

# ***YOUTH RESISTANCE TRAINING***

**Avery D. Faigenbaum, EdD, CSCS, FNCSA**



This paper was presented as part of the NSCA Hot Topic Series.

All information contained herein is copyright of the NSCA.

[www.nasca-lift.org](http://www.nasca-lift.org)

Current recommendations suggest that school-aged youth should participate daily in 60 minutes or more of moderate to vigorous physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities (27). While children and adolescents have traditionally been encouraged to participate in aerobic activities such as swimming and bicycling, a compelling body of evidence indicates that resistance training can be a safe and effective method of exercise for youth provided that appropriate guidelines are followed (3,8,15,16,26). The qualified acceptance of youth resistance training by medical and fitness organizations is becoming universal (1,2,4,9), and nowadays comprehensive school-based programs, such as Physical Best, are specifically designed to enhance health-related fitness components, which include muscular strength and muscular endurance (23).

By definition, the term resistance training (also called strength training) refers to a specialized method of physical conditioning that involves the progressive use of a wide range of resistive loads and a variety of training modalities designed to enhance or maintain muscular fitness. Although it is commonplace for boys and girls to resistance train in schools, recreation centers and sports camps to enhance their health, fitness and athletic performance, concerns about the safety and efficacy of youth resistance training still persist. Furthermore, coaches, teachers and parents are often asked if the potential benefits of youth resistance training outweigh the risks. Unfortunately, the correct answers to these questions are often obscured by the misconceptions surrounding resistance exercise. Five of the most common misconceptions associated with youth resistance training are discussed below:

Misconception: Resistance training will stunt the growth of children.

Fact: Current observations indicate no evidence of a decrease in stature in children who regularly perform resistance exercise in a controlled environment (14). Furthermore, a growth plate fracture has not been reported in any youth resistance training study. If appropriate exercise guidelines are followed, regular participation in weight-bearing physical activities, such as resistance exercise, will likely have a favorable influence on bone growth and development during childhood and adolescence (28).

Misconception: Youth resistance training is unsafe.

Fact: With appropriate supervision and instruction, the risks associated with youth resistance training are not greater than other activities in which children and adolescents regularly participate (17). The key is to provide qualified supervision, age-specific instruction and a safe training environment in order to reduce the risk of an accident.

Misconception: Children cannot increase strength because they do not have enough testosterone.

Fact: Testosterone is not essential for achieving strength gains. This is evidenced by women and elderly individuals who experience impressive strength gains without high levels of testosterone. When training-induced strength gains are compared on a relative or percent basis, improvements in children are comparable to adolescents and adults (25).

Misconception: Resistance training is only for young athletes.

Fact: Although resistance training may enhance the sports performance of young athletes while reducing their risk of sports-related injuries (18,21), regular participation in a resistance training



program may also offer observable health value to boys and girls who are not involved in sports programs. In addition to enhancing musculoskeletal health, regular resistance training provides an opportunity for participants to learn about their bodies and feel good about participating in strength-building activities that are engaging, progressive and fun (7). Resistance training may be particularly beneficial for overweight youth who are less willing and often unable to participate in prolonged periods of moderate to vigorous aerobic exercise without rest (29).

Misconception: The sport of weightlifting is inappropriate for children

Fact: In the sport of weightlifting, athletes attempt to lift maximal amounts of weight when performing the clean and jerk and snatch. Current findings suggest that youth can successfully perform these lifts and benefit from participating in this sport provided that the focus remains on proper form and technique and appropriate weights are used in practice and competition (5,11,17). Children and adolescents who want to participate in weightlifting should be encouraged to do so under the qualified supervision of a youth weightlifting coach.

## POTENTIAL BENEFITS OF YOUTH RESISTANCE TRAINING

Based on the facts addressing the previously mentioned misperceptions, it is evident that appropriately prescribed and competently supervised youth resistance training programs may offer significant health and fitness value to boys and girls. In addition to enhancing muscular strength and local muscular endurance, regular participation in a youth resistance training program has the potential to positively influence aerobic fitness, body composition, blood lipids, bone mineral density, and motor performance skills (e.g., jumping and sprinting) (7). In addition, resistance training may provide a unique opportunity for previously sedentary children and



adolescents to participate in physical activity. Since resistance exercise is not aerobically taxing, this type of exercise can provide an opportunity for all youth, regardless of body size and fitness level, to experience success and feel good about their performance.

Another contemporary benefit of youth resistance training may be its ability to improve the preparedness of aspiring young athletes for the demands of sports participation. Although millions of boys and girls participate in sport, it seems that a growing number of young athletes are suffering sports-related injuries because they are ill-prepared for the demands of sports practice and competition (22,24). While factors such as growth, improper footwear, and hard playing surfaces have been implicated as risk factors for overuse injuries in youth (20), the background physical activity level of young athletes must also be considered. An estimated 15% to 50% of all injuries sustained by youth while playing sports could be prevented if more emphasis was placed on developing fundamental fitness abilities prior to sports participation (21).

## RISKS AND CONCERNS

There is no scientific evidence to suggest that the risks and concerns associated with youth resistance training are greater than those of other sports and recreational activities in which children regularly participate. Nevertheless, youth resistance training programs must be competently supervised, properly instructed and appropriately designed. Youth coaches, physical education teachers and fitness trainers must be aware of the inherent risk associated with resistance training and should attempt to decrease this risk by following established training guidelines. It is important to keep in mind that youth should not resistance train on their own



without guidance from qualified professionals. Training without supervision and instruction can result in an accident.

Qualified supervision and instruction also mean considering the focus of a youth resistance training program. Teachers and coaches should be careful to match the resistance training program to the needs, interests and abilities of each child. For example, a structured resistance training program for a teenage athlete would be inappropriate for an inactive child who should be given an opportunity to experience the mere enjoyment of different types of resistance exercise in a less competitive environment. In any case, it is always better to underestimate the physical abilities of a participant rather than overestimate them and risk negative consequences (e.g., dropout or injury).

## PROGRAM DESIGN CONSIDERATIONS.

Although there is no minimum age for participating in a youth resistance training program, qualified professionals should provide instruction and all participants should have the emotional maturity to accept and follow directions. In general, if a child is ready for participation in some type of sport activity (generally age 7 or 8), then he or she may be ready to resistance train.

Different types of equipment and various combinations sets and repetitions have proven to be safe and effective (6,12,18,19). It has been recommended that children and adolescents resistance train two or three days per week on nonconsecutive days while performing 1 to 3 sets of 6 to 15 repetitions on a variety of exercises that focus on the major muscle groups (9). However, when beginning a resistance training program, a single set of 10 to 15 repetitions per exercise



performed twice per week will not only allow for positive changes in muscle function, but will also provide an opportunity for participants to gain confidence in their abilities before progressing to more advanced levels (10,13).

Over time, continual gains can be made by systematically changing the training weight, the number of repetitions, the number of sets, the choice of exercises, the order of exercises, and the training frequency. Every workout does not need to be more intense than the previous session, but it is recommended that the demand placed upon one's body should be gradually increased over time. This is where the art and science of developing a youth resistance training program come into play because the principles of training specificity and progressive overload need to be balanced with individual needs and abilities in order to optimize gains, prevent boredom and reduce the stress from overtraining.

In summary, no scientific evidence indicates that youth resistance training programs are 'riskier' than other sports and activities in which youth regularly participate. However, resistance exercise is a specialized method of conditioning that requires qualified supervision, appropriate overload, gradual progression, and adequate recovery between exercise sessions. When designing youth resistance training programs, it is important to remember that the goal of the program should not be limited to increasing muscle strength. Teaching youth about their bodies, promoting safe training procedures, and providing a stimulating program that gives participants a more positive attitude towards resistance exercise and physical activity are equally important.

## REFERENCES

1. American Academy of Pediatrics. Strength training by children and adolescents. *Pediatrics*, 107: 1470-1472. 2001.
2. American College of Sports Medicine. ACSM's Guidelines for Exercise Testing and Prescription, 7th ed. Philadelphia, PA: Lippincott, Williams & Wilkins, 2006.
3. Blimkie, C. Resistance training during preadolescence. *Issues and Controversies. Sports Med.* 15: 389-407. 1993.
4. British Association of Exercise and Sport Sciences. BASES position statement on guidelines for resistance exercise in young people. *J Sports Sci.* 22:383-390, 2004.
5. Byrd, R., K. Pierce, L. Reilly and J. Brady. Young weightlifters' performance across time. *Sports Biomech*, 2: 133-140, 2003.
6. Chu D, A. Faigenbaum, J. Falkel. *Progressive Plyometrics for Kids*. Monterey, CA: Healthy Learning, 2006.
7. Faigenbaum, A. Resistance training for children and adolescents: Are there health outcomes? *American Journal of Lifestyle Medicine*, 1, 190-200, 2007.
8. Faigenbaum, A. Youth Resistance Training. *President's Council on Physical Fitness and Sports Research Digest*, 4(3): 1-8, 2003.
9. Faigenbaum, A., Kraemer, W. Cahill, B. Chandler, J., Dziados, J., Elfrink, L., Forman, E., Gaudiose, M., Micheli, L., Nitka, M., and Roberts, S. Youth resistance training: Position statement paper and literature review. *Strength Conditioning*, 18, 62-75, 1996.
10. Faigenbaum, A., L. Milliken, L. Moulton, and W. Westcott. Early muscular fitness adaptations in children in response to two different resistance training regimens. *Ped Exerc Sci.* 17: 237-248, 2005.
11. Faigenbaum, A. and C. Polakowski. Olympic style lifting: Kid style. *Strength Cond J.* 21: 73-76, 1999.
12. Faigenbaum, A and W. Westcott. *Strength and Power Training for Young Athletes*. Champaign, IL: Human Kinetics Publishers, 2000.
13. Faigenbaum A, W. Westcott, R. Loud, and C. Long. The effects of different resistance training protocols on muscular strength and endurance development in children. *Pediatrics*. 104: e5, 1999.



14. Falk, B, and A. Eliakim. Resistance training, skeletal muscle and growth. *Pediatr Endocrinol Rev.* 1:120-127, 2003.
15. Falk, B., and G. Tenenbaum. The effectiveness of resistance training in children. A meta analysis. *Sports Med.* 22: 176-186, 1996.
16. Guy, J., and L. Micheli. Strength training for children and adolescents. *J Am Acad Ortho Surg.* 9, 29-36, 2001.
17. Hamill, B. Relative safety of weight lifting and weight training. *J Strength Conditioning Res.* 8: 53-57, 1994.
18. Kraemer W., and S. Fleck . *Strength training for Young Athletes*, 2nd ed. Champaign, IL: Human Kinetics; 2005.
19. Mediate, P., and A. Faigenbaum. *Medicine Ball for All Training Handbook.* Healthy Learning, Monterey, CA, 2004.
20. Micheli, L. Overuse injuries in children's sports: The growth factor. *Ortho Clinics N Am.* 114, 337-360, 1983.
21. Micheli L. Preventing injuries in sports: What the team physician needs to know. In: Chan K, Micheli L, Smith A, Rolf C, Bachl N, Frontera W, Alenabi T, eds. *F.I.M.S. Team Physician Manual*, 2nd ed. Hong Kong: CD Concept; 555-572, 2006.
22. Micheli L, Glassman R, Klein M. The prevention of sports injuries in youth. *Clin Sports Med.* 19:821-834, 2000.
23. National Association for Sport and Physical Education. *Moving Into the Future: National Standards for Physical Education.* (2nd ed.). Reston, VA: Author, 2004.
24. Outerbridge, A ., and L. Micheli. Overuse injuries in the young athlete. *Clin. Sports Med.* 14: 503-516, 1995.
25. Pfeiffer, R., and R. Francis. Effects of strength training on muscle development in prepubescent, pubescent and postpubescent males. *Phys Sports Med.*14: 134-143, 1986.
26. Sale, D. Strength training in children. In Gisolfi, G, Lamb, D, (eds): *Perspectives in Exercise Science and Sports Medicine.* Indianapolis: Benchmark Press, 12: 1453-1462, 1989.
27. Strong, W.B, Malina, R.M, Blimkie, C.J., Daniels, S.R., Dishman, R.K., Gutin B., Hergenroeder, A., Must, A., Nixon, P.A., Pivarnik, J., Rowland, T., Trost, S., Trudeau, F. Evidence based physical activity for school-age youth. *J Pediatrics*, 146, 732-737, 2005.
28. Vicente-Rodriguez, G. How does exercise affect bone development during growth? *Sports Med.* 2006;36:561-569, 2006.

29. Watts, K., T. Jones, E. Davis and D. Green. Exercise training in obese children and adolescents. *Sports Med.* 35: 375-392, 2005.