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THE PANDEMIC OF LOW PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS

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PANDEMIC OF LOW PHYSICAL ACTIVITY

Modern childhood: high fatness, low fitness and low physical activity

Modern children are fatter, less physically fit (including aerobic fitness) and less physically active than in the recent past. These secular trends have occurred in many countries, but have been described most clearly in Canada¹ (Figure 1).

Global nature and early origins of low physical activity

Low physical activity is not a problem that is confined to adults. The Lancet series on physical activity and health published in 2012 concluded that at least 80% of adolescents worldwide have lower than recommended levels of physical activity². Adolescence is traditionally considered the point in the lifecourse when the level of physical activity falls, particularly in girls.

Many health professionals and parents still perceive children to be naturally highly physically active. When the author was entering the emerging field of physical activity and health in the 1990s, young children were often described in exercise-science textbooks as 'supercharged dynamos'. However, the evidence contrasts with this traditional view. Recent longitudinal studies in children, and public-health surveillance of physical activity levels, have demonstrated that physical activity declines from school-entry age and the decline continues throughout childhood and adolescence.

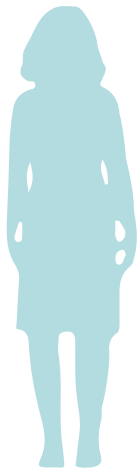
Valuable recent insights into the pandemic nature of low physical activity have come from the 'global matrix' of Active Healthy Kids Report Cards³, which assess the 'state of the nation' for physical activity and health in children and adolescents.

In May 2014, 15 nations produced Active Healthy Kids Report Cards, which were combined to produce a global matrix of grades for physical activity levels³. Almost all of the high-income countries in the global matrix received 'fail grades' of 'D' (i.e. <40% of children or adolescents meeting physical activity recommendations) or 'F' (i.e. <20% of this group meeting the recommendations). What may be more surprising is that a number of the low- and middle-income countries also received low grades, for example, fail grades (D) were assigned to Colombia, Ghana and South Africa³ and C grades (which mean that only 40 to 50% of children and adolescents met the recommendation) were assigned to Nigeria, Kenya and Mexico. An additional concern is that physical activity levels in low- and middle-income countries are likely to fall further with the advent of



Boys

1981	Body composition	2007-2009
150.9 cm (4'11")	Height	155.8 cm (5'1")*
41.6 kg (92 pounds)	Weight	48.0 kg (106 pounds)*
18.1 kg/m ²	Body mass index	19.2 kg/m ² *
64.9 cm (25.6")	Waist circumference	66.2 cm (26.1")
78.0 cm (30.7")	Hip circumference	84.0 cm (33.1")*
0.83	Waist-to-hip ratio	0.82*
Fitness tests		
49 kg	Grip strength	44 kg*
26.5 cm	Sit-and-reach	21.4 cm*



Girls

1981	Body composition	2007-2009
153.1 cm (5'0")	Height	155.9 cm (5'1")*
42.7 kg (94 pounds)	Weight	47.6 kg (105 pounds)*
18.4 kg/m ²	Body mass index	19.5 kg/m ² *
62.4 cm (24.6")	Waist circumference	68.0 cm (26.8")
81.2 cm (32.0")	Hip circumference	86.0 cm (33.9")*
0.76	Waist-to-hip ratio	0.79*
Fitness tests		
43 kg	Grip strength	40 kg*
32.0 cm	Sit-and-reach	28.2 cm*

Figure 1: Temporal trends in the body weight, body fat, and physical fitness of Canadian 12 year olds, 1981 to 2007¹.

future societal changes such as increasing economic development, availability of new technologies and urbanisation.

Inequalities in physical activity among children and adolescents

Age-related decreases in physical activity seem to be inevitable³; however, they are more marked in some population groups. For example, declines in physical activity with age are more marked in girls than boys and in the obese compared to the non-obese². At any age, average physical activity levels are lower in girls than in boys and in the obese². Low physical activity is both a cause of obesity (low physical activity increases obesity risk) and a consequence of obesity (obesity lowers physical activity levels).

There are other subgroups of children that have levels of physical activity even lower than in the general population³,

including some ethnic-minority groups and children with chronic disease or physical or intellectual disability (e.g. long-term survivors of childhood cancer have particularly low levels of physical activity).

Importance of intensity of physical activity

Physical activity is now defined as “any bodily movement produced by the contraction of skeletal muscle that substantially increases energy expenditure”. This article focuses on overall physical activity, sometimes referred to as habitual physical activity. Overall physical activity is the accumulation of movements during all the domains of physical activity, that is, sport, exercise (characterised by its planned, structured and repetitive nature), commuting (e.g. to and from school), physical education and active play.

Different intensities of movement have distinct biological effects. Recommendations

for physical activity in school-age children and adolescents have traditionally focused on the amount of moderate-to-vigorous physical activity (MVPA), usually defined as movement with energy expenditure at least three times the energy expended at rest. In adults, MVPA is usually described as activity equivalent to brisk walking that produces a noticeable increase in heart and breathing rates.

Light physical activity (LPA) (defined as movements with an energy cost 1.5 to 2.9 times the energy expended at rest) has received less attention historically, but probably has important influences on health that are still to be understood fully. In all human populations, most physical activity is of light intensity. In some populations of children, the levels of LPA are extremely high, while levels of MVPA are low. For example, in children living in rural South Africa, an extremely high level of LPA resulted from

many hours per day spent walking, but the pace of walking was slow⁴. For some health outcomes, particularly those related to the musculoskeletal system, including bone mineral density, vigorous physical activity (VPA) (defined as movements with energy cost at least six times the energy expended at rest) is more important. It seems that a musculoskeletal 'load' which is greater than moderate intensity physical activity is required for optimal bone health.

One of the most valuable sources of evidence on physical activity and health during childhood and adolescence is the large prospective Avon Longitudinal Study of Parents and Children (ALSPAC) study conducted in England. In adolescent ALSPAC participants, it was found that body fatness was influenced by MVPA (rather than LPA or VPA), LPA was the main influence on blood pressure, while VPA was the main influence on bone health.

Health benefits of physical activity in children and adolescents

The idea that physical activity is good for health is ancient: Plato noted, "lack of physical activity destroys the good condition of every human being, while movement and methodical physical exercise preserve and save it".

The 2012 Lancet series on physical activity⁵ summarised the health effects of physical activity in adults. There was strong evidence of substantial benefits of physical activity for cardiorespiratory and muscular fitness, body fatness, bone health, functional health and cognition; as well as strong evidence of reduced risks of all-cause mortality, cardiovascular disease and diabetes, some cancers and depression.

The benefits of physical activity are not confined to adults and recent systematic reviews have found a wide range of health benefits of physical activity for toddlers and preschool children⁶ and school-age children and adolescents⁷.

There is emerging evidence that physical activity in childhood and adolescence has cognitive and educational effects. In the ALSPAC⁸, higher levels of MVPA at age 11 years were associated with substantially better academic grades in public exams in maths, science and English at 16 years. Levels of MVPA in the 11 year olds in the

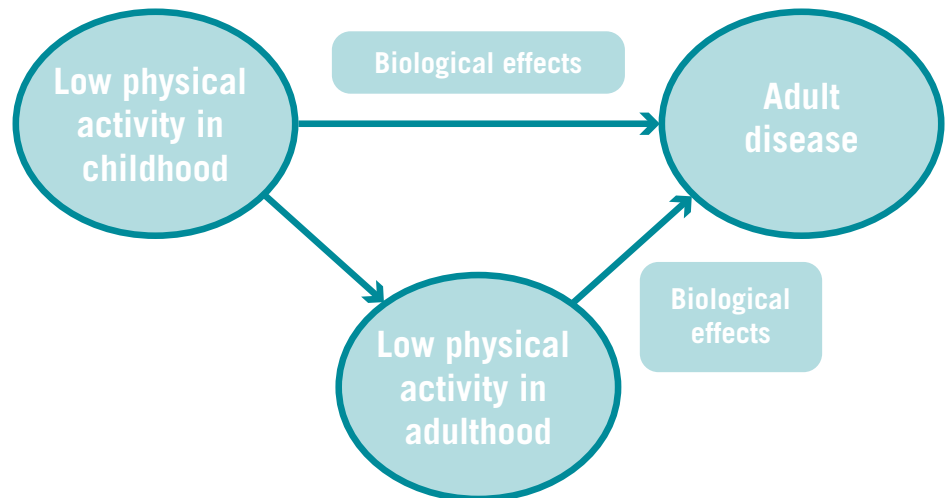


Figure 2: The 'double hit' effect of low physical activity in childhood on adult health.

ALSPAC averaged only 20 minutes per day in girls and 30 minutes per day in boys. It was predicted that increasing these levels to the recommended 60 minutes of MVPA per day would improve academic attainment at 16 years by an entire school grade (e.g. from a fail grade of D to a pass grade of C), independent of a range of confounding variables⁸. Given that families and schools value academic attainment highly, this evidence should provide useful arguments for advocating physical activity promotion in families and schools and local and national governments.

RECOMMENDATIONS FOR PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS

Early years

Physical activity recommendations have only recently extended to the 'early years' age range. This is in part because there was little concern about physical activity in the early years (as noted) and in part because of the perception of a lack of evidence upon which to base recommendations. Currently, physical activity recommendations are evidence-based, derived from systematic review and evidence appraisal, supplemented by expert consensus and with international harmonisation. Recent recommendations informed by systematic reviews for physical activity in the early years have been produced for Australia (in 2010), the UK (in 2011) and Canada (in 2012)^{6,7}.

Recent recommendations for the early years have focused on the accumulation of the total 'volume' of physical activity,

the sum of all time spent in LPA and MVPA. In Canada, the UK and Australia it is recommended that pre-school children and toddlers accumulate a minimum of 3 hours (180 minutes) of total physical activity per day; however, this is a recommended minimum more physical activity is better.

Recent physical activity recommendations include infants, recognising that a 'lifecourse' approach is important. No specific recommendations for the amount of time infants should spend in physical activity have been made, but reduced time spent sedentary (e.g. screen time) has been recommended to reduce the harmful effects of sedentary behaviour and to increase opportunities for physical activity.

School-age children and adolescents

Recent physical activity recommendations for school-age children and adolescents are evidence based and harmonised internationally, and have been produced by the World Health Organization (2010), by national governments in Qatar (2014), the UK (2011), USA (2008) and Australia (2014), and from authoritative bodies such as the Canadian Society for Exercise Physiology (2011). Three recommendations are provided (Table 1), and it is important to note that the 'headline' recommendation of 60 minutes of MVPA daily represents a minimum again, more is better. As noted, levels of MVPA among children and adolescents are typically much lower than recommended globally, and public health surveillance of physical activity usually focuses on

TABLE 1

MVPA. The other two recommendations (Table 1) concern VPA and activities to promote muscle and bone health and flexibility. These recommendations are important, but have generally received less attention (e.g. in public health surveillance).

APPROACHES TO TACKLING THE PANDEMIC OF LOW PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS

Lifecourse perspectives

Low physical activity in childhood creates a ‘double-hit’ for physical activity and health in adulthood (Figure 2). The first hit is that low physical activity acts directly and has biological effects (e.g. on the cardiovascular system) from childhood that are cumulative. The second hit is an indirect behavioural effect stemming from the fact that low childhood physical activity predisposes to low adolescent physical activity, which in turn predisposes to low adult physical activity, which causes many and serious health effects⁵.

International perspectives

The recent global matrix of Active Healthy Kids Report Cards³ has provided useful comparisons between countries that should be helpful in advocacy for physical activity in the future. National policymakers are usually sensitive to such comparisons, particularly when their nations are portrayed negatively. International comparisons may also reveal models of good practice (e.g. implementation of a successful

<ul style="list-style-type: none"> • <i>Accumulate at least 60 minutes per day, preferably more, MVPA on a daily basis</i> • <i>Incorporate vigorous intensity activities on at least 3 days/week</i> • <i>Include activities that strengthen muscle & bone, and promote flexibility, on at least 3 days/week</i>
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Table 1: Physical activity recommendations for school-age children and adolescents.

physical activity policy, inclusion of physical activity in health professional education) from which other nations can learn.

The global matrix of Active Healthy Kids Report Cards³ provides other insights into how the pandemic of low physical activity might be tackled. Across the high-income countries, levels of MVPA in school-age children and adolescents were low but, paradoxically, these countries had favourable environments for physical activity. In the high-income countries, it was found that safety of the local environment was generally good, outdoor play and sports facilities were accessible to families³, the wider environment (e.g. national policy to promote physical activity)³ was favourable and engagement in outdoor play and sport was generally high³. One of the main lessons from this international comparison is that a favourable environment alone is not sufficient to produce adequate levels of MVPA. Physical activity has been removed from most aspects of children’s lives in high-income countries. It will probably not be

restored to the required extent by initiatives that address only single domains of physical activity (e.g. sport, physical education, exercise or active commuting) – these may be necessary, but they are not sufficient in themselves.

Ecological and health professional perspectives

Physical activity, like many health behaviours, is best examined from an ‘ecological’ perspective that recognises that influences on the individual’s behaviour extend beyond the individual to the wider environment (including the physical, cultural and policy environment). This perspective is particularly important for children, as they do not create the environment in which they grow up.

Health professionals generally focus on the individual child and, while this is understandable, it is important to extend the perspective to the child’s local environment (e.g. family, school). The extent to which health professionals can influence a child’s physical activity is not clear at present, but there is great potential for this influence to be important. Health consultations for children might consider the benefits of physical activity, the costs of physical inactivity and the fact that children can no longer be considered ‘supercharged dynamos’. Influencing family routines (e.g. rules around time spent in front of screens, encouragement of outdoor and indoor active play) seems to be a promising approach that could be emphasised more often. Health professional education should also place greater emphasis on physical activity and health.

Health policymakers should take a comprehensive approach that considers the wider environment when promoting physical activity. Ecological perspectives

“ levels of moderate-to-vigorous physical activity among children and adolescents are typically much lower than recommended globally ”

have been built into a number of 'best public health bets' aimed at helping policymakers and health professionals promote physical activity⁹.

Perspectives on the role of sport and physical education

As noted, the problem of low MVPA in children and adolescents is unlikely to be solved by initiatives that involve physical education or sport alone. Both physical education and sport are probably necessary to any future solution, but they are not sufficient.

Reviews of the amount of MVPA during school physical education sessions have found that most of these sessions contribute relatively little to daily MVPA, though the potential to provide more MVPA in physical education classes exists. Physical education could also make a useful contribution to the more neglected aspects of physical activity recommendations noted earlier (i.e. VPA, muscle and bone strengthening and flexibility-promoting activities).

Sport is widely recommended as a means of tackling low MVPA and related problems such as the childhood-obesity pandemic. Sport plays a necessary role in the accumulation of MVPA, VPA, bone and muscle strengthening activities, and flexibility promoting activity. At present, there is a lack of evidence on the precise contribution of child or adolescent sport participation to public health, though some recent evidence suggests that continued involvement in sport helps maintain levels of MVPA across childhood and adolescence. A birth cohort study in England reported that participation in sports clubs declined with age, and that excess weight and body fat are accumulated with age. However, in children and adolescents who maintained participation in sports clubs, excess development of body fat was reduced compared to those who had dropped out of sports clubs, independent of a range of confounding variables¹⁰.

SUMMARY

Low physical activity among children and adolescents is pandemic. Levels of physical activity decline from approximately the time of school entry. Low physical activity compromises child health and

development. Adult health is also adversely affected by low childhood physical activity due to cumulative biological effects and the fact that low physical activity in childhood predisposes to low physical activity in adulthood. Levels of physical activity are even lower in some subgroups of children and adolescents. Achieving higher levels of physical activity would produce many benefits for physical and mental health and well-being for both children and adults. Achieving adequate levels of MVPA will require lifecourse strategies that target early life, an ecological approach that attempts to change the physical, cultural and policy environment and an international perspective in which lessons are learnt from international comparisons. Health professionals, physical education and sports make essential contributions in tackling the pandemic of low physical activity.

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