Safe Weight Training in Young Athletes

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APPLICATION TECHNIQUE
Objectives

- Benefits of Resistance Training
- Myths/mistruths of youth resistance training
- Maturational Physiology
- Steps to Set Up SAFE Resistance Training Program
Why The Fuss?

Childhood obesity has more than doubled in children and more than quadrupled in adolescents.

The percentage of obese children 6-11 increased from 7% in 1980 to 18% in 2012. The percentage of adolescents in the same time period increased from 5% to 21%.

In 2012, more than one-third of children and adolescents were considered overweight or obese.

The Vicious Cycle Of Childhood Obesity

Healthy Child

Obese Adult
- Coronary Artery Disease
- Diabetes
- Pulmonary disease
- High medical bills
- Mortality

Television
- Video Games

High Fat Foods

Mildly Obese Child

Severely Obese Child

Moderately Obese Child

Extra 20-50 Lbs.
- Exercise uncomfortable & painful

Other kids make fun of me

I'm too fat to climb stairs

I'm no good at sports.

Extra 10 Lbs.
Inhibits Movement
Psychosocial
- Poor self esteem
- Depression
- Quality of life

Neurological
- Pseudotumor cerebri
- Risk for stroke

Cardiovascular
- Dyslipidemia
- Hypertension
- Left ventricular hypertrophy
- Chronic inflammation
- Endothelial dysfunction
- Risk of coronary disease

Renal
- Glomerulosclerosis
- Proteinuria

Endocrine
- Type 2 diabetes
- Precocious puberty
- Polycystic ovary syndrome (girls)
- Hypogonadism (boys)

Gastrointestinal
- Paniculitis
- Steatohepatitis
- Liver fibrosis
- Gallstones
- Risk for cirrhosis
- Risk for colon cancer

Musculoskeletal
- Forearm fracture
- Blount's disease
- Slipped capital femoral epiphysis
- Flat feet
- Risk for degenerative joint disease

DVT/PE
- Stress incontinence
- Risk of GYN malignancy
Further Obesity Risks...

- More than twice likely to develop injuries in sports/physical activities (due to poor maintenance of postural stability)

- Obese children demonstrate lower motor coordination (due to lower physical activity)

Obese Children
Because their parents don't love them.
Common Training Myths

- Children are too young to resistance train.
- Children will bulk up too much.
- Resistance training results in growth plate injuries/stature arrest.
- Resistance training is unsafe in children.
Benefits of Resistance Training in Youth

- Improved strength and coordination
- Increased muscle endurance
- Improved sport performance
- Increased bone density/strength
- Improved self-image/self-confidence
- Reduced risk for injury
- Decreased obesity/metabolic effects
Age and Training

- No set age restriction

- **Youth must be physically and emotionally mature**

- Can start as early as 5-7 yrs

- Must recognize difference between **chronologic age** and **biologic age**

- Can be an up to 5 yr +/- biologic age discrepancy between chronologically same youths

- Must consider **training age** as well

- No experience vs. technical proficiency
Effects of Growth and Maturation on Muscular Strength During Childhood

- Strength gains are linear in boys and girls until puberty.
- Factors leading to childhood strength increases related to maturation of the nervous system:
  - Motor unit recruitment
  - Motor unit firing frequency/synchronization
  - Neural myelination
- Occurs ages 6-11 (girls reach peak adaptability 2 yrs younger than boys)
Strength and Bulking

- Don’t bulk in traditional sense

- Strength increases result of frequency and efficiency in neural activation of muscle units in children

- Focus of resistance training should be related to goals relating to enhancing strength, function, and control

- Quality not quantity

- Independent of sex

- Leads to 13-30% in strength over 8 week period

- Poorly understood

- Further testing unethical

Effects of Growth/Maturation during Adolescence/Puberty

- Strength gains tend to increase in non-linear fashion in male pubertal adolescents, while females continue to progress linearly.

- Factors for male increase:
  - further neural maturation/development
  - increases cross-sectional muscle area, motor unit recruitment/muscle fiber size
  - from incremental hormonal releases including testosterone, insulin-like growth factor, human growth hormone
Training and Growth Plate Injury: Physiology

Endochondral bone formation and ossification

Mesenchymal cells --> resting zone chondrocytes --> proliferation --> hypertrophy --> differentiation --> apoptosis --> blood vessel invasion --> mineralization/ossification
Training and Growth Plate Injury

- YES and NO

- Always potential for growth plate injury if proper form/weight/supervision is not observed
  - improper technique/unsupervised lifting/poorly chosen training loads

- Physis is 3-5x weaker than surrounding tissue; also less resistant to shearing/tension/compression forces usually from direct trauma or severe twisting

- Most cases of injuries have occurred at distal radius; also lumbar ring apophysis (dead lifts/power clings)

- Case study of 13 yo suffering from b/l epiphyseal separation of distal radius after attempting 30kg (66 lbs) overhead press with barbell
  - was unsupervised in makeshift home gym alone

Faigenbaum, A D, Myer G D. Resistance Training Among Young Athletes; safety, efficacy, and injury prevention effects. BJSM, 2010;44;59.
Training and Growth Plate Injury

“Injury to the growth cartilage has not been reported in ANY prospective youth training study that provided professional instruction and guidance.”

Also no evidence that resistance training will negatively impact growth in height during childhood/adolescence.

Growth plate injury is greater when there is jumping/landing activities during competition.

Induction of ground forces up to 5-7x child’s body mass.

In essence: greater chance suffering growth plate injury during competitive play than with proper supervised weighted training.

Faigenbaum, A D, Myer G D. Resistance Training Among Young Athletes; safety, efficacy, and injury prevention effects. BJSM, 2010;44;59.
Positive Effects on Growing Skeleton

Studies show that mechanical stress placed on developing skeleton is beneficial for bone formation and growth\(^1\)

Childhood and adolescence are key developmental periods increasing bone-mineral density, and that failure to participate in rigorous exercise can lead to long-term bone-health implications\(^2\)

Safety In Resistance Training

Always some inherent risk to MS, but no worse than other popular youth sports

Zariczyi & colleagues: ¹

- evaluated 1,516 injuries over 1 yr period in school-aged youth
- Football: 28%
- Wrestling: 16%
- Gymnastics: 13%
- Resistance Training: 0.7%

1. Faigenbaum, A D, Myer G D. Resistance Training Among Young Athletes; safety, efficacy, and injury prevention effects. BJSM, 2010;44;59.

60. Brady T, Cahill B, Bodnar L.
Safety and Training

- Age/Biologic Maturity
- Body Size
- Poor coaching/education
- Underlying poor fitness/conditioning
- Previous Injury
- Improper Equipment
- Inadequate Nutrition
- Hazardous conditions
- Poor lifting/training techniques
Prevention is KEY...

“Most important factor is having QUALIFIED SUPERVISION/PROFESSIONALS who are knowledgeable of the psychological, physiological and psychosocial uniqueness of each child/adolescent”.

Most injuries occur due to POOR COACHING and SUPERVISION !!!

Stricker, Paul R. Sports Success Rx! Your Child’s Prescription for the Best Experience. 2006 AAP.org
So... Where do we start?

“It is a grave mistake to submit children to the training programs of adults. After all, children are not simply little adults.”

-Tudor Bompa (2000)
Basics of Program...

- Certified/knowledgable instructors/parents/coaches/healthcare professionals

- Get a thorough understanding of previous activity level, experience, maturity levels of children/athletes and build programs accordingly
  - Make programs age/experience-related (great variation between ages/sexes/fitness level)

- Stay away from fixed exercise machines (fixed machine sizes usually inadequate; also static nature of machines inhibits overall development of body proprioception)

- Most importantly...
  - MAKE THINGS FUN !!!
  - KEEP THINGS INTERESTING!!!
  - KEEP THINGS VARIED!!!!
Sensitive periods ...

- First coined by Dr. Hugo DeVries
- Children go through physical “sensitive periods” as they develop
- During a “sensitive period” it is very easy for a child to acquire certain abilities.
- Once the sensitive period for a particular ability is past, the development of the brain has progressed past the point at which information can be simply absorbed.
- Important to capitalize during these periods
Sensitive Periods

- Balance skills
  - 9-10 yrs old girls
  - 10-11 yrs old boys
  - Doesn’t reach full capacity/ability until 13yo
- Aerobic Endurance
  - 7-10 yo both sexes
- Flexibility and stretching (7-10 yo boys/girs)
- Speed development (7-10 yo)

Basics of Training Program

Resistance Training Recommendations according to Age

<7yrs:

- Introduce basic exercises with no weight/body weight
- Emphasize training techniques/postural form
- Start slowly; 1 set 10-15 reps
- Build to 3 sets of each exercise 6-15 reps no more than 3x/wk
- Take into account skull size/arm ratio when formulating program (i.e., back rolls, forward rolls, etc).
Basics of Training Program

As child matures, can begin to add resistance

- Multi-joint lifts
- Low-intensity “plyometrics”
Plyometrics

- must progress slowly
- may add repetitive stress on growing MS system
- Must continue to reassess progress
- Be careful of overuse syndromes
Basics of Training Programs

8-10yrs

- Gradually increase number of exercises
- Begin to add free weights/strict supervised form and variety emphasized
- Gradual training volume/progressive load increase
- Carefully monitor toleration to exercise stress
- Fundamental exercises emphasized at this stage
  - Eg: running, catching, bouncing, hopping, galloping, etc.
- Static and dynamic balance skills emphasized as well
Basics of Training Programs

Age 11-13

- Teach all basic exercise techniques
- Continue progressive loading of exercises
- Start to introduce more advanced exercises with little or no resistance
- Specialized movements (sports specific drills) are emphasized with proper form and technique
Basics of Training Procedures

14-15yrs

- Continued progression to more advanced youth programs in resistance exercise
- adding of more sport-specific components
- continued emphasis on proper exercise technique/form
- increase exercise volume/progressive loads

16 and older

- Move athlete to entry-level adult programs after all previous steps mastered and basic level of training experience is gained
TABLE 1. General youth resistance training guidelines.

- Provide qualified instruction and supervision
- Ensure the exercise environment is safe and free of hazards
- Start each training session with a 5- to 10-minute dynamic warm-up period
- Begin with relatively light loads and always focus on the correct exercise technique
- Perform 1–3 sets of 6–15 repetitions on a variety of upper- and lower-body strength exercises
- Include specific exercises that strengthen the abdominal and lower back region
- Focus on symmetrical muscular development and appropriate muscle balance around joints
- Perform 1–3 sets of 3–6 repetitions on a variety of upper- and lower-body power exercises
- Sensibly progress the training program depending on needs, goals, and abilities
- Increase the resistance gradually (5–10%) as strength improves
- Cool-down with less intense calisthenics and static stretching
- Listen to individual needs and concerns throughout each session
- Begin resistance training 2–3 times per week on nonconsecutive days
- Use individualized workout logs to monitor progress
- Keep the program fresh and challenging by systematically varying the training program
- Optimize performance and recovery with healthy nutrition, proper hydration, and adequate sleep
- Support and encouragement from instructors and parents will help maintain interest
In Summary ...

- Resistance training is a safe method of exercise
- Resistance training has many potential benefits
- Many myths surrounding weight training that are simply not true
- CHILDREN ARE NOT LITTLE ADULTS, AND AS SUCH NEEDS A SPECIFICALLY DESIGNED PROGRAM ATTENDING TO INDIVIDUAL MATURITY AND DEVELOPMENTAL NEEDS
- Training should be slow, progressive, body weight initially, add resistance later according to chronologic age, physical age, and training age of child with special attention to developmental “sensitive periods”
- SUPERVISION by TRAINED PROFESSIONALS is key to safe training
Works Cited

- Stricker, Paul R. Sports Success Rx! Your Child’s Prescription for the Best Experience. 2006 *AAP.org*
Thank You !!!