

PLAYING SAFE



By Dr Craig Sharp

Up to puberty, children are not simply miniature adults in their bodily responses to exercise. In several important respects, they are more like a third sex. This is particularly true of 'middle childhood', which is the 5-12 age group, the principal subject of this article. Dr Craig Sharp of the British Olympic Medical Centre explains how children's bodies work, how to look after them, and how to warm them up before play.

Boys and girls grow fairly equally for their first decade, but then the adolescent growth spurt, which starts two years earlier in girls, means many girls are bigger, heavier and possibly stronger and faster than many boys by 11 or 12. Children of either sex who start their growth spurt early have a considerable advantage in age-group sport. While the growth spurt is actually taking place, however, physical training should not be too intensive.

Up to the age of eight, both sexes also have roughly equal proportions of body fat: between 16 and 18 per cent. From then on, though, fat levels in girls gradually increase, while those in boys decline. At around the age of nine children become capable of developing the early lesions of fatty change in their blood vessels which may eventually lead to hardening of the arteries and coronary heart disease - and of reducing high levels of blood fats

through exercise. This is one of the most important justifications for regular exercise from an early age.

Excessive amounts of exercise - particularly jumping, running and kicking - may cause injury to the growing skeleton, but only if the level of training is very intense, and there are reports indicating that moderate physical activity benefits bone growth and development.

Children's muscle can develop the same strength, weight for weight, as adult muscle; the trouble is that they have much less of it. Nor is their bone size yet suited to the mechanical properties of muscle. They are mechanically inefficient, so that much exercise is relatively harder for them than for adults. This should be borne in mind by anyone teaching sport to a child.

But there is no need to pamper children. One study found that children who take little exercise may grow into under-strength adults, which suggests that the stimulus of reasonable exercise may be necessary for muscle to realise its normal potential.

Children are also inefficient when it comes to aerobic fitness. To get one litre of oxygen into their blood, six-years-olds need to breathe about 40 litres of air. By the time they are 18 this figure has fallen to 30 litres. Thus young children waste energy in overbreathing.

Exercising children may also breathe out too much carbon dioxide, and occasionally this may cause cramp in hands and feet, with pins and needles around the mouth. This can be corrected by breathing in and out of a paper bag for about 15 seconds every half-minute for a few minutes, allowing them to breathe back in some of the exhaled carbon dioxide.

GOOD RUNNERS RUN FASTEST

Being less mechanically efficient, expending more energy on breathing and using more fat as fuel leads children to expend

over 25 per cent more energy while running and walking at the age of six than at the age of 16. Thus a seven-year-old, trotting gamely after his or her parents on a moorland walk, will be exercising at a much higher level than them, and may become hot and dehydrated. Interestingly, though, the bicycle mechanically evens out much of this inequality, and children can approach adult efficiencies when cycling.

Another major difference between children and adults is in their capacity for anaerobic activity. In adults, muscle can produce short bursts (up to 30 seconds) of very intense effort anaerobically, or without oxygen, with a lot of hard breathing afterwards. Such effort, associated with explosive activities like sprinting, causes the production by muscle of the fatiguing end-product lactic acid.

It is not necessary to over-protect children.





Young children do seem to have the same relative capacity for such anaerobic work, nor do they produce as much lactic acid as adults. In spite of their aerobic inefficiencies, therefore, children should be regarded as aerobic creatures. This is reflected in the fact that in the younger years at primary school, the children who are 'good runners' will run fastest as well as furthest; whereas by the time they are at secondary school, the good sprinters will rarely be those who win the longer distances. Adult and teenage athletes tend to be 'metabolic specialists'; young children are not.

This lack of anaerobic ability gives young children a capability for prolonged exercise which is not always to their advantage. Lactic acid in adults to some extent protects them from over-exertion; not so in children, who are more vulnerable to heat and fluid loss. A child of eight has nearly 40 per cent more surface area, weight for weight, than an adult. Thus the child absorbs much more heat if scantily clad on a hot sunny day and loses much more heat when swimming, especially in the sea.

FREQUENT DRINKS

During exercise children have a different pattern of heat loss from adults, losing over half their heat by radiation and less than half by sweating, whereas adults lose about 70 per cent of their heat through evaporating sweat. Young children may sweat at a rate of 350ml (3/5pt) per square metre of skin per hour, compared to over 800ml (1 1/2 pints) for an adult man. Yet though they lose less sweat, children still lose more fluid, because of their extra breathing (which contains moisture).

Taken with their capacity for prolonged exercise and the fact that they tend not, voluntarily, to drink what they have lost, this means that young children can easily become dehydrated. Attention should therefore be paid to providing them with fairly frequent drinks during exercise. Water is all they need, but squash or fruit juice, being more acceptable, may be more effective.

Another reason to beware of over-exertion is that children recover faster than adults even from strenuous exercise. In addition, they seem not to perceive a given rate of exercise as being as 'hard' as adults do, and thus do not moderate their exertions of their own accord.



From a physiological viewpoint, the key word in children's sport is variety. An ideal programme of exercise for children would develop all the aspects of fitness: aerobic fitness, muscle endurance, and some speed, strength and flexibility. Under the age of 10, though, the emphasis should be on the skills of sport and movement, improving co-ordination and neuromuscular development, with aerobic (walking, running, cycling), anaerobic and gymnastic work introduced occasionally for variety.

It is also important for under-10s to have frequent (every 20 minutes) short breaks, particularly in the heat, whether indoors or out, and frequent drinks. Stretching exercises for flexibility become important between 10 and 12, and thereafter everything may be gradually increased, although deliberate strength and power training should begin only after sexual maturity.

C.S.

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Children do not assess the degree of difficulty of an activity.