Growth cartilage in children is located at the epiphyseal plate, the joint surface, and the apophyseal insertions. Damage to the growth cartilage may impair the growth and development of the affected bone.
Preadolescent boys and girls can significantly improve their strength with resistance training. Neurological factors, as opposed to hypertrophic factors, are primarily responsible for these gains.
Preventing Youth Overuse Injuries

- Prior to participation, young athletes should be evaluated by a sports medicine physician.
- Parents should be educated about the benefits and risks of competitive sports.
- Children should participate in a year-round conditioning program.
- Nutritional status of young athletes should be monitored.
- Youth sport coaches should participate in educational programs.
- Children should be encouraged to participate in a variety of sports and activities.

Potential Risks of Youth Resistance Training

- Potential for injury to the epiphyseal plate
- Risk for repetitive-use soft-tissue injuries

Youth Resistance Training Guidelines

- The child should understand the benefits and risks associated with resistance training.
- Competent and caring fitness professionals should supervise training sessions.
- The exercise environment should be safe and free of hazards with equipment properly sized.
- Warm-up and stretching exercises should be performed before resistance training.
- Carefully monitor each child’s tolerance to the exercise stress.
- Begin with light loads.
- Increase the resistance gradually (e.g., 5% to 10%) as strength improves.

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Youth Resistance Training Guidelines
(continued)

- One to three sets of 6 to 15 repetitions can be performed.
- Advanced multi-joint exercises may be incorporated, provided that appropriate loads are used and the focus remains on proper form.
- Two to three nonconsecutive training sessions per week are recommended.
- When necessary, adult spotters should be nearby.
- The program should be systematically varied throughout the year.
- Children should be encouraged to drink plenty of water before, during, and after exercise.

In terms of absolute strength, women are generally weaker than men because of their lower quantity of muscle. When compared relative to muscle cross-sectional area, no differences in strength exist between the genders, which indicates that muscle quality is not gender specific.

Program Design Considerations for Women

- Development of the upper body is important for female athletes who play sports that require upper-body strength and power.
- The incidence of knee injuries in female athletes, particularly in sports such as soccer and basketball, is increasing.
Injury Prevention Strategies for Female Athletes

- Athletes should begin with a preparticipation screening by a sports medicine physician.
- Athletes should participate in a year-round conditioning program.
- Every exercise session should be preceded by a warm-up.
- Athletes should wear appropriate clothing and footwear.
- Athletes should be encouraged to maximize athletic potential by optimizing dietary intake.

Advancing age is associated with a loss of muscle mass, which is due to physical inactivity and the selective loss of Type II (fast-twitch) muscle fibers. A direct result of the reduction in muscle mass is a loss of muscle strength and power.

Though aging is associated with a number of undesirable changes in body composition, older men and women maintain their ability to make significant improvements in strength and functional ability. Both aerobic and resistance exercise are beneficial for older adults, but only resistance training can increase muscle strength and muscle mass.
Program Design Considerations for Older Adults

- Preexisting medical ailments: Many seniors have at least one chronic health problem.
- Exercise progression: Many seniors need to start at a very low level.
- Nutritional status: The quantity and quality of a person’s food intake may mean the difference between losing or gaining muscle mass.

Safety Recommendations for Senior Resistance Training

- Prescreen all participants, as many older people suffer from a variety of medical conditions.
- Seniors should warm up for 5 to 10 minutes before each exercise session.
- Seniors should use a resistance that does not overtax the musculoskeletal system.
- Seniors should avoid performing the Valsalva maneuver.
- Allow 48 to 72 hours of recovery between exercise sessions.
- Seniors should perform all exercises within a ROM that is pain free.
- Trained instructors should supervise exercise sessions.