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Recovery and the young tennis athlete.

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ABSTRACT

Recovery can be defined as the body's ability to return to a state of readiness following a physical and/or mental challenge. In tennis this applies to the player's ability to be ready to play the next shot, the next point, the next set or the next match. For optimal performance the player must be ready to execute each stroke at top ability and then recover from a physiological, psychological, tactical and skill standpoint for the next shot. This article will focus on issues of physiological as well as some psychological aspects of recovery as related to tennis for the youth player.

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INTRODUCTION

Competitive tennis by its nature is a true interval type sport, challenging both aerobic and anaerobic abilities of the player. The days of arduous points earned with wooden racquets have been replaced by high technology equipment, with enhanced power, increased speed, and explosive athleticism on the court; serves of 210 km/h are now common (Kovacs 2007).

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FACTORS THAT IMPACT PERFORMANCE

Anaerobic and Aerobic Aspects of Play

The aerobic demands of tennis may be high, but not as high as would be expected in marathon runners for example. Pragmatically, adult elite tennis players require VO2max levels above 50 mL/kg/min to perform well on the court, but increasing their aerobic capacity to extremely high levels (e.g., >65 mL/kg/min) has not been shown to enhance performance (Kovacs 2007). To put this in simple terms, traditional aerobic training at moderate intensity for long duration will not optimize the performance during competition, where points often last less than ten seconds, and bursts of energy requiring anaerobic ATP production is required. Interval training with short duration bouts (lasting 10 to 60 seconds) with a 1:3 to 1:5 work-to-rest ratio should be incorporated into the training and conditioning schedule to simulate game play.

Nutritional Recovery in the Young Athlete

Daily caloric intakes have been shown to be 4500 calories/day in male tennis players and 2800 calories per day in female tennis players (Bergeron et al 1995). In the young athlete, these numbers can vary tremendously based on the intensity of the training program and duration and frequency of tournament play. Parents, coaches, and trainers may be unaware of how little- or how out of balance- a particular teen's intake may be. Many children and adolescents do not realize that if they increase their energy expenditure, their regular quantities of food may not allow for adequate glycogen storage, which is essential for endurance for athletes working out more than 90 minutes per day (Rome and Blazar 2008). Good sources of carbohydrates include selections from breads, grains and fruits. For more rapid uptake of carbohydrates, simple sugars

(juice, sweet foods) can be used, but the benefits can be short lived.

Heat and Hydration Concerns in the Prepubertal Child

In extreme temperatures, children are more prone to heat related consequences than adults, with their smaller surface areas for blood cooling at the skin. Additionally, pre-pubescent children do not have apoeccrine sweat glands, which only develop during puberty, and produce sweat rates seven times that of eccrine sweat glands found elsewhere in the body (Falk, 1998). The prepubertal child is therefore at a disadvantage athletically as compared to the postpubertal child, with recovery impacted by suboptimal rehydration, core cooling, and other factors. In some tournaments where prepubertal and postpubertal teens of the same age may compete, careful attention to hydration needs at this age may go someway to compensate for changes in strength, endurance, recovery, and other factors in the prepubertal child competing in the same arena.

	CHILDREN	ADULTS
Surface area to mass ratio	Greater	lower
%Total Body Water	Greater (80%)	lower (60%)
Absolute blood volume	Lower	Greater
Cardiac output	Lower	Greater
Metabolic heat production per pound of body mass during exercise	Greater	Lower
Sweating mechanism	Less efficient	More efficient

Table 1. Differences in Physiology between Prepubertal Children and Adults, as adapted from Sinclair, Crowe et al 2007).

The Adolescent Mindset: Help or Hindrance?

"It can't happen to me." "That would never happen." "Long term consequences? You mean what happens tomorrow?" "I'll do it because I want to, not because you tell me to". Success for the adolescent elite athlete requires support from family, coaches, trainers, pediatrician and/or other medical caregivers to enhance physical performance while keeping the teen's"head in the game". Overinvolved parents have not been associated with improved tennis performance, but parental approval of the youth's athletic choices and success does correlate with better attitudes about play and competition (Ommundsen et al 2006).

When addressing questions of importance to a young athlete's career, the adolescent mindset and normal developmental tasks of adolescence need to be taken into account. Little data exists on optimal weeks in a row of competition for junior elite athletes, whether a 12 year old should be allowed to play 3 matches in a day, or how much time should be allowed between individual matches to allow for adequate recovery. Nutritionally, the young athlete already has been shown to underestimate their thirst and body's fluid and energy needs. Young athletes may also underestimate time needed for physiological recovery, asking for that third match to go on even when performance will likely be impacted. "Burnout" and overtraining can be self-induced by the overly conscientious or competitive teen, or by "achievement by proxy" from a parent or coach.

Effects of Fatigue on Performance

Fatigue reduces tennis-hitting accuracy by up to 81% (Davey et al 2002; Davey et al 2003). Best training should include strategies to avoid fatigue during competition in order to remain injury free and improve chances of winning (Kovacs, 2007a). Research for Kovacs (2007b) has shown that prolonged breaks between matches without adequate supervised training may not be in competitive players' best interests. On the flip side, the problems of overtraining, which can also happen in the very competitive young athlete, can emerge; many teens feel that "more is better" and will far exceed recommendations of trainers, coaches, doctors, and parents in order to gain themselves a perceived competitive advantage. These results tend to backfire, as injuries occur, effects of overtraining on performance become evident, or they show the effects on the psyche ranging from maladaptive coping strategies such as disordered eating to full burnout.

Musculoskeletal Injuries in the Young Tennis Player

Intensely active young tennis players are more at risk for severe injury than their recreational tennis-playing peers (Kibler and Safran 2000). Where the young elite player subjects his or her body to repetitive tensile overload, maladaptations in strength and flexibility can occur, compromising play and recovery. During physical screenings for young players, the pediatrician, sports medicine doc or clinician should pay attention specifically to the flexibility of the back, shoulder, and elbow; strength estimation through situps, pushups; power through the vertical jump and medicine ball; and anaerobic power through a brief sprint or shuttle run. Assessment of posture while standing can identify lumbar lordosis, which is common

in young people and can decrease core trunk stability (Sciascia and Kibler 2006).

Other common specific injuries in young tennis players include rotator cuff inflammation in the shoulder, a common injury at all ages. In addition, "Tennis elbow" and wrist tendonitis can happen in players using lots of topspin and in novices with a mechanically improper technique (Kibler and Chandler 1993).

Prevention: Prehabilitation and the Preparticipation Exam

Overtraining injuries and competitive staleness can be addressed by variations in the training focus and intensity of workouts. For training it can be efficient to break the season into one (or two) series of training phases: off-season; pre-season, and competitive-season. During the off-season, immediately following the competitive-season, training can be less intense and less sport specific. The player should focus on general fitness concepts, participate in fun, modified tennis games with an increased emphasis on pleasure versus winning. The off-season is also an excellent time to focus on basic skill development/refinement. In the pre-season training phase the intensity of the training increases and the training becomes more sport specific.

SUMMARY

The structurally, physiologically and psychologically immature male or female elite athlete may be at more risk from environmental stressors, suboptimal nutrition, nutritional depletion, insufficient recovery time and orthopaedic stress when compared to mature adults.

PRACTICAL APPLICATIONS:

- Skill development and technical aspects of training are best addressed when athletes are fresh and rested. Fatigue limits hitting accuracy by up to 81% and alters the motor-pattern sequencing.

- To optimize performance and recovery for tennis, conditioning drills should simulate game like conditions: the work-to-rest ratios for training should fall between 1:3 and 1:5, to best simulate match conditions.

- To optimize performance and recovery for speed, agility and power, the work-to-rest ratios for training should be from 1:25 to 1:40, with these far longer times allowing for appropriate recovery.

- Players whose game style is to be on the attack and play shorter points require more short, anaerobic-focused training with a focus on speed, strength, and power.

- Players with a more defensive game style require training to enhance muscular endurance.

- Athletes should start matches well hydrated and consume approximately 200 mL (6.6 ounces) of fluids per each change of ends in mild temperatures, with more recommended during warm weather play (200-400 mL). Young players are more likely to drink flavored sports drinks than water.

- Carbohydrate replacement during tournament play is also critical to help minimize the effects of energy depletion.

- Further data is needed to better address questions on the number of matches in junior tennis, the time between matches to ensure adequate recovery in the young athlete, and number of sequential weeks of competition without a break. These efforts help to avoid injury and burnout in the young athlete.

- To avoid overuse injuries, variety in intensity and duration is encouraged throughout the year and within each training session.

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