Point of View

Physical Activity and Children

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In addition to informing physicians of the benefits of childhood physical activity, the purpose of this editorial is to differentiate physical activity from health-related physical fitness, to emphasize the impediments to physical activity that children face, and to make recommendations for improving children’s physical activity, physical fitness, and physical education. A society is often measured by how it prepares for its future; informed adults must provide the opportunities for children because they are the future.

Background

For more than three decades, research has indicated that adults who are more physically active are at lower risk of a coronary artery event.1-3 Studies have demonstrated a beneficial effect of physical activity on the incidence and severity of coronary artery disease (CAD) in both humans and subhuman primates. From the pioneering work of Morris and Paffenbarger (Morris et al1,2 and Paffenbarger et al3) came evidence for this relation. Subsequent epidemiological research has confirmed the early data.4-8 In contrast to smoking, hypertension, and hypercholesterolemia, physical inactivity in the past has been relegated to a lower status, its role supposedly not independent of numerous other risk factors for CAD. The recent findings of Blair et al9, however, demonstrating the association of physical fitness with a reduction of all-cause mortality after adjustment for age, smoking habit, cholesterol level, systolic blood pressure, fasting blood glucose level, and parental history of CAD would seem to elevate physical inactivity to major-risk-factor status. The excellent review by Powell et al6 of the English language literature lends strong support to this concept.

The manner by which physical activity affects the incidence of CAD is subject to speculation. Figure 1 illustrates the multiple risk factors that are influenced by physical activity (exercise) as well as those affected by nutrition and nonsmoking. Thus, it can be seen that physical activity is beneficial because it directly affects physical inactivity. In adults, it also reduces the likelihood of obesity,10 elevates serum high-density lipoprotein (HDL) cholesterol level,11 reduces glucose intolerance,12 triglyceride levels,13 and also reduces mildly elevated systolic and diastolic blood pressure.14 Data such as those of Blair et al9 suggest that exercise might work both by modifying these risk factors and being independent of them as well.

Although the quantity of research data in pediatrics is not as voluminous as it is for adults, it is reasonably convincing, especially because it relates to obesity and blood pressure. The studies by Mayer and Bullen,15 Rocchini et al,16 and Dietz17 demonstrate the importance of physical activity on obesity during childhood and adolescence. The use of exercise to beneficially alter the biochemical and psychological effects of juvenile diabetes are not only recognized but virtually universally accepted.18 The studies of Hagberg et al,19 Fraser et al,20 and Hoffman et al21 support the blood pressure-controlling effect of physical activity in children. Data indicating that increasing physical activity in children elevates HDL cholesterol have been conflicting,22-24; this might be a result of experimental design or the fact that childhood levels of HDL cholesterol are at their optimum level and under relatively rigid genetic-metabolic control.

The data of the Augusta, Georgia, Survey of Children’s Activity and Nutrition, a multicenter longitudinal assessment of how children learn the behaviors of nutrition and physical activity, support the above studies by demonstrating that children who are more physically active have lower resting and exercise blood pressures and their weight-to-height ratio is less than that of children who are less physically active.25 The above studies demonstrate that habitual, life-long physical activity is likely to be beneficial in the reduction of CAD in adults. Paffenbarger et al26 have shown that participating in athletics while a youngster does not confer “immunity” against CAD unless one continues being physically active as an adult. A child is more likely to be an active adult if he or she was an active youth, especially if the child was taught lifetime sports and the joy of being physically active. The recent work of Dennison et al27 demonstrated that junior and senior high school students
who were more physically active in physical education tended to be more active as young adults. Unfortunately, to our knowledge, no long-term longitudinal data following children into middle life are available to further substantiate these findings. It is essential for children to learn physical activities, to enjoy them, and to understand their benefits to their health during their lifetime. Therefore, when we discuss childhood physical activity as being important, it is in the broader context of a developmental process, learned as a child and participated in throughout a lifetime. For children to accrue the benefits to be derived from physical activity, they must have the opportunities to participate and learn. The environment must also be conducive to this end.

Because behaviors are learned, it is reasonable to believe that children and adolescents who have learned appropriate motor skills and enjoyable physical activities and games are more likely to be active as adults than are those adults who have not had similar opportunities. Motor skills must be learned in the sequence of neuromotor development. A child who does not learn a skill at the appropriate age tends to have a self-perception of being “klutzy” and, therefore, unlike his or her peers. This generally leads to a reluctance to participate in activities in which he or she is not proficient. Learning motor skills at the appropriate stage of neurodevelopment is critical to the normal progression of physical skills, (e.g., children walk before they run and learn to kick, throw, or catch only as their neuromotor components and coordination develop). The child who does not have frequent opportunity to kick, throw, or catch during early childhood is highly unlikely to proficiently develop and enjoy performing these skills later in childhood. If we wish to ensure that adults will be physically active, it is imperative that we teach our children not only how to be physically active but also how to enjoy these physical activities as they learn them.

The need to enjoy the activities is critical to the process of continuing them for a lifetime. An activity that is not enjoyed is not likely to be continued, at least not by adolescents or young adults. The jogging movement was often joined by many middle-aged adults because of its potential health and cosmetic benefits rather than for the sheer joy of the activity. Individuals who became involved but did not learn the joy of movement returned to their previous sedentary lifestyle; some continued because it was one more activity in which they could compete, and many more have replaced their jogging shoes with walking shoes (which enables participation in what is a very respectable substitute physical activity) as identified by Blair et al.9

Physical activity rather than physical fitness has been emphasized. There are differences between physical activity and physical fitness both from the epidemiological and the physiological bases. Although physical activity and physical fitness are directly related, the early studies of CAD risk factors were related to physical activity, not fitness.1–8 Physical activity is usually measured by self-report questionnaires, diaries, and structured interviews that ascertain the degree of physical activity during work, leisure time, and sports participation. Physical activity relates, for example, to the number of flights of stairs climbed, distance walked to school or work, and quantification of other activities such as gardening and sports as well as the duration, frequency, and intensity of the effort. Some studies in both children and adults have objectively measured activity level by direct observation and have compared results with the self-report method.26

Physical fitness, on the other hand, relates to a measurable set of physical variables. Health-related physical fitness is defined by the American Alliance of Health, Physical Education, Recreation, and Dance (AAHPERD) as standards established for aerobic fitness (time for the 1-mile run or distance run in a set period of time). Muscular strength and endurance (as measured by the number of bent-knee sit-ups performed in 1 minute) is the second component of health-related physical fitness. Flexibility is measured by the sit-and-reach test, and body composition is assessed by skin-fold measurements (most commonly, the triceps).29 The relation between physical activity and health-related physical fitness is direct but quite variable, especially in childhood studies.30–32 As stated previously, the early studies on reduced coronary mortality related to physical activity, not to physical fitness.

What is the status of children's physical activity, physical fitness, and physical education? Paradoxically, multiple sources tell us that in our apparent physical fitness and health boom, children are not as physically fit as they were in past decades.33–37 This fitness trend is not a universal phenomenon enjoyed by young and old, rich and poor.35 It is a cultural phenomenon of more affluent adults.

Can it be stated that children are less physically fit than they should be? The recently released National Children and Youth Fitness Study identifies the decrease in youth fitness primarily by demonstrating that our children are more obese than in previous surveys.33 Tricep skin folds are greater. Data from the Bogalusa Heart Study confirm this phenomenon.35 Data citing the National Health Survey and the Health and Nutrition Surveys also confirm this.34,37
The National Children and Youth Fitness Study reviews the data of youth fitness and speculates on the causes. In his book, *Our Endangered Children*, Packard is more eloquent in his assessment of the problem; he attributes a great deal to the changes in our western society and its harsh attitudes toward children, changes that have become progressively more antichild since the early 1960s. Packard cites many reasons; however, from personal observations, a significant impediment to healthy lifestyle behaviors is the fragmentation of the family as a functional unit. This is as true for two-parent families as it is for single-parent families. The NIH multicenter project Survey of Children’s Activity and Nutrition is attempting to elucidate how children develop their nutrition and activity patterns. One approach taken by several centers, including the Augusta project, involved home visits. These visits were scheduled at supper time in two-parent families with young children (beginning at 3 and 4 years old). Six months into the study, the original design was abandoned because there were not enough opportunities to make visits when the family (mother, father, and child or children) ate together; so much for the traditional concept of family behaviors. Today’s family infrequently eats together. The concept of the traditional family is only that, a concept that is no longer a common situation. Society has changed remarkably since the 1950s. The family that cannot find time to eat together is not likely to find time or give priority to playing together.

More than 9 million children less than 6 years old have mothers who work outside the home; by 1995, the number could exceed 15 million. Many young children are, therefore, placed in day-care settings, and these settings vary tremendously in their physical structure, from an elaborate facility to a neighbor’s home. The quality of staff is just as variable, ranging from a loving relative or neighbor to a stranger or a highly competent professional educator. Many of these settings are not comparable with the home setting where the child has the opportunity to explore, be creative, and be more physically active. On the other hand, some of the better day-care facilities have quality staff and might be able to provide a better setting than some home environments. In many situations, however, the easiest way to care for young children is to keep them as inactive as possible. These issues are just beginning to rise to our level of consciousness, and in the near future, more accurate information will be available to better judge the quality of day care and its impact on children.

In addition to day care, there are other important societal trends that are impediments to children being physically active. The great living room baby-sitter (television) occupies approximately 4 hours per day of a child’s time. An inverse relation has been demonstrated between the duration of television viewing and a child’s physical activity.

But if children cannot watch television when they come home from school, what can they do? Because both parents are working, children are told to “stay in the house where you will be safe. Watch TV, do your homework.” This afterschool time used to be a wonderful time to be physically active and to work out the kinks of sitting behind a desk for most of the day. Another societal deficiency with which children must contend is the elimination of green space, of open fields. Many developers use every available inch of space to construct housing or malls rather than to preserve space for playgrounds and parks. Fields and woods allow children to play, explore, imagine, and create.

As family sizes get smaller in developed countries and couples elect to have fewer or even no children, who will speak for the child? The childless couple or our increasing elderly population is not likely to do so. Children are our future; adults must be their voice if for no other reason than a selfish one, that is, we will be looking to them to care for us when we are the elderly.

There are many explanations for this trend of growing inactivity among children but, rather than pointing a finger at any one of them (such as excessive television viewing), let us invoke “social changes in general” as the culprit. In today’s developed societies, especially North American societies, there are fewer opportunities to be active at school, the work site, or home. Mechanization, computerization, and technological advances all make life “simpler” and less physically demanding. In reality, this should provide increased leisure time that, if used properly, could enhance our physical well-being. When used inappropriately, however, it results in deleterious health habits and increased risk of CAD.

Are there solutions to the problem? Of course there are! Every society from the Greco-Roman to our own has bemoaned both the behavior and the fate of their children. Yet, for whatever reason, humans continue to muddle through. I suspect that we will develop the means to overcome the current problems of children. I offer some specific suggestions as to how society might improve the opportunities for physical activity, physical fitness levels, and physical education for children.

**Recommendations**

**Preschoolers**

Seek to incorporate significant physical activity into day-care programs. With 60% of our mothers of young children in the work force, it is critical that children be provided ample opportunity to run and play freely. Additionally, day-care facilities should provide the opportunity to go on field trips and walks with the teacher or day-care provider.

Encourage free play, creativity, and the joy of movement.
Encourage the teaching of motor skills (e.g., running, kicking, throwing, and swimming) at the appropriate age.

If children learn the skills and the joy associated with physical activities, they are more likely to perform them as they get older. Children who do not learn to throw a ball by 7 or 8 years of age are unlikely to ever become proficient at throwing because they “look different” than their peers who possess that skill. This desire “to be the same as” is a very strong motivator for children.

School-Aged Children

Physical education should be a component of the curriculum from kindergarten through grade 12. Preliminary studies in France and Canada indicate that children who have physical education daily perform better academically, have less absenteeism, and are more disciplined.42–43

As neuromotor development progresses, physical education programs must continue to teach motor skills at appropriate ages and encourage each child to participate to the best of his or her individual ability.

Health-related physical fitness should be measured at the beginning of each academic year, and realistic goals should be established for each child to strive to attain. The measure of health-related physical fitness should be repeated toward the end of each academic year to measure progress for those who require improvement and maintenance of performance for those who initially did well. Physical activity should be encouraged, and reinforcement of the school physical education program should be provided at well-child visits to the physician and other health care providers.

All children, especially those who are obese or awkward or have chronic medical problems, should participate in physical education. Programs should be flexible enough to allow these children to participate to the best of their abilities; this is important to enable children to reach their fullest potential and to achieve self-esteem.

Provide extended after-school care for children of working parents. The playground and gymnasium could be used. Alternatively, additional academic pursuits could also be offered.

Children should be active after school and before supper. “Unorganized” free play after school enhances creativity and provides more physical activity.

Discourage doing homework immediately after school. Children need to be able to physically exert themselves or find some diversion from the structure of the school day. (The latter two recommendations also reduce the opportunity to view television.)

Middle School–High School Youth

For students in middle school or high school, lifetime sports should be taught, and the joys of being physically active should be demonstrated and encouraged through good role models.

The curriculum should include physical education daily through grade 12. Participation on school and community teams is an excellent means of developing social skills, teamwork, and leadership abilities.

In addition to the school, the community, and parents, the physicians also must be good role models. The family is key and, as a group, should participate in physical activity. Enjoyable seasonal physical activities, such as going for a walk together after supper, hiking, picnicking, swimming, and jogging, should be encouraged in the evenings and on weekends.

The physician must be an advocate for, not only the child, but also the physical educator and the family. The physician must support programs and necessary funding to provide children with the opportunities to express themselves through physical activity.

Although the school is the focus for much of the preceding, it is the community as a whole that has the responsibility for providing the means by which healthy lifestyles are achieved. The community is responsible for fostering an environment conducive to good health. Parents must become advocates for the needs of children, and professionals must be supportive.

These are not unrealistic dreams of an ideologue; they are concrete recommendations that physicians should be making to their patients, their families, and their communities. Physicians can have a powerful influence for good in their communities if they desire to become involved. The American flag, apple pie, and motherhood attitudes that have been presented in this statement are derived from personal observations, involvement, and a sincere desire to have a healthier generation of children. Through such endeavors, a less-obese population with less hypertension and less premature CAD might be developed.

References
erate conditioning exercise in monkeys on an atherogenic diet. 


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