



Young athletes need to get a head start with the BFS Readiness Program.

BFS Position Paper: Strength Training for Young Athletes

The risks and benefits of having preadolescent and adolescent athletes train with weights

When someone starts lifting weights seriously, we often say that this individual has been “bitten by the iron bug.” Just a few decades ago those who belonged to this group were primarily football players, bodybuilders and, of course, weightlifters and powerlifters. Now just about everyone, male and female, is infected with the iron bug. Basketball players lift weights to improve their vertical jump, sports medicine providers prescribe lifting to rehabilitate injuries, and even senior citizens hit the iron to improve their quality of life.

There are many ways to get strong. To this day our military forces still rely on strenuous calisthenics, such as push-ups and pulls-ups, to prepare our soldiers for duty. And there is no question that hard physical labor, such as working in construction or doing chores on a farm, can certainly increase strength and even add muscle mass. But decades of research have proven that weight training is, hands down, the single most effective way to build strength. With weight training, whether it is with free weights or machines, the muscles can be targeted with specific exercises and the resistance can be precisely controlled to achieve an optimal training effect.

In the field of athletic fitness, coaches know that weight training is the best way to improve an athlete’s power, speed, flexibility, body composition and muscular endurance. Major colleges and professional sports often spend millions of dollars on weightrooms, and it’s rare that any high school in this country does not have some type of facility for resistance training. Our government-sponsored schools support weight training

Further, exercise scientists have conducted clinical studies that prove that any cardiovascular health benefits that occur with aerobic training can also be achieved with weight training. There also is research indicating that one of the most effective long-term solutions for preventing osteoporosis in women is to have them participate in activities that place a high level of stress on the bones during childhood and adolescence 1. So it’s not a matter of if weight training is an effective way to achieve physical and athletic fitness but when it is appropriate to start pumping iron.

The Medical View

One article that is often cited in support of the opinion that weight training is not safe for young people is the position paper on strength training published by the American Academy of Pediatrics 2. That article is not technically a research paper but is the opinion of a group of individuals – just as this BFS position paper is based upon the

opinions of BFS coaches throughout the 33-year history of this organization.

After presenting their summaries of the research, the authors of the AAP paper concluded, “Preadolescents and adolescents should avoid power lifting, body building, and maximal lifts until they reach physical and skeletal maturity.” Let’s take a closer look at the consequences of following such advice.

Although it depends upon the individual, “full skeletal maturity” may not be achieved until the age of 18 in males, and perhaps slightly younger for females³. The AAP opinion thus suggests that most male American football players should not lift heavy weights to prepare them for a strenuous contact sport such as football until they have graduated from high school. As for female gymnasts and figure skaters, who often retire in their early teens due to the expense of competing in these sports, they are in effect being told not to lift weights to improve their athletic performance until several years after they have quit the sport. Is this wise? We don’t think so.

Suggesting that a high school athlete can play football but should not be allowed to physically prepare himself for the stresses that occur in the game simply does not make sense. Although school districts try to maintain an equal standard of competition by having athletes compete against schools of approximately the same number of students, this is not enough to ensure that a reasonable level of safety will result between opposing players. Having a 6-foot, 225-pound lineman who power cleans 250 pounds, bench presses 300 and squats 400 (lifts that are common in many high school football programs) face off against an untrained, 175-pound lineman of the same height with no weight training experience cannot end well. Likewise, is it wise to expose young gymnasts and figure skaters to the extreme stresses in these sports without strengthening their muscles, tendons and ligaments with a progressive resistance training program?

Besides the lack of logic in this recommendation, the conclusions by the AAP do not appear to coincide with the research they



Bobby Doyle, who plays football for the Naval Academy, is the son of BFS clinician Bob Doyle. At Chardon High School in Chardon, Ohio, Bobby earned three letters in track and football. Doyle's earlier BFS training had given him a head start in his college career. His numbers during high school include the following: 300-pound clean, 455 parallel squat, 500 x 10 box squat, and 34.2 seconds in the Dot Drill.

cite in their article, as evidenced by these two comments: "Appropriate strength-training programs have no apparent adverse effect on linear growth, growth plates, or the cardiovascular system...." and "...strength training in youth may stimulate bone mineralization and have a positive effect on bone density." All we can assume is that this organization does not want to assume any liability risk by promoting weight training. After all, it would be difficult to prove in a court of law that a football player was injured because he was not physically ready to play a game, as opposed to that same athlete pulling a muscle in the weightroom from lifting a weight improperly.

Can Weight Training Stunt a Child's Growth?

One of the major concerns about weight training for young athletes is about its potential to damage the epiphysal (growth) plates, resulting in a failure to achieve normal

height. Addressing this subject in many of his publications and lectures was the late Mel Siff, Ph.D., an exercise scientist whose doctoral thesis examines the biomechanics of soft tissues. "It has never been shown scientifically or clinically that the periodic imposition of large forces by weight training on the growing body causes damage to the epiphysal plates," says Siff in his book *Facts and Fallacies of Fitness*.⁴ "It is extremely misleading to focus on the alleged risks of weight training on children when biomechanical research shows that simple daily activities such as running, jumping, striking or catching can impose far greater forces on the musculoskeletal system than very heavy weight training."

To illustrate his point, Siff compared the stress of squatting with that of running. "Suppose that one child runs a few hundred meters a day in some sporting or recreational activities. This can easily involve several thousand foot strikes in which the reaction

force imposed on the body can easily exceed 4 times bodyweight with every stride. Now let another child do a typical average weight training session with 3-5 sets of squats (say, with 10 reps, 8, 6 and 4 reps), with bodyweight or more for the last set. That bodyweight is divided between the two legs, so that, even taking acceleration into account, the loading per leg is bodyweight or a little more, while the spine is subjected to the full load on the bar. In other words, the legs and spine in controlled squatting are exposed to significantly less force than in running and jumping. Normally, exercises such as squatting will be done no more than twice a week for a total of about 60 repetitions, while the running child will run every day and subject the body to those many thousands of impulsive foot strikes.

"It does not require much scientific knowledge or computational genius to see that the cumulative loading imposed by simple running activities on the lower extremities and the spine is far greater than the cumulative load of two or three times a week of weight training. Does this now mean that we are justified in recommending that children not be allowed to run, jump, throw or catch because biomechanical research definitely shows that such activities can produce very large forces on many parts of the growing body?"

Siff also notes that bone density scans have proven that youngsters who do competitive weightlifting (i.e., the snatch and the clean and jerk) have higher bone densities than children who do not use weights, and that clinical research has not shown any correlation between weight training and epiphysal damage. Further, an extensive Russian study on young athletes, published in a book entitled *School of Height 5*, concluded that heavy lifting tends to stimulate bone growth in young athletes rather than inhibit it.

As with muscles, bones because stronger in response to stress, and the activities that the highest levels of stress can encourage the formation of stronger bones. In on study involving 64 elite athletes in several sports (including swimmers, soccer players, runners and throwers), the athletes with the highest bone density in the femurs (upper leg bone) were weightlifters.⁶ Further bones are better designed for resisting compressive loads, such as those that occur in the sport of weightlifting, as opposed shear forces that are more common in sports such as soccer.⁷

One possible reason for the fear that weight training could stunt growth is that many of the participants in weightlifting are not very tall, and may even appear shorter than they are because they possess more muscle mass than many other athletes. But consider that in gymnastics, the average height of elite athletes has steadily declined in the past several Olympics because shorter athletes tend to be more successful in this sport. So saying that weightlifting makes you shorter because many elite weightlifters are short would be like saying that basketball makes you taller because most professional basketball players are tall!

Is Weight Training Dangerous?

Risk of injury is another area of concern for some coaches and parents. In this regard, it's instructive to look at the many studies that have measured the rate of injuries associated with weight training compared to other sports. For example, a study published in the November/December 2001 issue of the *Journal of American Academy of Orthopaedic Surgeons* cited research showing that in children of ages 5 to 14 years, the number of injuries from bicycling was almost 400 percent greater than from weightlifting! Also, in a review paper on resistance training for prepubescent and adolescents published this year in *Strength and Conditioning Coach* (Vol. 9, No. 3) 9, author Mark Shillington reported in a screening of sports-related injuries in school-age children that resistance training was the nominated cause of 0.7 percent (or 1,576 injuries) compared to 19 percent for football and 15 percent for baseball. Further, the primary cause of injury in the studies we've examined is improper technique.

In the United Kingdom, a study by Brian P. Hamill 10 showed that of the 22 sports surveyed, soccer had the highest injury rate, with 6.2 injuries per 100 hours of exposures (6.2%), followed by rugby with 1.92 injuries per 100 hours of exposure (1.92%). The lowest injury rate was in the sport of competitive weightlifting, with a .0017 rate. In discussing competitive weightlifting in their country, the authors noted the following: "Britain's Schoolboy Championship has been staged annually for at least 18 years and has involved some 54,600 competition lifts (maximal or nearly so) and at least 54,600 lighter but still heavy warm-up lifts. In this period one boy suffered a concussion when he fell onto a weight after losing control, and another was bruised when he dropped a



Having young women lift weights is one of the most effective ways of preventing osteoporosis in later years. Shown is Kelsey Weisheit, a former figure skater who could clean 15 pounds over her bodyweight when she was 12 years old.

weight onto his upper back. In neither case has there been any evidence of a long-term consequence.... In short, there seems to be no rational case for continued widespread anxiety about weight training or weightlifting in children."

Renowned Russian sport scientist Vladimir Zatsiorsky in his book *Science and Practice of Strength Training* had this to say about the potential for injury in weight training: "The risk of injury for a well-coached strength training program has been estimated to be about one per 10,000 athlete-exposures," with an athlete-exposure being defined as one athlete taking part in one training session or competition. "Compared to tackle football, alpine skiing, baseball pitching, and even sprint running, strength training is almost free of risk." 11 The simple truth is that weight training and the competitive lifting sports are among the safest activities an athlete can participate in, and this fact is known worldwide.

Siff said that it is ridiculous to condemn many sporting activities solely because of presumed increased risk of injury. "Many school sports place the bodies of youngsters in danger – it is the nature of sport and,

if one is going to take part in any physical activities, no matter how well controlled, there is going to be a greater risk of injury than if the kids sat in front of the TV," says Siff. "On the other hand, the sort of heavy loading imposed on the child's growing body may well equip it better to cope with the normal physical stresses of life, as is suggested by research which reveals a high incidence of back pain, spinal dysfunction, osteoporosis and arthritis among people who are sedentary."

Although using lighter weights as recommended by many fitness and medical organizations seems the safest way to train, physics suggest otherwise. According to Siff, the lighter weights "can be accelerated more rapidly than heavier loads or in ways that deviate further from the body than heavy loads. This means that movement under these more modest conditions can produce much greater forces on the body, which is precisely what we are trying to minimize. We must not fall for the fallacy that training with heavy weights necessarily imposes greater forces and torques on the body. This simply is not true."



Nick Sellers is 11 years old and the son of BFS clinician Jeff Sellers. Nick is a multisport athlete who is getting a head start into high level athletics with a sound weight training program supervised by his father.

Although there is an emphasis in strength and conditioning programs to develop the core muscles of the body to develop stability, it's obvious to anyone who has ever performed a heavy squat that many of these so-called "core" muscles must work extremely hard to fight disruptive forces that occur during this exercise. Further, exercises such as the Olympic lifts (snatch and clean and jerk) and their many variations teach the athlete how to effectively control high impact forces, just as a boxer learns to "take a punch" or a skier learns how to adjust their body position to maneuver on a course. As a bonus, exercises such as the Olympic lifts develop a high level of overall body coordination, which can help when learning new sport skills.

A Question of Supervision

Whether you look at research studies, practical experience or the basic laws of science, the fact is that properly supervised weight training is safe for kids and can help prevent injuries and increase performance. It's not risk free, but it is certainly safer than most sports. To minimize the risk, BFS holds clinics not only to teach young athletes how

to lift and spot properly but also to instruct coaches in how to teach proper technique. As the proverb goes, "Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime."

When looking at the issue of having young athletes weight-train from a legal perspective, coaches and teachers named in lawsuits must provide evidence that what they were doing was professionally correct according to current standards and that the injury was unforeseeable. For this reason, BFS recommends that anyone in the field of exercise instruction obtain a degree, whether it is an associate degree or a four-year degree in such areas as human performance and sport sciences, physical education, adult fitness or exercise science. Such an education would help a coach determine when an athlete is ready to advance into heavy weight training, as the fact is that athletes often mature at different rates. Thus, a 13-year-old girl may have the physical maturity of an 11-year-old girl, whereas another 13-year-old girl may have the physical maturity of a 15-year-old girl.

After earning a degree, the coach should then focus on becoming certified through organizations such as BFS to learn the most current methods of training for athletic fitness. One such program is our Readiness Program, which is designed to teach the basics of weight training to young athletes, particularly those in middle school.

At BFS, we believe that a properly supervised weight training program is appropriate for young athletes, and that the best time to start teaching proper weight training, lifting and spotting techniques is in middle school. We also believe that the preponderance of research available on this subject shows that weight training does not present a high risk of injury, especially to the growth plates of young athletes. Finally, we believe that as our young athletes strive to achieve the highest levels in competitive sports, they must participate in serious training at a younger age than the champions of the past. For young bodies to handle the stress of this training safely, weight training is essential.