

## **Strength Training for Youth**

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As a boy, I generally liked physical education classes. However, I was not fond of fitness testing day. Like 50 percent of all young people then and now, I could not chin myself and always felt embarrassed struggling to lift my bodyweight. It was always interesting to me that this all-out, gut-wrenching muscular effort was considered good, but that any form of weight training was considered bad.

That is, it was okay to try to lift my bodyweight (something that I could not do one time), but it was not okay to lift a 30-pound barbell (something that I could do 10 times). This did not make much sense, especially since proper training with the barbell could enable me to perform a few chin-ups.

Several years later when I became the physical education teacher at that same elementary school, we did things differently. I developed an after-school weight training program for the 5th and 6<sup>th</sup> graders, and these students progressively increased their muscular strength. We had no injuries, and very few program participants who failed the chin-up test.

This took place in the early 1970s, and the prevailing misunderstanding was that youth strength training was at worst dangerous, and at best worthless. Dangerous, because it was thought that lifting weights would damage bone growth plates. Useless, because it was thought that youthful muscles did not have the capacity to gain strength apart from normal growth processes. Both assumptions have proven false. According to the National Strength and Conditioning Association (1985) there are no documented reports of bone growth plate injury due to strength training. Competitive weight lifting, yes; but sensible strength training, no.

Several research studies (Servedio et al., 1985; Sewall & Micheli, 1986; Weltman et al., 1986) have demonstrated that boys and girls can gain muscle strength at about the same rate as adults. During the past three years, we have completed four youth strength training studies at the South Shore YMCA. All of the research programs were conducted by certified strength instructors over a two-month training period.

### **Study One**

The first study (Westcott, 1991) was conducted with young teenage boys and girls. The training group consisted of 14 exercisers (average age 14

years), and the control group consisted of 5 non-exercisers (average age 14 years). The exercise group trained 3 days a week for 8 weeks with the following machines: leg extension, leg curl, leg press, decline press, pulldown, incline press, low row, and pressdown. The participants performed one set of 8 to 12 repetitions with each exercise, using slow movement speed and full movement range.

Results showed that the exercise group increased their lower body strength by 63 percent and their upper body strength by 33 percent. By comparison, the non-exercise group improved their lower body strength by 8 percent and their upper body strength by 4 percent.

Both groups experienced a 3-pound increase in bodyweight over the 2-month study period.

The exercisers added 4 pounds of lean weight and lost 1 pound of fat weight, whereas the non-exercisers added 2 pounds of lean weight and 1 pound of fat weight. Although the control group added lean tissue through normal growth processes, they did not improve their functional muscle strength significantly. However, the exercise group added twice as much lean tissue and made significant improvements in their functional muscle strength.

It is noted that there were no injuries to any of the boys and girls who participated in this strength training program.

### **Study Two**

This study (Westcott, 1992) involved 10 preadolescent boys and girls, with an average age of 10 years. All of the participants trained 3 days a week for 8 weeks with the following machines: leg extension, leg curl, chest press, biceps curl, and shoulder press. They performed one set of 8 to 12 repetitions with each exercise, using slow movement speed and full movement range.

Results showed that the subjects increased their chest-triceps strength by 66 percent. They also made a 4-pound improvement in their body composition by adding 3 pounds of lean weight and losing 1 pound of fat weight.

It is noted that there were no injuries to any of the boys and girls who participated in this strength training program.

### **Study Three**

The largest study (Westcott, 1993) included 57 preadolescent boys and girls, with an average age of 11 years. All of the participants trained 3 days a week for 8 weeks with the following machines: leg press, compound row, bench press, torso-arm and rotary torso. They performed one set of 8 to 12 repetitions with each exercise, using slow movement speed and full movement range.

Results showed that these exercisers increased their chest-triceps strength by 55 percent. They experienced a 6.5-pound improvement in their body composition by adding 4 pounds of lean weight and losing 2.5 pounds of fat weight.

It is noted that there were no injuries to any of the boys and girls who participated in this strength training program.

### **Study Four**

The final study (Faigenbaum, Zaichkowsky, Westcott, Micheli, & Fehlandt, 1993) involved two groups of preadolescent boys and girls. The training group consisted of 14 exercisers (average age 11 years), and the control group consisted of 9 non-exercisers (average age 10 years). Unlike the previous studies, this exercise group trained only 2 days a week for 8 weeks with the following machines: leg extension, leg curl, chest press, biceps curl, and shoulder press. The participants performed 3 sets of 10 to 15 repetitions with each exercise, using slow movement speed and full movement range.

The results indicate that the exercise group increased their chest-triceps strength by 64 percent and their overall strength by 74 percent. Body composition changes were assessed by the sum of 7 skinfold measurements. The exercise subjects experienced a 2 percent decrease in their skinfold measurements, whereas the non-exercise subjects experienced a 2 percent increase in their skinfold measurements. That is, the exercisers improved their muscle strength and body composition significantly more than the non-exercisers.

It is noted that there were no injuries to any of the boys and girls who participated in this strength training program.

### **Discussion of Research Findings**

All four studies revealed significant strength improvements in 10- to 14-year-old boys and girls following 8 weeks of sensible strength training. It is

interesting that the strength gains for the chest-triceps muscles were similar for the groups training with 1 set per exercise, 3 days a week (Studies Two and Three) and for the group training with 3 sets per exercise, 2 days a week (Study Four). These findings indicate that youth strength training programs consisting of 1 to 3 sets of exercise, 2 to 3 days a week, are effective for increasing muscle strength in boys and girls. Likewise, all four studies showed body composition improvements in 10- to 14-year-old boys and girls following 8 weeks of sensible strength training. On the average, the young strength exercisers added 3 to 4 pounds of lean weight and lost 1 to 2.5 pounds of fat weight.

One of the most important outcomes of these four studies involving almost 100 boys and girls was the absence of any exercise-related injuries. It is therefore suggested that well designed and well supervised strength training programs are a safe and productive means for improving muscle strength and body composition in teen and pre-teen boys and girls.

### **Youth Strength Training Program Design**

Generally speaking, the basic strength training principles, as recommended by the American College of Sports Medicine, are the same for youth and adults. However, special care must be given to training technique and exercise control when working with young people. Proper instruction and careful supervision are the keys to successful youth strength training programs.

### **Program Recommendations**

Realizing the importance of strength exercise for desirable musculoskeletal development in youth, the following medical and professional organizations met in August 1985 to develop sensible strength training guidelines for preadolescent boys and girls.

#### Equipment

1. Strength training equipment should be of appropriate design to accommodate the size and degree of maturity of the prepubescent.
2. It should be cost-effective.
3. It should be located in an uncrowded area free of obstruction with adequate lighting and ventilation.

## **Program Considerations**

1. A preparticipation physical exam is mandatory.
2. The child must have the emotional maturity to accept coaching and instruction.
3. There must be adequate supervision by coaches who are knowledgeable about strength training and the special problems of prepubescents.
4. Strength training should be a part of an overall comprehensive program designed to increase motor skills and level of fitness.
5. Strength training should be preceded by a warm-up period and followed by a cool down.
6. Emphasis should be on dynamic concentric contractions.
7. All exercises should be carried through a full range of motion.
8. Competition is prohibited.
9. No maximum lift should ever be attempted.

## **Prescribed Program**

1. Training is recommended two or three times a week for twenty to thirty-minute periods.
2. No resistance should be applied until proper form is demonstrated. Six to fifteen repetitions equal one set; one to three sets per exercise should be done.
3. Weight or resistance is increased in one to three-pound increments after the prepubescent does fifteen repetitions in good form.

## **Summary**

Research clearly indicates that boys and girls can safely improve their muscle strength and body composition through a basic and brief program of strength exercise. In one study (Westcott, 1993),

57 preadolescents performed 5 exercises, 1 set, 8 to 12 repetitions, 3 days a week, with slow movement speed and full movement range. After 8 weeks of training, the participants increased their muscle strength by 55 percent and improved their body composition by 2 percent (4 pounds more lean weight and 2.5 pounds less fat weight).

Although the long-term benefits of youth strength training have not yet been documented, it is logical to assume that leaner and stronger youth may become leaner and stronger adults.

Developing a strong musculoskeletal system during the formative years may also reduce the risk of injuries and degenerative diseases during the adult years.

The medically based guidelines for youth strength training programs emphasize an uncrowded facility, appropriate equipment, physician clearance, qualified instructors, brief exercise periods, gradual progression, no competition, and no maximum lifts. When appropriate training guidelines are observed, strength exercise is a recommended physical activity for teen and pre-teen boys and girls.

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