Jumping with a hex bar is biomechanically more specific than jumping with a barbell resting on the shoulders. Shown performing a squat jump is Lusia Angilau, a member of the women's volleyball team at Southern Utah. Angilau appeared on our Sep/Oct 2009 cover, and had a 27.1 inch vertical jump in high school.

Hex Bar Squat Jumps for *Ultimate Power*

A new peer-reviewed study shows hex bar squat jumps are superior to the straight bar

BY **KIM GOSS, MS**

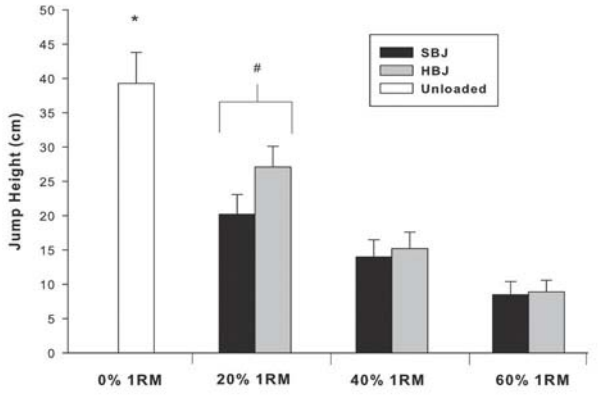
Plyometrics and weight training are proven methods of improving jumping ability, and it only seems logical to find ways to combine both. One method that does exactly that is weighted squat jumps. But the big question is what is the best way to add resistance?

Before getting to the answer, let's do a little review. One of the coaches who pioneered the use of weight training for jumpers was Dr. Vladimir Dyachkov. Dyachkov coached two Olympic gold medalists in the high jump: 1960 winner Robert Shavlakadze and 1964 winner Valery Brumel. Russian track coach and sport scientist Yuri Verkhoshansky sought to expand on Dyachkov's work by developing more-specific exercises for jumping events. Verkhoshansky shared his ideas in a paper he wrote in 1961 entitled "The Barbell in the Training of Track and Field Jumpers."

Nicknamed the "Father of Plyometrics," Verkhoshansky coached jumpers enrolled in the Aeronautical Engineering Institute in Moscow in the 1950s. It was here that he began experimenting with new ways to improve overall athletic power and jumping ability – partly out of necessity due to Russia's harsh winter weather.

Because the Russian winters were bad and the indoor track facilities for the jumpers were worse, Verkhoshansky decided to experiment with special weight training and jumping exercises. At that time the use of weight training for jumpers was not a training method embraced by track coaches – the best way they knew for a jumper to improve their jumping ability was to jump.

In his research Verkhoshansky discovered that the stress on the body



A peer-reviewed study on hex bar jumps vs. straight bar jumps is soon to be published, confirming that the hex bar is a superior method of training.

during the takeoff for the triple jump could reach up to 660 pounds, so to adhere to the concept of sport specificity he tried to find weight training exercises that would replicate this stress. Initially, he tried leg presses (in which the athlete would balance a barbell on their feet) and partial back squats. The problems with these exercises were that the leg press was considered too dangerous and such heavy squats caused lower back pain.

Verkhoshansky addressed the problem of how to significantly overload the legs safely by means of the *depth jump*, which is a specific type of exercise that uses the kinetic energy that develops in the muscles and tendons when an athlete lands during a jump. Stepping off a low platform and immediately rebounding upward upon landing is considered one type of depth jump. For the upper body, kinetic energy can be stored and released in exercises such as Marine Corps push-ups, in which trainees clap their hands between repetitions. Verkhoshansky applied the term *shock training* to the training system that used such exercises. One characteristic of shock training is a brief transition phase between landing and takeoff.

How effective is shock training? In the '60s a dozen of Verkhoshansky's athletes reached the prestigious level of "Master of Sport." One of these masters was Boris Zubov, who in 1964 broke Soviet and European records in the sprint events.

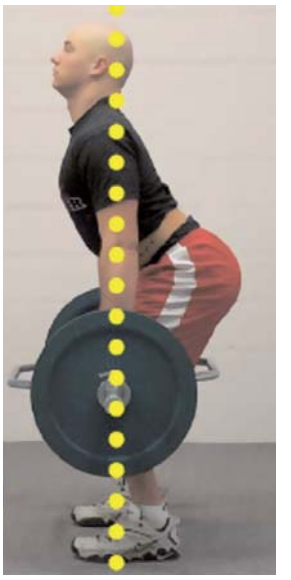
Verkhoshansky eventually decided to change his focus to teaching and research. When Verkhoshansky's accomplishments reached the US, the term *plyometric,* instead of shock training, was used to describe his training methods. This was a mistake, because in the US the term plyometric training described any activity that involved a rapid stretching of a muscle (eccentric phase) immediately followed by a rapid shortening of that muscle (concentric phase). As such, squats and even jumping rope were considered plyometric. Now we know better.

Shock Training with Squat Jumps

A barbell squat jump involves placing a barbell on your shoulders, as you would during a back squat, and then performing jumps. The late Dr. Mel Siff, a colleague of mine who co-authored with Dr. Verkhoshansky the exercise textbook *Supertraining*, was a sport scientist who promoted two additional types of squat jumps.

Siff promoted these two types of jumps because he believed that many US athletes were relatively weak eccentrically, which means they had a difficult time controlling the disruptive forces that occur to the body during the landing phase of jumping activities. If an athlete's knees buckle inward when they land after a jump, this could indicate a lack of eccentric strength. Also, being weak eccentrically means that it takes longer for an athlete to stabilize their body not just during jumping activities but also in agility movements that involve rapid changes of direction.

With the first type of squat jump,



The hex bar design allows the weight to be in alignment with the center of mass of the body, as indicated here by what BFS calls the *power line*.

you rise up on your toes, drop rapidly into a quarter (or even a parallel) squat, and repeat. This is the type of squat jump that can be performed by beginners or as a warm-up before more advanced shock training exercises. With the second type of squat jump you simply jump as high as possible, land in a quarter squat and immediately rebound.

The focus in both these exercises is a rapid eccentric contraction and a brief transition phase. As such, heavy weights are not necessary. Often only the weight of the empty standard Olympic bar (45 pounds) or of a lighter exercise bar is necessary.

Although it was not part of a scientific study, several years ago I worked with a high school girls weightlifting class in Salt Lake City used these jumps as part of their conditioning. A general workout consisted of performing 12-15 jumps for two sets, twice a week. Using a BFS Just Jump force platform, 11 of the girls in this class recorded vertical jumps of 23 inches or more, with one girl reaching 27.1. Although these girls also performed squats and cleans, such exceptional results suggest that these jumps were effective. It should also be noted that rather than using straight bars, the girls performed the jumps with hex bars.

The hex bar is a hexagonal-shaped barbell that enables the user to perform deadlifts while standing inside the bar; the handgrips are placed near the inside collars of the bar. One of the benefits of this type of bar is that the center of the barbell is in line with the hips – what we at BFS like to call the "power line." In contrast, with a straight bar deadlift the legs get in the way, and thus the resistance is applied farther from the individual's center of mass. This difference in design places less stress on the lower back and more stress on the legs. The advantages of the hex bar design were confirmed by the following study: "A Biomechanical Analysis of Straight and Hexagonal Barbell Deadlifts Using Submaximal Loads." Paul A. Swinton, Arthur Stewart, Ioannis Agouris, Justin W. L. Keogh, and Ray Lloyd. *Journal of Strength and Conditioning Research*. (2011 July). 25(7); 2000-2009.

Additionally, research shows that the hex bar is a superior method of performing not just deadlifts but also squat jumps. The same researchers who did the previously mentioned hex bar deadlift study also did an eight-week study comparing straight bar squat jumps (SVJ) to hex bar squat jumps. The study was submitted to the *Journal of Strength and Conditioning Research*, and when published it will be entitled "Effect of Load Positioning on the Kinematics and Kinetics of Weighted Vertical Jumps."

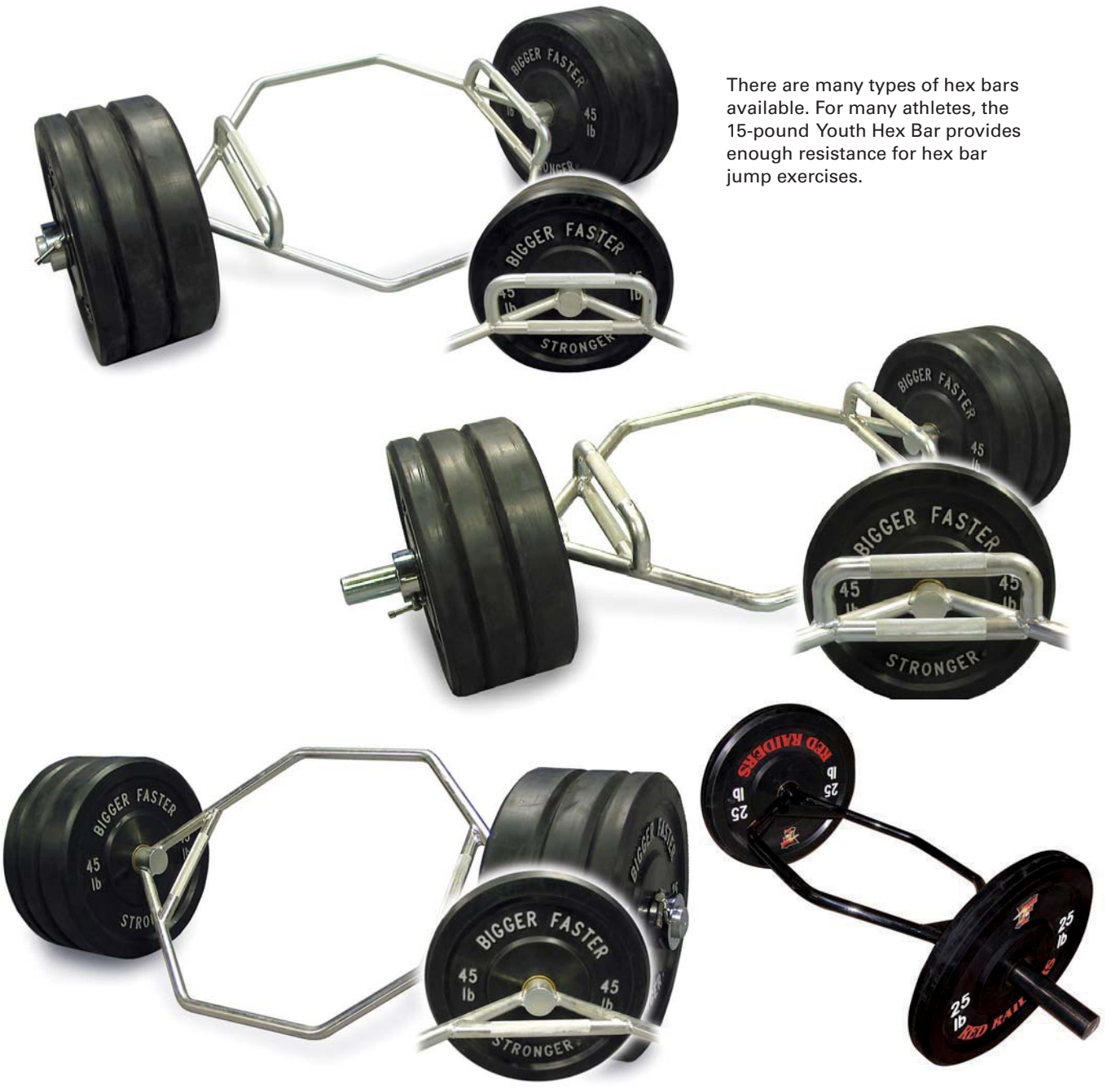
The authors reported that one of the advantages of using hex bars was greater stability, especially when compared to dumbbells (which, by the way, can bang against the athletes' thighs and cause bruising). The researchers also found that by using

Shown is the techniques used in the study on squat jumps, the first two photos showing the jump performed with a straight barbell, and the second with a hex bar.

a hexagonal barbell rather than a straight bar "…the athlete can jump higher and generate greater force, power, velocity and rate of force development."

The researchers believe that the primary reason for the improvements was that the biomechanics of hex bar jumps more closely resemble the type of jumping that most frequently occurs in sports. Here is how they explain it: "When the barbell is positioned across the shoulder to perform the SBJ the potential to create large resistance moment arms may cause athletes to divert from their normal unloaded jump technique and adopt a less effective, more vertical squatting motion." The researchers also found that the hex bar creates less "resistive torque on the lower-body joints," which "may have enabled athletes to accelerate the load more effectively."

BFS discovered the benefits of the hex bar more than 15 years ago, and we have been promoting it as a replacement for the straight bar deadlift. Now there is peer-reviewed research that confirms not only that using a hex bar is a better way to deadlift to improve overall strength but also that performing squat jumps with a hex bar is a superior training tool to improve agility and jumping power. Isn't it time you invested in a hex bar? BFS



There are many types of hex bars available. For many athletes, the 15-pound Youth Hex Bar provides enough resistance for hex bar jump exercises.

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