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Endurance development for 10-12 & under tennis players

Piotr Unierzyski (POL) and Mieczysław Bogusławski (POL)

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ABSTRACT

Within classical definition endurance is understood as the ability to perform hard or long-lasting physical activities involving large muscle groups, without the fast increase in fatigue and changes in inner environment of the organism. This definition also includes the strain tolerance and the ability of recovery (Astrand 1987, Kozłowski & Nazar 1999). This definition suits well into such sports like long-distance running, swimming, Nordic skiing, and so mostly "cyclic" sports. For these sports endurance is a factor limiting performance and there is almost a linear correlation between level of endurance and sport performance.

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Corresponding author:
Piotr Unierzyski
Email: piotrunierzyski@wp.pl

INTRODUCTION

From a physiological perspective, tennis is an interval and speed- explosive power oriented sport. Despite matches lasting sometimes 2-3 hours, players do not typically run more than a few kilometres in total. The energy source mostly utilised is predominantly (70%) anaerobic alactic sources of energy. The anaerobic lactic and oxygen sources are utilised approximately 30% during performance. It has been stated within literature that anaerobic and aerobic conditioning are necessary for enhancing tennis performance (Kovacs, Roetert, and Ellenbecker, 2016), however, the question is how much it should be developed, especially in relation with speed.

In studies by (Weber 1987, Unierzyski 1995, 1993) it was detailed that tennis players should develop "general" endurance to a sufficient level but certainly it is not a factor limiting performance such as coordination, speed and agility or tactical-technical and mental skills. Fundamentally, this means that every healthy player is able to develop and train their endurance capabilities to a desired level. Because tennis specific endurance is trainable it is not necessary to include more traditional forms of endurance training like long distance runs to talent identification testing protocols. Research has illustrated that despite comparable levels of basic endurance, individual players react physiologically completely differently to the same tennis-specific stimulus, suggesting that sport-specific endurance plays a considerable metabolic role in some individuals (Ferrauti et al., 1999; Quinn, Reid and Crespo, 2003). Of course this does not mean that coaches should not work on endurance with players. The question is how and when is best to develop it.

ENDURANCE DEVELOPMENT FOR YOUNG TENNIS PLAYERS

Research has shown that young tennis players aged 7-12 years old had superior physical exercise capacity scores (higher oxygen uptake and physical work capacity values) relative to body mass when compared to the non-competitors (Bloomfield et al., 1984). It has also shown that specific endurance training can improve the aerobic performance of a children aged between 9-11 (Krahenbuhl et al., 1985). However, with their ongoing locomotor development, rather than emphasising prolonged repetitive exercises (continuous runs), the presentation an aerobic stimulus should be started globally in the form of games. The child possesses functional and metabolic elements, which better accommodate this. In this way, the training principle of variety should take precedence over specificity in developing aerobic endurance among children.

Traditionally it is said that young athletes need to develop an "aerobic base". It is generally accepted that the sensitive phases for developing aerobic endurance lasts between the ages of 8-12. This can be interpreted as young children being able to naturally improve when taking part in any long lasting activities where the training load is moderate.

Therefore children within this age category do not tolerate longer lasting loads of high intensity there is no need to force them to participate in high intensity training, typical track and

field endurance training or "cardio" drills. Especially anaerobic lactic type of drills must be avoided. Exercises focused on speed and coordination with maximal intensity are recommended but they should not last more than 6-8 seconds with breaks 4-5 time longer than the drill.
The time for training with high intensity developing anaerobic and speed-endurance will come after the pubertal growth spurt, so usually at ages 15-16.
So, more specifically, at the age of 11-12, just before puberty a gifted tennis player has to finish the stage of the so called versatile all round basic training and may begin the next stage (phase) of semi- specialised training. Before puberty starts and after it is started, lots of abilities and skills can be learned or forgotten. It is obvious for experienced coaches that children are not small adults and they should organise the training process in a different way (Unierzyski, 1994b).
It should be remembered that the age of 12 is the best period for optimal development of the two most important motor abilities in tennis: agility and speed. Between the ages of 12-13 young athletes still have to have a develop versatile athletic skills and, during the same period, have to gain experience, improve their level of motor abilities, mental skills and improve major tennis-specific abilities (Unierzyski 1994a; Grosser & Schönborn, 2002). For a sufficient and versatile development period the training ought to be directed more into all factors limiting performance in tennis.
Young beginner tennis players can participate in prolonged low- moderate intensity activities up to twice a week. The activity could last up to 20-30 minutes (non-inclusive of warm-up and cool-down), while low-moderate intensity suggests that the activity should raise players' heart rates to ≈60-65% of their maximum. It is therefore advisable for coaches to intersperse activities with short rest periods, especially when that activity is a different sport (Crespo & Reid, 2009).

ENDURANCE DEVELOPMENT FOR 10 & UNDER PLAYERS

There are few better ways to develop basic, aerobic endurance than participating in activities akin to playing ball games, swimming, roller skating, Nordic skiing etc. Generally off-court activities should be predominant.
Also, regular tennis training (despite its specific character) helps to build the endurance. But it must be remembered that tennis drills with high intensity should not last too long (6-8 seconds) – and should be much below the anaerobic threshold level.
It is possible to apply extensive aerobic type intervals lasting around 20 seconds with moderate load reaching no more than 60-70% of maximal capabilities. A good example of such on-court activities are technical drills focused on rhythm lasting 20 seconds with pulse usually around 130- 140 b.p.m., but followed by 60 second breaks (1/3 ratio).
Other activities to develop the aerobic endurance of children are (González & Ochoa, 2003):
• Practising other sports: soccer, basketball, frisbee, swimming, cycling, walking/jogging etc.
• Using circuit training.
• Example game: The players run in any direction around the court and run to the coach when they indicate a certain number.
• Example game: The players run in groups and are required to create different monuments upon the coach's signal.
• Example game: The players run for one minute without seeing the time. The winner is the player who runs closest to one minute. The time can be gradually increased.
• Example game: Running to music of different rhythms for a set amount of time.
As per anaerobic lactic endurance, it has been shown that when compared to adults, children have a significantly lower ability to work anaerobically and perform strenuous exercise for periods between 10 and 60 seconds (Armstrong & Welsman, 1997). This is linked to lower intra-muscular glycogen concentrations and a slower rate of glycogen utilisation in children. Training to develop anaerobic endurance capacities should therefore be introduced at older ages.
Regarding the anaerobic alactic activities, it is important to remember that the anaerobic power generated by an 8 year old can be up to 70% of that generated by an 11 year old, suggesting that this is a trainable quality (Hegedus et al., 1993). Readers are directed to chapter 9 for examples of speed activities that may be utilised when working with children. Similarly, participation in games that place demands on reaction speed to different stimuli (visual, auditory, kinaesthetic) are well suited and beneficial to children. Here, as all beginner players typically direct their actions to the ball, such reaction speed activities should involve similar perceptual demands (i.e. with the ball).
So, coaches should encourage players to develop their aerobic capacity and movement economy through a variety of enjoyable
activities that involve intermittent short bursts of activity. Games of a continuous nature where the beginner's heart rate remains elevated can induce an aerobic training effect. Indeed, the playing conditions of soccer, touch rugby, water polo... can all be adjusted by the coach to provide an appropriate aerobic stimulus, depending on the size of the playing area and/or the number of players (Crespo & Reid, 2009).

SUMMARY- RECOMMENDATIONS

• Children at these ages should not tolerate longer lasting loads of high intensity
• Avoid high intensity, long lasting anaerobic lactic activities suitable for advanced players
• Endurance naturally "increases" when children take part in any long lasting activities with moderate loads
• Less skill specific activities and regular training are important to develop aerobic endurance
• Specific endurance training can improve the aerobic performance of children aged between 9-11. However, rather than only prescribing continuous runs, the use of games is recommended.
• Exercises focused on speed and coordination with maximal intensity are recommended but they should not last more than 6-8 seconds with breaks 4-5 time longer than the drill.

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