

## Sport readiness in children and youth



Physical activity is good for children of all ages. Participation in organized sports may be an enjoyable way for children to increase their physical activity. However, sporting activities must be developmentally appropriate for the child. Enrolling children in sports that are beyond their developmental ability can lead to frustration and early dropout. Thirty five per cent of children who participate in organized sports drop out every year. By age 15, 75% of youth no longer play organized sports (1). Physicians should be knowledgeable about the child's developmental level when assessing his or her sport readiness.

Sport readiness means that the child's motor development matches the requirements of the sport. The acquisition of fundamental motor skills, such as throwing, running and jumping, is an innate process, independent of sex or stage of physical maturity. Each fundamental skill is composed of a series of stages of development that all children go through at different rates. By preschool age, most children have acquired some of these skills but it is not until they reach the age of six years that sufficient combinations of fundamental skills are attained to allow them to begin participating in organized sports.

Predicting sport readiness involves the evaluation of an individual child's cognitive, social and motor development to determine his or her ability to meet the demands of the sport. Sporting activities should be tailored to the developmental level of the child through simple modifications, such as smaller equipment, frequent changing of positions, shorter games and practices, and by focusing on fun. The selection of appropriate sporting activities for children can be guided by an understanding of the developmental skills and limitations of specific age groups (Table 1).

### EARLY CHILDHOOD (TWO TO FIVE YEARS)

During early childhood, body composition changes dramatically. Between the ages of two and six years, there is a gradual increase of both fat mass and fat-free mass with body size. However, the percentage of fat decreases between three and six years of age as caloric intake decreases and energy expenditure increases (2).

The preschool years are marked by dramatic improvements in gait and specific motor skills. Children's legs become straighter, losing the normal infant bowlegs. Children's stride length increases and they develop a more mature running pattern. In this age group, balance is limited because children are just beginning to integrate visual, vestibular and proprioceptive cues. In addition, preschoolers have limited attention spans. They learn best with egocentric

activities, and visual and auditory clues. Emphasis should be placed on acquiring fundamental skills, such as running, throwing, tumbling and catching. Activities should emphasize fun, playfulness, exploration and experimentation. Competition should be avoided.

### MIDDLE CHILDHOOD (SIX TO NINE YEARS)

Growth during middle childhood is not as rapid. Aerobic and anaerobic exercise capacities increase slowly. Most children achieve mature patterns of fundamental motor skills, and their posture and balance are better. They are beginning to learn transitional skills, which are fundamental abilities performed in combination or with variation (eg, throwing for distance). Their attention spans remain short, so sports activities should emphasize fundamental skills and encourage development of transitional skills. Rules should be flexible, instruction times should be kept short and there should be minimal competition. Appropriate activities include entry-level soccer and baseball, swimming, running, skating and gymnastics. Other activities include dancing, riding a bicycle, martial arts and racquet sports, such as tennis.

### LATE CHILDHOOD (10 TO 12 YEARS)

During late childhood, girls are temporarily taller and heavier than boys because of the earlier onset of puberty. Strength begins to diverge but the differences are small. Boys and girls are able to compete evenly. Transitional skills improve and most children are able to master complex motor skills. Attention spans increase but may remain selective. Children are ready to learn strategy and more complex play combinations. Coaches should continue to encourage skill development with an increasing emphasis on strategy and tactics. Appropriate activities include entry-level football, basketball and ice hockey.

### EARLY ADOLESCENCE (13 TO 15 YEARS)

Growth during early adolescence is remarkable. Increases in muscle mass, muscle strength and cardiopulmonary endurance are at their greatest. Although both girls and boys continue to accumulate both fat mass and fat-free mass during adolescence, girls tend to accumulate fat mass at a greater rate with the onset of puberty. Both sexes continue to increase their muscle strength, but this increase is more dramatic in boys. However, adolescence is marked by a temporary decrease in coordination and balance, and a loss of flexibility. The onset of puberty varies among individuals and may affect sport performance. Early maturing boys are taller, stronger and have

**TABLE 1**  
**Developmental skills and sport recommendations during childhood and adolescence**

	<b>Early childhood: 3 to 5 years</b>	<b>Middle childhood: 6 to 9 years</b>	<b>Late childhood: 10 to 12 years</b>	<b>Early adolescence: 13 to 15 years</b>	<b>Late adolescence: 16 to 18 years</b>
<b>Motor skills</b>	Limited fundamental sport skills (eg, running, throwing and kicking) Limited balance skills	Mature fundamental sport skills Better posture and balance Beginning transitional skills (eg, throwing for distance)	Improving transitional skills Mastering complex motor skills (eg, lay-up in basketball)	Tremendous growth but loss of flexibility Differences with timing of puberty	Continued growth into adulthood Mature sport skills
<b>Vision</b>	Not mature until 6 to 7 years of age Difficulty tracking and judging the speed of moving objects	Improved tracking but limited directionality	Mature adult patterns	Adult patterns	Adult patterns
<b>Learning</b>	Very short attention span Visual and auditory cues important	Short attention span Limited memory and rapid decision-making skills	Selective attention Memory skills improving	Improved attention span Good memory skills; able to memorize plays and strategize	Good attention span and memory skills
<b>Skill emphasis</b>	Emphasize fundamental skills Emphasize play and experimentation rather than competition	Emphasize fundamental skills and beginning transitional skills	Emphasize skill development with increasing emphasis on tactics and strategy	Emphasize individual strengths	Emphasize individual strengths
<b>Suggested activities</b>	Running, tumbling, throwing, catching and riding a tricycle	Entry-level soccer and baseball, swimming, running, gymnastics, skating, dancing, racquet sports (eg, tennis), riding a bicycle and noncontact martial arts	Entry-level football, basketball and ice hockey	Early-maturing boys: track and field, basketball and ice hockey Late-maturing girls: gymnastics and skating	All sports depending on interest

greater muscle mass, and should participate in sports such as basketball, ice hockey and track and field, which emphasize these qualities. Girls who mature late have narrower shoulders and hips, and are ideally suited for sports such as gymnastics.

#### LATE ADOLESCENCE (16 TO 18 YEARS)

Boys continue to increase their strength, speed and size but at a slower rate than during puberty. Girls continue to accumulate fat mass. Muscular strength and aerobic capacity increase into adulthood. Late maturers usually catch up but tend to be lighter and not as strong.

All sports are appropriate, but participants usually choose sports that they are good at and enjoy. Sports may provide youth with the opportunity to develop independence, identify with a peer group and increase social interaction. Positive sport experiences may go a long way to maintaining exercise and sport participation during the adult years.

#### TAKE-HOME MESSAGE

Participation in organized sports should be aimed at the developmental level of the participants so that they enjoy being physically active. Children should be encouraged to participate in a variety of activities and avoid early specialization.

#### PAEDIATRIC SPORTS AND EXERCISE MEDICINE SECTION (2004-2005)

**Executive:** Drs Laura Purcell, Children's Hospital of Western Ontario, London, Ontario (President); Claire LeBlanc, Children's Hospital of Eastern Ontario, Ottawa, Ontario (Vice-President); Michelle McTimoney, IWK Health Centre, Halifax, Nova Scotia (Secretary); John Philpott, Toronto, Ontario (Member at large); Merrilee Zetaruk, Winnipeg, Manitoba (Member at large)

**Principal author:** Dr Laura Purcell, Children's Hospital of Western Ontario, London, Ontario

Parents can be instrumental in promoting physical activity and sport participation in their children by ensuring that children are having fun at their development level. To provide a basis for lifelong involvement, parents and coaches should strive to provide positive sport experiences for children that match their interests and developmental capabilities.

#### REFERENCES

- Harris S. Readiness to participate in sports. In: Sullivan JA, Anderson SJ, eds. *Care of the Young Athlete*. Rosemont, Illinois: American Academy of Orthopaedic Surgeons and American Academy of Pediatrics, 2000:19-24.
- Gomez JE. Growth and maturation. In: Sullivan JA, Anderson SJ, eds. *Care of the Young Athlete*. Rosemont, Illinois: American Academy of Orthopaedic Surgeons and American Academy of Pediatrics, 2000:25-32.
- Nelson MA. Developmental skills and children's sports. *Phys Sportsmed* 1991;19:67-79.
- Ganley T, Sherman C. Exercise and children's health: A little counselling can pay lasting dividends. *Phys Sportsmed* 2000;28:85-92.
- International Federation of Sports Medicine. Position statement on excessive physical training in children and adolescents. *Clin J Sport Med* 1991;1:262-4.
- Roemmich JN, Rogol AD. Physiology of growth and development. Its relationship to performance in the young athlete. *Clin Sports Med* 1995;14:483-502.
- Patel DR, Pratt HD, Greydanus DE. Pediatric neurodevelopment and sports participation: When are children ready to play sports? *Pediatr Clin N Am* 2002;49:505-31.

The recommendations in this article do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate.