

Development of Endurance Qualities of Young Athletes

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Annotation: Endurance exercise training enhances exercise tolerance and ultimately improves the performance of young athletes.

A large number of young athletes train for competitive sport before puberty, yet the understanding of their capabilities to benefit from endurance training is limited.^{1,2} Many studies of endurance trainability of children have methodological flaws. Most investigations that have involved adequate intensity, type, and duration of training have shown in children the qualitative changes expected from adults, although children may need a greater exercise intensity than adults to trigger cardiovascular adaptations to training.³

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Endurance is defined as one's ability to withstand fatigue or the ability to control the functional aptitude of movement instead of external stress. The latter definition lends itself well to the concept of athletic development and training of young athletes. As I have stated many times in both print and lecture, when working with youngsters, the key ingredient to producing a successful training program is the ability to recognize that quality of execution is profoundly more important than quantity. I still see coaches, trainers, and parents opting for more challenging training sessions that include high volume or high-intensity activities rather than concerning themselves with how correctly the exercise is being performed. Poor execution results in habitual patterns that are difficult to break and could result in injury. Concerning endurance training, proper mechanics are often compromised for higher volumes or intensities, and this is very much a mistake.

One thing to consider is that the term 'endurance' has application to varying lengths and types of effort:

- Long slow distances - efforts of limited intensity but high distance or time
- Speed - efforts typically lasting 15 to 45 seconds with high levels of intensity but limited time or distance
- Muscular - the ability to sustain a muscular contraction for a prolonged period

There are several factors to consider concerning the development of endurance in a young athlete:

Mechanical/Coordination/Movement

The efficiency of movement is a paramount factor for the endurance capabilities of a young athlete. Poor mechanics (which are only reinforced with repetitive training) lead to higher degrees of fatigue. To truly increase the ability of a young athlete (in all facets), coaches and trainers must exercise patience and teach proper movement habits rather than prescribe endless numbers of sets. A critical point here is that by perfecting the technique, you can effectively improve endurance without increasing training volume.

Body Type

The more overweight a young athlete is, the less endurance they will have. Excess body weight (particularly in the form of body fat) will serve to decrease endurance due to an increased energy cost. Additionally, being overweight often leads to low mechanical efficiency. According to Joseph Drabik, "each 5% of excess weight penalizes a child approximately 89 meters in a 12-minute run test". Conversely, "in a 10-mile run, each kilogram reduction of body mass improves performance by 30 seconds". Drabik did not indicate how body weight was determined to be excessive.

Psychological

Many young athletes do not possess significant amounts of mental toughness (but they are kids, so why would they?). To combat this, many over-anxious trainers and coaches opt to make drills and exercises challenging difficult to produce some perceived mental strength. Given that both the physical structure as well as the mental potency of youngsters is tenuous, this often leads to little more than burnout or injury. A more prudent approach to this factor is to systematically present challenges to young athletes that respect their individuality as well as the stage of development they are in and offers positive feedback at the conclusion. By providing challenging yet achievable forms of exercise, you will progressively improve their endurance and develop their self-confidence to attempt new and more challenging things.

It is essential to understand that endurance training with young athletes is critical for long-term development and not immediate results. Developing good endurance allows the young athlete to tolerate an increased amount of exercise stimulus in the future, and this alone is the crucial point. Do not become preoccupied with immediate effects. Like any other aspect of athletic development, endurance training is part of a continual, multi-tiered effort. Developmentally speaking, from the ages of 3 to 7, general endurance increases due to the typical activity level of kids in this age range (which has become a crucial issue of our time - kids do not 'play' as much as they used to, and this fact has a potentially damaging effect on their future athletic abilities and conditioning). For young males, endurance increases are best seen between the ages of 8 to 11 and then again between 15 and 16. For young females, increases are shown best between the ages of 8 to 10. After the age of 13, the endurance capabilities of young women stagnate and regress. These numbers illustrate that the young female's sensitive period for endurance development is shorter than it is for young males. Because of this, young females should begin their endurance training at a younger age than should young males.

1) Training Programs

There are several key points to remember when designing endurance-based training programs for young athletes. The most crucial aspect is to always start with a broad aerobic base. This will serve to raise the anaerobic threshold of the young athlete (delay needing to use anaerobic sources of energy during activity) and allow them to tolerate increased loads in the future.

Begin this aerobic-base phase, however, with low to moderate volumes. Children, although physiologically more fit than the average adult, still must begin their training programs gradually, working up to longer durations and higher intensities. As typical with the entire athletic development science, you should alter the stimulus of endurance training you do with young athletes. Think in terms of seasonal activities. In the summer, enjoy swimming; in the autumn, change to hiking or cycling; in the winter, offer stimuli such as snow-shoeing or cross-country skiing.

Notice how the suggestions are movement-based activities and NOT going to the gym to run on a treadmill! In our fixation on 'the perfect body', it seems we have forgotten how important movement and coordination-based activities are for young athletes. Do not train kids on single-function pieces of fitness equipment. Understand that there is a definitive crossover between all exercise stimuli and young athletes. Yes... snow-shoeing is a perfect endurance-building exercise for young athletes, but it also involves coordination and skill - IDEAL for the young, developing athlete.

2) Training Loads

Another key factor is the training load increases. Coaches, parents, and trainers must remember that increases in volume or duration must precede increases in intensity. In short, make things long before you make them harder. Lastly, wonderful progress can be made by altering the surface of the young athlete is performing their endurance training. For instance, if you are incorporating long walks or jogs into your training program, switch the training surface periodically to add variety and improve progress; sand, shallow water, forest trails, pool. Quick point of reference - by jogging or walking on sand, forest trails, or shallow water, you will also add to lower compartment strength and stability. Ankle proprioceptors, picking up varying degrees of balance-point change, will become stronger and more efficient.

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