Roundtable:

Power Clean

Question 1: Based on the principles of specificity, in what way does the power clean "transfer" to athletic performance?

Gene Baker:

The power clean teaches the athlete's muscles to react explosively and he develops what we call speed-strength. This development is accomplished by having the athlete hit proper positions during the lift. If done correctly, it will place the thighs in such a position that a pre-stretch is placed on them. This pre-stretch creates energy which enables the muscles of the legs to react more explosively. This action is very similar to that found in plyometric jumping. Speed of reaction is also critical in being able to utilize this energy. As the athlete gains proficiency in power cleaning, this reactive ability will develop. Later, it can be transferred to his other athletic endeavors.

Istvan J. Javorek:

It depends upon the branch of sports, but because the power clean is a very complete exercise, I consider it important enough to use it. The power clean helps to develop an athlete's explosion, muscle tone, orientation in space, neuromuscular coordination, and also shortens reaction time for all sports.

I consider the power clean more effective when used in combination with the power snatch, jerk, and behind the neck half-squat jerk press.

Pat Etcheberry:

The power clean allows the athlete to use the majority of the large muscle groups in the body (legs, hips, back, shoulders). The use of the rotary motion of the hips is the basic movement for tackling, running and jumping.

The power clean teaches explosive movements that are so important in football, basketball and throwing events in track and field.

John Garhammer, Ph.D.:

The power clean is moderate to highly specific, and thus transfers well to a large number of physical demands and skills required during sport activities. Perhaps the most direct example is the explosive leg and hip thrust or drive which occurs during the second pull of a properly executed power clean. This is very similar to the way the legs and hips are used for blocking or tackling in football, jumping in basketball and volleyball, and start and turn propulsion in swimming. If the power clean is performed properly with a "scoop," or second knee bend, between the first and second pull, then a stretch prior to the second pull will be imposed on the hip and knee extensors, providing for storage and subsequent use of elastic energy as occurs with the counter movement in all jumping activities.

More generally, the power clean requires an athlete to exert large multiple muscle group forces while standing on his own two feet, rather than while supported by external structures, such as benches or seats. This develops balance and coordination during forceful exertions. The speed of movement during the second pull is also very valuable in conditioning the nervous system (muscle fiber recruitment). Because so many muscles are used during the execution of a power clean, it is a very economical exercise in terms of muscle mass active per unit time, similar to the requirements of most sport activities.

Bruno Pauletto:

Based upon the principles of specificity, or the SAID Principle (Specific Adaptation to the Imposed Demands), the power clean "transfers" to athletic performance in two ways:

a) Development of muscular power.

b) Biomechanic similarity between the power clean and the athletic movement.

Development of muscular power

All athletic performances require power. Power is the result of a force multiplied by the distance the force is moved, then divided by the amount of time it takes to move the force or resistance. Therefore, the more weight you move over a longer distance in the shortest time, the greater the power output. The power clean fits perfectly. Many studies have shown that "pulling" exercises produce the highest power output of any human movement measured to date. Strength is of primary importance in the greater power output. Slow strength movements, such as squat or bench, can positively affect power output. I also believe that high power exercises, such as the power clean, will bring power performance to a peak.

Many coaches believe that the weight room is the place to develop strength and the field is the place to develop speed. I believe that some lifting exercises go beyond the strength factor and one of them is the power clean. Coaches also confuse specificity with skill acquisition. I do not believe doing power cleans in the weight room will help the athlete to learn a specific skill taught on the field. On the other hand, I am convinced that power cleans will make the athlete better perform that skill. Having the "power" does not guarantee the skill; but in order to execute the skill well, it is necessary to have the "power" (e.g. run faster, jump higher, tackle harder).

Biomechanical similarity between the power clean and athletic movement

Based upon the principles of specificity, the power clean has the most biomechanical

"transfer" to athletic performance compared to any other lift. A biomechanical analysis of the power clean will show the rotary action of the legs and hips, which is very similar to jumping, running and pulling action common to many sports. The power clean is also specific to athletic movement, being a multi-joint exercise working the ankle, knee, hip, back, shoulders, elbows, wrists, and most of the muscles associated with these joints.

As a strength coach, I want my athletes doing lifting exercises in which more than brute strength is developed. The power clean not only strengthens joints and muscles, but it also improves balance (many muscles working together), improves muscle coordination (one muscle contracts and the antagonistic muscle relaxes in a chain reaction), and facilitates neuromuscular transmission (because of the speed and number of contractions). All of these physical "improvements" can lead to better performance on the field.

Harvey Newton:

Obviously, training power cleans helps one most in getting better at power cleans. However, it is seldom, if ever, possible to arrange the specific action of a sports movement when in the gym. Certainly some sports lend themselves more appropriately to specificity, but within the weight room, it is usually a matter of giving a "best effort" at approaching specific muscle movement patterns.

One reason a properly executed power clean can be thought of as being specific is in those sports which require the use of a combined leg and hip drive. Such activities would include high jumping, shot put, a properly delivered punch in boxing, some judo throws, and certain movements in team sports such as basketball and football.

If the power clean is not performed properly, e.g., rotational forces are combined with excessive use of the arms, no jumping action will result, and thus, the transfer to the above-mentioned sports would be inadequate.

Assuming an athlete properly learns to lower his hips as the bar is pulled between the knee and waist areas by bending the ankles and the knees, the proper "stretch reflex" action of the quadriceps will result, thus permitting an explosive jumping motion upward.

Ed Bielik:

The power clean transfers to athletic performance primarily because of two inherent characteristics. First, the power clean is a total body extension movement with the muscles most involved being the anti-gravity musculature. The anti-gravity muscles typically are the large long muscles. They extend the body into an erect

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Ed Bielik is Associate Director for Speed-Strength and Conditioning at the University of Kansas. He holds an M.S. in exercise physiology and sports biomechanics from the University of Kansas. He has been involved with the United States Olympic Training Center, supervising the weight training program, instructing Elite Athlete Camp Programs, and most recently, acting as speed-strength consultant for the 1983 United States Luge Team. He also worked as an Event Crew Member for the 1984 Olympic Weightlifting Staff during the Olympic Games. Bielik received a 1983 NSCA Graduate Challenge Scholarship.

Pat Etcheberry is the Strength and Conditioning Coach for all sports at the University of Kentucky. He received an M.S. from Georgetown College and a B.S. from the University of Kentucky. Etcheberry was South American Javelin Champion, Southeastern Conference Javelin Champion in 1966, and participated in the 1964 Olympic Games in Tokyo and the 1967–1971 Pan American Games. He was a guest speaker at the 1979 NSCA National Convention.

John Garhammer, Ph.D. is currently Director of Biomechanics at the St. Mary Medical Center in Long Beach, California. He is also the biomechanics consultant for weightlifting to the U.S. Olympic Training Center in Colorado Springs; and a USOC Sports Medicine Research Associate. Garhammer has directed strength training programs for varsity football at UCLA, varsity basketball at Auburn University and for male and female shot, discus and javelin throwers at both institutions. He has been involved with the USOC's Elite Athlete Project for shot, discus and javelin throwers as well as weightlifting and has recently written *The Sports Illustrated Strength Training Book*, to be published by Harper and Row in the spring of 1985.

Istvan J. Javorek is Assistant Strength and Conditioning Coach at Texas A&M University. This year he conducted a two-week coaching clinic, invited by the Peruvian Olympic Committee, which was delegated by the U.S. Olympic Committee. In 1983, the South Korean Olympic Committee invited him for a two-month coaching residency. From 1975 to 1982, Javorek coached the Romanian National and Olympic Team. Among others, he has coached 1984 Bronze Medalist Dragomir Cioroslan and 1984 Silver Medalist Stafan Tasnadi.

Harvey Newton was the 1984 U.S: Olympic Weightlifting Team Coach. He has been involved with the U.S. International Team since 1976. From 1981 to 1984, he directed the training of weightlifters at the U.S. Olympic Training Center in Colorado Springs. Newton's recent publications include "The Power Clean: Teaching the Beginner." *NSCA Journal*, Volume 6, Number 3.

Bruno Pauletto is the first Strength and Conditioning Coach for the University of Tennessee. He has been an NSCA State Director since 1981. Director of the annual "Tennessee Power Strength and Conditioning Clinic." Pauletto received his M.S. in motor behavior from the University of Tennessee. A three-time All-American and 1978 NCAA Champion in the shot put for Central Michigan University, Pauletto was a two-time (1980, 1984) Olympian for Canada. He has competed in more than 60 international competitions, including Olympic Games, World Championships, Pan-American Games, World Cup, British Commonwealth Games and World University Games (1973–1984).

Roundtable:

position. The extension movement characteristic of the power clean is also inherent to most sport skills. To give a few examples, sprinting has been described as controlled falling; the athlete is continually combating gravity's downward pull by vigorous body extensions accelerating or maintaining his mass in an intended direction. The lineman exploding off the line of scrimmage, or the swimmer or runner propelling herself into the race from the start, exhibit sport skill movements identical to the power clean by their anti-gravity musculature involvement producing major body segment extension characteristics.

Secondly, the power clean is a multiple joint activity, as is any total body sport skill. For a more powerful total body movement to occur, each joint, with its associated musculature, must produce proper forces at proper times. With proper timing, the produced forces are joined, generating an end resultant force of great magnitude. The sequential force influence upon the skill movement is referred to as force summation. The power clean is one of a very few resistance exercises which are multiple joint in nature, working in a summatory fashion.

Question 2: Some people have claimed that the power clean is a dangerous lift and that the risk of injury outweighs the benefits. What is your opinion?

Newton:

No doubt there are documented cases of injuries occuring during the execution of the power clean. As pointed out in Newton, Harvey. Power Clean: Teaching the Beginner. *NSCA Journal* 6:3 pp. 41, 64–66, such injuries are likely to occur when faulty positions are reached, due to poor coaching or excessive weights being used.

The normal outcry against the power clean can be heard from those who wish to see simple movements employed, such as the bench press. Another group is those who wish to detract from free weight exercises in general, particularly those people with a vested interest in machines. One nice point about machines is that they do appear to be very safe. However, there certainly are documented cases of injury occuring from machine use as well as free weights.

It seems paradoxical to concern oneself so emphatically with the risk of injury while strength training for the athletic field (particularly football). Running produces injuries also, but few experts would say running should be avoided due to risk of injury.

In my eight years of coaching U.S. weightlifting teams in international competitions, I have not seen any athlete seriously injured performing a power clean.

Pauletto:

I do not think the power clean is a dangerous lift; I will say that the power clean is a "complex" lift requiring technique, mental concentration and total body fitness. Coaches have made the lift dangerous because many do not know how to teach it. They hear it is a good exercise, and they incorporate it into their program without much teaching. They do not recognize technical errors which will lead to injuries.

A second area where coaches make mistakes is in controlling the intensity. An athlete might be able to lift heavy in the bench press three times a week, but not in the power clean. The intensity has to be varied depending on fatigue levels (e.g. lifting after practice vs. before practice), in-season lifting compared to off-season lifting, and what other lifts are done on that day.

"An athlete who has not sufficiently developed the musculature cannot perform the lifts correctly because he cannot control the motion."

-Javorek

Another area where mistakes are done is in the order the lifts are performed. The power clean, or any other multi-joint lift, such as power pulls, snatches, etc., must be done first in the workout. These lifts are the most complex, therefore they require the athlete to be at his best mentally and physically. Doing power cleans after bench and squat is ridiculous. At the University of Tennessee, the athlete goes first to one of the eight Olympic platforms for his power cleans or related lifts, then he might lie down and do his bench presses.

Etcheberry:

The power clean is not a dangerous lift if it is taught properly, and the weight lifted is gradually increased. Make sure the athlete increases the weight, but do not force the athlete; forcing may lead to a breakdown in his/her technique.

We have used the power clean for many years without injuries. Provide good supervision. Provide an area large enough to make sure it is not too crowded.

Bielik:

I believe that all exercises have the potential for being structurally dangerous to our athletes. When prescribing the power clean to our athletes, certain steps are taken to ensure safety. To inhibit structural problems, due to either muscular weakness or other supportive structure inadequacies, a progressive exercise program is developed. To ensure proper technique execution, progressive exercises are prescribed. When each athlete accomplishes proper progression structurally and technically, they are ready for power cleans. Referring back to question one, it is apparent the benefits of the power clean outweigh the dangers. With adequate preparation, I see no problem with the power clean.

The following is our progression for the power clean, preparatory exercises only:

Weeks 1-4
Squat variation
Hyper roll-up (non-weighted)
Upright row (wall supported)
Forearm flexion

Weeks 5-10
Squat variation
Straight leg dead lift
Upright row
Snatch grip high pull (hang) (light weight)
Stage pulls (hang)
Forearm flexion

Weeks 11-14
Straight leg dead lift
Snatch grip high pull
Power clean (hang) (light weight)
Other various pull technique drills

Weeks 15-
Power cleans

Squat variations include:
Back squat
Front squat
Leg sled
Safe squat (Russian squat)

Garhammer:

Any physical activity, walking, running, throwing, can result in an injury; the power clean is no different. However, if learned properly and used in a reasonable manner, injury potential is low. The reason is that the body can compensate in many ways, such as dropping the barbell or stopping the movement if the weight gets out of position or out of control, or slightly modifying the pulling or catch position to accommodate a minor technique error during execution of the lift. The key to successfully using the power clean and maximizing its benefits with minimal risks is to be patient while learning technique

and be reasonable in choosing training weights.

One erroneous concept is that the accelerations and fast movements involved in the power clean increase the risk of injury. In a real sense, the opposite is true. Because the power clean overloads the muscles and connective tissues in an explosive manner (high loading rates), they are better conditioned to withstand these same high loading rates in actual sport competition in which high loading rates are the rule, rather than the exception, such as in jumping, landing after a jump or during a fall, sprinting, body collisions as in tackling, etc. To omit higher speed overload training from the conditioning program and still expect the athlete's body to be prepared to withstand rapidly applied forces in competition should be considered a serious error.

Baker:

Power cleaning is no more dangerous than any other weight-training exercise. Athletes injured doing this exercise probably either had poor exercise technique or very poor flexibility. Most coaches I have met who felt this lift was dangerous had little concept of its technical peculiarities. They had tried the power clean and had athletes complain of problems in the wrists or lower back. Both of these areas can come under great stress if the athlete is not flexible enough to catch the bar on his chest properly, or misdirects it due to poor technical execution. Both of these problems are easily corrected. One final comment on exercise technique: many coaches do not like the power clean because it takes several weeks to master the technique. This is unlike most barbell strength training exercises in which proper technique is learned during the first workout. However, it's like any complex activity: once it is learned, most athletes maintain proficient in its use forever.

Javorek:

Only coaches who do not have enough knowledge about the power clean teaching method, or who are impatient and do not teach athletes to strive for a perfect motion, can consider the power clean too dangerous.

It is vital that the perfect technique be taught step by step. First, teach theory without the barbell, followed by very light weights, dividing the motion and teaching every segment separately, thus developing all muscle groups for a perfect lift. This phase could take between one to four weeks, depending upon the athlete's general physical condition and ability. It is important to first develop the musculature and then develop those muscles needed to perform a perfect clean.

An athlete who has not sufficiently developed the musculature cannot perform the lifts correctly, because he cannot control the motion.

Teaching the power clean requires a coach with tremendous patience and knowledge of how to teach the perfect technique. In this way, I am sure that the benefits far outweigh any risks involved.

Question 3: At what age should an athlete begin power cleaning? More specifically, what "physical tools" or level of strength and conditioning should the athlete possess before the power clean should be taught to him or her?

Garhammer:

I do not believe there is a lower age limit before which the power clean should not be taught. In eastern Europe, the Olympic lifts are taught in grade school physical education classes. Again, the key is to learn proper lifting technique through detailed instruction and the use of light weights. The grade schoolers mentioned above learn with broomsticks with small rubber wheels attached at the ends (5–10 lbs.). No matter what age group, only after proper technique is learned should the trainee be permitted to increase the load. Remember also that the power clean should be used as a training exercise, not as a competitive lift to handle maximal weights. A weight that causes technique to deteriorate is too heavy for training purposes.

"To omit higher speed overload training from the conditioning program and still expect the athlete's body to be prepared to withstand rapidly applied forces in competition should be considered a serious error."
-Garhammer

Bielik:

By following the steps prescribed in the previous question, the power clean can safely be included in any program from the junior high school on up. Similar to any exercise, there will always be certain individuals who should not take part in the power clean. An example is an individual with chronic back problems. A safe rule to follow concerning age group lifting is: the younger the athlete, the lower the lifting intensity level. (Intensity equals average weight lifted per repetition.) Give younger athletes higher repetition exercises with lighter weight. Due to the importance of technique work in the power clean, it is good practice to place great importance upon drills to improve the power clean skill, and not to direct the young athletes toward using greater amounts of weight.

The strength prerequisite an athlete needs before doing power cleans is not easily answered. With planned technique drills, athletes should not proceed to more advanced drills until adequate skill levels are attained. Without the proper strength, an adequate skill level cannot be attained. These skill progression exercises will develop both the technical and physical properties needed. All athletes should be involved in upright rows, hyper rollups and squat variations for an adequate time period weeks prior to initial technique work. These strength exercises should physically prepare the athletes.

Baker:

There is no age limit on beginning to teach and use power cleans. For the very young weight trainer (11–13), I recommend some basic weight work for six to eight weeks before introducing the power clean. This allows the athlete to learn the "feel" of the barbell. Also, it gives the athlete time to work on flexibility which helps in power cleaning. I have actually found that it is more difficult to teach proper power cleaning technique to athletes with moderate to extensive experience in weight training. They tend to want to lift the bar on arm power and neglect the legs and back. In addition, if these athletes have not been on a good flexibility program, they tend to be much tighter than the younger athlete. Also, if they have a background of heavy squatting and deadlifting, they want to shift their body weight to the heels where they "feel" stronger. This is totally contrary to the "jumping" off the toes position used in the power clean.

Javorek:

Personally, I started power cleaning at age 11–12, but very carefully. Many coaches, in the hope of obtaining fast and substantial results, force the athletes beyond their capabilities.

Imagine comparing these youth to young fields of grass which are in a continuous growth. We could bring their young sprouts to ruin if we do not respect all laws of nature for growth. We can obtain optimal development with young children if we have enough patience and if we are not thoughtless.

First, we have to prepare their ligaments, joints and musculature, phase by phase. They do not need too much strength, because we have to teach the technique with a wooden barbell or a very light weight.

We will start by explaining the biomechanical meanings of the exercise. We will explain the meanings through all phases.

Why theory first? Because the athlete must understand the mechanism of the motion, the relationship between the commanding organ and the executor organ. It is a neuropathway between the point of stimulation and the responding organ. This is a reflex arc, with an afferent way from commanding you (brain) and an efferent way from the executor organ (muscle).

Then we start teaching (with very light weight) the segmented motions, combining different phases and changing the combinations, in this way developing a perfect neuromuscular coordination. The power clean, as with other specific weightlifting exercises, needs a great deal of general physical preparation which includes upright rows, bent over rows, shrugs, front squats, bench presses, chinning, clean pulls, narrow grip high pull snatches, dips, sit-ups, hyperextensions, vertical jumps, box jumps, stair jumps, short distance dashes, etc.

Newton:

Too much emphasis is placed on quantity, rather than quality, in terms of strength training for youngsters. Children under 12 years of age or so should be encouraged to develop strength through bodyweight resistance exercises, such as pull-ups, push-ups, dips, sit-ups, rope climbing, etc.

A period of general bodybuilding (hypertrophy) should occur during the adolescent years, but the emphasis should be on general muscular preparation of the large muscle groups (trapezius, latissimus dorsi, spinal erectors, gluteus, and quadriceps). Only after the body is properly prepared should one attempt heavy, multiple muscle group exercises such as the power clean.

However, during the period of 13–16 years of age, the athlete should be taught how to perform the power clean properly. This would involve light weights and moderate repetitions. If these pathways are not learned at about this age and with minimum to moderate resistance, there will genrally be a failure to do so at a later age.

Specific flexibility in the wrist, shoulders, and ankle joints and trunk musculature should be achieved during this learning phase. Of equal importance is the ability to maintain good trunk posture, which will come from a strong abdominal wall and deep musculature of the spinal erectors. As a simple subjective test of erector development, the athlete should not be able to feel the vertebrae of the lower back, nor should the coach be able to see the vertebrae, while the athlete is bending forward from the waist with a rounded back. Equal development of the rectus abdominus and the obliques should give a very good prediction that the athlete is ready for heavier power cleans.

Pauletto:

Chronological age per se is not a reliable determing factor for the simple reason that maturation proceeds at vastly different rates. Deciding upon an age as "14" or "teen" is not a rational approach. Maturity must be determined on an individual basis. This does not depend solely on physical ability, but also emotional maturity. Ligaments and tendons are particularly elastic and little able to resist pressures and pulling actions. Any heavy action for which the athlete is not well-prepared can cause injury.

An all-around conditioning program should be carried out before an athlete starts lifting weights. Basic exercises such as running, flexibility, push-ups, pull-ups, etc. should be included. Only then is the athlete ready to lift weights. The power clean can be taught along with the bench, squat, or any other lift. We understand that the power clean is more complex than most other lifts, therefore more time must be spent in the perfection of its technique. Correction motions should be learned with unweighted bars. The "physical tools" are coordination, flexibility, speed and patience. The latter attitude is particularly important.

"If we teach the perfect technique, a belt is not necessary."
-Baker

Etcheberry:

The athlete can probably start as early as 14 years of age. In the first two or three years, emphasis should be placed on developing good technique while the body does adjust to the stress of weightlifting. During this time, other exercises, such as squats (Olympic type) and upright rows, should help the athlete obtain full body development. Also, flexibility work must be included in the program.

Question 4: What is your advice in terms of the amount of resistance (load) used when learning to power clean?

Pauletto:

When the athlete is learning, the load should be very minimal (the bar with no weights) regardless of his strength. There will be plenty of time later to stack on those plates. The person must be able to do many repetitions in the beginning phase without getting physically tired. If there are weights on the bar, the athlete will try to "muscle" the weight up, therefore not learning the proper technique. When the pulling "concept" is mastered, weights should be added so that he can learn the proper power position at the start of the lift (bar resting on the platform). The coach should remember there is quite a difference between learning a lift and training in that lift.

Baker:

I start teaching the power clean using only a broomstick. I do this to give the athlete the chance to feel the movement and not have to worry about the amount of weight he is lifting. Once the athlete has picked up the movement pattern, I quickly move him to the barbell and increase the load. In training I rarely use more than 70% of maximum for the newer power cleaners, and only allow heavier lifts if the technique is perfect. In many ways, the amount of weight on the bar isn't as important as having the athlete do proper, explosive motions. I usually do 3 to 6 sets of 3 to 5 reps.

Bielik:

When training with partial or complete movements to acquire proper technique, our athletes use a light to moderate resistance. For the ladies, 45–95 lbs. is adequate. For the men, 65–125 lbs. is sufficient. These loads are for the initial stages of our technique progression. As their skill level improves, more weight can be used, but not so much as to allow deterioration of correct technique. We use sets of six repetitions during our technique exercises.

Javorek:

The weight used in teaching the power clean should be very light, because the primary goal is for the athlete to learn perfect technique.

Use light weight, 5–6 repetitions, 6–8 sets, then after six trainings we can test. However, the test depends upon the athlete's age, physical condition and ability. Evaluating these factors allows us to increase or decrease the load. It is the coach's ability, knowledge, feelings or whatever you want to call it, to be able to determine this increase or decrease. Personally, I always try to increase the weight during a training, making the exercise more of a challenge. Varying as much as possible the training schedules and the exercise loads and varying the number of repetitions will help to avoid monotony.

The recovery time after a maximum effort differs widely from one age to the other, varying from an unlimited load

possiblity at an early age to only once a month maximum effort in a 30-year-old athlete. As coaches, we have to determine the best methods to shorten the athlete's recovery time. There are several very efficient methods starting with different herb tea combinations and ranging to the self-regulatory technique. Personally, I have used many of these techniques with very good results.

Garhammer:

I recommend using the power clean in sets of 3 to 5 reps for training. For phases of higher rep training, I use high pulls, not power cleans. The maximal weight used should permit the required number of repetitions to be executed with speed and proper technique. The weight should be such that the heaviest load and last rep of a set can be caught with an almost vertical torso and the knees bent no more than to about a 90° angle.

Etcheberry:

At the beginning, most of the work must be done with light weights, even an empty Olympic bar, in order to teach the feeling of the movement in which muscles get into action. Increase weight gradually, but do not allow technique to break down. The athlete can sometimes use the bar with very light weight as a general warm-up before going on to the regular workout.

The power clean technique is difficult to master; the athlete must be patient. However, the benefit from the clean will make all the work worthwhile.

Newton:

In order to determine proper training percentages, a maximum effort needs to be tried. It is virtually impossible to accurately predict across all athletes what a 100% power clean will be simply by using other exercises.

Adequate development, as discussed in the previous question, is necessary before a 100% figure should be obtained. Assuming all this has been achieved, the general load for training this lift would be in the 75–90% range, depending on the repetitions used. Please note that in many workouts related to competitive weightlifters, the power clean percentages will normally range between 65–80%, as these figures are developed by taking the maximum clean (split or squat) as the 100% figure on which power cleans are based. One usually expects a power clean of about 80–85% of the clean.

If the power cleans are performed from blocks (high or low) or from the hang position, the intensities will probably need to be varied according to the abilities of the athlete.

For pure learning of the power clean movement, light weights allowing consistant performance should be employed. In this case, it is unlikely that a true 100% figure would be known. After the athlete is working hard on developing a maximum power clean, it can usually be expected that an attempt at a personal record, whether for a single or reps, from the floor or blocks, could be attempted about every 14–21 days.

Question 5: What safety precautions should be used in teaching the power clean? What advantages do using straps and a lifting belt provide?

Javorek:

Teaching step-by-step and assisting their backside with this execution are sufficient safety precautions. But as I said before, we will prepare well from the different phases and combine these with several supplementary exercises.

Straps may be utilized, but only for more than 80% intensity. The athlete should be accustomed to the hook grip from the beginning. The hook grip is very important because it helps the athlete to relax his arms and use only the muscles required in the lift. The hook grip is very similar utilizing straps.

"Too much emphasis is placed on quantity, rather than quality, in terms of strength training for youngsters."

-Newton

A belt should not be used, because we have to strengthen the abdominal and back muscles. If we teach the perfect technique, a belt is not necessary.

Pauletto:

1) Proper technique: By far the most important. If the technique is not correct, everything else you do becomes useless.
2) Proper intensity: Vary the load of your workouts. Be conscious of fatigue, especially if the lift is done after a long practice on the field. Start light in the off-season and increase the weight gradually.
3) Proper lifting surface: Wood is the best surface. Do not lift on carpets, rubber or cement floors.
4) Use a straight Olympic bar with smooth rotation at its sleeves. Your best bars should be used when doing power cleans. A bent bar can cause wrist and elbow problems. The weights must rotate at its sleeves, therefore an Olympic bar is essential. Do not do power cleans with regular bars or bars with fixed weights.
5) Belts give some support at the lower back. Mainly psychological help, but the belt makes you aware of keeping your back straight.
6) Lifting platform: Mainly because of the wood surface, but also to keep other athletes distant from the person lifting. The platform creates an area where nobody walks across or just stands in the lifter's way.
7) Magnesium carbonate: Chalk keeps the hands dry and prevents the bar from slipping.
8) Shoes with hard soles prevent ankle and knee sprains. Turf or tennis shoes are fine. Worst are running shoes with soft soles.

The advantage of using straps is that the athlete can lift more weight. The wrist grip is the weakest link in the power clean. Straps help keep a stronger grip on the bar. The lifting belt does provide some support to the lower back, but most of the benefits are psychological. The athlete feels "stronger" with a tight belt around the waist.

Baker:

I think the most important thing a coach can do to safely teach the power clean is to teach it by parts. This reduces the number of new things the athlete will have to think about in performance of the exercise. It also reduces the distance the bar travels, making it easier to control. This allows him to concentrate on the correct muscles and sequences of their use. I find that giving the athlete too much to think about causes erratic lifts, which may cause injury. Another area which may indirectly cause problems is the amount of working space the athlete has. Oftentimes, weight rooms are crowded and the lifter may be hindered in trying to save an errant lift for fear of dropping the bar on someone or something. As a minimum, give the power cleaner at least a 4′ X 8′ lifting area (8′ X 8′ would be even better). Also, keep this lifting area out of the mainstream of traffic. I do not like the use of spotters, as I feel they sometimes get in the way.

As for equipment, I don't have my lifters use straps for power cleans, unless the weight is over 80% of maximum or more than six reps are done. Lifting without straps helps develop the grip strength. The lifting belt is a matter of personal preference. Some athletes feel very comfortable without a belt and there is little evidence that the belt does anything more than give a secure feeling across the back and midsection.

Bielik:

To inhibit injury to the athletes performing the power clean, I suggest a total body warm-up consisting of five minutes of jogging followed by specific warm-up drills for the power clean. The specific warm-ups consist of a light ankle joint dorsi-flexion stretch followed by a light trapezius stretch. After stretching, the

athlete does 1–3 sets of light stage pulls followed by 1–3 sets of progressive warm-up power cleans or any partial power clean movement.

To inhibit injury to other athletes in the gym, a specific area of the weightroom is designated as our "pull" area. All athletes are to stay clear of the weightlifting platforms while others are doing their assorted pull movements.

Using straps allows the athlete to perform multiple repetitions on a particular pulling movement without being inhibited by a weak grip. This holds especially true with multiple repetitions from the hang. The grips also aid in protection of the hand. Occasionally, pulling type movements cause the tearing away of callouses. One problem in using straps is in the athlete's dependency on them. In order to be proficient in power cleans, athletes need adequate grip strength. Without the use of straps, grip strength can be developed doing the pulling type movements.

We use belts only during maximal efforts in any major resistance exercise. The rationale for using a belt is for structural support in the abdominal and lumbar region. I feel the support the belt provides is minimal.

Garhammer:

One of the most valuable pieces of safety equipment available for use in teaching the power clean is a light weight (10 kg/22 pound) set of rubber bumper plates. They position the bar at a reasonable starting height off the floor and can be dropped without damage to the floor or equipment if trouble arises during the lift. I always demonstrate how to "push" the bar away from the body, if it is out of balance or position when catching a power clean or power snatch. This is much better than trying to save the lift and risking injury. I often make each beginning athlete "throw" the bar away while purposely letting a lift weight get out of position.

Straps are useful for heavier sets and higher reps, but should not be used unless really needed. They can present a danger as it's harder to get away from an out of control bar when you're tied to it. I consider teaching athletes how to push themselves away from an out of control bar an important safety lesson that needs to be part of learning how to power clean. A secure grip is needed to properly execute a power clean; therefore, straps can be valuable when an athlete's grip may otherwise fail. Developing grip strength should not be overlooked. Similarly, a lifting belt can help stabilize low back and lower torso position, but it is not a necessity in most cases and should not be used as a substitute for strong low back and abdominal muscles.

Etcheberry:

Make sure you warm up properly. Start with a light weight and emphasize flexibility.

The weight room floor should be conducive to exercises such as the power clean. Also use proper shoes, not jogging shoes.

Clean up the area where you are doing cleans to prevent an athlete from stepping on a weight plate or other foreign object. Allow plenty of room so that athletes will not interfere with each other. Use collars. A lifting belt gives extra back support and does give the lifter psychological help. Use of the belt is optional, but I do recommend it. It is easier to prevent an injury than to heal one.

Lifting straps help the athlete in doing reps. Without straps the athlete sometimes may fall because of his grip.

Newton:

Proper safety measures are to be considered during the learning phases of the power clean. Adequate muscular development and proper lifting technique established prior to heavy power cleans should assure a safe performance.

"The extension movement characteristic of the power clean is also inherent to most sport skills."

-Bielik

A relatively straight bar is needed for this exercise or there is a possibility of wrist injury when turning the bar onto the shoulders at its final resting position. If a bent bar must be used, the usual advice is to start pulling with the bend in the highest position.

Solid footing is required for safety. A solid platform or floor surface is needed with no planks, rubber pieces, nails, plates, or other obstacles likely to get caught when the feet are jumped sideways.

Adequate weightlifting shoes should be used instead of running type shoes, particularly those with a flared heel. Obviously, the athlete should not perform this exercise barefooted.

A lifting belt may provide some sense of security, but is certainly not necessary. The belt will help keep the lower back warm and will provide something against which to push the abdominals. The belt will not prevent injuries.

Straps are helpful, particularly for hang repetitions or power cleans from the blocks. They should not be used exclusively, as the gripping strength of the hands and fingers will not receive maximum benefit, something important to those athletes who need gripping strength, such as defensive linemen, judo players, weightlifters, etc.

Straps do not add to safety and in fact may cause problems.

Spotters should not be used, as they run a greater risk of getting injured than does the lifter.

Question 6: What are the successive phases of the power clean? Describe the correct body positions for each phase. In your opinion, in what sequence should these phases be learned?

Garhammer:

In response to this question, I would refer the reader to my article "Kinesiological Evaluation of the Power Clean," and the accompanying article "Teaching the Beginner," by Harvey Newton, found in *NSCA Journal*, Volume 6, Number 3. I agree with Coach Newton that teaching the power clean from the top down (last component to first) will work best in most cases.

Newton:

Briefly, it seems easier to learn the power clean in reverse order, from the top down. General phases would include: 1) the final position on the shoulders and clavicles, 2) the jump portion of the lift, 3) the scoop portion or middle pull, and 4) the start of the lift.

Bielik:

I divide the power clean into three succcessive phases when describing it to large numbers of athletes.

Stance

-Toes turned out slightly with the feet pelvis width distance apart.
-Body weight on balls of the feet with heels in contact with the floor.
-Back flat or slightly arched with line of sight 90°from body line.
-Elbows turned out as much as possible with the shoulders dropped and back, positioned in front of the bar (trapezius on stretch, latissimus contracted).
-Bar over base of large toes, shins as close as possible to bar.

First pull

-Initiate pull by pushing down on the floor, do not jerk bar off of the floor.
-Arms are hooks with elbows still pointed out as far as flexibility allows.
-Body weight slowly shifts toward midfoot during pull.
-Hips and shoulders rise at the same time with the bar as close as possible toward body.

-Elbows still turned out.
-Back still flat or slightly arched with the line of sight 90° from body line.
-Bar rises as fast as possible while keeping correct body positions (correct leverage).

Second pull
-Phase is initiated when bar passes knees.
-Body weight moves over balls of the feet with heels still in contact with the floor.
-Arms are still hooks until body is maximally extended (elbows turned outward).
-Back still flat or slightly arched.
-Shoulders now vigorously rise while hips *react* (action-reaction) by "scooping" forward.
-Line of sight rises with shoulders.
-Shoulders over the bar during the majority of the pull.
-Instantaneously after reaction, hips rise upward with rising shoulders (movement simulates vertical jumping movement).
-After maximal body extension with shrugged shoulders, pull bar with the arms (elbows up). In a power clean, the athlete drops to approximately a 45° knee angle during the catch.
-The athlete drops down while pulling the bar up simultaneously, the bar and athlete meet at the catch.
-In the catch position, the bar is resting on the anterior deltoid with the elbows pointing down at a 45° angle from the body line. The athlete has a grip on the bar.

In my opinion, the power clean skill should generally be taught in reverse order. The stance, first pull, and second pull may be broken down into subphases when the skill is taught. Our athletes perform the following partial movements for skill acquisition. Each exercise is learned proficiently before moving on to the next exercise.

1. Snatch, High pull (hang) and Stage pull (hang)
2. Stance
3. Snatch grip high pull
4. Power clean (hang)
5. Power clean

Baker:
I feel there are six separate phases in the power clean.
Phase 1: Start
The athlete places his feet approximately shoulder width apart with the balls of the feet directly under the bar. He bends at the knees and waist and grasps the bar with a shoulder width grip. He pushes his knees forward so that the shins lightly touch the bar. The back is straight with the hips below the shoulders. To start the bar, the athlete pushes down on the floor with his feet. When the bar leaves the floor, the shoulders *must* be either over the bar or ahead of it to ensure a good lift. The arms are relaxed and straight, and serve only to connect the shoulders to the bar.

Phase 2: Lift from the floor to the knees
This phase is done by continuing the push on the floor with the feet. The bar goes up when the shoulders go up; therefore, it is important that the athlete's hips and shoulders go up together at the same speed. Most athletes kick their hips up first, then raise the shoulders. The arms are still straight throughout this phase.
Phase 3: Move into the jumping (scoop) position
The key to productive power cleaning is to get the athlete into a good jumping position at this point. He does this by lifting the shoulders up and back. If done properly this should force the hips and knees downward (causing the plyometric-like pre-stretch). The shoulders should also stay ahead of the barbell and the arms stay straight during this phase.
Phase 4: Jump
In this phase the athlete quickly transitions from the scoop to an extended body position. In order to do this, he drives the hips forward and up and stands explosively.
Phase 5: Lift the elbows
At this point in the lift, if everything is going right, the arms are finally ready to do their part. The athlete lifts his elbows, just like in an upright rowing motion. This keeps the bar close to the body.
Phase 6: Rotate the elbows
In order to complete the lift, the athlete rotates his elbows forward and up and

catches the bar on his chest. The bar should land high on the chest (actually on the shoulders) and the elbows should be well forward. The feet are moved slightly to the sides and the knees are bent to soften the catch.

Teaching Sequence

I teach this lift in reverse order. I start by using the front squat to teach proper positioning of the feet and the bar on the chest at the end of the lift. Next, I use the upright row to teach "lifting the elbows." Then, I work each phase of the pull, starting with the bar above the knees, and working down to the floor.

Javorek:

In the starting position, the feet are almost parallel, and wider than the width of the pelvis, toes turned out, but not exaggerated with the knees slightly outward as well.

The athlete's feet should be placed under the barbell in such a manner that the metatarsal-phalangeal joints of the big toes are as near as possible to the barbell. The hip joint is situated above the knee joint and the angle between the lower leg and upper leg is 56–58°. The back muscles are contracted and form a 45–47° angle in relationship to the upper legs. The shoulders are slightly ahead of the barbell. The elbows are turned out as much as possible. The arms are straightened completely and relaxed. The head is in line with the trunk, looking a few meters to the front. At this time, the athlete's body weight is distributed over the whole foot. Start to open the angle of the knees and to lift the shoulders so that the athlete simultaneously raises the hips and shoulder (**Figure** 1).

In the beginning of the start position it is very important to extend the barbell and *then* start to lift, because of the elasticity of the bar. If the athlete lifts the total weight up from the platform with a brisk motion, the weight has a tendency to go lower due to inertia. However, if the barbell is slightly lifted first (to allow the weight to flex the bar) the full effort of lifting the weight is utilized. Only with an extended (flexed) barbell can you make use of the inertia of the plates to help in the development of the barbell's velocity.

Begin the starting motion slowly, similar to the action of a rocket propelling from the surface, or the archer preparing to shoot an arrow. In both instances, the motion is initiated gradually, slowly giving way to an increase in velocity. With a fast start, the rocket and the arrow will both fall down because you cannot further increase the velocity. This same situation occurs in weightlifting.

The common center of gravity is toward the heel and then during the pulling motion, bring the center of gravity slowly to the middle of the full foot. At this time, keep in mind that the toes are to be free and the weight distributed over the full foot.

Start the bar and move it to a level above the knees with the shoulders forward and the legs almost extended. Next, follow the double knee bend motion. Press the knee forward and at the same time with a perfectly straight back, raise the shoulders, keeping the elbows turned out.

During the complete motion it is very important to try to find the optimal counter-balance position. When finishing the double-knee bend motion, "hit the barbell," with a full force from the shrug (trapezius muscle) and the extension of the legs. Give the barbell a projection so that it conforms with the physical laws of matter in suspension.

"A lifting belt gives extra back support and does give the lifter psychological help."

-Etcheberry

For maximal efficiency, perform flat-footed with the center of gravity in the middle of the foot and not on the toes. It is easily understood that an athlete can develop more strength with the more stable bar of the full foot than when raised on the toes. Also, utilizing the combined forces of the legs and trapezius are sufficient for a maximum lift. When the athlete "hits" with optimal strength in optimal position, sufficient inertia and velocity can be developed to do the same pressing motion under the barbell with maximal efficiency

Another rule is to never completely straighten the legs (knee). This way we can control and feel the barbell. Another rule to be understood by the athletes is that after the first phase of the motion (the pull) the barbell is not lifted further but we meet the barbell exactly in its optimal position by pressing the body under the barbell.

Due to inertia, the weight is equal to 0 kg. in this stage of suspension. At this moment, press the body under the barbell (screw the elbows under the barbell) because it is easier to press our body weight under the barbell than to try to lift the heavier weight further. This is the most important and most difficult part of the clean. We must work hard to develop perfect neuromuscular coordination. When the barbell gets the maximum inertia and it is in the suspension, the athlete's body is in suspension as well. Next, reposition both feet further apart in order to allow for the pelvis to get into optimal position without slowing down general velocity and to have perfect balance. In the same way, always do only as much squatting under the barbell as is necessary.

After the clean pull, it is very important to contract the back muscles at the same time and try to lift both elbows and press the pelvis forward.

The sequence order in teaching the power clean depends upon the athlete's physical qualities, performing first in the position in which he is weakest. But, in general, it is very important to teach different sequences, combining them from different phases. More combinations result in better neuromuscular coordination, better technique and fewer injuries.

Pauletto:

There are four successive phases to the power clean.

Start:

-Place the legs so that they are just touching the bar.
-Legs should be shoulder width apart, toes slightly pointing out. Weight is on the balls of the feet.
-Sit "back" with your head up and back flat. Shoulders over the bar.
-Reach down and grip the bar shoulder width, overhand grip, wrists curled inward.
-Knees inside arms with forearms slightly touching your thighs.
-Keep back flat and arms completely straight.
-Inhale at the start and exhale at the end of the lift. Hold your breath during the exercise.

First pull:

-Ease the bar off the floor slowly by using your legs, keeping the back flat at all times. Shoulders are still over the bar.
-The bar needs to be pulled close to the shins, just over the knees.

Second pull:

-When the bar passes your knees, slightly bend the knees forward, "under the bar." This will put your back in an almost vertical position. Now you are in the power position. Pull the bar by extending legs and back. This part of the lift is called the "double knee bend."
-As you extend your legs and back, also pull the bar with the muscles of the upper back (trapezius) and the arms. Keep the elbows out and high.
-Go up on your toes and try to pull the bar as high as possible.

Recovery:

-When the bar reaches its highest point, slightly bend the knees and get "under" the bar by shifting your feet to the side, not back.

-Rack the bar on your chest and shoulders with elbows high and forward. The wrists will turn over with the bar.

Success in learning the correct lifting position for the power clean is achieved by first learning partial or blocks of movements at a time. As each partial movement is practiced and polished, the athlete then progresses to the next sequence until the lift is learned in its entirety. This is most efficiently accomplished by working *downward.*

A) Standing, knees slightly bent, shrug as high as possible while extending legs and raising on toes.

B) Same as above but faster, trying to raise the bar higher by pulling with the arms after the shrug.

C) Same as B. At the highest point in the pull of the bar, slide the feet apart slightly, bending at the knees and dropping under the bar. The bar is recovered over the deltoids with elbows high and forward (this phase is known as the hang clean).

D) From the floor, pull the bar to the knees, extending the legs and keeping the shoulders over the bar and arms straight.

E) Same as D, but pull the bar over the knees, then "shifting" the knees forward so as to be in the power position.

F) Now that all the phases have been worked on separately, combine them to make the whole movement. At first, go slow and stop at the end of each phase. Try to reduce the time stopped between phases so it becomes one smooth accelerating movement.

Etcheberry:

Feet should be about shoulder width, toes slightly out. Hands, shoulder wide or slightly wider. Bar should be over the metatarsal part of the foot. Hips should be lower than shoulders, arms related, eyes forward and slightly down, back flat, shoulders slightly forward of the bar. The bar should come fast off the floor without pulling too soon. Back angle remains consistent until the bar passes the knees. Hips should accelerate bar, then arms should follow. The athlete needs to try to accelerate the bar through the entire movement. Make sure the bar does not get too far in front of lifter. If this happens, the athlete will not be able to get elbows through and control the bar.

The athlete should have good shoulder and elbow flexibility to control weight at the end of the pull.

Question 7: What are the most common technique flaws in the power clean, how can a coach recognize these flaws and what corrective measures should be used?

Pauletto:

1) Lifting on the toes with heels off the ground. Ankle and hip flexibility must be improved in order to keep the feet on the platform during the start and pull.

2) Round back. The back must be flat at all times. In the start position raise your head, keep your shoulders back and sit back.

3) "Muscling" the weight. Many athletes pull excessively with the arms and shoulders instead of pulling with their back and legs. They must keep their arms straight throughout the lift. Only at the top after the shrug can the athlete pull with their arms.

4) Swinging the back. Most athletes think the bar must be "swung" out before resting it on the shoulders. The bar must be "pulled" up close to the body. The closer the bar is to the body, the less force is needed to do the work. Do high pulls to the chin, keeping bar close to the body, in order to get it right.

"I do not think the power clean is a dangerous lift; I will say that the power clean is a 'complex' lift requiring technique, mental concentration and total body fitness. Coaches have made the lift dangerous because many do not recognize technical errors which will lead to injuries."

-Pauletto

5) Accelerating the bar. The first pull is done slowly, like a dead lift. Do not "jerk" the bar off the ground. Only after it passes the knees do you want to exert maximum force on the bar, using the whole body.

6) Throwing the head back. This will make the bar come "around" instead of straight ahead and keep the focus point all through the lift.

7) Excessive splitting of feet in recovery phase. The knees must bend to get under the bar. Many athletes keep their legs straight, therefore over-splitting to get under the bar.

Newton:

The most common problems in this lift are: 1) Incorrect starting position, 2) failure to pull properly from the floor, 3) failure to achieve a good "popping position," or 4) poor receiving position on the chest and shoulders.

1. Incorrect start: Frequent problems include a)feet too wide (should be shoulder or hip width), b)feet too far behind or in front of the bar (bar should be over the metatarsal joint), c)hips too low or too high (this varies according to the length of the athlete's femur), d)feet not flat or too much weight on heels, and e)back not flat.

2. Failure to pull properly from the floor: The tendency is for the athlete to move the hips more quickly than the shoulders during the separation of the bar from the floor. Generally speaking, the angle of the trunk should remain about the same as the bar is initially lifted. Another common problem is pulling with bent arms. The arms are simply too weak to be prime movers; the work should be done with the hips and legs, along with the lower back adding stability.

3. Popping position: After the bar passes the knees, there is a strong effort to pull the shoulders straight up (not rearward). This should result in the hips coming closer to the bar, which is achieved by bending the ankle and knee joints. There is debate as to whether this can be learned or if it is a natural reaction. At any rate, the bar should contact the thighs in a grazing fashion as the knees and ankles bend and the hips are positioned lower and closer to the bar. This "popping" position is where the most power should be generated.

4. Poor receiving position: Instead of firmly grasping the bar and setting it on

(Continued, page 22)

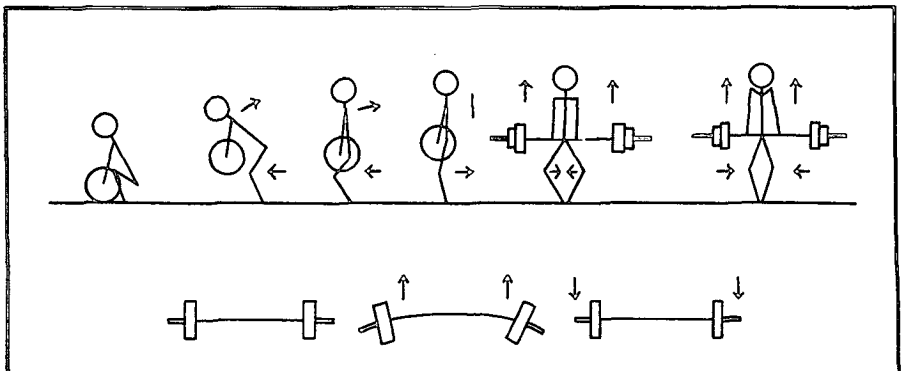

Figure 1 .

Roundtable:

(Continued from page 19)

the deltoids, chest, and clavicles, many poorly coached athletes will either rest the bar just below the sternum with the elbows low or will get it to the proper position but allow the bar to roll back onto the fingers.

One of the best ways to recognize these flaws is to videotape the exercise and look at the key positions on stop action. It will take some time to develop an eye for analyzing this movement properly. Additional help can be obtained by placing the U.S. Weightlifting Federation's poster "Learning the Power Clean" on the gym walls.

Correct teaching is the best prevention against these problems. Specific exercises can be employed to teach the proper movement, but the athlete who has learned incorrectly is likely to continue the same mistakes.

Bielik:

The technique flaws I see are generally centered around the arms and the hip/shoulder complex. The following are the common flaws and corrective measures associated with each of the three phases.

Stance:

Athletes tend to round their backs prior to initiating the first pull. Have the athlete flatten his back, tighten the latissimus (shoulders and back), and have the head at a 90° angle from body line.

During the stance and into the movement itself athletes tend to allow the bar body distance to become too great. The shoulders are to be in front of the bar. The bar itself is to be positioned over the base of the large toes.

First pull:

Athletes tend to jerk the bar off the floor. The jerking of the bar causes the back to round and the shoulders to rise too quickly. To correct this problem, the athlete needs to gradually accelerate the bar off the floor. The shoulders and hips should rise at the same rate keeping the trunk to floor angle constant.

Second pull:

During the second pull, three faults are common. First, the athletes have difficulty "scooping" under the bar with their knees. Having the athlete go through stage drills helps develop an advantageous thigh/bar relationship. During the execution of the power clean movement, have the athlete emphasize a rapid upward movement of the shoulders. The action-reaction effect forces the hips to "scoop" bringing the knees under the bar while the shoulders are moving rapidly upward.

The second technique fault common to the execution of the power clean is pulling too soon with the arms, the movement becomes an arm curl exercise. The athlete needs to maximize the use of the legs, hips and back. These are the large muscles and should be involved before bringing the arms into action. The muscles of the arms are relatively small and provide little to the lifting of the bar. The major influence the arms serve in the power clean is to pull the athlete under the bar after the bar reaches the upper trunk. It should be explained to the athletes that the arms are only hooks until total body extension.

A third problem common to the second pull as well as to the first pull is the bar distance from the body. Athletes tend to allow too great a distance between the body and the bar. This destroys advantageous leverage. The bar/athlete distance can be decreased by the proper "scoop" during the initiation of the second pull and by keeping their elbows pointed outward throughout the majority of the movement.

"The key to successfully using the power clean and maximizing its benefits with minimal risks is to be patient while learning technique and be reasonable in choosing training weights."

-Garhammer

Javorek:

The most common technique flaws are as follows.

Starting Position: the center of gravity is on the toes, bending the elbows, relaxing the lower back or bowing the upper back, excessive placement of the shoulders forward or backward in relationship to the bar, excessive incline of the head forward or backward, an excessively low or high position of the trunk and tension in the arms.

Pull position: raising shoulders first, pushing the bottom forward, shifting the center of gravity forward or backward, excessive shifting of the shoulders backward, raising on the toes, delay of going under the barbell at the time the weight has achieved the optimal height and excessively moving the feet outward.

The coach must possess a sufficient theoretical knowledge of the technique. He needs time for experience, to see all motion as in a replay. The coach has to feel the perfect motion, so that he may detect all types of technical error and mistake.

What corrective measures should be used? Space limits us, but, in short, the coach must stop and correct the athlete when he utilizes the wrong method and be able to figure out the best method.

Garhammer:

The most common technique flaws I observe in the power clean are pulling with bent arms, not having a "scooping" action (second kneed bend) during the transition from the first to second pull (to reposition the body into a stronger leverage position), and not keeping the shoulders in front of or over the bar during the pull. Pulling with bent arms is easily observable by a coach since the arms should be straight until the very top pull position. Correction of this error can be facilitated by performing hang cleans from knee level while making an effort to keep the elbows locked as long as possible, and by doing pulls from the starting position to knee level with locked elbows. If the "scooping" action is present during a power clean, the coach can observe, from a side view, that the hips move almost straight upward during the first pull, forward and slightly downward during the "scoop" (transition), and finally upward and slightly backward during the second pull.

If a transitional phase of hip movement is missing, then I'd refer to the appropriate learning steps discussed and pictured in the previously mentioned Harvey Newton article. A key to a successful transition phase in the power clean (or snatch) is the willingness of the athlete to wait for his or her body to shift position before starting the explosive second pull. Being anxious and rushing into the second pull is a problem that must be overcome. Typical durations for the transition phase of a clean in Olympic lifting competition are about 0.10 to 0.12 seconds, and slightly longer for snatches. Whether or not the shoulders stay over or in front of the bar during the pull can also be observed from a side view. The error of having the shoulders behind the bar too soon results in the easily observed technique flaw of jumping backward when catching the weight, or leaning backward (hyperextended spine) to catch the weight. Another result of this shoulder position error is that the athlete will have his or her balance concentrated backward on the heels. Ever lower-priced home video systems can be a major help to the coach in observing technique flaws, as well as a major help to the athletes in learning technique by seeing themselves in action.

A strong lower back is important in order to be able to keep the shoulders over the bar, so low back strengthening exercises are valuable. The use of a slow

start and gradually increasing speed in the first pull also helps maintain proper shoulder position during the lift and facilitates a proper transition into the second pull. Again, see Harvey Newton's article for steps in learning proper technique.

Baker:

The three most common faults I've seen are yanking the bar off the floor, over-rotating the back, and catching the bar poorly. The first fault is usually associated with a person we call an "arm puller." He puts everything into getting the bar moving. He usually pulls with the arms and moves the hips up very fast. The coach should watch for the early bending of the arms and check to see whether the hips and shoulders raise the same amount and at the same speed as the bar goes to knee level. To correct this fault, I usually have the lifter think of the power clean as a two-stage rocket. In the first stage, all you're trying to do is get off the ground. The lift from the floor should be smooth, not jerky. When the bar passes the knees, the second stage kicks in and the bar really takes off. Having the athlete smoothly deadlift the bar to knee level will help work on this fault.

The second fault occurs after the bar reaches knee level. Many athletes believe that they can move the bar faster by rotating backward with the shoulders. In the case of the "arm puller," he can only move the bar from this point by rotating up and back. This causes the bar to take an opposite path and it loops out away from the body. The same thing can happen to the athlete who lifts the bar correctly to the knees. He must fight this urge to rotate strongly to the rear and keep his shoulders over the bar. The coach can watch for this problem by watching the relationship of the shoulders to the bar. This problem can be corrected by having the athlete work from the "Hang" position (bar started above or below the knees). It's very important that this middle portion of the lift be done properly, as it includes the all-important pre-stretching of the leg muscles. It is also recommended that the majority of the work from the hand be done from below the knees because this position emphasizes the pre-stretch. Problems also occur in catching the bar on the chest. The "arm puller," because he has directed the bar in a loop away from himself, will usually find it coming back at him at a good speed. If he finishes with a lot of rotation, it's quite possible that his shoulders will be behind his hips when the bar makes contact with the chest. This could be very stressful on the low back. The position of the bar on the shoulders is also important. Many athletes aren't flexible enough to rotate the elbows around and have the bar land high on the chest and be held there by the arms. Most of the time their forearms are perpendicular to the ground. When the lift is done properly, the upper arm is parallel to the ground and the bar lies high on the chest supported by the deltoids. The coach should watch for this arm position, and add wrist and shoulder stretching exercises for those athletes who have problems.

Another facet of the catch of the bar is footwork. In a good power clean, the athlete should only be moving his feet a slight distance to the side and bending the knees to get under the bar. Lifters often fool themselves into thinking that they are lowering the body under the bar by kicking the feet far to the sides and leaning forward. Others shuffle the feet front and back. The coach should watch the feet and determine if they have moved too far. As a rule, the feet should be placed no wider to the side than the foot spacing used in front squats. If an athlete has problems with footwork, try limiting foot travel by the use of 2' X 4"s or large plates on the platform.

Etcheberry:

Some of the most common flaws are: Weight of the athlete on heels before

starting the pull; rounding of the back coming off the ground; not enough flexion at the knees; hips higher or at same level of shoulders; athlete does not get his hips through during the pull; and jumping back away from the weight. The athlete sometimes does try to start the pull with arms too quickly, feet too wide does not allow for good explosive pull, not enough flexibility in the shoulder.

The best way to correct flaws is to break down the exercise into different phases, and work on one flaw at a time. Start working in the major ones first, especially if the flaw occurs early in the movement. Once the athlete commits a mistake early in the pulling phase, this in turn will affect the rest of the movement.

Question 8: What special advice would you give a long-limbed athlete in learning the power clean?

Bielik:

A long-limbed athlete need only work more extensively on technique and structure exercises. The typical long-limbed athlete may use limb length as an advantage with proper technique. This same athlete with poor technique has the potential to generate greater negative effects. The resistance the bar provides to the athlete is magnified with the longer levers. I suggest the athletes with long limbs work to increase ankle, hamstring, and hip adductor (groin) flexibility. This allows a superior stance and first pull. These initial movements, when performed correctly, have a great influence upon proper techniques and injury prevention.

Baker:

The key in any lifting is to keep the bar as close as possible to the center of gravity and the long-limbed athlete must pay closer attention to this than most, because his limb length magnifies any problem. It's important to make him lift from comfortable positions. Oftentimes, tall athletes are forced to lift the bar from the floor and must bend over into almost unnatural positions. From these positions, it's almost impossible to make a good lift. I suggest the coach use blocks under the weights to move the bar up off the floor to a point where the athlete can start in good position.

Etcheberry:

For the tall athlete, make sure you develop the back to prevent back injuries. The athlete should learn to wait for arm pull; sometimes athletes with long arms will try to pull with their arms as soon as the bar comes off the ground. Height and arm length does affect body position at the beginning of the lift. The athlete should experiment and find which body position is most suitable for him/her.

Garhammer:

The long-limbed athlete, particularly one with long arms (relative to torso length) and/or long legs, will have difficulty lifting the bar from the floor to above knee height (without hitting the bar on the knees) and then shifting into a good position for the start of the second pull without bumping or swinging the bar off the lower thighs. These problems are not easily overcome. A wider hand grip spacing may help, as can a starting position a few inches further away from the bar (although the short torso athlete would then find his or her shoulders behind the bar at lift-off). Some experimentation and a lot of patience is needed to try to find what will feel comfortable to this kind of athlete. Sometimes using slightly bent arms will have to be accepted, other times substitution of hang cleans may be the only workable solution.

"I do not believe doing power cleans in the weight room will help the athlete to learn a specific skill taught on the field. On the other hand, I am convinced that power cleans will make the athlete better perform that skill."

-Pauletto

Pauletto:

The technique of the power clean is no different for a short-limbed athlete or a long-limbed athlete. The teaching procedure should be the same for all athletes. If the long-limbed athlete has problems in technique, flexibility, or speed they should be corrected in the same fashion as any other athlete. In some instances, using blocks to elevate the bar from the floor may help. The coach should understand that a long-limbed athlete will not power clean as much as a short-limbed athlete because the bar has to be pulled much higher, requiring more force.

Javorek:

It is the same method for everyone, from simple to complex, from easy to complicated, to study and analyze the athlete's technical motion and his body segment's ratio. Also, the athlete should divide the complete motion into different phases and use a complete method of study based upon statistical analysis. For long-limbed athletes, we must strengthen their lower back and thighs, but in general, we have to respect the aforementioned method of the individual analysis.

Newton:

Several factors are included with this athlete. Analysis must be made of his structure to determine whether he has all or some of these characteristics: 1) long legs, 2) long arms, and/or 3) long torso. The various combinations available can cause several problems.

Generally speaking, a long femur bone will cause the hips to be relatively high in the starting position (above parallel). This is actually a superior position from which to pull.

Long arms will usually mean the bar will contact the thighs very low, which can result in a rotation of the trunk rearward during the jumping phase, rather than a vertical jumping action. This can be remedied by using a wider grip on the bar. The long arms may also affect the receiving position on the chest, depending on whether it is a long lower, upper, or total arm. A long lower arm will restrict how high the elbows can be placed with the bar on the chest, while a long upper arm can actually facilitate this position.

A long torso presents special problems while pulling. With the bar around knee height, the shoulders should be at their farthest forward position over the bar. With a long-torsoed lifter, this can cause him to put his bodyweight on the heels rather than middle of the foot and the leg will be almost locked in a straight position. This usually causes a swinging motion of the trunk and bar after the popping position. This is not a strong position in which to lift. Usually the long-torsoed lifter will find his shoulders behind, rather than over the bar at the top of the pull. This slight leaning back at the top of the pull seems necessary in such an athlete, but should not be used in the short- or normal-torsoed lifter.

Some of these leverages, combined with poor flexibility or general lack of athletic skill may necessitate the exclusive use of blocks for performing the power clean. This would minimize the problems encountered when performing from the ground.

Question 9: How do alternative lifts such as upright rows, high pulls, and hang cleans rate with power cleans with regard to improving athletic performance?

Garhammer:

Alternative lifts, such as high pulls and hang cleans, are components of the full power clean and thus incorporate various features of the total lift. Exercises such as the upright row isolate the muscle action to fewer joints and eliminate the speed

component of power cleans. The total body involvement, particularly the explosive use of leg and hip musculature, is a major reason for the value of the power clean in training athletes. The only lifting exercises which really maintain the key value characteristics of the power clean, and thus may serve as alternatives, are its associated movements (high pulls and hang cleans), snatches and associated movements, jerks (split, push, behind-neck), and, to some degree, squats with lighter weights.

Javorek:

With regard to improving athletic performance, the combination of exercises can increase the results. More exercises mean greater possibility to obtain a better general physical condition, yielding greater athletic results. At the same time, we can eliminate workout monotony, which can negatively influence development.

Bielik:

If the exercise is a multiple joint exercise and involves the large extensor musculature, I believe these exercises are very similar to the power clean in improving athletic performance. I feel the high pull, hang clean, power snatch, and to a lesser degree the parallel squat, are similar to the power clean in improving athletic performance.

Baker:

Of the three exercises mentioned, high pulls and hang cleans offer the same benefits as power cleans, if their method of execution is correct. Using my description of the power clean, the high pull encompasses Phases 1 to 5 and the hang clean, Phases 2 to 6 or 3 to 6 depending on whether the bar is started above or below the knee. It's recommended that you do hang cleans from below the knee in order to get the valuable pre-stretch that makes any pulling exercise a speed-strength developer. Any other type of exercise, such as the upright row, even though it simulates a part of the pulling action, does not supply the explosive action and cannot be substituted as a speed-strength exercise. These exercises are strength developers and are valuable in that respect.

Pauletto:

I consider upright rows an auxiliary lift like arm curls, for it is not a multi-joint exercise. Lifts like high pulls, hang cleans, power pulls and snatches are in the same category as power cleans. The important thing to remember is the improvement of "power" and the hip and knee rotary movement. All of the above lifts are similar in that respect. They are different in themselves but all are very good in improving strength, coordination, speed and flexibility. The strength coach should incorporate two or three of these lifts in his workouts.

Newton:

There is nothing magical about the power clean. An exercise like the upright row certainly works some of the same muscles, and in fact, could be more beneficial for upper body development. No hip and leg benefit would be available, however.

Hang or back power cleans are power cleans anyway, so there is no significant difference.

High pulls allow for the use of more weight than can be power cleaned. Additionally, the hip and leg drive is available with this exercise, so benefit would be equal, as there is no great purpose served in placing the bar in the final receiving position after having done a high pull, which would be another way to describe the power clean.

Etcheberry:

Upright rows, high pulls and hang cleans can be good lead off exercises in teaching the power clean. They do teach athletes the feeling of the proper movement of the bar.

Hang cleans, as power cleans, do require the use of the hips (rotary motion) in an explosive movement, so important in athletics.