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STRENGTH TRAINING IN JUNIOR HIGH ATHLETES

The issue of strength training in prepubescent youth (**children be/ow the ages of 12-15**) has been debated for most of the twentieth century. Three issues have been at the heart of this debate: **1) Does strength training place undue stress on the musculoskeletal systems of young athletes?**, **2) Can prepubescent youth make significant strength gains through strength training?**, and, **3) How should strength training programs for youth be designed to maximize possible benefits and minimize the risk of injury?**

Many people confuse strength training with weight lifting and power lifting. *Weight lifting* is a competitive sport in which the lifter tries to lift as much weight as possible during one exercise. *Power lifting* is a competitive sport in which the lifter tries to lift as much weight as possible in one repetition. **Strength training involves lifting weights, and using other resistance methods, to improve athletic performance and reduce the risk of injury.**

RISK OF INJURY

The risk of injury from participation in strength training can be minimized through proper adult supervision and by teaching youth to use proper lifting techniques. Straining a muscle, hyper extending the back, or dropping a weight on one's foot are examples of injuries that can occur to anyone in a weight room. Due to being physically immature, youth also risk possible injury to growth cartilage in their joints and growth plates. While injury to growth cartilage is serious, it is also very rare. **Studies have demonstrated that high injury rates among prepubescent junior high school aged youth involved in strength training have at least one of the following training errors in common: 1) Lack of proper technique to do the lift. 2) Lack of proper supervision by someone who understood the principles of weight training in prepubescent athletes. 3) Lifting the weight over the head. 4) Lifting near maximal weight loads. 5) Involvement in competitive weight lifting. When properly organized and supervised, prepubescent strength training is a very safe activity.**

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STRENGTH GAINS

Scientific studies indicate properly performed strength training improves muscle strength and endurance, strengthens connective tissue, and enhances motor skills in prepubescent youth. These benefits reduce the risk of injury during sports participation and improve performance.

Strength training programs improve muscle strength and endurance, strengthen connective tissue, and enhance motor skills in prepubescent youth.

Since every child grows and matures at an individual rate, **there is no minimal age recommended for involvement in strength training.** Rather, **several factors should be considered before allowing children to become involved.** Those factors are: **a)** Is the child mature enough to accept and follow instructions?, **b)** Does the child want to participate in a strength training program?, and, **c)** Does the child have the basic motor skills to safely perform the various exercises?

It is important that strength training supervisors teach youth to relate to appropriate references. Adult references are inappropriate for youth. *Individual progress and self-improvement must be the principles that are taught and rewarded in prepubescent strength training programs.* Large, bulky muscles and "He-man" physiques are not going to be a reality for junior high students involved in strength training.

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DESIGN OF THE STRENGTH TRAINING PROGRAM

The following are widely accepted recommendations regarding prepubescent strength training programs.

EQUIPMENT RECOMMENDATIONS

1. **Strength training equipment should be of appropriate design** to accommodate the size and maturity level of the prepubescent athlete.
2. The **equipment should be cost effective.**
3. The **equipment should be safe, free from defects, and inspected frequently.**
4. The **equipment should be located in an uncrowded area free of obstructions with adequate lighting and ventilation.**

PROGRAM RECOMMENDATIONS

1. A **pre-participation physical should be mandatory.**
2. The **child must have the emotional maturity to accept coaching and instruction.**
3. There must be **adequate supervision by adults who are knowledgeable** about strength training for prepubescent youth.
4. **Strength training should be part of an overall comprehensive fitness program** which involves a variety of sport and fitness activities designed to increase motor skills and fitness levels.

5. Strength training should be **preceded by a 5-10 minute warm up period and followed by a 5-10 minute cool down.**
6. The strength training program should be **limited to two or three, 30-40 minutes sessions a week, including warm up and cool down.**
7. **Every child must be taught and use proper lifting technique.**
8. **Develop proper technique using very low resistance, then increase intensity.**
9. **Progress slowly by increasing repetitions first, then adding resistance.**
10. **All exercises should be performed through a full range of motion.**
11. **No maximum lifts should ever be attempted!**
12. **Competition should be prohibited!**

Maximum lifts and competition should never be allowed in prepubescent strength training programs!

EXERCISE SELECTION

Train each major muscle group to ensure balanced muscle development. **For a balanced workout that builds functional strength, perform multi-joint exercises and also alternate muscle groups.** The following are suggested exercises and the primary muscles they strengthen. 1) leg press (quadriceps, gluteals, calf and leg curl (hamstrings & gluteals), 2) bench press (chest & shoulders) and seated row (back & shoulders), 3) military press (triceps, shoulders, & upper back) and let pull down (shoulders & upper back), 4) press down (triceps, chest, & shoulder) and biceps curl (biceps & forearm), and, 5) back extensions (spinal erectors) and abdominal curls (abdominals).

Calisthenics (such as push-ups, pull-ups, sit-ups, and bench dips) and rubber exercise tubes or bands can also used as resistance to build strength.

EXERCISE FREQUENCY

A regular training schedule is necessary to improve strength. **Three nonconsecutive workouts per week or two equally spaced training sessions per week are effective.** If an athlete seems tired lifting three times per week reduce the number of workouts to two per week. Remember, this is supposed to be fun!

EXERCISE DURATION

A junior high strength training program should be completed in 30 - 40 minutes; including warm up and cool down. Sixty seconds to ninety seconds of muscle stimulus per exercise (that which is produced by 8 to 12 properly performed repetitions) is sufficient for developing strength in youth. **Prepubescent youth involved in strength training should do 1 set of 8 to 12 repetitions for each major muscle group.**

EXERCISE INTENSITY

Never allow young students to use a weight they cannot lift at least eight times in succession while using good technique.

The recommended training intensity is 70% to 80% of the "perceived" maximum resistance. To reach this intensity, **use a weight that can be lifted at least eight times, but no more than twelve times.** If less than 8 repetitions can be completed, the resistance is too high, and can increase the likelihood of injury. If more than 12 repetitions can be completed, the resistance is too low, and the likelihood of strength gains decreases. During the first 24 weeks of any training program some muscle soreness will probably occur the following day. **After a few weeks of strength training, extreme muscle soreness and stiffness should not occur. Any soreness that limits ones activity or range of motion the day after performing strength training is extreme and indicates too high of a training intensity.** If extreme muscle soreness occurs, the intensity should be reduced at the next workout. ***Never allow young students to use a weight they cannot lift at least eight times in succession while using good technique.***

EXERCISE SPEED

All strength training exercises should be performed in a slow, controlled manner using proper technique. This will increase muscle force production and decrease potential for injury. Lifting the resistance should take approximately 2 seconds, while lowering it should take approximately 4 seconds. There should be a momentary pause in the fully-contracted position. This gives the target muscle group an excellent strength stimulus and gives the opposing muscle group an excellent stretch. **Slow, controlled strength training will greatly reduce the risk of injury.**

EXERCISE RANGE

Each repetition should go through the full range of joint movement. Moving the joints through a full range of motion not only produces strength throughout the entire range of motion, but also helps enhance flexibility.

EXERCISE PROGRESSION

Gradual increases in training resistance are essential for developing strength safely. When 12 repetitions can be completed in good form, approximately 2-3 pounds more resistance should be added. This represents a double progressive system in which **repetitions are increased first, then resistance is increased.** A program with emphasis on progressing slowly will result in greater muscle and tendon strength gains and less muscle soreness. Progressing too quickly will result in extreme muscle soreness. If this occurs, reduce the repetitions or resistance.

EXERCISE CONTINUITY

A 60 - 90 second rest period between exercises should be adequate for most students, and still allow for increased heart rate and calorie utilization. If an athlete is working with a partner and alternating exercises he or she should receive adequate rest between sets.

In summary, research indicates that prepubescent youth participating in strength training can strengthen connective tissue, enhance motor skills, improve muscle strength and endurance, and reduce the risk of injury. After having a physician's medical clearance, strength training programs that are well supervised, and emphasize careful instruction and technique, pose little risk of injury.

The key components of a strength training program for junior high students are: 1) selecting exercises for all major muscle groups, 2) utilizing 2 to 3, 30 40 minute, strength training sessions per week, 3) using 1 set of 8 -12 repetitions per muscle group, 4) training at 70% to 80% of the "perceived" maximum resistance, 5) training in a slow, controlled manner, 6) using a full range of motion, 7) gradually increasing the repetitions, then the resistance, and 8) taking 60-90 second breaks between exercises.

Questions and comments about strength training in prepubescent athletes or any other areas of student wellness are welcomed and encouraged. They should be directed to Alan Beste, Wellness Coordinator at the Iowa High School Athletic Association, Po Box 10, Boone, IA 50036. (515) 432-2011

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STRENGTH TRAINING FOR CHILDREN, A REVIEW OF RESEARCH LITERATURE

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Two of the most frequently asked questions about children and strength training are; *"Is it safe for kids to lift weights?"* and *"At what age can kids start lifting weights?"* The sad truth is, many doubts surround the safety and validity of weight training for children. Many would even have you believe that kids have no place at all in the weight room. Despite this conservatism, exercise physiologists and the American Academy of Pediatrics both support the implementation of strength and resistance training programs for young children.

Is it safe for kids to lift weights?

The answer from today's top research authorities is a resounding "yes." Studies show that **a moderate intensity strength training program can help increase strength, decrease the risks of injury while playing sports**, and increase bone density in children. Exercise physiologists aren't the only ones recommending resistance training. The American Academy of Pediatrics has also put forth a pro-strength training for children statement. **The American Academy of Pediatrics position on strength training supports the implementation of strength and resistance training programs, even for prepubescent children, that are monitored by well-trained adults and take into account the child's maturation level. The only limitation the AAP suggests is to avoid repetitive maximal lifts (lifts that are one repetition maximum lifts or are within 2-3 repetitions of a one repetition maximum lift) until they have reached Tanner Stage 5 of developmental maturity.** Tanner Stage 5 is the level in which visible secondary sex characteristics have been developed. Usually, in this stage, adolescents will also have passed their period of maximal velocity of height growth. **The AAP's concern that children wait until this stage to perform maximal lifts is that the epiphyses, commonly called "growth plates," are still very vulnerable to injury before this developmental stage.** It is repeated injury to these growth plates that may hinder growth. For this same reason, two of the leading researchers in the field of youth fitness, Fleck and Kraemer, agree that maximal lifts should be avoided. (2) However, Fleck, Kraemer and the AAP agree that a strength training program that doesn't include maximal lifting is beneficial for prepubescent and pubescent youth. In fact, a strength and resistance training program should be required in certain instances. Let's take a moment to review some of the research:

"If appropriate training guidelines are followed, regular participation in a youth

strength-training program has the potential to increase bone mineral density, improve motor performance skills, enhance sports performance, and better prepare young athletes for the demands of practice and competition." (3)

A study of young male power lifters found that high-intensity resistance training is effective in increasing lumbar spine and whole body bone mineral density. (7)

Resistance training enhances strength and muscular endurance in youth and children. (6) In prepubescent children, this increase in strength appears to be the result of neuromuscular activation and coordination supporting evidence that androgens (the hormones largely responsible for increased strength and muscle mass) are not needed for strength gain. (4)

With proper supervision, children and youth who participate in a strength training program are not at an increased risk for injury compared to children and youth who do not participate in such a program. (4)

These few examples also make a strong statement that a strength and conditioning program reduces the possibility of injuries in children by increasing bone mass. In fact, proper resistance training is incredibly effective at stimulating growth and development, not a hindrance to it! (2)

Young Females and Strength Training

Strength training is particularly important for young girls, as females are at an increased risk for osteoporosis, a degenerative bone disease. There have been several studies that suggest other forms of training, such as plyometric jump training and high impact aerobics, can also increase bone mass in young, even when begun prior to puberty. Greater gains in bone mass can be made in premenarchal girls than in those who have already started menstruating. (5)

At what age can kids start lifting weights?

Neither the AAP nor exercise physiologists have a minimum age set for a child to begin a resistance training program. Research has been done on moderate weight training programs with children as young as eight years. However, **researchers also recognize the use of calisthenic-type exercises such as push-ups and sit-ups that are commonly used in elementary school physical education classes. Body-weight resistance exercises are a good starting point for most children under the age of 8, or those at any age, who are just starting a strength training program.** (2) The object of this type of program is to introduce

the body to the stresses of training and to teach basic technique. Fleck and Kraemer recommend a training scheme of 10-15 repetitions and 1-3 sets per muscle group. The weight should be one that the child can lift for 10-15 repetitions without going to muscular failure.

Once a base has been established, the amount of exercises and the weight lifted can be increased. **When a child has reached puberty (around age 13 for girls and 15 for boys) and a training foundation has been established, a more advanced periodized routine can be incorporated.**

Tips for Supervising a Youth Strength and Resistance Training Program

Safety should always come first when training a youth or child. Before you begin training anyone under the age of 18, be sure to **have written parental and medical permission to do so. Make sure the equipment you will be using is free from defects.** It is vitally **important that young clients are adequately hydrated and sufficiently warmed-up before beginning a training session.** A few other important guidelines to follow are: 1) **youth and children should always be under the direct supervision of a competent trainer or coach when weight training,** 2) **first establish the concept of a training program that emphasizes technique and form, not amount of weight used,** 3) **teach positive lifestyle habits,** 4) **allow only gradual increases in volume and intensity,** 5) **after background knowledge of training has been established and basic technique has been mastered employ a wide variety of exercises and training styles,** 6) **to keep motivation levels high encourage participation in a wide variety of sports and activities.**

Following these basic guidelines will help develop safe and effective for young children and adolescents. Of course, there are many other aspects of training children that cannot be overlooked, but are beyond the scope of this article. The ISSA's Youth Fitness Trainer Course covers topics such as assessing a child's maturity level, nutrition, and developing a basic strength training program. For more information, call the ISSA at 1-800-892-4772 or visit <http://www.FitnessEducation.com>

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