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WAYS TO PROPERLY GROW THE BODY STRUCTURE OF 5-6-YEAR-OLD CHILDREN THROUGH WATER ACTIVITIES

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Annotation

For prepubescent athletes, lower levels of circulating anabolic hormones limit the contribution of hypertrophy (i.e., lean tissue growth) to strength gains (11), and the changes to muscles that do occur appear to be more qualitative rather than quantitative. Neural effects thus appear to underpin much of the gains from resistance training in these younger athletes. Such neural adaptations are suggested to include improved recruitment and activation of the muscles mobilized during the training movement.

Keywords: physical, attention, before, puberty, less, circulate

Enhanced motor coordination within and between muscle groups is also thought to contribute to strength gains after training. By the nature of these training adaptations, such strength gains would seem to be less permanent; prepubescent players will show marked detraining effects once regular resistance training is discontinued (11). However, modest (1 or 2 days per week) maintenance programs do appear to be sufficient to sustain strength gains. The greater hormonal response to resistance training in adolescence than at earlier stages of development leads to structural changes to the muscles and associated connective tissues (11). As a result, marked changes in muscle hypertrophy and gains in fat-free mass are seen in this older age group. Such increases in muscle cross-sectional area and changes in muscle proteins therefore augment the gains in strength of neural origin that occur.

STRENGTH TRAINING FOR PERFORMANCE ENHANCEMENT IN YOUTH SPORTS

It is becoming recognized that young players can experience benefits from strength training similar to those observed with adults (11). All youth sports demand, to varying degrees, strength and power to overcome the players own body weight when moving and the resistance of opponents, particularly in contact sports. It follows that developing strength through resistance training should positively affect performance in the young players sport (43). The effects of strength training in young players, which include increased strength and improved motor skills and coordination, have the potential to improve athleticism. Improvements in scores on motor performance measures are often observed after resistance training in children (43). Positive changes have been noted in vertical jump, standing long

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jump, sprint times, and agility run times (11). The available data from the limited number of studies that have been published indicate that increases in flexibility can be made, particularly if the resistance training incorporates specific stretching and warm-up and cool-down (43). This appears to refute concerns in some youth sports that resistance training will lead to the young athlete becoming muscle-bound and consequently decrease their flexibility and range of motion. Warm-up before training and team practices should comprise dynamic flexibility exercises; this form of stretching appears to offer the most effective preparation for dynamic activity (30). There is also some evidence of adverse effects on athletic performance associated with performing static stretching immediately before dynamic activity (6). Static and partner-assisted stretching still has a role to play as a means to develop flexibility. However, based on the available evidence, it seems sensible to restrict their use to the cool-down after sessions or to standalone flexibility sessions to avoid any detrimental effects on performance. STRENGTH TRAINING FOR INJURY PREVENTION Participation in team sports involves some inherent risk of injury. Although these injuries can never be eliminated entirely, appropriate training can assist in minimizing injury incidence and help reduce the severity of those injuries that do occur. Young players are subject to additional risk because of physiological and developmental factors.

All sports and athletic events feature fundamental movements in some combination, which include squatting and lifting, pushing and pulling, lunging, locomotion (e.g., running), and twisting (35). The top layer of the athleticism pyramid is functional skill, which can be viewed in terms of sport-specific strength and movement skill training. Training to build young athletes therefore must start at the foundation of the athleticism pyramid and build upward. Development of mobility and stability is therefore the first priority when training young players. In turn, these qualities underpin the players ability to perform fundamental movements that are common to all sports. As Cook states, “Fundamental movement supports specific movement” (7). That is, players fundamental movement abilities will determine their ability to perform sport-specific movements. There is no point in trying to impose sportspecific training on flawed fundamental movement patterns. It follows that training activities at this stage of the athletes physical preparation should predominantly feature fundamental athletic movements. Exercise selection can then progressively shift to sportspecific movements with advances in the athletes physical development. NEUROMUSCULAR AND MOVEMENT SKILL TRAINING As discussed earlier, mobility and stability are major training goals to build the foundation of athleticism in young players. Neuromuscular training interventions often comprise dynamic stability and balance training exercises (37). These forms of neuromuscular training offer a means for development of whole-body balance and postural control (46), which underpin stability. Functional movement abilities, the next tier up in the athleticism pyramid, likewise can be developed through appropriate movement skill instruction and training (37). Prepubescent athletes have less mechanical efficiency compared with adolescent athletes. Although mechanical efficiency improves as the young athlete progresses through puberty, adolescent athletes still have less mechanical efficiency than adults (38). It follows that there is considerable scope for this aspect of performance to be improved through specific instruction and practice. Exercise economy has been identified as an area for development in young athletes (38), allowing the young player to sustain a higher relative work rate throughout the course of a match. Some evidence supports the potential of neuromuscular training to improve athletic performance in young players. Jump training incorporating specific instruction and training of proper movement mechanics has been shown to improve vertical jump andmovement biomechanics in high school female athletes (36). A neuromuscular training intervention significantly improved lower-limb alignment and reduced knee valgus angles in young female athletes (39). Similarly, balance training improved shuttle run agility performance in a mixed-gender recreationally active training group (46). Dynamic balance training has also been shown to significantly reduce impact forces on landing in adolescent female team-sports players (37). The neuromuscular control capacities that allow an athlete to dissipate impact forces and maintain proper lower-limb alignment have been identified as key factors in reducing players relative risk of injury (42). Both forms of neuromuscular training described above may thereby help guard against injuries through different mechanisms. Prepubescent athletes have a tendency to have neuromuscular control deficits, particularly, valgus hip, knee, and ankle alignment during jump-landing tasks (2). This is indicative of impaired ability to control joint motion particularly at the knee and, as such, is associated with increased injury risk (14). Training to improve lower-limb neuromuscular control therefore appears important to correct the potentially injurious lower-limb alignment when it is observed in prepubescent team-sports players. Young female athletes in particular showed these traits (2). Neuromuscular control issues may contribute to making female athletes ligament-dominant. Specifically, as a result of inadequate active muscular stabilization, girls can rely more on ligamentous support to assist in stabilizing lower-limb joints, subjecting these ligaments to greater strain (14). In combination with anatomic factors, including hypermobility and joint laxity of lower-limb joints, this strain can make girls more prone to lower-limb ligament injury than boys. Girls appear to show valgus knee motion to a greater extent on their dominant leg (14). Such side-to-side imbalances in neuromuscular control and coordination represent another risk factor for injury. As boys pass through puberty, they undergo a neuromuscular spurt, which accompanied by limb growth and favorable changes in body composition (i.e., increased muscle mass relative to fat mass), improves their biomechanics (42). One observed aspect of this improvement is an enhanced ability to dissipate ground reaction forces on landing. These landing-impact forces, in turn, directly influence the loading absorbed through lower-limb joints (22). This neuromuscular spurt phenomenon does not occur in girls. The lack of any marked improvement in neuromuscular power and control, in combination with limb growth and body mass gains, can make the lower limbs even more unstable in adolescent girls (42). Certainly, female players continue to have a tendency to have potentially injurious lower-limb alignment and movement mechanics as adolescents (3,42). In the absence of neuromuscular training, female players also have a tendency to preferentially recruit the quadriceps over the hamstring muscles during activity, known as quadriceps dominance (14). Such biomechanical factors and aberrant recruitment patterns are implicated in the gender differences in rates of anterior cruciate ligament injury after puberty, which is not seen before this stage of development. Various studies report adolescent female players to have between 2 and 10 times greater incidence of anterior cruciate ligament injury compared to male players, depending on the sport (17). Neuromuscular training to address these issues therefore remains a priority for adolescent female players (2,42). Numerous studies support the capacity of neuromuscular training to offset this increased knee injury risk. After a neuromuscular training intervention, the knee injury incidence rates of high school female team-sports players were reduced to a level similar to those of untrained male athletes studied (22). The rates of knee injury in these adolescent female players after intervention were nearly 4 times lower than those in the untrained female players in the study.

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