, the athlete can work from the hang position, holding the bar in the power position).

Stance and posture: The width of the stance and direction of the feet must be determined empirically, but should closely approximate the position from which vertical jumping is most easily performed. The athlete’s balance should be on the balls of the feet with the metatarsals situated directly under the bar. The back should be arched and the shoulders should be ahead of the bar with the latissimus dorsi tensed. The arms should be medially rotated (toward the center) by flexing the pectoralis major. This will have the effect of forcing the elbows to point...
outwards toward the ends of the barbell. The head should be erect with the eyes fixed on a focal point slightly higher than standing eye level.

The action—jump and shrug (Figure 8): From the aforementioned posture, the athlete should simply attempt to spring upward by extending up on the balls of the feet and bringing the hips forward and upward in a scooping motion. As the body reaches a vertical posture, the shoulders should shrug violently upwards while the arms remain straight.

Coaching suggestions: Emphasize that the action is initiated by a rapid extension of the knees and hips. An emphasis should be placed on maintaining contact with the floor throughout the movement, and to hold the final position up on the toes. Constantly encourage the athlete to keep the back arched since the forces generated by the legs cannot be transferred to the bar through a limp skeletal structure. Emphasize bringing the hips upward and forward until they are directly over the toes.

The action—adding arms (Figure 9): Once the shrug off blocks has been mastered the athlete is now ready to incorporate the arms into the pull. The sequence of actions should be leg-hip extension, shrug and arm pull. To the untrained eye, these may at first appear to be simultaneous, but they are in fact sequential in the previously stated order. The critical point to be emphasized to the athlete in the arm pull is to concentrate on elevating the elbows high to the side instead of elevating the bar. In all movements, it is essential to emphasize the movement of body parts, rather than the moving of the bar.

The movement should be completed by attempting to remain up on the toes with the elbows raised and pointing upwards.

Coaching suggestions: Encourage the athlete to attempt to curl the wrists in toward the coronal (frontal) plane of the body. This may not be possible given the weight that will eventually be lifted, but it will have the effect of forcing the elbows out to the side, which will insure a linear pathway for the bar. Throughout the movement encourage the lifter to feel the pressure only on the balls of the feet. Upright rowing with snatch grip emphasizing the action of the elbows is an exercise which will aid in learning this movement.

The Snatch—The Turnover

The pull having been mastered, the athlete must now concentrate on the turnover phase in which the arms come under the bar and support it overhead. This is best accomplished using an exercise called the muscle snatch.

The muscle snatch (Figures 7, 9, 10).

As before, the movement should be started with the bar on blocks at power position height. The key phase here is the activity of the arms after the pull has been completed. Again, the emphasis should be placed on the action of the arms and not on forcibly moving the barbell.

Once the pull has been performed
with a light weight, the lifter will quickly settle back down to a flat-footed stance with locked knees. The elbows should be swung forward from the raised position to a plane in front of the bar simultaneously with the planting of the feet and locking of the knees. This arm movement should be performed in a fast and snappy manner. The arms should then immediately begin to press the bar overhead in a nearly vertical pathway.

During the course of the turnover, the elbows have moved from a position lateral to the head, forward and medially, and then upward, backward and laterally. All of this should be done as smoothly as possible.

Coaching suggestions: Emphasize the fast and snappy movement of the arms. This particular turnover action is designed to keep the bar moving in a linear pathway, and will ultimately be used to force the lifter to wedge the body under the weight in the squat snatch. Encourage the athlete to rotate the elbows forward and press up. Don’t forget to emphasize maintenance of the focal point. The snatch grip press in front of the neck is a good exercise to learn the movement.

The Snatch--The Catch

The primary exercise to teach the catching of the weight overhead is the power snatch from blocks. The greatest difficulty here lies in the ability of the legs to stop the downward drop of the body simultaneously with the lockout of the bar overhead. This movement will differ from the muscle snatch in three ways: the weights used will be heavier, the arm lockout will be much faster, and the legs and hips will bend as the lifter simultaneously lowers the body under the bar as it is locked out.

The starting position will be the same as in all previous exercises.

The power snatch from blocks (Figures 7, 9, 11).

The bar is pulled rapidly as before, and the action remains identical to that of the muscle snatch. The primary difference here is the action of the legs. At the completion of the leg extension in the pull and simultaneous with the action of the arms, the feet will be planted and the knees and hips unlocked to allow the body to lower itself under the bar. The legs and hips should then instantaneously tighten and stop in a position resembling a one quarter to one half squat. This position should be held for a couple of seconds in order to reinforce balance. The entire movement should be fast and snappy.

Coaching suggestions: Emphasize speed. Reviewing the maintenance of the arched back and the focal point may be in order. Emphasis should be placed on keeping the balance on the balls of the feet during the pull phase.

A set consisting of a shrug, a pull, and power snatch will help to reinforce the necessary motor patterns.

The Snatch--The Catch and More.

The squat snatch is learned when the trainee can negotiate a power snatch and then drop with control into an overhead squat position. Once the power snatch is mastered, the athlete can then proceed to go into an overhead squat without standing erect between the two. The descent into the overhead squat should be controlled by the hips and legs, and crashing should be avoided since this can lead to injury and loss of control. Emphasis should be placed on being aware of the position of the bar throughout the entire movement. It is not unusual for the stance of the overhead squat to differ from the stance for the pull. In this case the athlete should move both feet at the completion of the pull and prior to the catch. This will generally be a lateral move, and in no case should it be intentionally forward or backward, at least during the learning phases. The actual movement of the feet should be a skimming one, and not a hop since the body is nonsupportive when the feet are not in contact with the floor.

After many repetitions of power snatch-overhead squat combinations, a motor pattern will develop that is conducive to learning the squat snatch off blocks, and the athlete will develop a sense of security in the squat position.

The Snatch--The Squat Snatch Off Blocks
(Figures 7, 9, 12)

The learning of the squat snatch is an almost “all or nothing” proposition. The power snatch/overhead squat combination is merely a jumping off point. From this point, heavier weights must be employed until the athlete can no longer catch the weight at a height significantly
necessary to prevent flaws from developing.

Again it is helpful to perform a shrug, a pull and then a squat snatch to reinforce correct pulling technique. Shadow lifting or performing the movement with an empty bar has some value. The coach should constantly re-emphasize the importance of focal point and arched back. The arched back is especially important during the catch in the bottom position in order to prevent a collapse in posture, and a subsequent loss of the lift, or an injury.

When the squat snatch is performed correctly, the athlete will feel the body being pushed into the bottom position through the actions of the arms as they lock out. During this phase (called the amortization phase), the torso should be tightened in preparation for supporting the weight. Once the bottom position is reached, the entire body should be tightened in preparation for the recovery. Frequently, it may be necessary to balance for a moment in the bottom position, but remaining there for an unnecessary period of time will only fatigue the athlete and make recovery to an upright stance more difficult.

Coaching suggestion: The squat snatch is not a variation of the power snatch, nor vice-versa. They are, in fact, two different movements. This should be emphasized to the athlete. There is no substitute for learning the squat snatch properly.

The Snatch--Pulling Off the Floor

Dividing the first pull into two phases: For the purpose of learning the pull off the floor, experience has shown that it should be learned in two phases--the first from the floor to the knees, and the second from the knees to the power position as has been described in a previous section. The first phase of the first pull begins with the learning of the get set position.

The get set position (Figure 13)

With the barbell on the floor in front of the lifter, the feet should be placed at the previously empirically determined optimal width and angle in such a manner that the bar is directly above the metatarsals. The torso should now be inclined forward from the hip joint with the back arched in such a manner that the chest and abdomen are protruded forward. The knees should be
simultaneously bent until the bar is in contact with the shins. While keeping the back arched, the lifter should incline the torso to a point where the shoulders are ahead of the bar and take the previously determined snatch width grip with a hook. The legs should be in a quarter to third squat. The head may either be at an angle to view the focal point at slightly-above-standing eye-height, or held at an angle that allows the neck to form a straight alignment with the spine. The balance of the lifter should now be on the balls of the feet, although the heels are maintained in contact with the platform. This is the optimal get set position.

The first phase (Figures 13 & 14)
As the bar travels from the floor to knee height, every effort must be made to insure that the correct angle of the torso in relationship to the platform is maintained. That is, the hips and shoulders should travel upward at the same speed. The best way to conceptualize this is to think of the barbell as a stationary implement and the platform as movable. The optimal movement, therefore, is to push the floor down by extending the legs only. This will cause the barbell to begin to swing forward to a position directly under the shoulders. Every effort must be made to avoid this since the success of the pull is dependent upon keeping the shoulders ahead of the barbell during the first phase and second phase.

This is accomplished by stabilizing the arms with the latissimus dorsi. This, however, may tend to pull the elbows backward. This can be prevented by medial rotation of the arms by the pectoralis major.

During the lifting of the bar from the floor to the knee, the balance will move from the balls of the feet backward and slightly laterally to the middle of the anterior-posterior axis of the foot, but never as far back as the heels.

Learning this first phase is vital, and many sets of two to three reps must be performed to develop this pattern. At no time must the shoulders be allowed to be over or behind the bar during this phase.

While many experts advocate the arms being rather loose and cable-like during this phase, they must, in fact, be held rigidly straight. This might best be conceptualized by considering the bar to be a gymnastics horizontal bar while the athlete holds a planche. In this manner, the athlete is using the bar to keep the shoulders in front of the bar.

The second phase
In the second phase of the pull off the floor, the athlete is concerned with “cocking the trigger,” so to speak. The bar will be moved from the knees to the power position, which can be anywhere from mid-thigh to crotch height depending upon the relative limb-lengths and body weight. The most important feature is that the knees will actually rebend as they move forward under the bar, and the point of balance will shift from mid-foot to the ball of the foot while taking a more medial pathway during the return (as opposed to the pathway taken during the first phase).

Philosophical approach
While actually impossible, the theoretical ideal is to move the bar in a pathway that is basically a vertically straight line (as viewed from the side). Any movement of the bar in an anterior-posterior plane is discouraged, since the athlete has the best leverage in bar movements that are vertical. To accomplish this, the aim is to move the body into the most biomechanically effective positions as the bar continues in its upward path.

Continuing on in the second phase of the pull off the floor (Figure 15)
Once the bar has been pulled above the knees, with the shoulders still in front of the bar, the lifter extends the hips, forcing the knees forward under the bar while brushing the bar with the tops of the thighs. During this phase the bar is rising in a straight line, and the hips are being brought closer to the vertical pathway. The shoulders must still be kept in front of the bar through contraction of the latissimus. When the bar has reached the power position, the balance should now be on the balls of the feet, ready to jump, with the heels still in contact with the platform. If the lifter started the movement with the head as an extension of the spine, the head should now be in a position to allow viewing of the focal point.
A common problem

The most common problem associated with pulling off the floor is the tendency of the lifter to "shoot" the hips at the very beginning of the lift. What will prevent this is a very controlled eccentric contraction of the hip flexors. Hips commonly rise prematurely due to an isometric contraction of the hip flexors coupled with an attempt to place the legs in a favorable leverage position prior to actually moving the weight off the floor. The correct motor pattern must constantly be coached and reinforced. This is one bad habit that must not be allowed to develop.

A learning pattern

The lift might best be learned by performing sets of four repetitions. In the first repetition, the weight is lifted only to knee height and held for a two-second pause. In the second repetition, the weight is lifted from the floor to power position. In the third repetition the weight is high pulled. In the final repetition, a full snatch movement is performed (Figure 16).

A review of the snatch

The following sequence should be followed in the correct performance of a full squat snatch:
1. Starting position
   a) Optimal grip
   b) Optimal stance
   c) Arched back
   d) Shoulder ahead of the bar
2. Pull from the floor
   a) first phase
   b) second phase and shift
3. Power Position
4. Jump
   a) leg extension
   b) hip extension
5. Shrug
6. Arm Pull
7. Turnover and drop under bar
8. Lock and catch
9. Tighten and support into bottom position.

Learning the snatch

Learning the correct patterns for the snatch is best done with weights that are in the 60 to 85 percent range of weights. This is obviously going to be an approximation with the neophyte since it is impossible to determine 100 percent if technique has not been learned.

One of the problems of working with the lower percentages is that these lifts become power snatches rather than squat snatches. Two options are available for the athlete, and both should be utilized. The first is to simply power snatch and then ride the weight down into the overhead squat. The second is to perform the second pull at submaximal speed, while moving under to catch it at maximum speed. As the weight increases in this second variation, the speed of the pull can be increased to maximum, while the movement under the bar can be maintained. The maximizing of both speeds should be reached at around the 85 percent of maximum level.

To reiterate and reinforce, technical training should take place at the beginning of the workout when the nervous system is fresh. It should be supervised very closely initially to insure that incorrect motor patterns do not develop.

A closing note to coaches

Most experienced coaches should be aware of the fact that it is more important to teach the "feeling" of a movement, rather than just tell the athlete what to do. Obviously this "feeling" can best be imparted by someone who can correctly perform the movements, but this will not be possible in all cases. A coach's alternative to learning the lifts is to discuss them with a practicing olympic lifter with good technique, or with a weightlifting coach experienced in teaching the lifts.

My closing bit of advice brings to mind the first episode of Star Trek. In that maiden voyage, a dismembered woman is the only survivor of a spaceship crash on an alien planet. The alien technology allows them to save her life and reconstruct her body. However, since they had no other examples available she is reassembled in a rather grotesque caricature of a human. "We had no idea . . .," explain the aliens to the captain of the Enterprise. If you are going to coach the lifts, you need to see what they look like when performed correctly, and no number of articles or pictures is going to replace the real thing. The timing and dynamics can only be appreciated by actually witnessing the lifts.

Figure 16. Full snatch position.