CANADIAN ACADEMY OF SPORT MEDICINE
ACADÉMIE CANADIENNE DE MÉDECINE DU SPORT
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DISCUSSION PAPER

Physical Inactivity in Children and Adolescents

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This discussion paper was prepared by the Canadian Academy of Sport Medicine (CASM) Ad Hoc Committee on Children's Fitness. This discussion paper was approved by the CASM Board of Directors as a CASM discussion paper in April, 2004.

1.0 INTRODUCTION

This discussion paper outlines the concerns of the Canadian Academy of Sport Medicine (CASM) regarding the alarming increase in sedentary activity and the declining fitness of children in Canada. Other developed countries are also facing this trend. The objective of this discussion paper is to raise the awareness of health professionals, particularly physicians, about the decrease of physical activity and fitness in Canadian youth and the contribution of physical inactivity to the increase in childhood obesity. Exercise has invaluable benefits for all children, whether obese or normal weight. This article discusses multiple factors that may influence physical activity behaviour. It also presents recommendations for professionals to address this epidemic.

2.0 DEFINITIONS

Standardized definitions concerning childhood fitness and obesity are controversial. Within this paper, *childhood* is defined as 2 to 11 years of age, and *adolescence* is defined as 12 to 19 years of age. *Physical activity* is defined as "any bodily movement produced by skeletal muscles that result in energy expenditure."[1] Physical activity is considered a behaviour, with a degree of choice on behalf of the individual involved. It is further defined by type, frequency, intensity and duration. *Physical fitness* on the other hand, is an attribute. Fitness components include cardio-respiratory endurance, muscle strength and endurance, flexibility and body composition.[1] *Obesity* is defined as the presence of excess fat (adipose) and is often incorrectly used interchangeably with the term *overweight*. Current thinking is that those individuals with a body mass index (BMI) equal to or greater than the 95th percentile for age and sex are considered obese, while those with a BMI between the 85th and 95th percentile are described as "at risk for

being overweight."[2] In adults, BMI cutoff levels of 30 and 25 kg/m^2 reflect obesity and overweight but these values are unsuitable for children and adolescents. International definitions using pediatric BMI cutoffs based on pooled data have been proposed, however Canadian data was not included.[3]

3.0 CHILDHOOD OBESITY

The field of exercise science has shown tremendous growth, particularly in the areas of physical inactivity and the increasing rates of childhood obesity. The field of exercise science has shown childhood obesity. A recent study by Tremblay and Wilms provided strong evidence supporting an increase in BMI in Canadian children.[4] Using BMI obesity and overweight cut-off values from 1981, the number of obese children in Canada between the ages of 7 and 13 has increased from 5% in both sexes in 1981 to 13.5% in boys and 11.8% in girls in 1996.[4] The prevalence of children classified as overweight has increased from 15% in 1981 to 28.8% for boys in 1996 (a 92% increase) and from 15% to 23.6% for girls (a 57% increase). Similar rates of obesity have been found in many industrialized nations including the United States[5,6] and Australia.[7] The National Center for Health Statistics (NCHS) has indicated that more than 1 in 5 children and adolescents in the United States are overweight.[5] Over the past several decades, obesity has increased by 54% in children 6 to 11 years old and 39% in adolescents 12 to 17 years old. Severe obesity has increased by 98% in the younger group and by 64% in the adolescent age group.[8]

There is a concern that childhood obesity may lead to adult obesity, which is described as "tracking." Obese children are 5 to 7 times more likely to become obese adults than non-obese children.[9] Research by Whitaker et al.[10] indicated that children who were obese at age six had a 50% chance of becoming obese as adults. Obese adolescents had a 70% to 80% probability of adult obesity. Several factors, including diet and activity level, contribute to the development of obesity. Activity level is the variable that appears the most amenable to change.[11] The importance of addressing childhood obesity is paramount, since several studies have linked it with an increased risk of adult morbidity even when obesity has not persisted into adulthood.[12] Also, the "heavy" economic burden of physical inactivity translated to an estimated total direct cost of $2.1 billion to the Canadian health care system in 1999.[13]

4.0 INCREASED SEDENTARY ACTIVITY

It is reasonable to assume that the increase in prevalence of obesity results from a combination of increased caloric intake and decreased physical activity. The importance of physical activity is often underestimated. Some evidence even suggests that obese children do not consume significantly more calories than non-obese children.[8,14] Overall fat consumption by the general population has also decreased in the general population. This suggests that physical inactivity plays a key role in the problem.[15] Total caloric intake has been positively associated with the number of hours of television viewing. Crespo et al. [16] observed that children who watch television more than 5 hours a day have significantly greater energy intake than those who watch less than one hour per day. Sedentary lifestyles lead to a sustained positive energy balance and are a major contributing factor to the development of obesity in children and adolescents.[17,18]

Children frequently choose to engage in sedentary activities over participation in physical activities. Television viewing, video games, computers, Internet surfing, and reduced physical education contribute to a reduction in physical activity. Canadian children ages 2 to 11 years watch an average of 15.5 hours of television per week, while teens ages 12 to 17 years watch an average of 14.1 hours of television per week.[19] A survey of 6 to12 year old Canadian children showed almost 1 in 3 (36%) do not get the physical activity necessary for adequate development of cardiovascular fitness, muscle strength and flexibility.[20]

5.0 ADVERSE EFFECTS OF NON-EXERCISE

It is well known that adult obesity has been associated with several chronic diseases including coronary artery disease, hypertension, osteoporosis, diabetes mellitus, lung disease, and some forms of cancer.[21,22] These diseases are also becoming a concern in obese children.[23] Type 2 diabetes, once known as "adult onset," is a growing problem among children and adolescents, particularly among First Nations youth.[24] Obesity and inactivity contribute to insulin resistance, the hallmark of type 2 diabetes. The fact that the rates of obesity, physical inactivity and type 2 diabetes are increasing in children is concerning.[25,26] Exercise-induced bronchospasm may be a limitation to physical activity. Obesity is associated with bronchial hyper-reactivity to exercise and may pre-dispose to asthma.[27]

6.0 IMPORTANCE OF EXERCISE AND PROPER NUTRITION

Health benefits of regular physical activity include the ability to maintain healthy bones and muscles, control weight and reduce fat, and decrease cardiovascular risk factors. Activities involving repetitive cycles of loading during the first two decades of life before peak bone mass is usually achieved lead to adaptation by the bone,[28] which can have positive effects on bone density. This has the potential to reduce the risk of osteoporosis and fractures later in life, especially if the weight bearing exercise is maintained throughout adulthood.[29,30] Exercise can also decrease the prevalence of hypertension.[31]

Exercise has been found to be beneficial in reducing adverse health issues in young people. There is an association between childhood obesity and low levels of self-esteem.[32] Regular physical activity can increase self-esteem and may reduce anxiety and stress in adolescents.[33] Students who participate in physical activity and sports are also less likely to be heavy smokers[34] or use drugs[35] and more likely to stay in school.[36] Sports also introduce young people to useful life skills such as teamwork, self-discipline, sportsmanship, leadership, and socialization.[37]

Given the potential effects on growth and development, proper nutrition is a critical aspect of health in children and adolescents. Unfortunately, there is cause for concern in the diet of Canadian youth. A cross-sectional survey comparing 24-hour recall dietary interviews of Canadians to "Canada's Food Guide to Healthy Living," showed that females age 13 to17 had mean milk product and meat and alternatives intake below the recommended minimum level.[38] The eating habits of grade six students in a 1998 Canadian survey revealed 73% ate at least one fruit a day, 45% ate at least one vegetable a day, 24% had chocolate or candy daily and 15% ate potato chips or french fries daily.[39] US studies[40,41] showed that of children between the ages of 7 and 14 years, only 46% met

the recommended daily intake for grain, 20% for vegetable, 5% for fruit, 9% for dairy, and 26% for meat. Moreover, a large proportion of total caloric intake came from fat and added sugar and accounted for 46% of the total calories.

Excessive portion size can also lead to unnecessary calorie intake. Two other concerning changes in eating habits of adolescents are an increased intake of soft drinks and a decline in frequency of regular breakfast consumption.[39] Consumption of juice, which has the approximate caloric intake of soft drinks, should also be considered as it may contribute a significant number of calories. Children and adolescents should eat a balanced diet with a range of calories and nutrients appropriate for their levels of activity. They could, for example, follow suggestions in "The Canada Food Guide."

7.0 HOW MUCH EXERCISE?

While agreement exists that sedentary activity increases the likelihood of childhood obesity,[42] there is less consensus on the minimal or optimal levels of activity in children. Several recommendations have been published including "The International Consensus Conference on Physical Activity Guidelines for Adolescents,"[43] "The National Association for Sport and Physical Education"[44] and "The Surgeon General Report."[45] Most recommend that children and adolescents should be physically active every day or at least most days of the week. The suggested duration of activities ranged from 20 to 60 minutes. Children and adolescents should be involved in moderate to vigorous activities, or exertion sufficient to cause mild shortness of breath or sweating. Activities may be part of play, sports, work, transportation, physical education or planned exercise.

Health Canada has recognized the need for promoting and improving physical activity as a key component of a healthy lifestyle.[46] Physical activity guides are available for both children and adolescents. These guides were written in conjunction with specialists from the Canadian Society for Exercise Physiology, the Canadian Paediatric Society and the College of Family Physicians of Canada. "Canada's Physical Activity Guides for Children and Youth" (www.healthcanada.ca/paguide) are based on the assumption that most of Canada's young people are insufficiently active. These guides recommend a 30-minute increment of activity beyond the level currently practiced by the child/adolescent. To make time for added activity, "The Guides" recommend a concomitant reduction of 30 minutes per day of "screen time" (TV, computer, video). The goal is to gradually increase the daily physical activity of youth to 90 minutes over a period of months.

8.0 WHAT EXTERNAL INFLUENCES AFFECT PHYSICAL ACTIVITY?

Lifestyle behaviours may be determined early in life. Parents, peers, health professionals and school significantly influence youth. Socioeconomic factors, media, government and sporting organizations also play a role in determining participation in exercise activities.

8.1 Adult influences

Adults are important role models for children in dietary and physical activity practises.[47,48] Childhood is a critical time for children to seek approval from adults. Parents should set appropriate examples for healthy behaviours. Short- and long-term

success in behavioural intervention has been demonstrated when at least one parent is an active participant.[49] Compliance with exercise and diet increase when children observe similar behaviours in their parents.[50] During childhood and adolescence, risk factors for becoming overweight[51] include: overweight parent(s); low income family situation, chronic disease or disability that restricts movement, and certain ethnic/racial groups, such as First Nations' people.

Coaches also have major influences on young athletes. Coaches should have proper training and help promote a healthy, fun environment for sports, including healthy competition, skill development, and safety. Coaches can also provide advice on fitness and nutrition. The Coaching Association of Canada certification has become a leader in standardizing qualifications. Training programs, volunteering screening or reference checks help provide education for coaches. This translates to coaches teaching healthy behaviors as well as sports skills.

8.2 Peers

As children progress into adolescence, the influence of peers begins to become a competing factor with parental influence in determining behaviour. Widespread decline in physical activity among groups of young people is a major concern. In general, boys tend to participate in greater numbers and exercise more intensively than girls.[52] Participation in activities tend to peak by age 10 to 13 (92%).[50] Information from "The Government of Canada National Population Survey" showed that both sexes experience a decrease in physical activity as they mature, and the decline is greater for girls.[53] Therefore, adolescent girls are a group of particular concern for declining physical activity.

Analysis of the 1990 Ontario Health Survey revealed a major decline in physical activity between the ages of 13 and 19 especially in females, which resulted in an increase of physical inactivity from 22% to 60%.[54] Twenty-seven per cent of girls ages 12 to 14 were inactive which increased to 48% by ages 15 to 19. In comparison, twenty-one percent of 12 to 14 year old boys were found to be physically inactive, which increased to 28% in males ages 15 to 19. A review of nine other studies by Sallis revealed a consistent decline in physical activity seen over the school-age years with the mean level of physical activity decreasing about 2.7% per year in males and about 7.4% per year in females.[52] The pressures of adolescence often distract young people from participating in physical activity. A movement toward keeping young people active through promotion, education and opportunities for activity needs to be a priority.

8.3 School

The decreasing trend of physical activity during leisure time is mirrored in the participation and requirements of physical education in schools. The Canadian Association for Health, Physical Education, Recreation and Dance (CAHPERD) recommended that all Canadian children ages 5 to 18 participate in 150 minutes of school-based physical education per week.[55] CAHPERD estimated that schools are averaging only 60 minutes of physical education per week. Ontario high school students are required to complete only one course in physical education and many of them have met this requirement by age 14 or 15.[56] Regional disparity in the amount of physical activity provided exists between and within provinces and territories. Increased quality

of life is a benefit of regular physical activity in specific populations such as children with special health care needs. The stark contrast between the optional status of physical education and the mandatory nature of academic subjects may give a mixed message of the importance of exercise and could lessen students', teachers', and schools' perceived value of it.

Physical education is necessary to give students the opportunity to gain the knowledge and the skills to adopt active lifestyles. These translate into increased physical competence, health-related fitness, self-esteem and enjoyment.[57] Physical education curricula in schools should focus on promoting individual activities of moderate to vigorous intensity, which can be transferred outside the school setting, rather than only to team or organized sports.[58]

School, by its nature of having a captive audience, is an ideal situation to influence children. Schools should offer quality, daily physical education, recess for unstructured play, extracurricular programs and appropriate classroom health education. Together, these elements provide knowledge and skills to maintain an active lifestyle.[59] The United States has made it a priority to increase the amount of participation and class time involving physical activity.[60] School-based physical education programs have been strongly recommended as an effective intervention for improving physical activity, particularly in elementary schools.[61,62,63]

8.4 Primary care physicians

Three recent reviews of randomized controlled trials (RCT) examined the effectiveness of activity promotion counseling by primary care physicians on activity levels.[64,65,66] One of the RCT studies was performed in Canada.[67] The support for counseling varied among the three reviews. Further research, including long term studies, needs to be performed to assess the effectiveness of counseling, especially for children. Nevertheless, physicians have a responsibility to obtain information and educate patients to promote physical activity.

Brief counseling interventions by primary care physicians are effective in improving self-reported physical activity levels in adults in the short term.[68] However, only 36% to 48% of physicians counsel to promote physical activity.[69,70] Physicians identified inadequate time, knowledge, and experience as barriers to counseling.[71] Suggestions to improve patient compliance include: focused visits on physical activity counseling; tailored interventions and written materials; and use of a variety of health care team members.

Physicians can take the initiative to review age-specific recommendations for patients and parents. Written exercise prescriptions using standardized pads of instructions or written handouts increase compliance. A separate counseling session focused exclusively on exercise is more beneficial than dealing with physical activity during the course of a regular visit for multiple health issues. Finally, encouraging the individual to exercise in a group or with a parent or partner was found more effective in increasing physical activity.[72]

Education of parents and family is also extremely important since adults and siblings can act as physically active role models, plan family activities for the children which include

physical activity, facilitate participation of children in sports programs, and advocate for quality school and community physical activity programs.[73] Physicians can help publicize and disseminate tools such as "Canada's Physical Activity Guides to Healthy Living" to raise awareness of the benefits and methods of increasing physical activity. Physicians have a responsibility to the community which they serve, and advocating for safe access to facilities for physical activities is another way to be proactive.

8.5 Societal factors

Considerations must be made to the accessibility of facilities, the distribution of facilities, and the resources and programs for physical activities. This is important particularly for low income communities. Data in "The National Longitudinal Survey of Children and Youth" (NLSCY) in 1999 showed that children in lower income families with very young parents or single parents, or whose primary caregiver had less than a high school education, were least likely to participate in organized activities.[74] Adequate organization, funding, supervision and equipment are all essential. Municipal, provincial and federal governments should ensure that community physical activity facilities are easily accessible and safe.[72] Community programs can mix non-competitive and competitive activities in addition to offering a variety of developmentally appropriate and socially enjoyable activities throughout many age ranges. The government should take a centralized role in improving the consistency of availability of services and funding to communities.

The media play an important role through their major influence on youth today. Food-related television commercials have influential effects on children's dietary preferences and eating habits.[75] Advertisements that promote sedentary activities like video games, and that downplay the benefits of physical activities, can have an insidious health effect. Media can instead use its powerful influence to raise awareness by promoting physical activity messages in community-wide campaigns and advertising local community physical activity events.

9.0 SUMMARY

Multi-factorial issues involving physical activity and exercise promotion determine the level of childhood fitness. It is important that organizations such as Health Canada, the Canadian Academy of Sport Medicine, the Canadian Society for Exercise Physiology, the Canadian Paediatric Society, and the Canadian College of Family Physicians, continue to advance the movement of improving physical activity and fitness in children and youth. A concerted effort must be organized from the grass-roots level with participation from community groups, schools, health professionals, media, private corporations, and government. These groups play a pivotal role in providing access and opportunities for physical activities for Canadian children.

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