

Information for Parents



LIFTING OFF – Is weightlifting Safe

Nowadays many medical practitioners who see young patients are often asked about strength training programs for children. Many parents seek guidance over the safety of resistance training for both competitive and cross training purposes. Other parents of overweight or underweight children seek guidance about which activities are effective for weight loss or weight gain.

Among the general concerns of weight training include musculoskeletal injuries (back and knees) and damage to growth plates, with excess muscle development and masculinisation a specific concern for young girls and their parents. Informed clinicians can reassure parents that, with adult supervision, proper equipment, and realistic expectations, strength training programs designed for children and adolescents are safe and effective.

Realistically, strength training in prepubertal children is a safe and effective way to improve muscle strength and joint flexibility while potentially decreasing the rate of

sports-related injury. A properly designed and supervised program will help improve children's overall health and sense of psychosocial well-being. Current published literature demonstrates that the benefits of strength training far outweigh the small potential risks. When a child or adolescent is involved in strength training, the emphasis is on technique rather than the amount of weight lifted, and qualified coaches always ensure these guidelines.

LIFTING WEIGHTS IS NOT ALL THE SAME

Understanding the distinctions between strength training (weight training or resistance training) and the competitive sports of weight lifting, power lifting, and bodybuilding is essential.

STRENGTH TRAINING uses resistance methods to increase one's ability to exert or resist force. Free weights, the individual's own body weight, machines, or other devices (eg, elastic bands, medicine balls) provide resistance.

OLYMPIC WEIGHT LIFTING AND POWER LIFTING are competitive sports that contest maximum lifting ability.

§ The sport of weight lifting is composed of two competitive lifts: the clean-and-jerk and the snatch. It is the sport seen at both the Olympic and Commonwealth Games

§ Power lifting involves three competitive lifts: the squat, bench press, and dead lift. Athletes train for these sports at very high intensities.

BODYBUILDING is an aesthetic sport that does not involve competitive lifts but depends on weight training.

HOW MUCH? HOW SOON?

The development of muscle strength in children is related to age, body size, previous levels of physical activity, and various phases of growth.

In the past it was recommended that children and adolescents should avoid weight lifting, power lifting, and bodybuilding as these activities were thought to show an increased risk of musculoskeletal injuries and potentially dangerous acute medical events for younger participants.

In contrast, a retrospective review of injuries associated with weight lifting and weight training in preadolescents and adolescents found that *weight lifting and weight training are safer than many other sports and activities* (see the statistics listed below). In fact, the rate of injury for *Olympic weight lifting* was even lower than for *weight training*.

To perform the more complex multi-joint lifts involved in weight lifting, one must undergo a gradual progression of training loads. First, a child or adolescent must successfully master the introductory exercise techniques using minimal loading. Weights are added only under strict, qualified supervision, such as an accredited Club Weightlifting/Sports Power Coach 1 Licence holder.

A recent article by Faigenbaum and Polakowski also supports weight lifting by children and adolescents, stating that when qualified coaches teach the highly technical manoeuvres and lifting techniques make it almost impossible to use too much weight too soon.

Figure 1 - SPORTS INJURIES (Hamil 1993)

Sport	Injuries per 100 participant hours in school sports
Track and Field (USA)	0.570
Track and Field (UK)	0.260
Badminton (UK)	0.050
Basketball (Denmark)	0.300
Basketball (USA)	0.030
Basketball (UK)	1.030
Cross Country (UK)	0.370
Fives (UK)	0.210
Football (USA)	0.100
Gymnastics (USA)	0.044
Handball (Denmark)	0.410
Physical Education (UK)	0.180
Powerlifting (USA)	0.0027
Rugby (AUS)	1.480
Rugby (SA)	0.700
Rugby (UK)	1.920
Soccer (Denmark)	0.560
Soccer (UK)	0.100
Tennis (USA)	0.001
Tennis (UK)	0.070
Volleyball (USA)	0.001
Weightlifting (UK)	0.0017
Weight Training (UK)	0.0035

GETTING STRONGER

Muscle strength development in children has been a topic of debate in the past few decades. However, scientific evidence to separate fact from fiction has been lacking. Many young athletes and parents are seeking ways to achieve a competitive edge. They are bombarded with confusing and, very often, conflicting information regarding the safety and efficacy of youth strength training. Parents frequently ask if their child will develop big muscles, if athletic performance will improve, if training is safe, or if growth plate injury or stunted growth are possible side effects. Well-informed physicians can help demystify some of the confusion and controversy

Increasing Strength – wont that give my child big muscles?

Today, more reliable methods of testing strength and a better understanding of the physiology behind neuromuscular strength are known. Children as young as age 6 can improve strength when following age-specific resistance training guidelines. Researchers have found that strength gains seen in resistance-trained children are due to various neural adaptations and actual muscle size is not.

In 2001, the AAP revised its policy statement to reflect the latest research findings regarding strength training by children and adolescents. It now states, "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." Therefore, parents can be reassured that when their children participate in a strength training program, the children will benefit from increased strength because of their efforts. However, parents will not see an increase in the size of their children's muscles, even though the kids are physically stronger, until after they have reached puberty.

WEIGHING SAFETY CONCERNS

Despite the belief that strength training was dangerous or ineffective for children, the safety and effectiveness of youth strength training are now well documented. Much of the fear surrounding youth strength training was a consequence of publications that did not distinguish between properly supervised programs and unsupervised at-home activities, which often lead to excessive loading and improper technique.

Several prospective studies examined the risk of injury to prepubescent strength training subjects under various protocols. The risk of injury was actually very low when children received appropriate supervision. Thus, major health organizations, such as the ACSM, AAP, AOSSM, and NSCA, now support children's participation in appropriately designed and competently supervised strength training programs.

Growth Plates?

One theoretical concern is that the growing bones of children may be less resilient to physical stresses than the bones of adults. Although a few case study reports have noted growth plate fractures in children who lifted weights, most of these injuries occurred as a result of improper training, excessive loading, and lack of qualified adult supervision.

A literature review reported **no** cases of any overt clinical injuries, including epiphyseal fractures, among those in appropriately supervised strength training programs. Overuse injuries can occur in any repetitive activity, including strength training. A well-designed, properly supervised program aimed at increasing strength, coordination and flexibility (such as those used in Olympic lifting) is the best prevention.

Back Injury?

Low-back injury while participating in weightlifting activity, continues to be the greatest clinical concern for many parents. Individuals involved in strength training can be at risk of acute (eg sudden) back injury if they fail to demonstrate appropriate lifting technique. The Olympic lifts and training exercises are bio-mechanically safe and efficient, distributing weight onto the strong leg muscles and promoting the development of good posture in the upper and lower back. All accredited coaches understand the importance of insisting on correct technique to ensure safety and success for the beginner.

However, it is also important to note that no evidence about the incidence and severity of musculoskeletal injuries proves that strength training is riskier than simply participating in youth sporting and recreational activities.

Effects on Growth?

Many parents observe the shorter athletes seen lifting weights at Commonwealth and Olympic Games and think that weightlifting has made them short...not so. Being short is biomechanically favourable in the sport of weightlifting (the lifter doesn't have to lift the

bar as far), so naturally shorter people tend to be better than taller people and earn a place to compete for their country.

Further, recent literature indicates that strength training will not have an adverse effect on growth. A few studies have shown positive growth effects as long as proper nutrition and age-specific physical activity guidelines were met. Therefore, resistance training will not affect an individuals' genotypic maximum (eg how tall a child will naturally grow to). Parents can be assured that strength training (in moderation), particularly weightlifting will not have an adverse effect on growth. Training may actually be an effective stimulus for growth and bone mineralization in children (ie stronger bones), especially for those at risk for osteopenia or osteoporosis.



HAPPY LIFTING - SELF-ESTEEM AND WEIGHT-LOSS BENEFITS

Improvement in self-esteem is an important and often overlooked benefit of strength training programs. Some studies have reported that parents observed positive personality effects in their children, including increased readiness to perform household chores and homework.

In an age when childhood obesity statistics continue to increase along with the associated risk of developing related diseases such as diabetes and hypertension, children should be encouraged to establish healthy lifestyles at an early age. Strength

training may also have a cholesterol-lowering effect. Resistance training combined with aerobic exercise may be the ideal solution for fat loss and weight maintenance in overweight children.

Some literature suggests that strength training prepares children for participation in organized sporting and recreational activities and improves their sense of character, self-esteem, and overall psychosocial functioning.

BENEFITS IN SUMMARY

- Increased muscle strength, flexibility and coordination.
 - Sports performance improvement –cross training.
 - Better cardio respiratory function.
 - Helps to protect the child's muscles and joints from injury associated with other activities.
 - Stronger bones – important especially for young girls.
 - A desirable body composition.
 - Lowered blood cholesterol levels.
 - An exercise habit which lasts a lifetime.
 - Ability to be organized, plan and set goals.
- Self confidence.
 - Good nutritional habits.

REFERENCES:

Youth Strength Training. Avery Faigenbaum Umass Boston
<http://www.afpafitness.com/articles/YouthTrain.htm>

Strength Training for Young Athletes John A. Bergfeld, M.D. Cleveland Clinic Sports Health Head Team Physician, Cleveland Browns and Cleveland CAVS.
<http://www.infosports.com/clvclinic/strengthtrainingforyoung.htm>

American Academy of Pediatrics Committee on Sports Medicine: Strength training, weight and power lifting and body building by children and adolescents. Pediatrics 1990;86(5):801-803

Cahill BR (ed): Proceedings of the conference on strength training and the prepubescent. Chicago, American Orthopedic Society for Sports Medicine, 1988, pp 1-14

Hamill BP: Relative safety of weightlifting and weight training. J Strength Conditioning Res 1994;8(1):53-57

Faigenbaum AD: Strength training for children and adolescents. *Clinical Sports Med* 2000;19(4):593-619

Faigenbaum AD, Kraemer WJ, Cahill B, et al: Youth resistance training: position statement paper and literature review. *Strength Cond* 1996;18(6):62-76

Faigenbaum AD, Polakowski C: Olympic-style weightlifting, kid style. *J Strength Cond Res* 1999;21(3):73-76

Heidt RS Jr, Sweeterman LM, Carlonas RL, et al: Avoidance of soccer injuries in preseason conditioning. *Am J Sports Med* 2000;28(5):659-662

Current comment from the American College of Sports Medicine: August 1993--'The prevention of sports injuries of children and adolescents.' *Med Sci Sports Exerc* 1999;25(8 suppl):1-7

Vrijens J: Muscle strength development in the pre- and post-pubescent age. *Med Sport* 1978;11:152-158

Docherty D, Wenger HA, Collis ML, et al: The effects of variable speed resistance training on strength development in prepubertal boys. *J Hum Mvmt Stud* 1987;13:377-382

American Academy of Pediatrics: Weight training and weight lifting: information for the pediatrician. *Phys Sportsmed* 1983;11(3):157-161

Falk B, Tenenbaum G: The effectiveness of resistance training in children: a meta-analysis. *Sports Med* 1996;22(3):176-186

Payne VG, Morrow JR Jr, Johnson L, et al: Resistance training in children and youth: a meta-analysis. *Res Q Exerc Sport* 1997;68(1):80-88

Weltman A: Weight training in prepubertal children: physiologic benefit and potential damage, in Bar-Or O (ed): *Advances in Pediatric Sports Science: Biologic Issues*, vol 3. Champaign, IL, Human Kinetics, 1989, pp 101-129

Blimkie CJ: Resistance training during preadolescence: issues and controversies. *Sports Med* 1993;15(6):389-407

Falk B, Mor G: The effects of resistance and martial arts training in 6- to 8-year-old boys. *Pediatr Exerc Sci* 1996;8(1):48-56

Hakkinen K, Komi PV: Electromyographic changes during strength training on cardiovascular function. *Med Sci Sports Exerc* 1983;15(6):455-460

Weltman A, Janney C, Rians CB, et al: The effects of hydraulic resistance strength training in pre-pubertal males. *Med Sci Sports Exerc* 1986;18(6):629-638

Blimkie CJ, Ramsay J, Sale DG, et al: Effects of 10 weeks of resistance training on strength development in prepubertal boys, in Oseid S, Carlsen K-H (eds): *International Series on Sport Sciences: Children and Exercise XIII*. Champaign, IL, Human Kinetics, 1989, pp 183-197

Ramsay JA, Blimkie CJ, Smith K, et al: Strength training effects in prepubescent boys. *Med Sci Sports Exerc* 1990;22(5):605-614

Belanger AY, McComas AJ: Extent of motor unit activation during effort. *J Appl Physiol* 1981;51(5):1131-1135

Faigenbaum AD, Micheli LJ: Youth strength training. Current Comment from the American College of Sports Medicine. *Sports Med Bull* 1988;32(2):28

Webb DR: Strength training in children and adolescents. *Pediatr Clin North Am* 1990;37(5):1187-1210

Faigenbaum AD, Zaichkowsky LD, Westcott WL, et al: The effect of a twice-a-week strength training program on children. *Pediatr Exerc Sci* 1993;5(4):339-346

American Academy of Pediatrics: Policy statement: strength training by children and adolescents. *Pediatrics* 2001;107(6):1470-1472

Sewall L, Micheli LJ: Strength training for children. *J Pediatr Orthop* 1986;6:143-146

Faigenbaum AD, Westcott WL, Micheli LJ, et al: The effects of strength training and detraining on children. *J Strength Cond Res* 1996;10(2):109-114

Weltman A, Janney C, Rians CB: The effects of hydraulic-resistance strength training on serum lipid levels in prepubertal boys. *Am J Dis Child* 1987;141(7):777-780

Faigenbaum AD, Zaichkowsky LD, Westcott WL, et al: Psychological effects of strength training on children. *J Sport Behav* 1997;20(2):164-175

Rians CB, Weltman A, Cahill BR, et al: Strength training for prepubescent males: is it safe? *Am J Sports Med* 1987;15(5):483-489

Credit: Holly J. Benjamin, MD Kimberly M. Glow, MD, MPH