

How to Develop Powerful Athletes

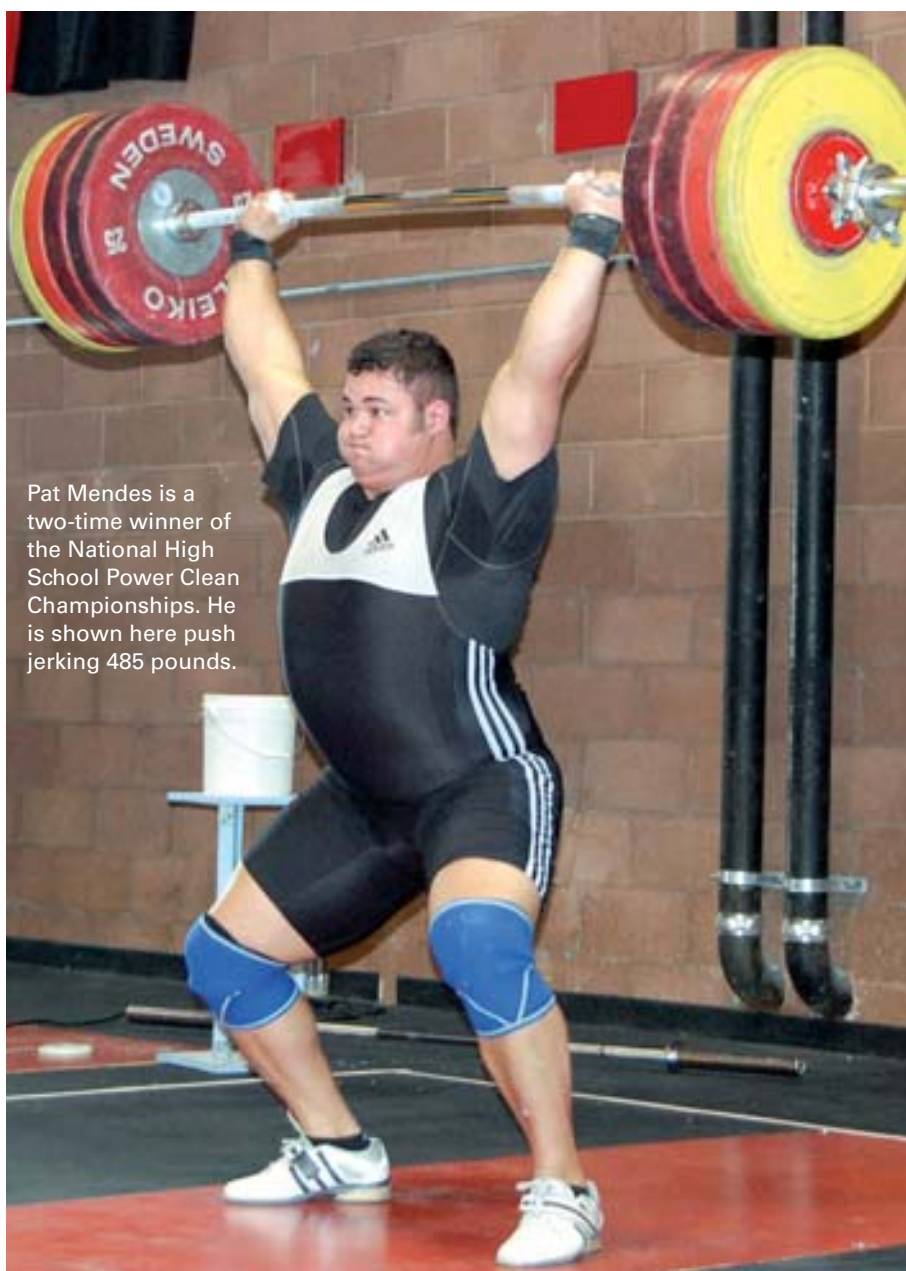
Key exercises that enable athletes to run faster and jump higher

BY **KIM GOSS, MS**

In comedian Eddie Izzard's stand-up routine on martial arts, he notes that tai chi is not very effective for self-defense because it is "a little too slow." Likewise, one of the reasons for Bruce Lee's popularity was his incredible speed, and it was reported that for the fight scenes in some of his movies the film speed was reduced because his kicks and punches were so fast. Beyond martial arts, just about every sport has a vital speed component. That much we know – what coaches often get confused about is how to get faster.

Due to the concept of sport specificity, your ability to excel in one sport does not necessarily mean that you will excel in another. Michael Jordan was one of the greatest basketball players of all time and reportedly could vertical jump 48 inches. But because he did not focus on baseball when he was young, when the brain is still maturing, he was not able to achieve exceptional prowess in professional baseball. If he had spent his youth practicing baseball as well as basketball, then maybe he would have become an exceptional two-sport athlete such as Deion Sanders and Bo Jackson.

One of the standard tests for quickness is the vertical jump, which



Pat Mendes is a two-time winner of the National High School Power Clean Championships. He is shown here push jerking 485 pounds.

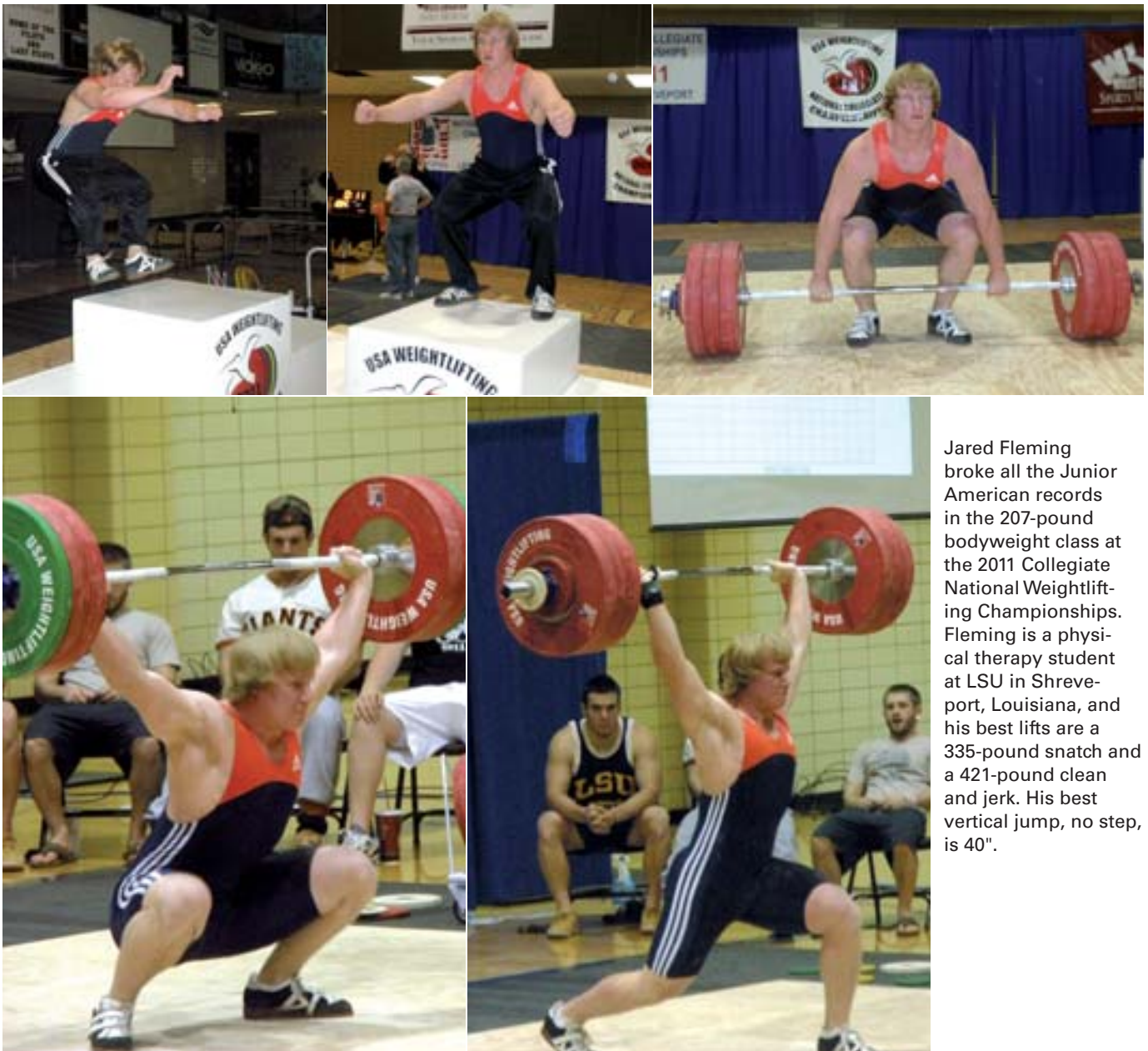
is a lower body test that measures how quickly an athlete can overcome inertia. A professional tennis player trying to return those 100-mile-an-hour serves needs to move quickly to position their racquet to hit the ball. Great serves may make the highlight reels, but it's great players such as Jimmy Connors, Andre Agassi and Roger Federer – all number-one-ranked tennis players – who are considered the best of their era for being able to return serves.

What is a good vertical jump?
In *Functional Testing in Human*

Performance by Michael P. Reiman and Robert C. Manske (Human Kinetics, 2009), you'll find normative data for the vertical jump for many sports and also for the general population. There is a great chart in this book which shows the vertical jump percentile ranking for males and females, ages 7 to 18 years of age. That's a good starting point.

When combined with bodyweight information, the vertical jump test can help determine an athlete's lower body power. As opposed to strength, which refers to the ability to produce force,

power relates to the ability to generate force quickly. Power can be calculated with the use of special formulas, such as the following: $\text{Power (watts)} = 21.67 \times \text{Mass (kg)} \times \text{Vertical Displacement (m)} \times 0.5$. Getting back to our example of tennis, power is an important variable to determine serving speed. Pete Sampras and Andy Roddick, who are among the physically largest tennis players in the sport, are also considered to be two of the best servers in the sport – Roddick's fastest serve has been timed at 155 miles per hour!



Jared Fleming broke all the Junior American records in the 207-pound bodyweight class at the 2011 Collegiate National Weightlifting Championships. Fleming is a physical therapy student at LSU in Shreveport, Louisiana, and his best lifts are a 335-pound snatch and a 421-pound clean and jerk. His best vertical jump, no step, is 40".

Athletes who display the highest levels of power include shot-putters and weightlifters. Werner Günthör had a best result of 74 feet 7 ½ inches in the shot put. He weighed 278 pounds and had a vertical jump of 35 inches. Olympic champion (1980) Yuri Vardanyan, who clean and jerked 493 pounds at a bodyweight of just 181 pounds, could high jump over 7 feet with a 3-step approach. Olympic champion (1984) Nicu Vlad of Romania weighed 220 pounds and could vertical jump 42 inches; and Olympian Shane Hamman weighed 358 pounds, and at a height of 5'9" could jump over a box that was 42 inches high!

Putting Vertical Jumps to the Test

The basic vertical-jump test is the Sargent Jump Test, named after Dr. Dudley Sargent, which dates back to 1921. It involves determining how high you can reach with one hand (usually by placing your hand on a wall) and keeping your feet flat, then, without

taking a step, jumping as high as possible and measuring the difference between the two heights. If you had a difference of 25 inches, then you would have a 25-inch vertical jump. The cheapest way to perform the Sargent test is to perform it against a wall, putting chalk on your hands to determine your reach and your highest jump. The next major evolution of this test is to hit a series of plastic tabs set at ½-inch increments; the more tabs you hit, the higher your score.

When you look at vertical jump results, you have to address the question of sports specificity. Most vertical jump tests require the athlete to jump off both legs and then reach overhead with one arm to touch a spot on a wall or pegs attached to a pole. With the exception of basketball, how many sports require you to jump in the air with one arm outstretched overhead? According to strength coach Michael Jonathan Wahl, PhD, the vertical jump would be more sport-specific for hockey if the test were performed with the arms at your sides. That is

why it would be better to use a force plate, such as the Just Jump and Run. With this testing equipment, you simply jump as high as you can, and the computer determines your vertical jump based upon how long you were airborne – no standing-reach measurement is necessary, and you can place your hands anywhere. You can also test the jumping power of one leg at a time, which is important for not only optimal athletic performance but also injury prevention, because, according to Wahl, imbalances between limbs may place an athlete at a high risk of injury.

According to Wahl, a coach should consider not only the position of the arms but also the type of knee bend (what he refers to as the “stretch shortening cycle”) that should be tested. If you match a group of shot-putters to a group of high jumpers, you’ll often find that the shot-putters will have better results in the Sargent test. The difference is the stretch shortening cycle. During a traditional Sargent test your best results come by starting with a relatively slow and deep knee bend, much like the initial movement in the shot put. With the high jump and figure skating jumps, the athlete needs to be able to transfer horizontal movement to the vertical, and the knee bend is relatively shorter and faster. So a better vertical jump test would be to take a step and jump, or perhaps perform the jump from a slight drop off a platform. The plyometric function of the Just Jump and Run allows you to measure this type of jump.

This plyometric function can also apply to testing upper body power. By placing your hands on an elevated platform, you can perform a “plyometric push-up” and determine ground contact time. The less time you spend on the mat, the greater the power. If an



The BFS Just Jump and Run is a force plate that offers a fast and accurate way to test many types of jumps, including single leg jumps.

athlete has a low score, then additional plyometric training, such as medicine ball throws, would be advised. A similar test would be to throw medicine balls for distance, and I would refer you to Reiman and Manski's book to determine how to administer this test and interpret the results.

The 1-2-3 Punch for Developing Power

Now that we know the value of the vertical jump and how to test for it, the question that must be answered is "How does an athlete increase their

vertical jump?" One clue is to determine which muscles are primarily responsible for a high vertical jump. According to strength coach Charles Poliquin, the gluteal muscles contribute approximately 40 percent of the power for vertical jumping and the hamstrings about 25 percent – and the quads only about five percent. What exercises develop the glutes and hamstrings? How about squats and deadlifts?

Taking this argument one step further, which athletes have the best vertical jumps? Two obvious choices are weightlifters and gymnasts. What do

weightlifters do? Lots of snatches and clean and jerks. What do gymnasts do? Plyometrics and jump drills. As such, an ideal combination of exercises to increase vertical jumping would be the classical Olympic lifts and their variations, such as the power clean, plyometrics and jump drills.

If you look through the magazine archives on the BFS website, you'll find many detailed articles about squatting, Olympic lifting exercises, plyometrics and jump training. These are the tools athletes need to develop speed and power – and that's no joke! BFS



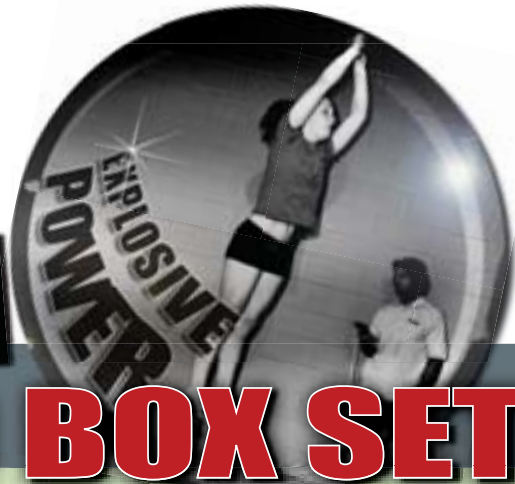
Chloe Van Tussenbroek is the 2011 recipient of the BFS Weightlifting Scholarship. Chloe has a 26.5" vertical jump without a step, and 27.5" with a step. She is pictured above and left performing a clean and jerk at the Poliquin Strength Institute in East Greenwich, Rhode Island. At right she shows her vertical strengths at competition.

Photo by Freson Norris

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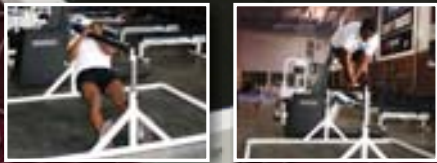
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