



Strength and power development for tennis players ages 10-12 and under

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ABSTRACT

While the "Game-Based-Approach" – summarising a whole training philosophy in three words – is a well-established approach in tennis training, the "Child-Based-Approach" has yet to gain importance among coaches of tennis players aged 10-12 and under in strength/power training and beyond.

Key words: strength, power, child-based approach .

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INTRODUCTION

When working with children in this age group, the training approach is crucial and needs to be aligned with the psychological and physical development of children aged 10-12 and under. The quality of training is mainly driven by personal will. To "trigger" this will in order to achieve optimal training progress, requires the coach to consider the following methodological/didactical aspects in the training:

- Switching between exercise and play or exercise while playing.
- Ensure that the hope to succeed is greater than the fear to fail.
- Provoke/activate cross-linking of learning processes by using different receptive channels.
- Combine goal-oriented learning and fun.
- Use the concept of "Lachen-Lernen-Leisten" (Laughing-Learning-Accomplishing).
- Do group training.
- Always link physical exercises with coordinative elements.

For more information on methodological aspects in training refer to the Swiss national sports education program (Youth&Sport – Kids, 2010-2014).

In adults, it is difficult to define which exercises, intensities, number of repetitions etc. are best to achieve maximum progress in strength training due to inter-individual differences. In children aged 10- 16 years, those differences are known to be even more profound. Chronological peers may therefore show biological age differences of several years. In addition, the biological age can change in a short period of time due to growth (hormonal changes, levers, passive/ active structures). The nature of the psychological and physical development of children does not allow for general recommendations on strength training parameters for the age group of 10-12 years and under. Nevertheless, strength training should be guided by the Child- Based-Approach, which requires a continuous assessment and critical eye on the physical development of the child combined with the didactical/methodological approaches the child is particularly susceptible to.

THE ESSENTIALS OF STRENGTH TRAINING

The human body is predictable. Whenever the body is challenged or even overstressed its reaction is to adapt in order to be prepared and protected for a next challenge. Strength training starts at birth when gravity is experienced for the first time, followed by the numerous attempts to get up and walk

and probably culminates in the perfect squat position of the two to three year old child when lifting toys off the floor. The strength of the body has to keep up with growth. Even in old age, the body is able to make strength adaptation yet the extent of those adaptations is age-related.

Purposeful training results in strength gains that go beyond the normal, growth-related increase – also in pre-pubescent children (Pfeiffer et al., 1986). The positive effects this has for the tennis player will be discussed below. The body of both children and adults will lose the strength gains acquired as soon as purposeful training stops.



That said, the answer to the question whether strength training is beneficial for children aged 10-12 and under is positive. However, the key question is how strength training is done and which methods are used, including the effects that can be achieved.

Defining strength and power training

In Switzerland, training that is done between 30-70% of maximal strength is referred to as power training (Schnellkrafttraining), including the special case of plyometric training. Training that is above 70% of maximal strength is defined as strength training. Refer to (Weineck 2009) for a discussion of all forms of strength training and definitions.

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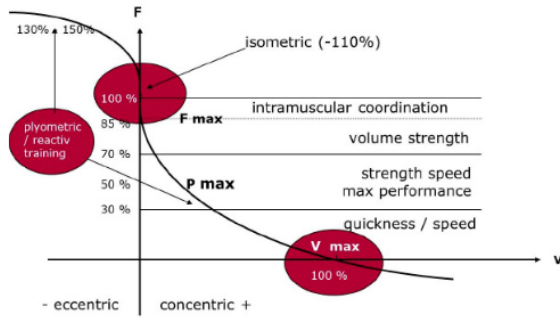


Figure 1. An overview of the different forms of strength training (Egger, 1998)

The body of a child between 10 and 12 years

The physical development of children in the age group of 10-12 years is characterised by an optimisation of the body's proportions and relatively large strength gains with little increase in height and weight. In addition, the development of the equilibrium organ is completed, which is why complex exercises, not only in strength/ power are possible and should also be applied in training (Weineck, 2009).

Talking about strength training, the following differences of a child's body compared to the body of an adult should be taken into consideration:

- The muscle tissue of the child is richer in water, but tonicity is less.
- The long bone shows more plasticity and less elasticity, particularly in children under 10 years of age.
- Muscle fibre is thinner and more elastic.
- Due to increased water retention capacity and greater thickness and elasticity, cartilage is less susceptible to injuries resulting from overstress.

Strength Training	Power Training
Adaptations of the central nervous system leading to less co-activation of antagonists resulting in increased strength	
Improved stability (entire body as well as joints)	
	Strengthening of the bones – the long bones are fragile, particularly in children under 10 years of age, and can be strengthened by power training
Positive impact on self-confidence and mental strength (I succeed because I am physically strong)	
Hypertrophy	
Strength & Power Training	
Improved recruitment, synchronisation, and firing rate of muscle fibres	
Improved capacity in terms of strength/power/speed. Combined with coordination training, the development of this capacity can even be enhanced.	
Improved quality of movements specific to the discipline (to tennis)	

Table 1. A table to show the effects of strength and power training.

What can be achieved with strength/power training in children 10-12 years old?

The area of strength/power training in children aged 10-12 years has received little attention in research, particularly in Europe. More evidence is needed to better understand the benefits of strength/ power training in this age group (BISp et al. 2010). Despite this gap, studies suggest the positive effects of strength/power training in children, depending on the methodological approach used (Fröhlich et al. 2009). The table below summarises some of the effects that can be expected from strength and power training respectively (Fröhlich et al. 2009). It has to be assumed that both, strength and power training, in part produce the same effects, although to varying extent.

In addition to the physical adaptations listed in the table above, the capacity to perform, to a sufficient standard, complex strength exercises, for example clean and jerk or snatch, may result in a more efficient approach to strength training later in a career.

The current level of knowledge suggests that strength/power training before puberty results in even greater relative strength gains than during adolescence. In comparison with most other disciplines, the risk of injury is lower in strength training. This risk can further be reduced if the training program is continuously adapted to changes in the growth and development of the athlete.

How important is strength and power development in tennis?

Having argued for the implementation of the child-based approach to strength and power training for children aged 10-12 and under, this section looks at strength training from the tennis-specific perspective.

Contrasting the tennis game in the category U10/U12 to the one in the category U14/U16, the latter is characterised by stronger strokes, faster balls and more spin which results from changing relationships of the levers and strength. As a result, the speed of the game is higher, stop and go's fiercer which together provoke a higher physical stress. Therefore, the main reason for strategic and well planned strength training with tennis players aged 10-12 and under is the "changing game" when they enter the category U14/ U16. Entry into this category happens at a time when the body is experiencing profound changes, often accompanied by moments of increased vulnerability to injury. A strong body is expected to better cope with the changed characteristics of the game as well as with extreme positions where body and joints have to be stabilized at the end range of motion. Strength training in children 10-12 year old has another health-related benefit as it counteracts tennis-related one-sidedness by also building those muscles that are not actively involved in tennis playing. Other tennis related positive aspects of strength training are the following:

- Strength training stabilises the body. A stable position positively influences the quality of the stroke.
- A stable core supports balance in motion which again has a positive influence on stroke execution, particularly in difficult positions.
- A child-based approach to strength training also includes whole-body exercises which foster body awareness and coordination.
- Strength and power training have a positive effect on speed. Finally, an important aspect not yet discussed is the endurance of explosiveness/strength speed (Paganini, 2005) – the ultimate goal of every top player. Endurance of explosiveness and strength speed are composed of different forms of strength. Both can only be developed step-wise and following a proper build-up training program (Weineck, 2009). This long-term development is optimally facilitated by an early start in strength training.

Tennis-specific strength/power training is not recommended for children aged 10-12 years and under. Certain types of power training are similar to movements, sequences and temporal patterns in tennis and could therefore be regarded as tennis-specific. However, a purposeful tennis-specific orientation of training sessions should be avoided.



PRACTICAL APPLICATIONS

The list below provides selected examples of activities/games following the Child-Based-Approach.

- Climbing.
- Wrestling games.
- Push-pull games.
- Balance and stabilise (Proprioception).
- Rope skipping (challenging exercises).
- Barbell technique.

CONCLUSION

Strength/power training for tennis players aged 10-12 years and under has many positive effects. The most important effects being:

- A well-protected body ready to cope with the stress and challenges characteristic of the U14 tennis game.
- A greater physical performance.
- A decreased risk of overstress and injury.
- An improved body image and self-confidence.

Strength/power training for this age group has to follow the Child-Based-Approach, which requires knowledge of the different developmental stages of a child's body and mind and the methodological/didactical skills for effective implementation.

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