

Strength Training, Weight and Power Lifting, and Body Building by Children and Adolescents

Some children and many adolescents use weights to increase strength or enlarge muscles. A smaller number compete in the sports of weight lifting, power lifting, and body building.

DEFINITIONS

Free weights are dumbbells and barbells that are used without the external support of a machine.

Major lifts are lifts used in the sports of weight and power lifting. Also used are the power clean and the incline and overhead presses. These lifts involve the use of free weights lifted through the extremes of joint motion in a ballistic rather than a controlled fashion. They have significant potential to cause injury.¹⁻³ In the clean and jerk, the athlete lifts the barbell in a two-step movement from the floor to the chest and then over the head; the snatch involves the same movement of the barbell performed without interruption with a different technique. The power clean requires raising the barbell from the floor to the shoulders in a two-part maneuver. The dead lift is accomplished by raising the barbell from the floor by straightening the flexed knees. In the squat lift, the athlete holds the barbell behind the head on the shoulders, squats until the thighs are parallel with the floor, and then straightens the legs. In the bench press, the athlete lies supine on a bench, holds the barbell over the chest with the arms extended, lowers the weight to the chest, and then raises it again. The incline press is similar, except that the bench is at a 30° angle. In the overhead press, the lifter stands and raises the barbell from in front of the chest to over the head by extending the arms.

This statement has been approved by the Council on Child and Adolescent Health.

The recommendations in this statement do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate.

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Strength training ("weight training," "resistance training") is the use of a variety of methods, including exercises with free weights and weight machines, to increase muscular strength, endurance, and/or power for sports participation or fitness enhancement.

Weight lifting and power lifting are competitive sports in which an athlete attempts to lift a maximal amount of free weight in specific lifts. In weight lifting, the lifts performed are the clean and jerk and the snatch. In power lifting, they are the squat lift, dead lift, and bench press.

Body building is a competitive sport in which the participant uses several resistance training methods, including free weights, to develop muscle size, symmetry, and definition.

STRENGTH TRAINING IN THE PREPUBESCENT ATHLETE

Recent research has shown that short-term programs in which prepubescent athletes are trained and supervised by knowledgeable adults can increase strength without significant injury risk.⁴⁻⁶ These studies did not evaluate the relationship between improved strength, injury prevention, or enhanced athletic performance. No data exist defining risks of injury in less well-organized programs.

STRENGTH TRAINING IN THE PUBESCENT AND POSTPUBESCENT ATHLETE

Interscholastic athletic programs in secondary schools are increasingly emphasizing strength training as a conditioning method for participants in male and female sports. The major lifts are often used.

Although the incidence is unknown, strength training in adolescence occasionally produces significant musculoskeletal injury, eg, epiphyseal fractures, ruptured intervertebral disks, and low back bony disruptions, especially during use of the major lifts.¹⁻³ Safety requires careful planning of several

aspects of a program. This includes devising a program for the intensity, duration, frequency, and rate of progression of weight use, as well as selection of sport-specific exercises appropriate for the physical maturity of the individual. Proper supervision should be provided during training sessions.⁷⁻⁹

WEIGHT LIFTING, POWER LIFTING, AND BODY BUILDING

More than 600 teenagers are registered with the United States Weight Lifting Federation, and more than 3000 with the United States Power Lifting Federation. The limited available data indicate that these sports have a significant risk of injury. Brown and Kimball³ determined that 71 adolescent power lifters with a mean age of 16 years and a mean duration of 17 months participation sustained 98 musculoskeletal injuries, causing discontinuance of training for a total of 1126 days. Body building, with at least 8500 adolescent participants, uses some of the same exercises and presumably is associated with the same risks.

LIFTING MAXIMAL AMOUNTS OF WEIGHT

Because very little data are available on the relative rate of injury at different ages, controversy exists concerning when young athletes should be allowed to lift maximal amounts of weight. The United States Weight and Power Lifting Federations recommend the age of 14 years. Other experts suggest an older age, for example 16 years.⁷ Given the widely varying tempo of pubertal development among adolescents, a more appropriate guideline is one based on physical maturation. If male and female athletes have reached Tanner stage 5 in the development of their secondary sexual characteristics, they will have passed their period of maximal velocity of height growth,^{10,11} during which the epiphyses appear to be especially vulnerable to injury.¹² This level of developmental maturity is reached at a mean age of approximately 15 years in both sexes, with much individual variation.^{10,11}

TRAINING FOR COACHES

It is essential that coaches have training in supervising strength training programs. Adequate instruction may be obtained in collegiate or graduate school programs or from continuing education courses offered by college strength training instructors. A convenient training program of high quality is offered by the National Strength and Conditioning Association,⁸ with home study of written materials and videotapes followed by a certification examination.

RECOMMENDATIONS

The American Academy of Pediatrics recommends:

1. Strength training programs for prepubescent, pubescent, and postpubescent athletes should be permitted only if conducted by well-trained adults. The adults should be qualified to plan programs appropriate to the athlete's stage of maturation, which should be assessed objectively by medical personnel.

2. Unless good data become available that demonstrate safety, children and adolescents should avoid the practice of weight lifting, power lifting, and body building, as well as the repetitive use of maximal amounts of weight in strength training programs, until they have reached Tanner stage 5 level of developmental maturity.

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REFERENCES

1. Brady TA, Cahill BR, Bodnar LM. Weight training-related injuries in the high school athlete. *Am J Sports Med.* 1982;10:1-5
2. Gumbs VL, Segal D, Halligan JB, et al. Bilateral distal radius and ulnar fractures in adolescent weight lifters. *Am J Sports Med.* 1982;10:375-379
3. Brown EW, Kimball RG. Medical history associated with adolescent powerlifting. *Pediatrics.* 1983;72:636-644
4. Sewal L, Micheli LJ. Strength training for children. *J Pediatr Orthop.* 1986;6:143-146
5. Rians CB, Weltman A, Cahill BR, et al. Strength training for prepubescent males: is it safe? *Am J Sports Med.* 1987;15:483-489
6. Servedio FJ, Bartels RL, Hamlin RL, et al. The effects of weight training using Olympic lifts on various physiological variables in pre-pubescent boys. *Med Sci Sports Exerc.* 1985;17:288
7. Fleck SJ, Kraemer WJ. *Designing Resistance Training Pro-*

- grams. Champaign, IL: Human Kinetics Books; 1987
8. *How to Build a Strength and Conditioning Program in Your High School*. National Strength and Conditioning Association. PO Box 81410, Lincoln, NE 68501. Tel. 402-472-3000
 9. Cahill BR, ed. *Proceedings of the Conference on Strength Training in the Prepubescent*; 1988; Chicago. American Orthopaedic Society for Sports Medicine, 70 West Hubbard

- St, Suite 202, Chicago, IL 60610
10. Marshall WA, Tanner JM. Variations in the pattern of pubertal changes in girls. *Arch Dis Child*. 1969;44:291-303
 11. Marshall WA, Tanner JM. Variations in the pattern of pubertal changes in boys. *Arch Dis Child*. 1970;45:13-23
 12. Smith NJ, Stanitski CL. *Sports Medicine*. Philadelphia, PA: WB Saunders Co; 1987:33

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