



Youth tennis – A medical overview.

Brian Hainline.

Chief Medical Officer, NCAA, USA.

ABSTRACT

Children differ physically, physiologically, emotionally, cognitively, and socially from adults. This article sheds light on the limited amount of studies regarding medical concerns for children in sports. However, it is clear that training programs should be adjusted and careful monitoring is required. Similar to adults, children need to recover physically, nutritionally, and emotionally after exercise.

Key words: Children, Injuries, Strength Training, Recovery, Periodization

Received: 21 January 2013

Accepted: 27 February 2013

Corresponding author: Brian Hainline, Chief Medical Officer, NCAA, USA.

Email: bhainline@ncaa.org

INTRODUCTION

There are few studies available regarding the medical concerns of children in sports. Most of the children's sport literature focuses on the critical period of puberty, during which time there is a considerable change in growth accompanied by hormonal and sex characteristic changes. It is during this time that children may become more specialized in sport, and the training load may increase substantially.

Medical Concerns

It is observed that the increased activity during puberty leads to an increase in the amount of injuries, however there is very little information about tennis injuries in children under 10. An analysis of the hospital emergency rooms in the Netherlands demonstrates that the risk of injury from tennis in children ages 6 to 12 is of 0.01 injuries per player per year. This means that for every 100 children who play tennis, one child will develop some type of injury; there is no pattern to the type of injury that develops. In an Australian study of school children ages 5 to 12, tennis had an injury rate of 1.10 per 1,000 hours of play. This means that for every 1,000 hours of playing tennis, there is a little more than one injury that will develop; again, there is no specific pattern of injury noted.

Heat illness, which includes heat stroke, heat exhaustion, and severe cramping, is more common in teenagers than in children under 10. Even though a child's physiology is not well adapted to heat dissipation relative to teenagers and adults, young children seem to adapt in other ways so they do not become heat ill. There is not good data about sudden cardiac death in children who exercise. In high school athletes, one in 200,000

will develop sudden cardiac death, which is why pre-season screening exams are recommended.

Burnout has been reported in teenagers, but there is limited data for children under 10. Burnout is a psychological and physical condition that results from overtraining, and that leads to poor athletic performance, irritability, fatigue, lack of motivation, and an increase in resting heart rate.

In summary, there are limited data about medical problems in young children who exercise. Most injuries and medical concerns become apparent during and after puberty. Whether the emphasis on early specialization will cause increasing medical problems in children under 10, however, warrants monitoring.

STRENGTH TRAINING

There are many myths and concerns about strength training in children, and this is compounded by a lack of consistent competency standards that are in place for strength and conditioning coaches. Another problem is that there are very strong commercial influences for strength training, and these influences are more in keeping with selling a product or program rather than focusing on best evidence for age-appropriate strength and conditioning. Furthermore, commercial influences often market the use of machines, and they are rarely, if ever, properly designed for children.

The primary reasons for considering strength and conditioning training in children is to improve health and athleticism. Realistic goals for strength training in pre-pubertal children include:

- Improved muscle strength and power
- Improved muscular endurance
- Improved body composition
- Improved strength balance around the joint
- Prevention of injury
- Improved sport performance
- Improved self-confidence

In order to achieve these goals, a program should be properly designed and supervised by a knowledgeable adult, and the child and adult should share realistic goals while assuring that the child can follow directions safely and with proper form. When this is accomplished, the evidence indicates that very few injuries develop from strength (resistance) training relative to actually playing sports, as shown in the chart below (Figure 1).

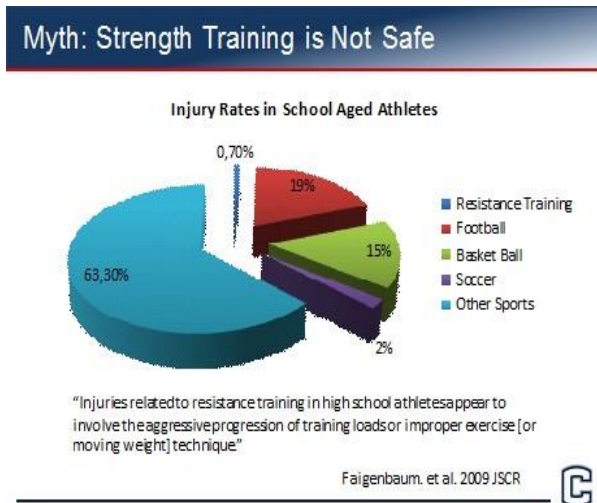


Figure 1. Injury rates in school-age children.

Furthermore, if a properly designed program is accompanied by good nutrition, the results are even better. For example, if you substitute milk for sugar-containing beverages in 14-year-old girls, their overall strength and conditioning gains are statistically significantly better.

In a study of soccer players, children performed much better when they combined resistance exercises with soccer play, as noted in the figure below. Similar gains are also demonstrated for girls.

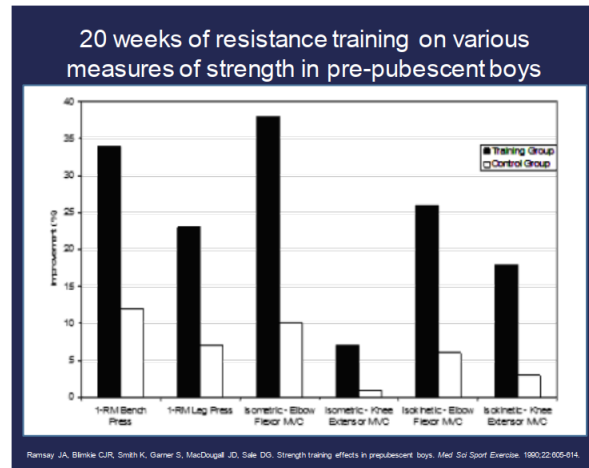


Figure 2. 20 weeks of resistance training on various measures of strength in pre-pubescent boys.

Although there are no tennis-specific guidelines, there are general strength training guidelines that can be followed by children who play tennis, which include:

- Begin at 7-8 years old.
- Frequency: 2-3 days per week.
- 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 the joints.
- Sensibly progress the training program depending on needs, goals, and abilities.
- Increase the resistance gradually (5-10 percent) 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.

RECOVERY AND PERIODIZATION

Recovery may be the most important component of being able to train and compete on a regular basis. Although we have limited data on children, we know with certainty that lack of recovery impedes performance and leads to repeated injuries in teenagers and adults. In a 16-year study of players at the US Open Tennis Championships, the majority of injuries were from overuse, and the most common trend was for players to return to training or competition before recovering adequately.

Recovery is an integral part of daily training and is not simply reserved for injury management. Recovery is the body's ability to return to a state of readiness following a physical and/or mental challenge. Recovery is physical, nutritional, emotional, and mental. Figure 3 illustrates the role of recovery in training.

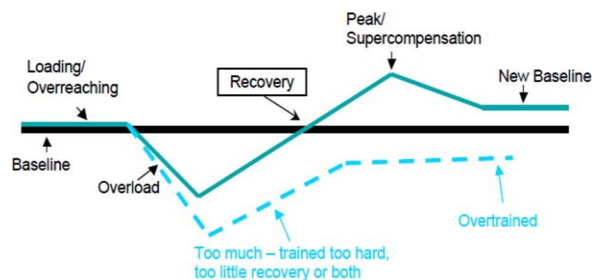


Figure 3. Role of recovery in training.

This chart demonstrates the difference between overreaching and overtraining. Overreaching is a normal process of training, and it is the accumulation of training and non-training stressors that lead to a short-term decrease in performance – a decrease that can be overcome with a recovery lasting a few days. Every good coach pushes a player to a place of overreaching. It is here that the player discovers new and creative sources of inner strength and adaptations. If the athlete recovers following a vigorous workout, then a new baseline of superior strength, athleticism, or adaptation develops.

Overtraining results from an accumulation of training and non-training stressors that has a detrimental long-term effect on performance, with a recovery period that may take several weeks or months. Approximately 50 percent of athletes who play individual sports such as tennis overtrain. All too often, the athlete begins to perform more poorly and the response is to train harder rather than to back off and recover more. An athlete who is overtrained by 5 percent will perform less well than an athlete who is 90 percent prepared for competition. It is the wise coach who understands the difference between overreaching and overtraining, between going to the edge of the cliff and falling over the cliff.

We have very little data on recovery in children. However, it is noteworthy to observe children in unstructured, active play. Typically, the duration of low- to medium-intensity activities in 6- to 10-year-old children is six seconds, and it is three seconds for high-intensity activity. The question is whether this data should serve as a guide to how we structure tennis and other physical activity in children. Should we do away with 20-second-and-more drills? We have no answers. However, based on everything we do know, children should take time to recover after exercise. They should eat properly within one hour (carbohydrates and proteins), they should be well hydrated, they should be able to rest, and they should sleep properly.

CONCLUSION

This article has showcased the available knowledge about the effects of sports on pre-puberty children. Medical concerns, recovery and periodization need monitoring to prevent or reduce the risk of injuries. Strength training can be performed by children to improve health and athleticism, however, the medical concerns will have to be taken into account. In the critical period of puberty children may become more specialized in sport, and the training load may increase substantially. This could lead to an increase in the amount of injuries. The future asks for more research about medical related subjects related to children and sport.



REFERENCES

Faigenbaum, A. D., et al. (2009). Youth resistance training: updated position statement paper from the national strength and conditioning association. *Journal of Strength and Conditioning Research*, 23: S60-S79.

<https://doi.org/10.1519/JSC.0b013e31819df407>

Kovacs, M. S. (2012). Maximizing the tennis player's competitive potential: Sport Science Perspective. Recovery and Periodization. Presented at USTA Youth Tennis Symposium. February 2012. Tampa, FL.

Ramsey, J. A., Blinkie, C. J. R., Smith, K., Garner, S., Macdougall, J. D., Sale, J. D. (1990). Strength Training effects in prepubescent boys. *Medicine and Science in Sport and Exercise*, 22: 605-014.

<https://doi.org/10.1249/00005768-199010000-00011>

Note

This article was completed by Mr Hainline while he was in the position of Chief Medical Officer at the USTA.

RECOMMENDED ITF TENNIS ACADEMY CONTENT (CLICK BELOW)



Copyright (c) 2013 Brian Hainline.



This text is under a [Creative Commons BY 4.0 license](#)

You are free to Share - copy and redistribute the material in any medium or format - and Adapt the content - remix, transform, and build upon the material for any purpose, even commercially under the following terms:

Attribution: You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

[CC BY 4.0 license terms summary](#) [CC BY 4.0 license terms](#)