兒童的體育運動與活動: 對生長和發育的重要性

Physical activity and movement in children: its consequences for growth and development

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The value of physical activity to health and fitness and normal growth and development is undisputed. In contrast, lack of exercise or excesses in physical activity can be harmful to the growth and development process. Normal physical maturation represents a succession of events which appear in the same sequence in all individuals but vary in both starting point and speed of occurrence. It is often difficult to distinguish the effects of regular physical activity upon fitness from the changes associated with growth and maturation. An integral component of the relationship between health and fitness is body composition. Maintenance of a desirable body composition is an integral component in health status and in the evaluation of health, fitness and physical performance of individuals. Traditionally, discussions that have considered the benefits of regular physical activity have referenced cardiorespiratory and other components of physical fitness such as muscular strength and endurance. More recently, body composition has received considerable attention with numerous individuals of all ages preoccupied with body characteristics such as body fat and muscularity. Less recognition has been given to the role that exercise plays in the maintenance of skeletal health and the potential benefits to be gained by this component of body composition. This is gradually changing with the knowledge that osteoporosis is mediated by nutritional, physical activity and hormonal influences and that inappropriate physical activity can be potentially hazardous to the immature and mature skeleton. Regular physical activity that provides an appropriate weight bearing stimulus is critical for the maintenance of desirable body composition including normal skeletal health, irrespective of age or sex. Benefits derived for body composition are equally important to personal health as the development of other components of fitness.

Physical activity is one of numerous factors which influence the growth and development of children and adolescents. Whilst changes in physical, motor and physiological fitness of such individuals are influenced by growth and maturation it is not easy to isolate the direct effects of regular physical activity on fitness status from the inherent growth and maturational adjustments. Knowledge of the effects of regular childhood physical activity on risk factors for a number of health problems including cardiovascular disease are still ambiguous. But it is the general consensus that enduring benefits to health in respect of desirable body composition require the incorporation of habitual physical activity from an early age.

The importance of regular physical activity to the health status and normal growth and development of children and adolescents is undisputed[1,2]. In contrast, lack of exercise (hypoactivity) or excesses in physical activity can be injurious to the growth and development process. During childhood and adolescence, nutrition and physical activity influence the growth and development of numerous body tissues[3] but, in the context of this paper, discussion is limited to body fat and the skeletal system.

The potential benefits of physical activity must be considered in relation to age of commencement of regular activity. Patterns of habitual physical activity and the opportunity for variability in the movement environment during the growing years have the potential to be sustained across the lifespan and possibly impact on morbidity and longevity[4]. Too often inactivity in combination with nutrition excesses contribute to overfatness in youngsters. A combination of sound nutrition and adequate physical activity is a cost-effective stimulus to reduced risk of future chronic diseases[3]. Such practices require focused educational programmes and support for those at greater risk.

Children display a natural spontaneity and enjoyment in movement. They are forever on the move with a degree of vitality that is infectious to others. This characteristic of joy and excitement in the movement setting must be fostered and supported to facilitate an appreciation of the ongoing benefits of regular participation in physical activity. The opportunity for movement in the childhood years should not be hindered and every attempt be made to encourage self-direction in movement. Early experiences of movement should be complemented by quality physical activity/physical education programmes that enable health and motor related fitness to be fostered.

The interrelationships between habitual physical activity, physical fitness and health status have not been comprehensively researched, particularly from a longitudinal perspective. The paucity of quantitative information is more pronounced in children of pre-school age[5]. There are how-

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ever definitive indications of the importance of genotype in relation to each of the above mentioned suggesting that the general level of activity of an individual is a phenotype exhibiting a degree of dependence of the genotype. However, Bouchard[6] identifies non-genetic factors as being largely responsible for most individual differences related to habitual physical activity such as level of participation in activity.

Benefits of regular physical activity are generally considered on the basis of cardiorespiratory improvements or benefits in other health-related components of physical fitness including muscular strength and endurance, flexibility and body composition status. Customarily, less recognition has been given to the role that exercise plays in the maintenance of skeletal health. With increasing knowledge of the complexities of osteoporosis this is changing so that body fatness levels and the health status of the skeleton are receiving comparable emphasis.

Osteoporosis is recognized as the most common disorder of the skeleton and is characterized by decreased bone mineral content, increased porosity of bone and a decreased resistance to fracture. The pathogenesis of the disease is multifaceted including genetic predisposition, nutrition, physical activity, age and hormonal status[7]. Osteoporosis and the profound loss of bone mass and strength in older adults may well have its genesis at much younger ages[7,8]. If this is the case, prevention of age related osteoporosis must begin in childhood with desirable nutrition and physical activity habits.

The maintenance of physical fitness may be one of the most effective measures in the prevention of age-related osteoporosis. The progressive decline in levels of physical activity across the lifespan may be a major contributor to the development of osteoporosis[9]. Physical activity has long been known to influence the characteristics of bone with disuse and lack of weight bearing resulting in loss of bone mineral and also atrophy of skeletal muscle[10].

The direct role that physical activity can play is still, however, somewhat unclear. Whilst physical inactivity and lack of weight bearing can result in bone loss, the definitive physical activity loads to provide the stimulus for functional adaptation of bone are poorly defined[11]. The threshold levels of activity associated with either positive or negative changes are difficult to quantify because of a range of factors including loading history in a variety of activities, age plus the physical and physiological status of an individual.

Regular physical activity that provides an appropriate weight bearing stimulus for the skeleton is critical for the maintenance of normal skeletal health for all individuals, irrespective of age. Clearly, benefits accrued during the growing years are equally advantageous to personal health as a desirable level of fatness and fat-free mass and level of development of the other health-related components of physical fitness[12].

The importance of regular *weight-bearing* exercise across the lifespan can also be illustrated by the changes in body composition experienced over time. Across the lifespan there is a progressive decline in lean body mass and total body water[13]. This equates to approximately 6% per decade for lean body mass[14]. Preservation of lean tissue and a consequent maintenance of muscular strength and endurance and cardiorespiratory fitness at reasonable levels is augmented with regular physical activity. Equally important is the quality of body composition. This is far more critical at all ages than body weight per se[15]. A more appropriate balance between body fat and fat-free mass can be maintained with participation in regular physical activity[16].

Levels of participation of children and adolescents in appropriate physical activity is an area of major concern today[17,18]. Increased levels of adiposity and a diminution of energy output tend to perpetuate a vicious cycle of poor exercise and nutrition habits. A recent survey of factors determining participation in sport commissioned by the Australian Sports Commission[19] provided an important insight into the primary concerns in society about activity. A significant number of young people wanted to play sport but felt that opportunities were limited. Similarly, a large group of respondents believed that they simply lacked the necessary skills. Responses reflected a lowered self-esteem, lack of confidence and poor body image.

Far too many children are not provided the opportunity to be active from a young age and to establish a sound motor skill base. A good level of motor skill rather than a high level of proficiency should be a goal for all young people. This can be fostered by exposure to a variety of activity areas rather than attempting to specialize in one area from an early age. Skill competency is one of the requirements likely to have a bearing upon participation levels during later years. This, combined with knowledge and understanding of the health of physical activity should assist informed decision making.

Positive knowledge, attitudes and beliefs about the health benefits to be gained from physical activity participation may be insufficient to encourage regular participation in many adults[20]. For others, lack of knowledge and negative experiences in the physical activity setting may be barriers to participation. Every attempt must be made to engender regular physical activity opportunities for all young people, rather than waiting until adulthood before the benefits are espoused and adopted by a proportion of the population.

Awareness of body composition status and methods of assessment are important in the early identification of predisposition to overfatness[21]. The significance of the body composition area is underlined by the knowledge that two of the most common hypokinetic and nutrition-related diseases are obesity and heart disease[22]. While obesity and cardiovascular disease are deemed adult health problems there is strong evidence to suggest that, as for osteoporosis, each begins in the early years of life. This knowledge should provide the necessary impetus to address prevention of these major community health problems by developing sound nutrition and physical activity practices from birth[23]. In this way society, over time, might expect a consequent improvement in health. An appreciation of the 'normal' physical growth changes during infancy, childhood and adolescence and the individual variability in body shape, physique and body composition are important in conjunction with good nutritional and physical activity practices. Monitoring of physical changes and where necessary additional assistance in the management of body composition and activity status are the responsibility of all health professionals but primarily exercise and sports scientists, physical educators, health educators, medical practitioners and dietitians. A consolidated approach by these groups would ensure consistency of advice and support and help to minimize the gross misinformation that often pervades our society.

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tion are equally important to personal health as the development of other components of fitness. A concerted effort for awareness of the needs of children and adolescents in physical activity is required of all individuals and groups who have a responsibility for the provision of safe and meaningful physical activity during the growing years.

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