

Safe and Effective Strength Training for Grades 3-8

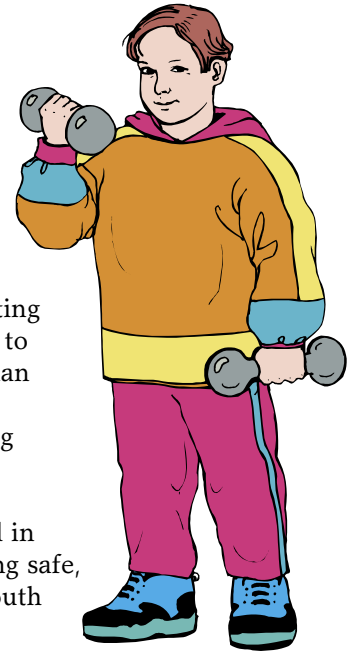
by *Kristy M. Grossman*

For many years, physical education instructors have been hesitant to include strength training activities in the elementary curriculum. This is a result of confusing and conflicting information regarding the safety and effectiveness of strength training for young children, including concerns related to musculoskeletal injuries, epiphyseal fractures, and stunted growth; however, recent interest in strength training for children generated by parents of overweight children, not to mention parents seeking to give their child a competitive edge in increasingly popular youth sports, has prompted physicians to collect and gather new research in an attempt to debunk the controversy surrounding youth strength training. Recent research published and compiled by well-informed physicians suggests that with appropriate supervision, equipment, objectives, and realistic expectations, strength training activities and programs designed for children can be safe, beneficial, and effective lifestyle activities. Such programs are also a suitable addition to the elementary and middle school physical education curriculum.

Strength Training vs. Competitive Weight Lifting

Physical education instructors planning to include a strength training program or strength training activities into the curriculum must first understand the distinction between strength training and competitive weight lifting/power lifting. Strength training, also called resistance training or weight training, is a process of gradually increasing muscular strength. Strength training uses resistance methods including free weights, body weight, machines, or other devices such as elastic bands or medicine balls to gradually increase one's ability to exert or resist force. In contrast, competitive sports such as weight lifting and power-lifting challenge participants to exert their maximum lifting ability. Power-lifters and weight-lifters strain to lift very heavy weights one or a few repetitions at a time, while strength trainers lift lesser weights with multiple repetitions. A common misconception about the safety of strength training

comes from the fact that many potentially serious injuries reported in the literature are associated with the kind of weight-lifting and power-lifting common to competitive sport rather than within supervised strength training programs operating under different objectives (Benjamin & Glow, 2003). This distinction is essential in designing and implementing safe, beneficial, and effective youth programs.



Concerns vs. Benefits

Prior to implementing a strength training program or activity for children in grades three to eight, physical education instructors should understand the research related to the risks and benefits associated with strength training for children. Concerns regarding strength training for children exist primarily due to reports of injuries incurred by children such as strains, sprains, and fractures. However, reports of injury data often neglect to distinguish between properly supervised programs and inadequate or unsupervised activities. It is unsupervised strength training that more often results in excessive loading and improper technique, leading to a variety of injuries among children (Faigenbaum, 2000). Several studies coordinated by Faigenbaum, an expert on strength training for children, have examined the risk of injury to children as they participate in various types of strength training. These studies have found a very low risk of injury when children receive appropriate supervision.

A primary misconception surrounding strength training and children is that the growing, fragile bones of children are less resilient to physical stresses than the bones of adults and are, therefore, more susceptible to fracture. Although there have been several case studies documenting growth plate fractures in children lifting

weights, a literature review of injury data by Faigenbaum, Kraemer, and Cahill (1996) found no epiphyseal fractures among children who weight trained in appropriately supervised situations (Benjamin & Glow, 2003). Other concerns voiced in regard to children and strength training include the risk of musculoskeletal injury and stunted growth; however, once again, there is no evidence related to the incidence and severity of musculoskeletal injuries that would suggest that strength training is any riskier than participation in youth sport or recreation activities at a similar level of exertion. Further research by Faigenbaum also indicates that strength training has no adverse effects on growth. Rather, Faigenbaum's studies have shown positive growth effects when proper nutrition and age-specific physical activity guidelines are met (reported in Benjamin & Glow, 2003). Furthermore, a 2001 policy statement by the American Academy of Pediatrics (AAP, 2001) concerning strength training in children and adolescents states that training may be an effective stimulus for growth and bone mineralization in children, especially for those at risk of osteopenia or osteoporosis.

One of the primary benefits associated with children and strength training is increased strength. As a result of increased reliability in the testing of strength, in addition to a better understanding of the physiology underlying neuromuscular strength, recent studies are finding that strength increases when children follow age-specific resistance training guidelines (Benjamin & Glow, 2003). Faigenbaum, Milliken, Loud, Burak et al., 2002 compared the effects of one and two days per week of strength training on upper body strength, lower body strength, and motor performance ability in children. Participants between the ages of 7.1 and 12.3 years of age strength trained once or twice a week for 8 weeks using child-size weight machines. On average, participants who strength trained once and twice per week achieved significant strength gains with no significant differences in motor performance ability. Such findings support the concept that muscular strength can be improved during the childhood years and favor a training frequency of twice per week for children participating in an introductory strength training program. The AAP policy statement reflects similar research when reporting, "Studies have shown that strength training, when properly structured with regard to frequency, mode (type of lifting), intensity, and duration of program, can increase strength in preadolescents and adolescents" (AAP, 2001).

Another important benefit associated with children and strength training is a link to fitness and combating childhood obesity. In a time when childhood obesity statistics continue to rise at an unprecedented rate, along with the risk of developing related chronic diseases such as diabetes, high cholesterol, and hyper-

tension, children need to be encouraged to establish healthy lifestyles at an early age. Strength training, as part of an overall fitness program, translates well into a lifelong activity. Physical educators are currently striving to make fitness a basic part of their students' lives, and weight training is, or at least should be, an essential component of that process. Learning concepts such as the proper mode, frequency, intensity, and form associated with strength training at an early age in physical education class helps students to continue this beneficial activity later in life, thus promoting active and healthy lifestyles.

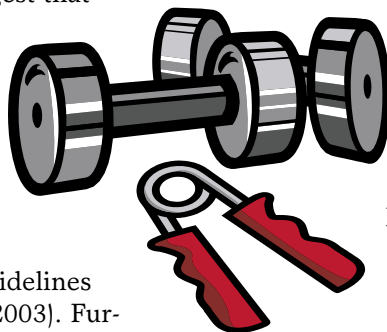
Therefore, strength training is a tool for teaching children healthy exercise habits that can last a lifetime. According to *Physician and Sportsmedicine* (November, 2000), juvenile obesity has risen in the last decade to exceed 20% of all youth. Particularly alarming is that 50% of obese children

6 years or older are likely to become obese adults, compared with 10% of children who are not obese. Furthermore, numbers from the Centers of Disease Control and Prevention indicate that almost half of American youths are not vigorously active on a regular basis, which also results in children displaying signs of heart disease and diabetes before they finish their teenage years. Overweight children struggle to keep up with their peers in traditional sports, which often require running; these same children can benefit immensely from training with weights. Not only do they have the opportunity to improve strength, coordination, and endurance, which enhances their athletic performance, they can also improve their health and avoid dangerous adult illnesses by eliminating excess body fat (Weider, 2001).

A study presented at the American Heart Association's annual meeting in November, 2003 illustrated that endothelial function, an indicator of susceptibility to arterial disease, improved in obese children and teens who took part in an eight week weight training program (Briley, 2004). Further studies suggest weight training in children can help control cholesterol levels. Weltman, Janney, and Rians (1987) reported that a moderate-load resistance-training program with a high number of repetitions had a favorable effect on the blood lipid profiles of prepubescent children. Therefore, it appears resistance training contributes to fat loss, weight maintenance, and disease prevention in children while encouraging an active, healthy lifestyle.

Safety

Physical education instructors implementing strength training programs or activities into the curriculum must understand how to begin safely. Minimum requirements for a successful program include competent supervision



provided by trained and qualified adults, appropriate clothing and footwear worn by all participants, and a child-friendly environment that is safe and free of hazards. Goals and objectives should be established based on students' abilities, needs, and expectations.

Use an Appropriate Warm-Up and Cool Down

An effective warm-up comprised of light aerobic exercise and stretching should be done before each session, and at least 10 to 15 minutes of stretching should follow the session as a cool down phase.

Follow the Prescribed Guidelines

Guidelines for children's strength training have been developed by the American Academy of Pediatrics, the American College of Sports Medicine, the American

Orthopaedic Society for Sports Medicine, and the National Strength and Conditioning Association to promote safe and effective activities (see Table 1). These recommendations play a critical role in the success of a strength training program.

Use Proper Equipment

Some private companies, such as Hoist Fitness of San Diego, CA have taken note of the recent interest in strength training for children and have created workout machines designed specifically for children to help reduce or eliminate the risk of possible injury. David Salisbury, marketing director for Hoist Fitness explains, "Adult machines tend to isolate one joint at a time and work it hard, a technique that can put undue stress on children's less-developed joints. Each of our pieces [for children] keeps multiple joints in motion throughout the exercise and is designed to be fun to use" (Briley, 2004).

TABLE 1—Youth Strength Training Guidelines(adapted from Benjamin & Glow, 2003)

Basic Concepts	Basic Guidelines
Strength training is one part of a well-balanced youth fitness program.	Include adequate warm-up and cool down stretching in every session.
Training takes place at least 2-3 times per week with a minimum of 1 day of rest in between sessions.	Begin with 1 light set of 10-15 repetitions of 6-8 different exercises.
Training involves all major muscle groups, with a balance between opposing muscle groups.	Encourage success by choosing the appropriate exercises and workload for each child.
Resistance exercises are done through a full range of motion to develop strength while maintaining flexibility.	Focus on participation and proper technique rather than the amount of weight lifted.
Participants are encouraged to maximize their athletic potential by optimizing their dietary intake (i.e., adequate hydration, proper food choices).	Perform 1-3 sets of a variety of single and multiple joint exercises, depending on time, goals, and needs.
Prehabilitation of the shoulder and torso muscles is encouraged.	When necessary, adult spotters should assist the child in the event of a failed repetition.
Begin with minimal resistance (body weight against gravity or a bar without added weights); add weights in 1 lb. increments as needed.	Teach students how to use workout cards and regularly monitor progress.
Work intrinsic shoulder muscles, with special focus on the anterior deltoid, supraspinatus, middle deltoid, posterior deltoid, internal rotators, and external rotators.	Vary the strength-training program over time to optimize training and prevent boredom.
Work upper back (scapular stabilizing muscles) with resistance exercises, including shoulder shrugs, bent-over lateral raises, bent-over rows, bench rows, seated rows, and latissimus pull-downs.	When proper technique is mastered, weight can be added.
Work lower back and abdomen with resistance exercises, including lumbar paraspinous stretching, 3-direction crunch sit-ups (for rectus and oblique abdominals), and reverse sit-ups (for the lumbar paraspinous muscles).	If a child cannot do at least 10 repetitions per set with a given weight, the weight is too heavy and should be reduced. When 15 repetitions become too easy, the next weight increment can be attempted (typically a 5%-10% increase on average is recommended). A child should be able to do 3 sets of 15 repetitions of a given exercise in 3 consecutive sessions before more weight is attempted.

Structure Routines Appropriately

Fitness experts recommend that a child's muscle should not be worked to exhaustion. Faigenbaum agrees, suggesting that young children start with a circuit of eight to ten exercises that use the child's own body weight as resistance, such as push-ups. The workout could begin with a set of up to 15 push-ups and then move to other activities that engage all the muscle groups, such as sit-ups, lunges, or pull-ups. Moving quickly from one exercise to another also helps to prevent boredom and keep children focused on proper form. As children reach their preteens and teens, they can progress to working with light weights, either on machines or utilizing small dumbbells. Faigenbaum recommends starting with a weight load the child can lift for 10-13 repetitions. Once the child builds strength and can complete a set of 15 repetitions, increase the resistance slightly, not exceeding 5% of the starting weight. Additional information regarding sample strength training workouts for children can be found at Faigenbaum's web site: www.StrongKid.com. This site provides additional resources and cites various research projects that support the benefits of strength training for children (Forster, 2003).

In conclusion, strength training for children is beneficial when it includes activities appropriate for them,

even in the third through eighth grade physical education curriculum. Well-designed programs can enhance strength, flexibility, motor fitness skills, sports performance, and overall health.

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