"The Training Stresses for Children"

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A shortened version of a paper presented at the Society's conference "Managing fitness and sports injuries" 1989, and subsequently published* in the 'Conference Proceedings'

*Available from Dr P A Gardner 50p post free.

There is an almost total gap in the literature about children. I pulled together some of the information that we do have from the fields of paediatrics, developmental medicine and sports medicine, and provide some 'food for thought' as to how we should be tackling the growing problem of early training.

The children can be involved in a wide spectrum of sporting activities ranging from straightforward play -

PLAY ---> INFORMAL GAMES ---> ORGANISED SPORT ---> COMPETITIVE SPORT ----> TRAINING

These can often be in a variety of environments (hard concrete playground, swimming pool etc.) each posing particular tasks and strains on the developing body.

It is important to remember that the child's body is a developing body - the child is not just a smaller version if the adult. The body proportions are different; producing engineering and mechanical differences; moreover these proportions are changing.

Age

Bone age is more relevant than chronological age since not only does this indicate the state of fusion of epiphyses and thus the vulnerability of joints and bones to particular types of injury, but bone age gives us a better yardstick for developmental ages, e.g. a female gymnast aged 14 with no periods might raise the question if delayed puberty due to overtraining and weight loss, however if we knew her bone age was only 12 this would be in favour of a constitutional later development.

Children who specifically train for one sport are thus placed in an artificial situation when possibly one group of muscles or one type of movement is exaggerated. Thus normal developmental patterns can be altered. A great exponent of this theory was Isadora Duncan who believed that the formal training of classical ballet stunted normal female development by not allowing freedom of movement of the bust and pelvis. Her very young pupils were far removed from the flat chested anorexics that we have grown accustomed to see on the ballet stage.

Growth and Power

Tanner's research into childhood growth patterns clearly revealed the variation in growth velocity for girls and boys. Girls enter their period of peak height velocity just before menarche and are thus more or less fully grown before they can reproduce. Boys peak later. During this period of very rapid growth, the body has a very high nutritional requirement which will obviously be magnified if that growing adolescent is involved in training. This is a time for care, not only with regards to nutrition, but also with regard to the gawky teenager whose co-ordination may not be perfect until he learns to adjust to his new size. Obviously girls in training will have to face the differences caused by menstruation, possible premenstrual tension and training causing irregular periods.

How does the growing body cope with exercise? The cardiac output at sub maximal exercise of an 11-13 year old boy is 1-2 litres per minute less than for a young adult man.

The maximal heartrate decreases with age peaking at about 230 beats per minute at 5-10 years of age. It should be remembered that the resting heart rate also decreases with age from 140 beats per minute of a newborn baby.

Maximum oxygen uptake also decreases with age peaking at about 10 years for girls and 15 years for boys.

'Athlete's heart' has been demonstrated in young prepubertal male swimmers, with lower resting heart rates and echographic findings consistent with chronic left ventricular volume overload. Paediatricians need to be aware of this condition in order to avoid misdiagnosing disease. The ECG findings are of course normal. The heart is obviously functionally enlarged - do we consider this normal? Similarly preliminary findings have shown that the stress induced blood pressure rises caused by running in very young children 3-4 years old are predictive of hypertension in adult life.

Maximal isometric strength also varies with age. Muscle fibre differentiation starts at 20 weeks gestation and is probably complete by one year. The baseline ratio between slow type I fibres and fast type II is genetic but habitual use i.e. training, changes and establishes the final ratio. Thus the fibre distribution and ultastructure of the skeletal muscle is no different in a 6 year old than in an adult.

Neurological considerations

As the child's muscular system grows and develops, so the neurological apparatus undergoes maturation and development. Proprioceptive patterns are established so that at first the child can achieve simple tasks such as keeping the trunk upright and steady, and later can perform precise complex movements such as the gymnast balancing on the bar. Young children are perhaps easier to train than adults in some agility movements, their bodies being still receptive to learning new patterns of movement, however no amount of training will allow a child to perform a feat for which his neurological system is not ready.

Training Implications

Generally speaking children are involved in a variety of sporting activities so the particular stresses of one type of training will not be disproportionate. When considering training needs and nutrition it is important to remember certain basic facts':-

1. A developing child has about twice the calorific needs of the adult - 120 calories per kilo at one year, 80 calories per kilo at 12 years (adult level 40 calories per kilo).

2. The proteins needs of a normal unathletic 12 year old are double those of an adult (2gm per kilo per day).

The child's body has a greater fluid requirement - 150mls per kilo per day at 1 year; 70 mls per kilo per day at 12 years and 50mls per kilo for an adult.

Thus not only will children need adequate nutrition during training, they will also deplete their body fluids quicker in heat or prolonged exercise. Getting children to "sweat off" weight gains for competitions, such as Judo, can be more dangerous than for an adult.

Injuries.

In principle we need to bear in mind the differing types of injury that occur in children and young adults; Conjunctivitis (swimming pool); grazed knee (skateboarding); black eye (rugby); cut chin (diving); head injury (cycling); asthma (cross country). Osteochondritis in its various forms will pose a problem for some young children; greenstick fractures etc. Presentations and signs of injury will vary in young children.

Psychological Issues

Psychological issues in training not only provide motivation for sport, they also provide the major source of training stresses for children.

Parental over-investment in their children doing well can result in tremendous pressure. Parents can be linked in a symbiosis - an inability to see their child as an individual but only as an extension of their self. Thus the parents are achieving their own needs through their child.

The coach wanting to win too much and forgetting the welfare of his protegees. Is competition good for a child? What happens to the self esteem of a child who never wins, who trains hard and cannot satisfy his dad? How many young athletes never reach the adult circuit due to 'BURNOUT' caused by being pushed too hard too early and losing the enjoyment of the game and the meaning of play?

ARE YOU INTERESTED IN HIV/AIDS?

To attempt to produce a Society statement, working groups will be meeting **in London** on -

Thursday Sept. 24th at 3-30pm
& Friday Sept. 25th at 9-30am

If you are interested -

in attending - contact Dr P A gardner as soon as possible for details

if unable to attend - if you have any comments on the topic, please send to Dr Gardner **before Sept. 20th.**