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THE IMPORTANCE OF SWIMMING IN THE PROPER FORMATION OF THE SPINAL CORD IN PRESCHOOL CHILDREN

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Annotation
However, training volumes, such as total foot contacts for plyometric training, must be monitored to avoid excessive strains and potential overuse injury. Applying resistance through strength training is another means to generate the mechanical stresses required for an osteogenic response.

Keywords: physical, swimming, health, overuse, activity

The particular role of strength training for young athletes has been termed “anatomical adaptation” (5). Such effects include increased strength of supporting connective tissues, passive joint stability, and increased bone density and tensile strength (12). In the same way as weight-bearing activities are recommended, structural multijoint strength training lifts, such as variations of the squat, lunge, and step-up, offer a means to elicit whole-body skeletal adaptations. Site-specific gains in strength and cross-sectional area of bone and connective tissues associated with the muscles recruited during a given strength training exercise can also be used (9). Specifically, strength training exercises can be used to strengthen bones and connective tissues at particular sites that tend to be exposed to strain in the particular sport, such as the shoulder girdle in contact sports. Immediately before and during puberty appears to be a key phase that offers a window of opportunity for skeletal adaptations (18). It is suggested that osteogenic training activities therefore can be used to amplify the skeletal growth and growth-related gains in lean body mass that occur naturally during these stages. However, studies have shown that postpubescent females may be less responsive to skeletal adaptation, which suggests an earlier and narrower window of opportunity for female players (18). Increases in bone density brought about by strength training are of relevance to female players from a longerterm health perspective. Women have a higher incidence of osteoporosis than men do during late adulthood. During adolescence, the growing skeleton seems to be particularly responsive to training (18). For this reason, young players, and females in particular, are recommended to perform

dynamic weight-bearing exercise and appropriate strength training during childhood and adolescence (9,27). Increasing the players bone mineral content at this stage of development is likely to have a favorable impact on his or her risk profile for osteoporosis in later life. YOUTH TRAINING AND BODY COMPOSITION As mentioned earlier, it is suggested that there be a threshold level of physical activity that, in combination with proper nutrition, is required for young players to achieve their genetic potential in terms of growth and maturation (23). A structured program of physical preparation offers a means to guarantee that this goal is achieved, particularly at critical periods in the young players growth and maturation. Furthermore, dedicated training sessions for youth sports also appear vital to help players maintain lean body composition given the background of decreasing physical inactivity and increasing obesity among youth. During and after puberty, some characteristic changes in body composition can be unfavorable to performance and potentially to health, specifically the gains in body fat mass in females particularly (38). Appropriate resistance training, in conjunction with aerobic exercise, has been proposed for losing body fat and for maintaining weight, in much the same way as is recommended for adults (12). In view of the increasing incidence of childhood obesity, the potential of physical preparation, including resistance training, to favorably alter body composition can be seen as advantageous from a health perspective (23). Conversely, the potential for strength training to increase lean body mass is of relevance to players in collision sports. In sports such as rugby and American football, physical size is a determining factor for participation at higher levels. Young players are naturally predisposed to, and selected for, particular playing positions on the basis of their anthropometric characteristics (i.e., height and body mass) and strength capabilities (10). Without experience of systematic strength training, young players are unlikely to have undergone the requisite physical development. As in other collision sports, such as American football, rugby union players body mass and muscularity have increased at a disproportionate rate during the past 25 years, particularly since the advent of professionalism (40). This trend among certain playing positions in these collision sports places them increasingly further away from the general population norms in terms of their physical characteristics. Players at higher levels of competition in rugby football have greater lean body mass than those participating in lower leagues. Body mass has also been shown to correlate with the respective performance of rugby union national teams in World Cup competition, with the heavier playing squads progressing further in the competition (40). SUMMARY The need for different aspects of physical preparation, including strength training,

metabolic conditioning, and neuromuscular training has been described for a range of sports and for young athletes at different stages of maturation. The efficacy of each of these different components of physical preparation for athletes, in general, and young team-sports players, in particular, is also becoming increasingly well established. The nature of responses to each of these forms of training at different stages of growth and maturation has also been examined, but further research is necessary to provide a clearer picture. Any training program should be geared to the physical and emotional maturity of the individuals in the group. Because of the paucity of well-controlled studies in the literature, there is a shortage of conclusive recommendations regarding training design for young populations at different stages of maturation (38). As discussed, rates of growth and maturation within a group of players can vary widely. Phases of development are therefore difficult to define within a squad when training young players competing in team sports. For the purposes of this section, guidelines will be divided into prepubescence (i.e., before showing physical signs indicative of the onset of puberty), early puberty (i.e., the phase between the onset of puberty and attaining peak height velocity), and adolescence (i.e., the period after peak height velocity has been attained and advancing into adulthood). The divisions between stages are necessarily vague. The average age at which peak height velocity is attained (i.e., marking the transition between early puberty and adolescence, as defined earlier) is near 12 years for girls and 14 years for boys (33), but there is considerable variability in this age. Observing changes in physical characteristics, assessing neuromuscular performance, and monitoring seated and standing heights at regular intervals will help in determining the progression between stages. Standing and seated heights are the most helpful objective measure to track with young players when used to plot velocity curves (i.e., gain in height per unit of time) for each player (4). Seated height is helpful because trunk length tends to lag behind leg growth. Ultimately, it is dependent on the coach.

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