

# A Comparative Study of Weight Training and Power Lifting in School Children below 19 Years

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## ABSTRACT

Strength training in children, in combination with plyometric and/or agility training, has become an increasingly popular tactic for school children below 19 years to gain a competitive edge in weight training and power lifting during the off-season. Children can improve strength by 30% to 50% after just 8 to 12 weeks of a well-designed strength training program. Youth need to continue to train at least 2 times per week to maintain strength. The case reports of injuries related to strength training, including epiphyseal plate fractures and lower back injuries, are primarily attributed to the misuse of equipment, inappropriate weight, improper technique, or lack of qualified adult supervision. Children who establish regular exercise habits will ideally continue them into adulthood.

**KEYWORDS:** strength, children, weight training, power lifting, school, exercise, supervision

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## INTRODUCTION

Proper weight training and power lifting programs in school for children below 19 age with good supervision, creates a plethora of associated benefits including increased strength, lower rates of sports-related injury, increased bone strength index (BSI), decreased risk of fracture and improved self-esteem and interest in fitness. There are risks involved with improper or poor training programs. Proper training programs involve knowledgeable trainers, effective supervision and tailored weight training is essential. [1,2]

Physical activity has proved to be an effective means of preventing several diseases and improving general health. In most cases, though, light to moderate efforts are suggested, for both youngsters and adults. Common sense advices call for late inception of intense, strength training-related activities, like weight lifting and plyometrics, which are usually postponed at the end of the growth age, even among sport practitioners. However, such advices seem to have a mainly anecdotal nature. The purpose of this

review is to evaluate risks and benefits of early inception of strength training, at adolescence or even earlier, and to verify whether concerns can be grounded scientifically. At the same time, several studies provide consistent findings supporting the benefits of repeated, intense physical efforts in young subjects. Improved motor skills and body composition, in terms of increased fat free mass, reduced fat mass and enhanced bone health, have been extensively documented, especially if sport practice began early, when the subjects were pubescent. It can be therefore concluded that strength training is a relatively safe and healthy practice for children and adolescents.

In addition to the obvious goal of getting stronger, strength-training programs may be undertaken to try to improve sports performance and prevent injuries, rehabilitate injuries, and/or enhance long-term health. Similar to other physical activity, strength training has been shown to have a beneficial effect on several measurable health indices, such as cardiovascular

fitness, body composition, bone mineral density, blood lipid profiles, and mental health. Appropriately supervised programs emphasizing strengthening of the core (focusing on the trunk muscles, eg, the abdominal, low back, and gluteal muscles) are also appropriate for children and theoretically benefit sports-specific skill acquisition and postural control. Unfortunately, gains in strength, muscle size, or power are lost ~6 weeks after resistance training is discontinued.[3,4]

The data from the National Electronic Injury Surveillance System neither specify the cause of injury nor separate recreational from competitive injuries that result from lifting weights. Muscle strains account for 40% to 70% of all strength-training injuries, with the hand, low back, and upper trunk being commonly injured areas. Specific anthracyclines that have been associated with acute congestive heart failure include doxorubicin, daunomycin/daunorubicin, idarubicin, and possibly mitoxantrone. Youth with other forms of cardiomyopathy (particularly hypertrophic cardiomyopathy), who are at risk for worsening ventricular hypertrophy and restrictive cardiomyopathy or hemodynamic decompensation secondary to an acute increase in pulmonary hypertension, should be counseled against weight training. Individuals with moderate to severe pulmonary hypertension also should refrain from strenuous weight training, because they are at risk for acute decompensation with a sudden change in hemodynamics[5,6]

If your child is interested in starting a weightlifting program, there are many things to keep in mind, including the following. Conquering the heavier weights does not happen overnight. When you're young, it's important to take it slow and build up gradually.

This means starting with lighter weights and higher reps and focusing on the execution of the movement rather than on the number on the dumbbell.

Children should not be lifting weights with the goal of drastically increasing muscle size, DC, CSCS, CCSP. In fact, the majority of the benefit that a child will get from weightlifting will be neuromuscular.

“When a child is able to lift heavier weight due to strength training it is usually due to increased muscular performance rather than an increase in the size of muscle,” Training programs need to be designed with this in mind. Determining when a child or teen is ready to start a weightlifting program should be performed on an individualized basis, not just by age.[7,8]

“Safety with weightlifting is all about maturity and proper supervision. If your adolescent or teen is interested in participating in a strength training program, make sure they are supervised by a certified personal trainer, coach, or educator who has training in how to design a weightlifting program for kids.

If you have any concerns about your child's participation in a weightlifting program, talk with their pediatrician or doctor before they start lifting weights.[9,10]

## Discussion

While there are many complex causes behind the current decline in children's mental and physical well-being, resistance training is one of the most potent tools we have available for fighting the obesity epidemic.

Strength training is has been consistently proven to support everything from general growth and development, improve bone mineral density and better heart function, body composition, and slashing the risk of preventable lifestyle diseases.

And if you thought weight lifting isn't suitable for children, you may want to reconsider.

There are a tonne of reasons that, with the right know-how and application, you can make resistance training safe, effective and fun for your kids, at any age.[11,12]

Strength training may also help you at age below 19 by these facts:

- **Develop strong bones.** By stressing your bones, strength training can increase bone density and reduce the risk of osteoporosis.
- **Manage your weight.** Strength training can help you manage or lose weight, and it can increase your metabolism to help you burn more calories.
- **Enhance your quality of life.** Strength training may enhance your quality of life and improve your ability to do everyday activities. Strength training can also protect your joints from injury. Building muscle also can contribute to better balance and may reduce your risk of falls. This can help you maintain independence as you age.
- **Manage chronic conditions.** Strength training can reduce the signs and symptoms of many chronic conditions, such as arthritis, back pain, obesity, heart disease, depression and diabetes.
- **Sharpen your thinking skills.** Some research suggests that regular strength training and aerobic exercise may help improve thinking and learning skills[13]

Strength training can be also be done at home or in the gym for school children below 19 age by a correct supervisor. Common choices may include:

- **Body weight.** You can do many exercises with little or no equipment. Try pushups, pull ups, planks, lunges and squats.
- **Resistance tubing.** Resistance tubing is inexpensive, lightweight tubing that provides resistance when stretched. You can choose from many types of resistance tubes in nearly any sporting goods store or online.
- **Free weights.** Barbells and dumbbells are classic strength training tools. If you don't have weights at home, you can use soup cans. Other options can include using medicine balls or kettle bells.
- **Weight machines.** Most fitness centers offer various resistance machines. You can invest in weight machines for use at home, too.[14]
- **Cable suspension training.** Cable suspension training is another option to try. In cable suspension training, you suspend part of your body — such as your legs — while doing body weight training such as pushups or planks.

## Results

There is potential for serious injury during strength training, necessitating the need for competent and qualified supervision of age-specific and developmentally appropriate training programs. Strength training done with knowledgeable instruction and adequate supervision is safe for children and adolescents. Youth strength training programs are to be supervised by health/fitness professionals who have adequate education and experience to apply scientific knowledge and principles to the development and progression of a training program. The health/fitness professional should:

Clearly explain, demonstrate, and enforce exercise technique, use of equipment, weight room etiquette, training guidelines, and safety

Be able to work with individual participants to change the program as needed to meet individual needs and progression.

Be able to incorporate exercises that use rubber tubing, medicine balls, and the participant's body weight as resistance into the strength training program.

Have the skills and ability to organize a variety of activities and games that are fun for this age group, provide variety, increase compliance and adherence, and complement the overall objectives of the strength and conditioning program.[15,16]

Strength training typically produces lactate in the muscles, which is a limiting factor of exercise performance. Regular endurance exercise leads to adaptations in skeletal muscle which can prevent lactate levels from rising during strength training.

For many sports and physical activities, strength training is central or is used as part of their training regimen. A scientific review indicates that, based on mostly observational studies, strength training appears to be associated with a "10–17% lower risk of all-cause mortality, cardiovascular disease (CVD), total cancer, diabetes and lung cancer". Two key outcomes of strength training are muscle hypertrophy and muscular strength gain which are associated with reduced all-cause mortality.[17]

Strength training causes endocrine responses that could have positive effects. It also reduces blood pressure (SBP and DBP) and alters body composition, reducing body fat percentage, body fat mass and visceral fat, which is usually beneficial as obesity predisposes towards several chronic diseases and e.g. body fat distribution is one predictor of insulin resistance and related complications. Strength training also leads to various beneficial neurobiological effects – likely including functional brain changes, lower white matter atrophy, neuroplasticity (including some degree of BDNF expression), improvements of mental health and white matter-related structural and functional changes in neuroanatomy. Moreover, it also promotes decreases in total cholesterol (TC), triglycerides (TG), low-density lipoprotein (LDL), and C-reactive protein (CRP) as well as increases in high-density lipoprotein (HDL) and adiponectin concentrations.

Circuit weight training is a form of exercise that uses a number of weight training exercise sets separated by short intervals. The cardiovascular effort to recover from each set serves a function similar to an aerobic exercise, but this is not the same as saying that a weight training set is itself an aerobic process.[18]

Strength training is typically associated with the production of lactate, which is a limiting factor of exercise performance. Regular endurance exercise leads to adaptations in skeletal muscle which can prevent lactate levels from rising during strength training. This is mediated via activation of PGC-1alpha which alter the LDH (lactate dehydrogenase) isoenzyme complex composition and decreases the activity of the lactate generating enzyme LDHA, while increasing the activity of the lactate metabolizing enzyme LDHB.

A drop set is an easy method of strength training where you perform a set of any exercise to failure or

right before failure, and then reduce the weight and continue to lift for more repetitions with the decreased weight. Pyramid sets are weight training sets in which the progression is from lighter weights with a greater number of repetitions in the first set, to heavier weights with fewer repetitions in subsequent sets.

A reverse pyramid is the opposite in which the heavier weights are used at the beginning and progressively lightened.[19]

Burnouts combine pyramids and drop sets, working up to higher weights with low reps and then back down to lower weights and high reps. There are a few different ways one could perform burnout sets but the main idea is to perform an exercise until failure. You should start with a weight that is 75% of the amount of the maximum amount of weight you can lift for 1 rep. Once you've performed the exercise to exhaustion, reduce the weight and perform another set until failure, which will usually consist of much fewer repetitions. Burnout sets sound very similar to supersets but there are differences in the results they produce. Supersets help increase muscle mass, but are more efficient for producing muscle definition and shape. Burnout sets help increase muscle growth because of the buildup of lactic acid in the muscle when it's forced to the point of failure.

Weight stripping is a technique used after failure with a normal resistance in certain exercises, particularly with easily adjustable machines, whereby the weight trainer or a partner gradually reduces the resistance after a full set is taken to failure. With each reduction in resistance, as many possible reps are completed and the resistance is then reduced again. This is continued until the resistance is approximately half the original resistance.[20]

### Conclusions

Orthopaedic specialists used to recommend that children avoid weight training because the growth plates on their bones might be at risk. The very rare reports of growth plate fractures in children who trained with weights occurred as a result of inadequate supervision, improper form or excess weight, and there have been no reports of injuries to growth plates in youth training programs that followed established guidelines. The position of the National Strength and Conditioning Association is that strength training is safe for children if properly designed and supervised. There is no link between any prolonged health risks and strength training in pre-adolescence, adolescence or teenagers, if the procedures of strength training are followed correctly and under suitable supervision. Strength training for school children below 19 age should focus on skills

and techniques. Children should only work on strengthening all the big muscle groups, using free weight and body weight movements with relatively light loads. The benefits of these practices include increased strength performance, injury prevention and learning good training principles[21]

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