The Vertical Jump

Advanced Speed and Strength Methods

Martin Rooney

Joe DeFranco

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Head Strength & Conditioning Coach – Football
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Eric Downing
Defensive Tackle, Kansas City Chiefs
2002 Rookie of the Year (Kansas City Chiefs)
33 ½" vertical jump, weighing 313 lbs.

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Introduction

There is nothing quite like watching it. Everyone in the place has their eyes looking straight up at the spinning plastic pieces of the Vertec. The athlete explodes up with a grunt and reaches with everything he's got. All onlookers simultaneously jump slightly and shrug their shoulders. The athlete, at maximum height, nicks the next highest piece of plastic and the crowd erupts with OOOHH's and AHHH's, as if they were at a Fourth of July fireworks show. The athlete has performed a personal record and all the onlookers are pumped for him. Rarely does any test produce this kind of interest and excitement. It is amazing to see something so simple attracts the attention and imagination of everyone around. It may be equally amazing to the reader that we were able to produce such a volume of work about an event that seems so elementary. But we did. And you will be amazed at how much more there is to the vertical jump than just "squatting down and jumping up." Trust us. Most coaches over-simplified the 40-yard dash until they read our last manual. Then, our phones were ringing off the hooks with coaches in disbelief at how much faster their athletes had gotten after implementing our techniques. The same will hold true for this manual. We guarantee you will produce higher jumps and more explosive athletes by following the techniques in the pages to follow. So read first and ask questions later, damn it!

Probably the second most commonly asked question after "What is your 40 time?" is "How high is your vertical?" Athletes in many collegiate and professional sports including the NFL, NBA, MLB and others are all currently using this test as a measure of athletic performance, specifically their ability to express power. Many times,

this jump performance could have made or broke their careers along the way. Athletes are, in some cases, obsessed about their vertical jump. The ability of the athlete to overcome inertia in an explosive vertical manner is needed in almost every athletic venue for success. Therefore, the vertical jump is an excellent and accurate way to measure both explosive upper and lower body power.

As many readers of our last manual quickly found out, not only do we challenge some common ideas about training, we also know what we are talking about. This manual, addressing the vertical jump, will prove no different. We are again going to *engage* you into questioning what you think about the event, *educate* you about the intricacies of the event, *entertain* you with our "tude", and finally, *empower* you with the techniques to improve your previous best performance. We have performed years of tests, training and trial and error to give you the cutting edge knowledge contained in this manual. Use it wisely and attack the event like an Olympian would. Again, we question you, "If the vertical jump was an Olympic event, do you think you would train differently for it?" We know the answer is yes, and we know that this manual is the first step in allowing you to master the event. Many people like the quick, to the point style of our manuals. Some, however, want a little more science. This introduction is going to include a little more science than our last introduction, but we will keep it as understandable as possible. The contents of this introduction are going to set the tone for the rest of the manual.

The vertical jump can be defined as an event in which the athlete uses the coordination of many muscles and joints of the body to propel himself with the highest velocity possible at takeoff from the ground. The higher the initial takeoff velocity, the

higher the athlete will jump. This is a very important concept to take into account early. You must conceptualize and believe that it is not just the maximal force that you can impart into the ground, but also the maximal rate that this force can be developed that are equally important. All too often, athletes focus on the maximal strength aspect of training with heavy, slow lifts and forget about rate of force development (RFD). You will see that both have their place in your training and in this manual. Understanding and utilizing this concept alone will already have you higher than your competition. Along with this concept of speed and strength, you must also remember that perfect technique is also a must during the event.

A simplified equation to explain the vertical jump is as follows: Speed X Strength = Power. Speed is defined as *distance divided by time*, and strength is determined by *force production*. This equation helps you to see that to develop power, (which is what the vertical jump ultimately measures) one must have the highest amounts of speed and strength combined to achieve the highest jump. This equation can also cross over to the development of power in other sports as well. For instance, when we ask "who is the most powerful hitter in baseball?", we usually receive the names Mark McGuire, Sammy Sosa, or Barry Bonds. When we ask "who are some of the strongest guys in baseball?", we get the same names in response. Finally, when we ask, "Who has the highest recorded bat speeds in baseball?", you guessed it, the names are still the same. Using the equation above, the reader can see why these players have some of the furthest bombs in history. They combine the most body strength with the highest bat speed and, therefore, hit with the most power (as seen through distance). Just like the takeoff

velocity can be used to predict the height of the vertical jump, the initial velocity and angle that the ball leaves the bat can also be used to predict the distance of the shot.

Through the testing and training of thousands of athletes, we estimate that forty percent of the height attained during the vertical jump is due to the use of the gluteal and erector muscles. We also believe that twenty five percent is contributed by the hamstrings and fifteen percent is generated by the shoulder complex. We also believe that the other twenty percent of contributors are not as important as the first eighty percent mentioned. These contributors would be the quads, calves, abs, upper back and arm muscles. The gluteal, hamstring and lower back muscles are a continuous unit connected by ligamentous structures. Together, they are known as the posterior chain. We consider the training of the posterior chain paramount in the development of an athlete. Now that you know the muscles of the posterior chain are the most important to the vertical jump; you should obviously see that these muscles will receive the highest attention in the training sections of this manual. This training will be developed in chapters ahead.

Now that we are familiar with the anatomy used during the jump, we get to the good stuff - strength. One should understand that an athlete must have a solid strength base to perform an explosive jump. The athlete and coach must first work to develop maximum strength, but once strength levels are high, further strength work at the expense of speed is not going to add more height to the jump. An example of this is that weightlifters usually have higher vertical jumps than powerlifters, although their absolute strength may not be as high. Since they both have a base level of strength that is great, but the weightlifters do more explosive movements, just adding more strength to the powerlifters program would not be the answer. On the other hand, if an athlete does not

have a base level of strength, building a strength base will improve their jump height in and of itself. Once initial strength is built, athletes should start paying attention to their rate of force development.

The rate of force development is defined as the time it takes to develop maximal force. We have found this rate to be directly related to the athlete's ability to jump high. One just has to imagine Michael Jordan leaping from the foul line to see that the goal is to produce an explosive, minimal contact time with the ground, while attempting to maximally recruit the muscles to attain an incredible height. Training for maximal rate of force development is not as simple as the coach or athlete may think. Many coaches and athletes think that heavy squatting will lead to a fast rate of force development when the athlete reverses from the eccentric to concentric motion. Although this would allow for a maximal contraction, the contraction would be slow and could, therefore, actually slow the rate of force development down. Lighter weights with maximal acceleration will better able the athlete to rapidly develop force as the weight moves faster. Plyometric activities such as drop or depth jumps would also be an excellent choice at this time.

Another important concept that the athlete and coach has to be familiar with when learning about the vertical jump is the stretch shortening cycle of muscle. The stretch shortening cycle can be described as the increase of elastic energy that is developed in the muscle and tendon after the muscle has been quickly stretched. This elastic energy is then added to the concentric contraction of the muscle. This produces more force than would have been generated without the stretch. To reiterate, the stretch shortening cycle occurs right before the concentric contraction of the muscles that have first been eccentrically stretched by the rapid descent. This rapid descent can be seen to increase

force through the musculotendinous unit, making it stiffer and full of stored energy. The addition of this energy to the concentric movement makes the jump more powerful and, hence, the athlete jumps higher. The faster this descent occurs, the faster the muscle is stretched and the more energy one can add. We have found that this rapid "dive-bombing" descent is one of the toughest things to learn about the vertical. We also feel it is a necessary component of the successful athlete's arsenal of training weapons. We have seen that training the stretch shortening cycle takes time and by inhibiting the golgi tendon organ over time, the athlete will be able to recruit more muscle at a higher level of tension. In addition to the added elastic energy, a rapid descent also increases the stretch reflex of the muscle and increases neural stimulation to the muscle. This also can add height to the jump. If the science is losing you a bit, bear with us. We will put it all together and make it more practical later in the manual. If you can care less about the science discussed in the last two paragraphs then just remember this: *Train your body to descend faster and you'll jump higher!* Simple enough for ya? We think so. Now you don't have to go and buy the Cliff Notes. (And you thought we didn't care.)

Although we have created this manual to assist you towards the best vertical jump of your life, the vertical has a number of applications besides just power output evaluation. We will describe some of these for your knowledge, but the manual is going to solely focus on the application of improving the vertical jump. Some of these tests can, however, help the athlete to see where the weak links in their vertical jump form are. This will help to direct their training. The most important and easiest test to perform is comparing the heights of your vertical jump with a countermovement as opposed to one without a countermovement. This will alert you or your coach to whether or not you are

using the stretch shortening cycle to its fullest or relying solely on strength. Try this: get into a quarter squat position, hold that position for 5 seconds, then jump. Next, try and jump with a countermovement (a.k.a. the technique we will be describing in this manual). If you jump only 2 inches higher with the countermovement than you did from the statically held position, you should focus on countermovement activities, such as plyometrics. If you jumped 12 inches higher using the countermovement than from the statically held position, perhaps more absolute strength work is in order. If you jumped higher from the statically held position than from the countermovement, it is time to look at your technique. There are no hard rules or heights about this test, but the different heights should give an athlete or coach some direction in their training. Another more intricate test would be using the measurement of the descent time or the contact time on the ground after the start of the jump. This would give interesting information about the rate of force development, as well as the athlete's ability to rapidly descend. One could also do contact jumps from different heights and record the contact time. According to the results, an athlete would be able to assess the quality of the muscle activation and compare it with the height of their jumps. Another evaluation would be the actual video taping of the athlete's vertical jump. This test offers instant feedback about technique and allows the athlete access to mental imagery techniques for further attempts. This enables the athlete to see what works best for him and assess form after good and bad jumps.

Besides adding strength, increasing the maximal rate of force development and improving the stretch shortening cycle, you must also be aware that there is a great technical aspect to the vertical jump. The athlete can be strong and explosive, but if the

motor pattern of a great vertical jump is foreign to him, he may jump lower than a slightly less gifted, yet technically superior, athlete. So remember that the technical aspect is a huge piece of the jump and many chapters of this manual will focus on different aspects of proper technique.

In our dealings with so many different athletes and coaches in a myriad of different sports, we have found that there are many fallacies out there about the vertical jump. For one, most think that the quadriceps are the most important muscle to increase your vertical. Most athletes and coaches then try to train the quadriceps with slow, heavy squats. They feel this will automatically increase their vertical. Others think that the upper body is not involved in the vertical jump and that training the upper body could be counterproductive. Some coaches believe that adding more muscle mass could decrease the athlete's vertical because now they weigh more. Many athletes also feel that endurance training will not harm their ability to vertical jump. Finally, and commonly, many still believe that the vertical jump is genetic and that training won't improve the height of the jump significantly. These are the kinds of ideas that we have dealt with every day, as well as the ones that have made us ask the questions that have lead us to what we consider the truth. These fallacies, and many more you might have, will be answered by the end of this manual.

In case you haven't figured it out yet, we've thrown the kitchen sink at you with this intro. We did this on purpose. We wanted to get you thinking. (Hey, we don't want to be the only one's doin' all the thinkin'.) Hopefully, you now realize there's a lot more to this vertical jump thing than you originally thought. There's probably a plethora of thoughts going through your head right now. . . stretch shortening cycle, jumping

technique, strength, rate of force development, testing strategies, etc., etc. You may even be a little confused. RELAX! The hard part is over. Everything will now be explained, step by step, in an orderly fashion. So read on and tie your shoes tight. You just may blast right out of them!

Tricks of the Trade

For those of you that think this section is going to contain ways to shorten your reach, bend your knees, and explain other ways to cheat for a higher vertical jump, you are sadly mistaken. When we use the term tricks, it is not to be confused with the word cheating. There are little ways to improve your jump, though. Now, remember that there is a fine line between tricks and cheating. We separate ourselves in that we are trying to give you the knowledge you need to attain your best jump, while still putting an honest effort in. Be aware that we are also not saying that if you can get away with murder, don't do it. After all, these numbers can affect your future. We just want you to get your PR the old fashioned way and hey, if the event judge is blind and not paying attention, get your 40 incher as well. Our advice on the vertical jump is just like our advice on any test - be flexible to the situation. If they rip every guy's shoulder out of the socket to measure their reach before they jump, give them an honest reach. If they are letting guys measure their reach with no shoes on and their arms pulled in so they resemble a T-Rex, don't be the only guy with a conscience.

Our first big trick would be to pay attention to your shoe wear when performing the vertical jump. Be sure that your shoes have a stiff sole and that the arch is well supported. Shoes with a lot of give do not catapult you up as high as many athletes suspect. They actually dampen the forces you put into the ground and lengthen the time you spend on the ground. You want a shoe with a rigid sole that supports the first metatarsal (foot bone) as much as possible. Picture that as you rapidly descend toward the ground, the foot also collapses slightly and absorbs force. This dissipation of force

can reduce the height of the jump. So remember that as there is a best shoe for sprinting, there is also a best shoe for jumping. Find one you like and experiment to be sure the one you like leads to the best performances. Then, not only will you have great motivation, but when your competitors see you pulling out another pair of shoes for the vertical, they will feel that they are missing something. Now, not only do you rise to the top, the psyche out could ensure they don't outshine you on your day.

This next trick could possibly add up to 2 inches to your jump without ever doing another thing in training. When we used to experiment with our verticals, we would almost always have sore hip flexors and abs the next day. We have even pulled our hip flexors when performing vertical jumps. Surprisingly, it took us a lot longer to figure out what was going on than you would expect of two training "gurus". What we eventually figured out was that the rapid, full body extension following the rapid descent was ripping our hip flexors and abs up. Taken further, if these muscles were getting ripped up, that meant they were probably resisting our jump height. We should all know by now that static stretching is not indicated before a big event because it puts muscles to sleep. That is, unless they are a couple of muscles you would rather have out cold during the event! That's right, we started putting the hip flexors and abs on static stretch immediately before the vertical jump and we had instant increases in most of our athletes. We recommend at least 30 seconds held on each hip flexor. The hip flexor stretch should be performed within a minute of the jump, so it has to be timed well. This stretch will be described later in the "Fab 15" exercises section. We believe this is one of the true "gems" described in this manual.

The Set-up

Before we begin to discuss the technical components of the vertical jump, we want to set the standards for the jump. We are going to be describing the test as if the athlete were being tested on the Vertec vertical jump tester. Although there are other methods to assess vertical jump, such as jumping up against a wall with a chalked hand, jumping up on a vertical jump platform, and jumping with a measuring tape attached, the Vertec is commonly used at any tryout of true stature. This is the method used at the NFL combine, college pro days and other professional sports tryouts. We also believe it is the most accurate way to measure the jump. The techniques we describe can be used on any of the other test styles and will result in higher marks, but we are going to describe the jump as if it were being performed on the Vertec. If you don't have the Vertec, just use the techniques and best fit them to the situation you have at hand.

Just like in the forty-yard dash, the initial stance in the vertical jump is critical to the ultimate success of the performance. We have watched so many athletes line up inappropriately that we know when we are going to see a great jump or not. Athletes usually line up in the incorrect position under the Vertec because it presents itself like an optical illusion.

There are two common mistakes that athletes will make when lining up for the vertical jump. Both of these will cause the athlete to be too far away from the jumping pegs, even though they may feel more comfortable in that position. Just like when you are in the dentist's chair, you are not there to feel comfortable, you are there to get a job done. Worry about being comfortable when your athletic career is over, now it is time to blast the highest jump possible. First, if you allow the athlete to pick where he wants to

set up under the Vertec, he will always line up too far away. This will cause the athlete to have to jump up and forward instead of just up. Because of this, the athlete is going to have to cover a greater distance to reach the closest peg. Here's a way to prove this. Stand under the pegs and raise your hand straight up. Now, measure the distance from your hand to the first peg. Next, step a foot back, raise the arm towards the first peg and measure the distance again. Do you see how much further you have to jump when you're too far away? We want to begin the jump as close as possible, don't we? Yes, it will seem like you are too close! Yes, you will feel uncomfortable at first! And yes, you will also get used to it and jump higher, so stop the whining! The way to insure that your feet are in the right position is to have your toes even with the vertical metal bar of the Vertec. Now that you are under the pegs, most athletes will also line up too close to the bar so that their head is under the pegs and not their arm. To remedy this, the athlete must step about 2 feet away from the vertical bar of the Vertec and make sure that the hand he will be reaching with is under the pegs. Once these two coordinates are reached, the athlete is in the right position to assume the correct stance for the jump. Believe it or not, getting into this position was the easy part. There's still more to it.

With the athlete in the correct place, we first ask them to bring the feet to about 4 inches apart. Again, most athletes do not feel comfortable here. They all like to bring the feet out much wider before they jump. A simple way to correct this is to ask the athlete to first hold one hand in the air. Then we ask the athlete to slowly start to bring the feet further and further apart and to watch what happens with their hand. When they see that the further apart their feet are, the shorter they get for takeoff, they don't seem to mind putting their feet where we tell them to put them. We then tell them to never question us

again! After all, we're the one's that wrote the book on the vertical, not them! (Where's the respect?)

After the feet are in place, we have the athlete assume our pre-descent stance. We like to describe this position to the athlete by telling them to imitate an Olympic diver right before coming down onto the diving board. The arms should be maximally outstretched overhead, the eyes should be forward and the head held straight, the knees should be fully extended and the athlete should be up on their toes. This is the position that the athlete must hit before every vertical jump attempt. By rehearsing the stance before each attempt, the athlete is going to create a motor program for the vertical jump. With perfection of this program, the athlete can insure quality jumps on each attempt by removing guesswork. This position is also going to allow the athlete to descend with as much speed as possible. As was stated in the introduction, without a rapid descent, the stretch shortening cycle and stretch reflex will not be fully used. This position will also allow the muscles to pass through the greatest range of motion before they are stretched. Going from this shortened position of the anterior delts and the posterior chain will allow the athlete to maximize their power into the jump. This power can only be generated with a perfect, rapid descent.

The Descent

In the previous chapter, we left off with the athlete standing up on the toes with the arms extended overhead. We are not going to leave you there for long. This chapter is going to discuss the rapid descent that you keep hearing about. First, however, we would like to justify why the vertical jump is being broken down into such great detail.

Everything in life goes in sequence. For instance, you cannot walk before you can crawl, you cannot run before you can walk. To reach your highest potential in any event or sport, you must execute technique in perfect sequence, or the technique will suffer. For instance, as our last manual demonstrated, you can run a lousy first 10 yards and then finish with your best technical 30 yards and still have a sub-par 40-yard dash time. Even though you maximized a later portion of the technique, because the initial stages were not optimal, the end result was not your best. By understanding this, you will see why each portion of the vertical jump is described in detail, and that each portion has to be perfect to allow for the perfect jump.

We consider the descent phase the most critical portion of the vertical jump. We make this claim due to the fact that when an athlete does not maximize stored elastic energy and the increased neural drive from the stretch reflex, the vertical jump is not going to be a personal record. This concept should really alter how an athlete or coach views the vertical jump. Most athletes and coaches view the takeoff as the key event, but we look at the descent as the key event. The descent sets the athlete up for a great takeoff. Knowing this, an athlete will attack the jump and their training differently.

Through our experience of training athletes of all ages and levels, we have found that, in general, most athletes won't naturally descend fast enough when jumping. This is

because they haven't developed the intramuscular coordination required to rapidly shut off the agonists and antagonists to allow for the rapid descent. We also believe that this is a critical ability needed in a number of sports to improve an athlete's chances for success. For instance, a wrestler that is able to rapidly change heights can be in much better positions for takedowns or avoiding being taken down. A football player that can rapidly descend can get in a lower position to make a successful tackle. A baseball player may need the ability to rapidly descend when fielding a ball. The list of examples goes on and on. The fact remains that neural training to allow for a rapid descent is not just important for the vertical, but for all sports.

Now that we have hammered the importance of the descent into the ground, we want to give you the key cues to insuring a perfect descent. First, we like to tell the athletes to focus on their arms. Not only does the stretch across the shoulder muscles enhance the jump, but rapidly accelerating the arms down will get the rest of the body started. The arms also have to move the farthest to hit the correct final descent position, so they will be ripped down first. While cueing the athlete, we like to instruct them to rip the arms down as hard as possible, while keeping the elbows slightly flexed. The hands should end up at the hips, with the thumbs up, at the final position.

One of the biggest mistakes athletes make while jumping, besides not rapidly descending, is that they descend entirely too deep. Hey, don't get us wrong, we're all for squatting deep in the hole. It's just that this is not the best time to do so if you want to jump through the roof. We'll explain why. We have found through extensive experimentation with our athletes that the knees should only bend to the quarter squat position (15 degrees of knee flexion). This will allow for a faster reversal of direction

and more use of the stored elastic energy. This shorter, quicker descent must be attempted by the athlete. (Remember that the speed of the descent is still the most important factor, though. If the athlete hits this 15 degrees of knee flexion, but descends slowly, the jump won't be his best. On the other hand, if he drops down slightly further than 15 degrees of knee flexion, but the descent is super-fast, it can still end up being a great jump.) These positions take time to practice, and like anything else, there is going to be a process of motor learning. The athlete just has to take the vertical jump like learning any other skill, there is a best way and it takes time and practice to learn.

In addition to the arm and leg positions, the head should also slightly tilt forward and the athlete's eyes will commonly gaze quickly down at the floor. This seems to enhance the descent as well as put neck and upper back muscles in a position for a good stretch reflex when the reversal of direction occurs. The torso will also lean forward slightly to gain access of the powerful low back erectors.

At this point, if we were watching an athlete in slow motion and we stopped the camera at the bottom of the descent, he would be in the quarter squat position, with the elbows cocked back and the hands at the hips. The neck, upper back, anterior delts, low back, glutes, hamstrings and calf complex are all being rapidly stretched. The faster this stretch occurs, the more neural stimulation and potential elastic energy are possible. If the amortization phase is very short before the concentric (jumping) phase of the jump, the potential takeoff velocity will be maximized. This portion of the vertical jump will be our next stop in this manual.

The Amortization Phase

The rapid descent has lead us to the critical event which will decide how high the athlete actually jumps. This is called the amortization phase in science. This phase is defined as the period between the rapid eccentric stretch of the muscles and the subsequent concentric contraction. The less time the amortization phase takes, the higher the athlete will jump. This is due to the stored elastic energy that will be developed, as well as the excitation of the nervous system through the stretch reflex.

You can better understand the amortization phase by using a spring as an example. If you depress a spring slowly and release it slowly, it will not travel too far. If you quickly press the spring down and then instantly release the pressure, the spring will travel farther. That period of time between the descent and the ascent is the athlete's time to take advantage of the inherent properties of the muscular and nervous systems. The best way to do this is not only to practice jumps with the technique we have described, but to also train the muscular and nervous systems for the fastest amortization phase possible.

A simple test that we use to see how the athlete's nervous system is firing is to have them complete as many tiny jumps off the ground as possible in 15 seconds. You can coach it as skipping rope without the rope. Use the baseline number they attain as the starting point and assess changes for the next few weeks of nervous system training. The "pogo jump" warm-up that is described in the "Fab 15" exercises section of this manual will help you to further understand this training methodology.

We also want the reader to realize that the amortization phase transcends sport in more than just jumping. For instance, science has demonstrated that the fastest sprinters

in the world spend the least time on the ground. Not only does this mean that they have the fastest rate of force production, but they also have the fastest amortization phase. This can also be seen with the basketball player that rebounds a ball and gets up and jams the ball faster than anyone can block him. Another example would be the deceptive volleyball player that explodes up for a quick, surprise kill. The list in sport goes on and on, all leading back to a faster amortization phase as a prerequisite for success.

The amortization phase is, as we have described, an interaction of the muscular and nervous systems. The muscular system relies on the stretch shortening cycle and the stretch reflex. This is done through the elastic energy stored in the muscles and tendons as well as the utilization of the muscle spindle and the golgi tendon organ. As previously discussed, the inherent properties of the muscles and tendons allow for the storage of elastic energy to be used for subsequent contraction. The muscle spindle alerts the nervous system to the rate of stretch that is occurring and can activate the stretch reflex. This will reflexively add more force to the concentric contraction. This spindle is actually present along side muscle fibers within the actual muscle. On the other hand, the golgi tendon organ alerts the nervous system to how much tension is placed through a muscle. This acts as a safety mechanism to ensure there is not too much tension present to cause possible injury. The golgi tendon organ is found in the tendon of the musculature. The interesting thing about the golgi tendon organ is that the amount of tension that it will tolerate before shutting muscles down can be increased. This is why maximal strength training methods, using heavy weights and low reps, is a must if you want to become stronger. The key lies in the amount of *tension* this type of training creates in the muscle.

When coaching the athlete in the amortization phase of the vertical jump, the key cue is to have the athlete reverse direction as fast as possible. Since they are rapidly descending, they have to reverse direction or they are going to descend too far and change direction too slow. If this happens, the athlete may still have to develop adequate amounts of strength, or start training the nervous system for this event. The key that we coach our athletes with is to reverse the arms in an upward direction as fast as possible. Once this has begun, they want to drive the legs into the ground with as much force as possible. When the athlete hits it right, they feel an incredible stretch in the shoulders and biceps as well as the lower extremities. That is when the athlete is primed for this type of training and huge amounts of force are fired through the muscles and tendons.

At this point, the athlete is now on his way up, leaving the ground. This takes us to the final portion of the vertical jump - the takeoff and reach phase. If the athlete can nail all the technique up to this point and finish with a perfect reach, the highest heights one can aspire to are literally in their grasp.

The Take-off and Reach

The take-off and reach phase is the final portion the athlete has to execute to maximize his vertical jump height. We have seen athletes cost themselves inches, which ended up costing them thousands of dollars, by blowing this phase of the jump. It may sound easy, but this portion is difficult to execute correctly, especially under the pressure of a crowd of pro scouts and coaches. Without this phase, you have only set yourself up to jump high. The athlete must finish this phase correctly to achieve the perceived result. We say perceived because even though the athlete may be capable of a higher jump, if he swings and misses the Vertec pegs, he's screwed. This is because what you hit is what your jump is recorded as, even though it could have been higher. This should hammer home the fact that the jump is not over until you have returned back down to the ground. (With the jump of your life, that is).

Up until this point, the athlete is just leaving the ground as the arms are ripping overhead and the legs and low back are extending. This is where the athlete must concentrate on the final pieces of the form that are going to produce the highest results.

Because the athlete should have been in perfect position under the Vertec, he should not be jumping forward or to the side which, as we previously stated, will decrease the height of the jump. The athlete or coach can monitor this by seeing where the athlete lands following the jump. If it is not directly under the pegs, there has to be something changed during the jump.

The first common mistake an athlete makes after takeoff is that they do not look at what they are reaching for. We do not know why many athletes instinctively rely on this method, but it is a poor choice to try to maximize jump height. First, you cannot

touch what you cannot see. Second, the pegs are very thin, and the odds are that you will miss if you blindly swing at them. Finally, with the head looking up, the athlete has a better ability to reach higher with the arm. This could affect the jump a few inches or more. We do not know any athlete that would rather jump 28 inches instead of 30.

The next most common mistake is that athletes feel the need to smash the pegs with a volleyball-like spike. We have only found this to be detrimental in height of the jump. By swinging hard, the athlete is now using energy to swing the arm, not to reach up. This spike motion cuts the maximal height the athlete can reach to and moves the athlete's torso off of the straight line to the pegs. When this occurs, the athlete's jump will always be lower.

The correct form should involve the athlete jumping upward on a straight line like an arrow. The athlete should begin looking up at the target following takeoff from the ground. The arm should be maximally outstretched overhead and the athlete should just lightly push the pegs as if he were performing a tip-off in basketball. The athlete should then absorb the landing on the ground with a deep knee bend to decrease the chances of injury. Many athletes land entirely on one leg when they hit the ground. If this is true of your athlete's form, the absorption at ground contact becomes even more important.

If you can master all of the phases listed thus far in this manual, when you hit the ground, the crowd will have already erupted and you will look up to see pegs moved that you didn't think were possible. Then you will watch your psyched out competition flop as if they couldn't jump over a piece of paper lying flat on the ground.

The Proper Landing

The most under-appreciated and least studied aspect of the vertical jump is the landing. Most trainers and coaches only focus on the jumping portion of the vertical jump. What is interesting is that when non-contact athletic injuries are examined, it is the deceleration that usually causes the injuries, not the acceleration portion. The jump is only half-complete if you leave the athlete in the air without the tools to allow for a proper landing. Not only can this area of the jump be a great teaching opportunity to improve performance, it is also an excellent way to reduce the risk of injury. By examining the mechanics used during the landing, an evaluator can gain insight into the strength, balance, and current motor programs used by that athlete.

When we watch an untrained athlete perform a landing, there are a few common flaws that we often see. First, most athletes return to the ground and land on one leg. This is usually the leg that they would use to takeoff if they were to do a running one-footed jump. We consider this the balance or stability leg. Second, when these athletes land on this one leg, the leg is usually extended and the landing is a shocking one. What we mean is that we rarely see the athletes absorb the landing properly using correct joint angles and mechanics. The third common presentation is that the athlete lands off balance and commonly falls to the side or forward. Not only can this tell the evaluator about specific strength limitations, it can also demonstrate improper landing motor patterns that can lead to injury.

Another pattern that must be addressed if seen in training is an increased genu valgus angle ("buckling" inward) at the knees. This may cause the athlete to collapse and fall down. Whenever the knees are seen to buckle inward, whether it is on the takeoff or

landing, it should be an immediate red flag to the trainer about the strength and stability of that athlete. The particular areas that are commonly deficient in strength with this presentation are the hips, low back and core. Many trainers try to address this problem with exercises that focus on the knee itself, but we have found that it is the hip abductors that keep the femur aligned. Whenever an athlete lands from a jump and falls down or can't control their own bodyweight, the trainer must use caution with that athlete. Strength, as well as an electromechanical delay issue of the athlete's muscles, may be at fault. Further jumping before the adequate strength and landing training is developed could result in a devastating injury.

Teaching proper landing is quite simple. We find it ironic that it is very rare to ever see someone teaching landing, yet most of us teach athletes to leave the ground. This can be compared to flying. Imagine if all pilots were only taught how to takeoff and the landing was never addressed? We have to say, when you look at it, the landing is the most dangerous part. This holds true whether you are falling from 30,000 feet or 30 inches. It is the sudden stop that is going to get you if you are not prepared for it.

Proper landing involves using the correct joint positions, as well as the correct muscle activation. Correct landing mechanics involves dorsiflexion at the ankle, flexion at the knees and flexion at the hips. This should all occur in the sequence of the ankle, knee and then hip. The athlete should contact the ground first with the balls of the feet and then the heels. Landing on the heels or flatfooted is going to increase joint forces and place the rest of the kinetic chain out of position. The cue the athlete should have during the landing procedure is to think about increasing the tension of the muscles in the legs

and hips to prepare for the landing. This increased activation before the landing takes place is going to increase joint stability and decrease the forces placed on the ligaments.

The coaching of the landing has to take place. Any coach or trainer that doesn't address this portion of the jump only did half of his or her homework. Unfortunately, the athlete is also only getting half of the value.

THE FABULOUS 15

"Top 15 Exercises for Higher Jumps"

You now hopefully realize that there is a lot more to the vertical jump then you originally thought. This should also help you to understand that there's a lot more to the training then you maybe originally thought. It's not just about wearing some funny-looking shoes that claim to work magic on your vertical jump. There is definitely a science to this type of training. There is also a *reason* and *purpose* why every single exercise in this section was chosen. It's now time for the fun stuff! After learning and understanding the following 15 exercises, it will soon be time to go to our favorite place in the world. . . The Gym!

In this section we will give you our Fab 15 list of the exercises we've found give the best "bang for your buck" with regards to improving your vertical jump. Remember that there are many exercises out there that will work, but in the *training economy* you want to pick the exercises that will give you the greatest results in the least amount of time. This list of exercises accomplishes that goal. These are the main exercises we have used to get our athletes to jump high... in minimal time! An added benefit of this list of exercises is that you'll notice your sprint times will also improve. Any time you train to improve your vertical, you'll notice you get faster also. Not a bad side effect, is it?
Anyway, let's check out the Fab 15! (They are in no particular order.)

#1) Box Squats with bands – We love box squats in that we feel they teach the athlete to "sit back" while squatting, which further recruits the all-important hamstrings. Your hamstrings must be super-powerful if you want to run fast or jump high. We also like the fact that we can set the depth of the squat without any error. This prevents cheating, especially when athletes start to fatigue and the squats tend to get higher and higher. We squat anywhere from 6" off the floor to 1" above parallel, depending on our goal. We also like the fact that box-squatting builds "static overcome by dynamic strength". This type of strength is important in many athletic movements (sprinter coming out of the blocks, lineman coming off the ball in football, etc.).

Some say box squats are dangerous. That is complete crap! Box squats done *incorrectly* are dangerous. We've never had an athlete get injured box squatting. Open your mind and learn how to do them the right way! It will pay huge dividends. To learn how to box squat correctly, goto Dave Tate's website at www.eliteFTS.com. He has

numerous articles written on how to box squat correctly and does a great job of teaching it.

One of the main reasons we chose the bands for box squatting is their ability to *accelerate the eccentric portion of the lift.* You see, the athlete's we train that have the best verticals are also the one's who *descend* the fastest during their jumps. Newton's 3rd Law states that *"For every action there is an equal and opposite reaction"*. What this means is the faster an athlete can descend, the faster he will explode upward and the higher he will jump. The bands train this often-overlooked component of the vertical jump.

We also like the fact that as the athlete approaches the top of the squat the bands stretch out, thus increasing the tension. This teaches the athlete to accelerate through the entire rep. Basically, as the athlete's leverage increases, so does the tension of the bands. In order to complete the rep, the athlete must apply more force at the top then he would if there were no bands attached to the bar. After this type of training an athlete will be much more likely to explode downward, make a quick reversal, and then accelerate upward rapidly during his jumps. Put all of these qualities together and you have a huge vertical. We usually perform multiple sets of low-rep box squats, focussing on speed (on the way down as well as on the way up). We like our advanced athletes to be able to perform 2 reps in less than 2 seconds.

#2 **Static Hip Flexor Stretch** – In general, we're not big fans of static stretching, especially before performing explosive activities. This stretch is a major exception. Try this. Perform a vertical jump and record the height. Then, static stretch your hip flexors – 2 sets of 30 seconds each leg. Really stretch the sh** out of them! Stretch as if you're trying to tear that hip flexor off the bone, baby! Don't just go through the motions! Now jump again. Chances are you'll jump ½" – 2" higher, just by static stretching the hip flexors. Why is this, you say? We'll tell you. You see, most athletes have super-tight hip flexors. When you jump, tight hip flexors cause a lot of friction, preventing you from fully extending at the hip, as well as reaching as high as you can. By *static stretching* them immediately before you jump, you not only stretch them out, but also "put them to

sleep" do to the long, slow stretch. This causes less friction at the hip when you jump. This results in higher jumps. You will be amazed at how well this works. (By the way, the hip flexors are the only muscles you would ever want to static stretch before jumping.) It is also a good idea for athletes to get in the habit of stretching their hip flexors everyday, not just before jumping. This will help to increase your stride length when you run, as well as prevent hamstring pulls and low-back pain.

Any hip-flexor stretch will do but we will describe the one we use the most. Get in a lunge position with your left knee on the ground and your right foot as far forward as possible. Drive your hips as far forward as you can, while keeping your chest up. Try to get your left thigh 45 degrees to the floor. Raise your left hand as high as you can and twist slightly to your right, looking over your right shoulder and reaching over your head. You should feel a stretch in the left hip flexor as well as your abs. Perform 2 sets of 30 seconds and then switch sides.

#3) **50-Rep "Rhythm" Squats** – This is a little-known exercise we usually bust out about 3 weeks before one of our athlete's would be getting tested in the vertical. You would always start your workout with this exercise and you will only perform one all-out work set after a good warm-up. Try to go as heavy as possible for your one set. A good goal is 90 - 100% of what your max full squat is. Basically, you will perform 50 quarter-squats as fast as possible. Due the first 10 reps exploding onto your toes, then on reps 11-20 keep your heels down on the way up, then, explode onto your toes again while performing reps 21-30, keep your heels down for reps 31-40 and then finish the final 10 reps by exploding onto your toes again. It helps to have a partner count out loud so you can perform all 50 reps as fast as possible without breaking momentum. This is a great exercise for athletes with a poor elastic component. It is also a bitch!

WARNING: You may not be able to feel your legs when you're done. TOUGH SH*T! Do them anyway! They work.

Note: You can also do this exercise with bands attached to the bar. This will help in the same way we explained with the box squats (by accelerating the eccentric portion of the lift). The bands also help in this exercise because they hold the bar down on your neck.

Anyone who has done this exercise knows one of the drawbacks is that the bar has a tendency to bounce up and down on your neck once you get the "rhythm" of the set going. The downward pull of the bands helps to prevent the slightly uncomfortable feeling of a heavy barbell exploding up and down on your cervical spine!

#4 <u>Snatch Grip Deadlifts</u> – This exercise is basically a regular deadlift, yet you use a "snatch" grip. By taking this wider grip, you must get deeper "in the hole" when lowering the weight to the floor, thus further recruiting the posterior chain (hamstrings, glutes and low back). Snatch grip deads are ungodly in their ability to strengthen the posterior chain and is a great foundation exercise to be used when training for the vertical. This exercise will put slabs of muscle on your glutes, hamstrings, spinal erectors, forearms and upper back. The only problem with this exercise is it makes sitting on the toilet very challenging the day after performing it.

#5) <u>Depth Jumps</u> – A depth jump or shock jump is performed by *stepping* off a box and then exploding upward immediately upon landing on the ground. We use boxes of varying heights, depending on the level of athlete we're training. By stepping off a box, the muscles are rapidly stretched upon landing, which enables them to contract harder and faster when exploding upward (similar to what we were talking about with the box squats and the bands). The goal of this exercise is to spend the *least* amount of time on the ground as possible. We like to use .15 seconds as a guide. If the athlete spends any longer on the ground, it is no longer a true plyometric exercise because the amortization phase is too long. If performed properly, we have found this exercise to be very effective. The problem is that most athletes and coaches that perform this exercise don't follow these rules. If an athlete crumbles like a deck of cards upon hitting the ground and then takes 5 minutes to jump back into the air; the box is either too high or the athlete isn't advanced enough to be performing the exercise.

We usually start with a 6" box and work up to a 24" box with our more advanced athletes. Again, don't get too crazy with the height of the box. Time and time again we hear of some super athlete who does depth jumps off of the roof of his house or some other BS. We're not impressed. Remember that choosing a box that is too high can end up defeating the point of the exercise by increasing ground contact time.

#6) **Reverse Hyperextensions** – The reverse hyperextension machine was made popular in this country by powerlifting guru Louie Simmons of Westside Barbell in Columbus, Ohio. He has a patent on the original reverse hyper model. This is the one we have at our facility and it's probably the most frequently used machine in our gym. Why is this, you ask? Because the friggin' thing works! We don't know of any other machine that works pure hip extension in such a synchronized manner – hitting the hamstrings, glutes, and spinal erectors all during the course of one rep. It also works as traction for the low back during the lowering of the weight. The bottom line is that if you want to run fast and jump high, then you should have one of these in your gym. We can't say enough about this machine. All of our athletes use it – no matter what their sport, age, or training goal. It can be ordered through Elite Fitness Systems at www.eliteFTS.com

#7) **Dumbell Swings** – This is one of those "old school" exercises you don't see too often anymore. To perform this exercise, first grab a dumbell with both of your hands (use a hand over hand grip or interlock your fingers of both hands). Set your feet as if you were about to perform a squat, while holding the dumbell in front of you. Squat down and let the dumbell drop between your legs. Keep your back arched as you descend down and look straight ahead. Once you reach the full squat position, immediately explode up by extending at the hips, while simultaneously flexing at the shoulders and raising the dumbell above your head. Keep your elbows straight. This exercise "kills 2 birds with 1 stone" as it works pure hip extension as well as your front delts in a synchronized, explosive manner. This is exactly what happens when you perform a vertical jump. You can perform this exercise with a box under each foot for added range of motion.

Note: As you swing the dumbell upward, DO NOT leave go of it! Throwing the dumbell forward would not be a bad exercise, but we think it may piss the owner of your gym off.

#8) Bulgarian Split Squats – This is basically a single leg squat, with the non-working leg elevated on a bench behind you. Perform this exercise by holding a dumbell in each hand, descend until the back knee touches the floor and then explode back up to the start position. This exercise will crush the glutes and VMO (the quadriceps muscle on the inside of your knee) of the front leg, while stretching the hip flexor of the back leg. Remember what we said about the importance of flexible hip flexors with regards to your jumping ability? Well, this exercise makes our "Fab 15" list of exercises due to the fact it promotes strength AND flexibility in the specific muscles used in jumping. Also, because it is a unilateral movement, it helps to correct muscular imbalances that may exist in the athlete's legs.

#9 "Pogo Jump" Warm-up – This is a warm-up we use before many of our lower body strength workouts, plyo workouts and speed workouts. It is not only a great warm- up, but we believe this "warm-up" may actually increase your vertical jump in and of itself! But first, let us describe exactly what a pogo jump is, anyway. A pogo jump is performed by jumping off the ground by just springing off your ankles. While you're in the air you want to dorsiflex your ankles, a.k.a. "pull your toes up". You also must prevent your heels from ever touching the ground. The key to this exercise lies in your ability to keep your knees locked while jumping and landing on and off the ground, as well as spending the least amount of time on the ground as possible. Be sure not to flex at the hips, either. Many times when athletes perform this exercise their feet kick uncontrollably out in front of themselves. Don't let this happen! Your whole body should remain in a perfectly straight line, with the exception of your ankles dorsiflexing while you're in the air. We do both low and high pogo jumps in our warm-up. The technique remains exactly the same except for the height differences, of course. Low pogo jumps should be performed for speed. You only want to jump about 1" – 2" off the ground, but try to perform as many

reps as possible in the required time. The goal of the high pogo jumps is to get as much height as possible by just springing off your ankles during each jump. Pogo jumps are an incredible exercise that trains the Achilles tendon for elasticity. This will help to prevent ankle injuries as well as increase explosiveness. Here's the warm-up we use...

A. Low Pogo Jumps – 3 sets of 20 seconds, rest 30 seconds between each set

B. High Pogo Jumps – 3 sets of 20 seconds, rest 30 seconds between each set

10) <u>Trap Bar Deadlifts, off a 4" box</u> – Trap bars are diamond-shaped bars that allow you to perform deadlifts and shrugs by standing inside the bar, as opposed to having the bar in front of you. This puts less stress on the low back/spine. Many athletes feel much more comfortable using these bars as opposed to straight bars while deadlifting. Because of this, we feel they are a great tool for all athletes, young and old. We have gotten many athletes who swore they would never deadlift again, to start deadlifting because of the trap bar. One thing we like to due is have our athletes trap bar deadlift while standing on a 4" box. Once again, by increasing the range of motion, the hamstrings are further activated. This will greatly help your running and jumping ability. You can use various box heights, yet we've found 4 inches to be great for increasing the range of motion while not causing a breakdown in the athlete's form.

11) <u>Standing Backward Medicine Ball Throw</u> – This exercise is similar in nature to the dumbell swing, but by using a medicine ball you can actually release the object you're holding, thus producing more explosive power. (This is because you don't have to worry about decelerating the weight.) To perform this exercise, hold a med ball in front of you, bend forward, and then toss it up and over your head, behind you, to a partner. This is another exercise that links the lower and upper body in a synchronized, explosive manner. This is vertical jump specific.

Don't use a med ball that's so heavy you can barely get it over your head. But don't use something that's so light you toss it into another zip code, either. Use common sense, huh. Our athletes usually use med balls they can toss anywhere from 10 – 20

yards. Once all of your throws start going beyond 20 yards, you're ready to graduate to a heavier ball.

12) Power Clean/Power Snatch – We like the Olympic lifts in that we feel they teach the athlete to maximally "turn on" the higher threshold (type IIB) motor units. This is due to the fact that you cannot perform a max power clean or power snatch slowly. If you move too slow you will miss the lift. We do feel there is somewhat of a learning curve involved in being explosive and if an athlete never learned to "turn on" maximally, they would be much less likely to do so during their vertical jump – or any other athletic movement. Besides being explosive by nature, both of these exercises require a strong posterior chain (which you should now be sick of hearing about), with the power snatch involving the entire extensor chain. You should now know this is one of the major requirements for an exercise to make our Fab15 list.

13) Weighted Ab Work – Your "core" (abs & low back) is the link from your lower to upper body. It is also responsible for the transference of force from your lower to upper body. Basically, your arms and legs can be strong as hell but if you have a marshmallow in the middle you will never completely benefit from your limb strength. The vertical jump is one of the ultimate examples of this. So don't sell yourself short by only training your arms and legs. Hit the abs hard, too. This doesn't mean 3 sets of 10 cruches at the end of you're workout, either. We like weighted crunches on a Swiss ball, standing rotational work using high and low cables and medicine ball training. Remember that your abs just may be the missing "link" to that big jump!

14) Push Jerk – This is another great exercise that has been highly correlated with the vertical jump. When doing push jerks, we have our athletes place their feet about hip-width apart. We have them start with the bar resting on the front of their shoulders, with their hands OPEN. By starting with the hands open, they will be more likely to initiate the movement with their legs. Start the movement by dipping down and then explode up

onto your toes, while pushing the bar overhead. Finally, bend the knees, bring your heels down and hold the bar overhead for a second. Lower the bar and then repeat the movement. This is another great example of an exercise in which the power is initiated by the lower body and then finished off with the upper body. Once again, this is vertical jump specific.

15) <u>Vertical Jumps</u> – No, this is not a misprint. One of the best ways to improve your vertical jump is to practice vertical jumping! We have had many athletes come to us with great strength, speed and flexibility bases, yet they had horrible verticals. This is because their jumping technique stunk! We have made as much as a 3" improvement in just *minutes* of working with some athletes, not by showing them how to cheat, but by correcting their form. Hopefully, after reading through this manual, you will know what proper form is. Then, once you have the form down and start working on the recommended exercises, you will possess eye-popping jumping ability!

SAMPLE 6-WEEK TRAINING PROGRAM

Some athletes are strong. Others are fast. The best athletes are both strong and fast. When designing programs to increase athlete's verticals, we've found that training for both speed (rate of force development) and maximal strength, simultaneously, gets the best results. If you only train for increased strength, without ever paying attention to how fast you're moving the weight, you may get very strong, but not necessarily faster or more explosive. This is why, in general, powerlifters can't jump as high as Olympic weightlifters. Too many powerlifters train using heavy weights, which move slowly, all year long. Instead of always trying to lift more than their friends do, powerlifters should spend some time trying to lift *faster* than their friends. The bottom line is if no speed work is done, you will end up with a strong, slow athlete. On the other hand, if you only train for speed and never increase your maximal strength, you will not have enough of a strength base to develop explosive power. So what the hell is an athlete to do, you say? We will tell you one more time. Train for both maximal strength and speed simultaneously in your training cycle! The following program is designed so that on Monday your main exercise is designed to increase your max strength. Heavy weights will be used and the weights will move slowly. On Thursday, your main lift will be dynamic in nature. Speed is king on Thursday. Basically, the goal is to lift *heavier* on Monday and *faster* on Thursday.

We did not include any sample upper body workouts in this program, but recommend you lift upper body 2 times during the week while on this program. You can either split your upper body in half and lift on Tuesday(chest & back) and Friday(shoulders, tris, bis). Or just do a full upper body workout two times during the week. Whatever you choose, remember to stick to the basics and keep your workouts short and intense. After your warm-up, don't let these upper body workouts go longer than 45-50 minutes. Remember that we're going to the gym to make progress, not friends. You don't want to fry yourself out for the Monday and Thursday workouts. Stick with incline benches, chins, shoulder presses, etc. If you follow this program for the full 6-weeks, you will be amazed at the progress you will make. Who knows, you may even become a member of "The Mile High Club". (Not that Mile High Club, stupid!)

Enough talk, let's get to work!

WEEKS 1 & 2

Monday

A. Warm-up – Pogo Jump warm-up then static hip flexor stretch

B. Trap Bar Deadlift off 4" box – Warm-up to 4 sets of 5 reps, increasing weight each set, rest 3 minutes between work sets.

C. Bulgarian Split Squats – 3 sets of 8 reps each leg, rest 30 seconds between each leg and 2 minutes between each set.

D. Reverse Hyperextensions – 4 sets of 10 reps, rest 1 minute between sets

E. Weighted Swiss ball crunches – (use either a rope attached to the low cable or a dumbell held on your chest for resistance) 4 sets of 10 reps, rest 1 minute between sets.

Thursday

A. Warm-up – Pogo Jump warm-up then static hip flexor stretch

B. Box Squats with bands – Warm-up to 10 sets of 2 reps, resting 30 seconds between sets
*Use maximal band tension with less bar weight.
*Use a box that is parallel or 1" above parallel.
*Have someone time your sets. The goal is to perform the 2 reps in 2 seconds or less. Don't raise the weight until you're able to perform all 10 sets in under 2 seconds. Remember that speed is king on Thursday's! Adjust the weight accordingly.

C. Dumbell Swings off boxes – 3 sets of 8 reps, rest 2 minutes between sets

D. Reverse Hyperextensions – 3 sets of 10 reps, rest 1 minute between sets

E. Rotational Ab Work, using hi & low cables – hi to low woodchoppers – 3 X 10 reps each side, low to high – 3 X 10 reps each side, rest 30 seconds between sets

WEEKS 3 & 4

Monday

A. Warm-up – Pogo Jump warm-up then static hip flexor stretch

B. Snatch Grip Deadlifts – Warm-up to 4 sets of 4 reps, increasing the weight each set, rest 3 minutes between work sets.

C. Bulgarian Split Squats – 3 sets of 6 reps, rest 30 seconds between each leg and 2 minutes between sets

D. Reverse Hyperextensions – 4 sets of 8 reps, rest 1 minute between sets

E. Weighted Swiss ball crunches – (use either a rope attached to the low cable or a dumbell held on your chest for resistance) 4 sets of 10 reps, rest 1 minute between sets.

Thursday

A. Warm-up – Pogo Jump warm-up then static hip flexor stretch

B. Box Squats with bands – Warm-up to 10 sets of 2 reps, resting 30 seconds between sets. *Perform this exercise in the same manner you did during weeks 1 & 2. The only difference is during weeks 3 & 4 you will use slightly less band tension, but increase the barbell weight slightly.

C. Dumbell Swings off boxes – 4 sets of 6, rest 2 minutes between sets

D. Standing Backward Medicine ball throw – Perform 2 sets of 5 throws, rest 1-2 minutes after the first 5 throws.

E. Rotational Ab work, using hi & low cables – hi to low woodchoppers, 3 X 10 reps each side – low to hi, 3 X 10 reps each side, rest 30 seconds between sets.

WEEKS 5 & 6

Monday

A. Warm-up – Pogo Jump warm-up then static hip flexor stretch

B. Depth Jumps – 4 sets of 3 reps, rest 1 minute between each set of 3 jumps.

C. Power Snatch or Power Clean – Warm-up to 4 sets of 3 reps, increasing weight on each work set. Rest 3 minutes between work sets.

D. Reverse Hyperextensions – 4 sets of 6 reps, rest 1 minute between sets.

E. Weighted Swiss ball crunches – (use either a rope attached to a low cable or hold a dumbell on your chest for resistance) 4 sets of 8 reps, rest 1 minute between sets.

Thursday

A. Warm-up – Pogo Jump warm-up then static hip flexor stretch.

B. 50-rep Rhythm Squats, with light band tension – Warm-up to 1 max set of 50 reps!

C. Box Squats with bands – Warm-up to 8 sets of 2 reps, resting 30 seconds between sets. Perform this exercise in the same manner as you have been, but decrease the band tension slightly from what you were using the last 2 weeks and increase the barbell weight. The goal is still to perform all sets in 2 seconds or less!

D. Push Jerks – Warm-up to 4 max sets. 1^{st} set = 5 reps, 2^{nd} set = 4 reps, 3^{rd} set = 3 reps, 4^{th} set = 2 reps. Rest 3 minutes between work sets.

E. Medicine ball ab circuit – toe touches X 20 reps, russian twists X 20 reps, crunches X 20 reps – Perform this "circuit" 3 times. Rest 20 seconds between circuits.

* Test your vertical jump 3 – 5 days after this workout after week six.

Commonly Asked Questions

1. I have found that when I work more on the stamina aspect of my game, I feel less explosive and when I work only on my jumps, my stamina seems to fade. Why is this happening and what should I do?

This is occurring for the simple reason that explosive work is not good to develop muscular endurance and endurance-based work is not good for the development of explosive power. In this case, the old adage, "train slow, get slow" applies. Even though the explanation is simple, there is more depth to the answer. For instance, training for endurance involves less rate of force development. Because of this, the nervous and muscular system may lose their ability to rapidly develop force. Endurance training usually lacks maximal force development as well. Because of this, the athlete may lose a bit of the amount of force he can apply into the ground. Endurance training also uses a predominance of red, slow-twitch fibers. As we know, it is the white, fast- twitch fibers we want to optimize. This may lead to an athlete's lack of ability to properly turn the fast-twitch fibers on, or an actual atrophy of those fibers. Finally, endurance training has been found to break down muscle tissue. This breakdown can possibly limit or lessen the cross sectional area of the muscle, which is directly related to how much force a muscle can apply.

We have explained the why, now we'll explain the how. If you are noticing this occurring in your training, first you must examine what is your weakest point. Is it your stamina or your jumps? From here, you may want to focus on the weaker area at the slight expense of the other. The way to do this, however, is not to neglect either training style, but to use both at the same time. Do not believe that you can never train different phases at the same time. This is one common mistake when using the classic periodization scheme.

2. I want to improve my vertical, but with all the weightlifting I see being prescribed, I am afraid to gain too much weight. Won't this increase in weight make it harder for me to jump higher?

Weightlifting can be found to have numerous benefits that can improve your jumping ability. There are two main benefits. First, the added strength that you gain can be used to produce more force into the ground when you jump. Second, by training with appropriate speeds, power can also be increased. This is essential for a big jump.

Since the athlete can gain cross sectional area in the muscles when lifting, there may be some weight gain. This increase in area, however, also produces a major increase in strength. So, if the increase in strength is even more than needed to overcome the new added weight, the athlete will still jump higher. The incredible jumps (40+ inches) of many heavy football players are a testament to this fact.

You must remember to use proper lifting principles and ensure that the proper speeds of the lifts are being used, along with maximal strength training methods.

3. I have been training with heavy squats for a long time to improve my vertical. I have maxed out in both weight and height of my jumps. What should I do?

This is an interesting question that we receive often from our athletes and coaches. How much strength is too much? How long do you keep going to the same dry well until you look somewhere else?

We have seen interesting examples of what you are describing. One example is powerlifters with better squat numbers than weightlifters that get blown away in the vertical. Through this example we see that it is not only maximal strength, but maximal rate of force development, that is more important. Think about this; if you are always maxing out with weights, the weight is going to move very slowly. This slow speed is going to allow for maximal force development, but *not* a maximal rate of force development! Because of this, the athlete becomes very strong, but not as powerful as possible. Since the rate of force development required in the vertical jump is much shorter than the time it takes you to perform a 1 RM in the squat, your jump will be limited to how much force you can produce in that short period of time. So, therefore, an athlete with less maximal strength, but a faster rate of force development than another athlete, will jump higher. This should demonstrate the need for some speed and plyometric work in your training.

4. I am thinking of purchasing vertical jump shoes for my son. Are these alright for a fourteen year old? Are there any precautions I should be aware of?

Another great question! We have been interested in these shoes for a long time and have had numerous experiences (good and bad) with them.

However, to better answer your question, we need more information about your son. How long has he been training? What training has he been doing? How biologically mature is he (hair on his legs and face, or late bloomer)? How tall is he and how much does he weigh? What is his body fat percentage? These are the questions we need to know in order to develop a better picture of your son and keep the training safe. The reason these questions are important is that we know that athletes must have an incredible base of training and strength before they ever use these, or any, extra force generating devices. Like the old adage goes, "Don't think about putting on a tie before you put on your shirt!" This means that if the kid is weak and can't jump, he doesn't need to go and find special training gadgets to try and increase his performance. You cannot skip sequences in nature and you cannot skip sequences here. Just like the athlete that wants to use creatine but doesn't eat right, it is not going to work.

The reason biological maturity is so important is because at fourteen, we have seen a thousand different presentations of an athlete. Some are strong and look seventeen, while others are weak, frail and look twelve. The hormonal spurt that occurs around this age is the key to muscle, tendon and strength development. If the athlete is not physically prepared for the stresses these shoes place on the calf complex and the Achilles tendon, an injury can occur.

Bodyweight is important (especially fat free mass) because it is going to tell us how much force is going to be generated, by and into, the muscles, tendons, joints and bones. So if your athlete is not jumping high because he is fat, these shoes are not the answer. They will only predispose him to injury.

We don't want to look like we don't like certain products, we just want to make sure that athletes take the appropriate steps before using them. We also caution the athlete when using these products to watch out for the aggressiveness of programs that the makers of these products prescribe. We have found them to be advanced and have seen athletes injured. There are so many ways to get better without them. We suggest you build a tremendous speed, strength and flexibility base and then think about giving them a try.

5. I am a 36-year-old basketball player and am looking to increase my vertical jump about 6 inches. I already jump 30 inches. Do you think I can do it?

Wow, 30 inches at 36 years old is not bad! As for the improvement of six inches, that may be tough to produce, depending on how you have been training. For instance, if you have been very active and doing many of the right things, we think it is going to be difficult to produce those gains at this time. If you look at it in terms of percentage, you will need to improve 20% on your previous best. That is a huge amount, especially since the original jump is already high. If you have been doing nothing and can jump this high, (which is highly unlikely), you may have a shot. We believe in every athlete and as long as they give it their best, there is always a chance.

We would also be interested to see how you are measuring your vertical jump. Whenever we hear a flat number like 30 or 40 inches, we are always a little suspicious. We would also like to know why you picked out 36 inches as the goal. We guess it would be a neat trick to try to jump your age in inches. We must say though, you better do it soon because it is going to get unrealistic in a few years!

6. Have you found any other tests that are correlated with a high vertical jump?

We have tested thousands of athletes that have entered our program, and yes, there are many tests that we have found to correlate with the vertical jump. First, maximal squat and trap bar deadlift have been directly related to how high a *younger athlete* can jump. We believe that this is related to the fact that the more force they are able to apply into the ground, the higher they will jump. For the more *advanced athlete*, maximal power cleans, snatches and push jerks help to predict high verticals. Even though these events do require a technical aspect, great amounts of power(speed-strength) must be produced to properly perform them. This general quality of high power production is directly related to jump height. The forty-yard dash has also been correlated with good vertical jumps. Whenever we see an athlete with an exceptional forty time, they will almost always jump higher than an athlete who runs slower. We believe this is a function of the fact that a great forty time, as well as vertical jump, require huge amounts of relative strength and high power production. Single leg and double leg jump distances

also correlate well with the vertical jump. Medicine ball throws for distance can also be used as a test to predict athletic power.

7. I always hear about professional athletes with supposed verticals of over forty inches. I never hear how or where these heights were measured. Is it possible to jump that high and what is the highest jump you guys have heard of?

Great question! The magic 40-inch mark is one that we hear a lot about, but never see too many athletes actually doing it. We are sure that there are a number of athletes that can crack this plateau, but we feel they are much rarer than might be perceived. One reason for this is that there is no real standard for measuring the vertical jump. This, coupled with the fact that an athlete can cheat on almost every test, leaves much suspicion out there when one hears about amazing vertical jumps.

We have seen tests administered at many different venues with many different devices. Everyone we went to, athletes were trying to find the best way to beat the test. We don't advocate cheating, but when in Rome, well you know how it goes. Because of the slight adjustments the athlete can make in the measurement of his reach, and the fact that oftentimes their own coach may be the evaluator, numbers are often inflated. This becomes a problem because there is no standard. If one athlete cheats and another doesn't, that could affect their career.

We have *heard* of many athletes jumping over forty inches, we must say though, we have only *seen* a few. We have read of an athlete going over the 50-inch mark. Even though it sounds outlandish, you never know, there is always somebody out there. Whenever you hear somebody talk about their numbers, get a feel for where they did it, who was testing, and finally, if it sounds like an outright lie, it very well may be.

8. Whenever I perform jump training, I get pain in the front of my knees at the patellar tendon. I don't have as much soreness when I lift. What is going on and how can I remedy the situation?

This pain may mean that you might not be physically prepared for the activity, your technique might need some altering, or you may be doing entirely too much.

Many athletes begin "jump training" with no physical base before they begin. We have seen this over and over when an athlete does too much, too soon. When this occurs, the huge amounts of force fired through the patellar tendons are much higher than experienced when lifting. Then, the athlete usually develops problems, such as the one you describe. Also, depending on your current bodyweight and limb lengths, you may not be ready to perform advanced training until you get to an optimal weight. For instance, our heavier athletes do much less jumping, at much lower intensities, then our lighter athletes. Everyone is an individual and that must be remembered.

The technical aspect of your jumps is another piece of the puzzle you may have to look at. If you are shearing the knee forward during the jumps, you could be placing too much force on the knees.

Finally, you must remember that every jump is a repetition and you must keep track of them. We have found it interesting that an athlete can tell you how many reps they have done in a workout for lifting, but have no idea when it comes to their jump training. Just like any other modality, this must be recorded and progressed properly. We always find athletes doing too much volume with this aspect of their training. This will always lead to breakdown or injury.

9. What are some good supplements that can help to improve my vertical jump?

This is a commonly asked question. Unfortunately, we think it is because most athlete's eating habits are a joke, and that they think they can just wait for the next magic supplement to come along. The first thing that we tell our athletes is that there is a magic supplement! It's called food! Building a solid foundation doesn't only apply to training, it also applies to your nutrition. First, build your foundation with a balanced diet of proteins, low glycemic carbs and healthy fats. Have these in 5-7 meals per day. These meals should be moderate in size, and a multivitamin can be thrown into the mix once per day.

Once you get this foundation right as an athlete, then you can worry about adding the extra supplements. That is why they are called supplements in the first place. They are to be used as a "supplement" to a balanced diet.

In terms of supplements, we believe all athletes and busy coaches can benefit from meal replacement shakes and nutrition bars. These can be used as one or two of those 5-7 meals per day, but you must make sure that you are still getting enough "real food" in the course of a day.

As for the most important meal of the day, we consider this the postworkout shake. We like our athletes to have the shake immediately after their workout - at least within 10-60 minutes of finishing the workout. Research demonstrates the sooner the better to stop catabolism and put the body back into an anabolic state.

Our favorite supplement for increasing the vertical jump is creatine. Creatine is not only the most studied supplement available today, but the one that has been proven time and time again to increase performance in explosive activities, as well as speed up recovery.

10. Can the vertical jump be used to find the percentage of fast-twitch fibers in an athlete?

This is always an interesting question asked by our readers. We would like you to understand that science has found that the delineations of fast-twitch and slow-twitch fibers are very oversimplified. There is actually a continuum of many different fibers from the slow range all the way to the fastest. Because of this, one would find it impossible to give the actual percentage of fast vs. slow-twitch fibers. Muscle biopsy is a method commonly used, but depending on what muscle and where the biopsy is taken, results can be skewed. Instead of percentage, we like to think of the term predominance.

If the athlete possesses a vertical over 30 inches, we know they have a dominant amount (over 50% or more) of fast-twitch fibers working. So in terms of using the vertical jump to predict if an athlete is a fast-twitch individual, we think it is a valuable test.

11. I have a 12-year old daughter and 14-year old son. They both love basketball and are obsessed with their verticals. What would be considered good jumps for both of them? Are there differences between girls and boys, as well as different age groups?

This is a great question. All too often we hear about 30 or 40 inches being the "gold standard" for the vertical jump, yet this is an unreasonable goal for very young kids. Over the past 10 years we've performed thousands (and we mean *thousands*) of evaluations on kids ranging from 9 – 19 years old. Below you will find 2 charts with our vertical jump averages for both girls and boys of various ages.

BOYS (ages)	9-11	12-14	15-17	18-19
Excellent	**16"**	**21"**	**25"**	**28"**
Good	**15"**	**19"**	**23"**	**27"**
Average	**13"**	**17"**	**21"**	**25"**
Below Average	**11"**	**14"**	**19"**	**23"**

GIRLS (ages)	9-11	12-14	15-17	18-19
Excellent	**16"**	**18"**	**20"**	**22"**
Good	**15"**	**16"**	**17"**	**19"**
Average	**13"**	**14"**	**15"**	**17"**
Below Average	**11"**	**13"**	**14"**	**16"**

12. Isn't it true you need to have big calves to jump high? I do tons of standing and seated calf raises and, not only won't my calves get any bigger, my vertical jump still stinks! Please help me. What's the deal?

Does size really matter? This is one of those questions that just won't go away. Whether we're talking about calves or ...well, you know. The fact of the matter is, big calves have about as much to do with your vertical jump as the color of your shirt has to do with how much you can bench press. Sure, there's nothing wrong with doing calf raises in your training routine, but they shouldn't be the *focus* of the routine. As we've said time and time again, the posterior chain (spinal erectors, glutes and hamstrings) make up most of the musculature that will help you to run faster and jump higher.

In fact, none of the athletes on our client list in this manual possess very big calves at all. The one thing they all do have in common are what we call "high cut" calves. What we mean by this is the calves insert very high on the lower leg, which usually means a longer Achilles tendon. A longer Achilles tendon can store more elastic energy, which translates into more explosive jumps. Think about this; have you ever seen a kangaroo with big calves? Of course not, yet they can jump pretty well, can't they? This is because they have very long Achilles tendon's, which store tons of elastic energy and enables them to spring off the ground like no other animal. (By the way, we can't take credit for the length of our athlete's Achilles tendons. We're just trying to dispel the myth that you need big calves to jump high.) What we can take some credit for is the fact that all of the athletes on our client list that have performed incredible vertical jumps were all super-strong in relation to their bodyweight – especially in the posterior chain.

So next time you go to the gym and you're debating between doing a couple of sets of deadlifts or doing some donkey calf raises with your training partner sitting on your low-back, we hope you'll make the right decision.

CLIENT LIST

Below you will find a list of just a few of our athletes who have produced incredible vertical jumps. All of the following athletes have used many, if not all, of the methods described in this manual. Once again, as we discussed in our 40-yard dash manual, we know what works by actually practicing what we preach, as well as experimenting on real athletes – not just reading books and discussing theory. Hopefully this list helps to prove our point.

1. **Kevin Kasper, WR, Denver Broncos** – *43 ½"* vertical jump at 2001 NFL Combine! Second highest jump of the entire Combine.

2. **Jonathan Carter, WR, NY Giants** – *42 ½"* vertical jump at 2001 NFL Combine.

3. **Rashad Holman, DB, San Francisco 49ers** – *42"* vertical jump at 2001 NFL Combine.

4. **Bryan Thomas, DE, NY Jets** – *34 ½"* vertical jump at 2002 NFL Combine, weighing 266 lbs.! 1st round draft pick.

5. **Eddie Freeman, DT, Kansas City Chiefs** – *34"* vertical jump at 2002 NFL Combine, weighing 310 lbs.! 2nd round draft pick.

6. **Joseph Jefferson, DB, Indianapolis Colts** – *39 ½"* vertical jump at 2002 NFL Combine. 3rd round draft pick.

7. **Eric Downing, DT, Kansas City Chiefs** – *33 ½"* vertical jump at 2001 Pro Day, weighing 313 lbs.! 3rd round draft pick.

8. **Kris Richard, DB, Seattle Seahawks** – *39 ½"* vertical jump at 2002 NFL Combine. 3rd round draft pick.

9. **Mike McMahon, QB, Detroit Lions** – *37 ½"* vertical jump at 2001 NFL Combine. Highest jump of all quarterbacks.

10. **Jason McAddley, WR, Arizona Cardinals** – *36 ½"* vertical jump at 2002 NFL Combine.

11. **Deion Branch, WR, New England Patriots** – *36"* vertical jump at 2002 NFL Combine. 2nd round draft pick.

12. **Sean Brewer, TE, Cincinnati Bengals** – *36"* vertical jump at 2001 NFL Combine. 3rd round draft pick.

13. **Curtis Fuller, FS, Seattle Seahawks** – *36"* vertical jump at 2001 NFL Combine.

14. **Mathias Nkwenti, OL, Pittsburgh Steelers** – *35 ½"* vertical jump at 2001 NFL Combine, weighing 293 lbs.! Highest jump of all lineman at the Combine.

15. **David Thorton, LB, Indianapolis Colts** – *35 ½"* vertical jump at 2002 NFL Combine.

16. **Rocky Boiman, LB, Tennessee Titans** – *35"* vertical jump at 2002 NFL Combine.

17. **Sedrick Hodge, LB, New Orleans Saints** – *32"* vertical jump at 2001 NFL Combine. 3rd round draft pick.

18. **Daleroy Stewart, DT, Dallas Cowboys** – *33"* vertical jump at 2001 NFL Combine, weighing 300 lbs.!

19. **Jonathon Reece, RB, NY Jets** – *39 ½"* vertical jump at 2002 Columbia University Pro Day.

20. **Patrick Venzke, OL, Jacksonville Jaguars** – *34"* vertical jump at 2001 NFL Combine, weighing 302 lbs.!

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About the Authors

Martin Rooney & Joe DeFranco direct The Parisi Speed School in Fair Lawn, NJ. Due to the school's prodigious results, it has become a mecca for performance enhancement. They have also teamed to develop one of the top NFL Combine preparation programs in the country. Their program has produced the fastest athlete at the 2001 NFL Combine, and the 3rd fastest athlete at the 2002 NFL Combine. Their program also boasts the first place finishers at 8 different positions, including 3 all-time Combine records. Martin & Joe have also been speed consultants to the NY Giants for the past 2 years, and have been commissioned by Nike to run speed camps at various universities throughout the country. The two have also lectured on the topic of performance enhancement for The American College of Sports Medicine. They are both Certified Strength & Conditioning Specialists(CSCS), certified by the International Institute of Flexibility Sciences and members of the Society of Weight Training Injury Specialists.

Martin Rooney holds a Master of Health Science and a Bachelor of Physical Therapy from the Medical University of South Carolina. He also holds a Bachelor of Arts in Exercise Science from Furman University. He is also certified in Active Release Technique for the upper extremity.

Martin was a member of the United States Bobsled team from 1995-1997, 2000 and a 4-time MVP performer in Track and Field at Furman.

He has traveled as far as the Middle East to conduct training seminars, as well as helped prepare fighters in Japan. He has also trained Olympians, including one gold and one silver medalist. Currently, Martin trains some of the top mixed martial artists and boxers in the world. He also writes for eliteFTS.com and is a columnist for Brazil's Gracie Magazine.

Martin is married and lives in Fair Lawn, NJ. He and his wife, Amanda, are expecting their first child a few months from the time this manual was written.

Joe DeFranco holds a Bachelor of Science degree in Exercise Science from The College of New Jersey in Hillwood Lakes, NJ. But his degree pales in comparison to the thousands of hours he has spent educating himself, as well as the endless hours he has spent "in the trenches" training athletes from all walks of life.

This past year alone, Joe trained NFL football players from 22 different teams, Major League baseball players, Olympic athletes, professional boxers and various college and high school All-Americans. He was even featured on NBC and CNN for the extraordinary results he has produced with his athletes.

A former all-state high school football player and Division I scholarship athlete, Joe took up powerlifting after 4 back surgeries ended his football career. A lifetime drug-free powerlifter, Joe has won 3 National Championships in his class.

Joe currently resides in Hackensack, NJ and can be contacted at joede34@aol.com.

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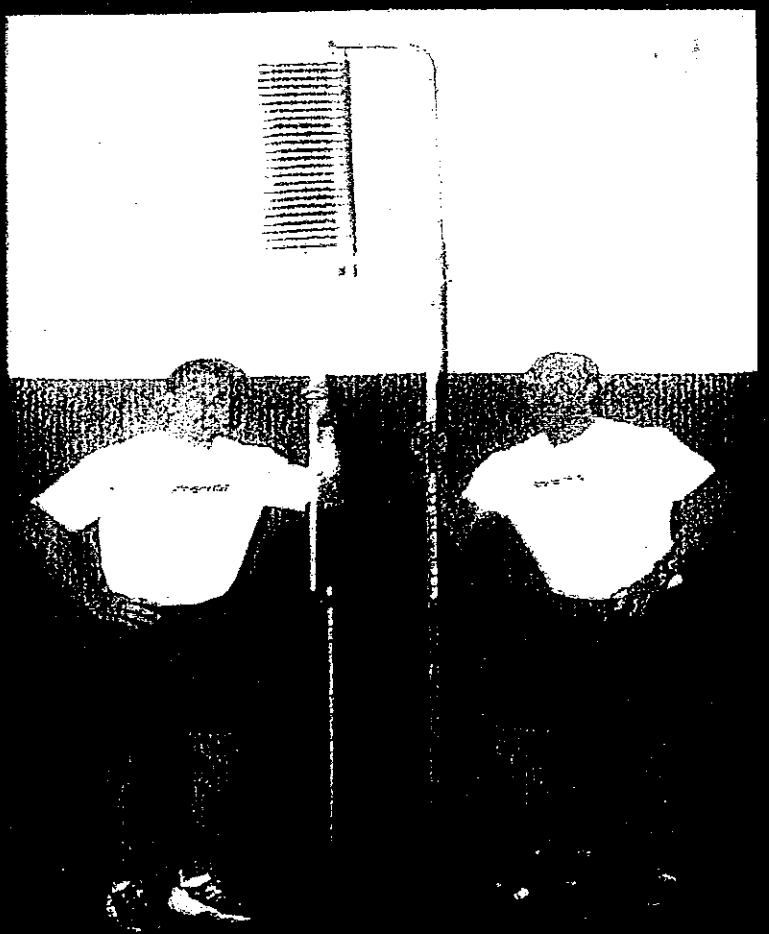

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