A life less sedentary

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We know that being physically active is good for us. It works our muscles, heart, and lungs, helps us feel better, and reduces the risk of disease. These benefits not only arise from regular exercise, but also from keeping your body moving throughout the day.

The importance of avoiding excessive sedentary time

The World Health Organization (WHO) estimates that physical inactivity is associated with 3.2 million deaths worldwide each year.[1] Recommendations encourage adults to do 150 minutes per week of moderate-intensity aerobic activity (e.g. running, brisk walking, swimming; any movement that makes you feel warm and slightly out of breath). Children should spend at least 60 minutes being physically active each day. This activity reduces the risk of non-communicable diseases, including breast and colon cancers, diabetes and cardiovascular disease (CVD).[1] However, recent findings raise concerns that there remain unique health risks associated with extended periods of sedentary time, even in people who exercise regularly.[2]

Sedentary activities

“Sedentary” derives from the Latin word ‘sedere’, which means ‘to sit’. This includes any activity that has a low-level energy expenditure.[2] At rest, the organs of the body require an essential amount of energy for vital functioning which is known as the basal metabolic rate (BMR). Each motion, action, and gesture entails an additional energy cost. The more active we are the more energy we expend. The energy cost of an activity can be expressed as multiples of metabolic rate (to account for differences in body size) as a metabolic energy equivalent (MET) or physical activity ratio (PAR). One MET is the equivalent of burning approximately 1 kilocalorie per kg body weight per hour.[3] For example, based on the figures in Table 1, a person with a body weight of 70 kg who swims for 1 hour roughly burns 490 kilocalories (70 kg x 7 MET). Sedentary activities are defined as having ≤1.5 METs, as they do not raise energy expenditure much above resting metabolic rate (around 1 MET). They include any activity in

which there is little physical movement.[4]

Table 1. Energy costs of selected activities[3,5]

Activity	Metabolic energy equivalent (MET)
Sleeping	0.9
Sitting, watching television, reading, writing, desk work, typing, standing in line	1.3
Fidgeting when standing or sitting	1.8
Cooking, washing dishes, cleaning up, vacuum-cleaning (moderate effort)	3.3
Walking (4.8 km/h or 3 mph)	3.3
Tennis (doubles)	5
Bicycling (15 km/h or 9.3 mph)	5.8
Dancing	6
Swimming	7
Jogging (9.7 km/h or 6 mph)	10
Rope skipping	12
Squash	12

Daily energy expenditure can be estimated using a physical activity level (PAL) value. PAL values can be equated to very general lifestyle categories (sedentary, low and moderate activity). PAL values range between 1.38 for the least active and 2.5 for the most active. Replacing time usually spent being inactive with being active can increase PAL by 0.12 per hour of walking (4.8 km/h or 3 mph), by 0.46 per hour of jogging (9.7 km/h or 6 mph) and up to 0.6 per hour of intense aerobic exercise. Meeting the WHO recommendations of participation in 150 minutes of moderate-intensity activity per week would increase PAL by 0.15. If a person who is generally inactive with a PAL of 1.5 increases their activity levels to meet these recommendations their average PAL is predicted to increase to 1.65.[3]

However, total energy expenditure varies greatly between individuals largely because of repetitive body movements that occur throughout daily living such as fidgeting, posture change and maintenance of muscle tone, known as ‘spontaneous physical activity’ (SPA). Individuals with higher levels of SPA move more throughout the day and therefore have higher average PAL values. The difference in the level of spontaneous body movement accounts for ±15% variation in energy expenditure between individuals. In daily life some individuals are naturally inclined to choose activities of low-energy expenditure such as standing still on escalators rather than walking up or taking the elevator rather than walking up stairs.[3] At work, at home, and while travelling, there are increasing opportunities to be sedentary.[4]

Historically a sedentary lifestyle has been explained as a lack of moderate to vigorous physical activity. There are health benefits to be gained from meeting the WHO recommendations for moderate-intensity physical activity levels. However, research now suggests, even if an individual does achieve these exercise recommendations, they still face health risks from sitting for continuous periods of time. Therefore, exploring ways of breaking up periods of inactivity (i.e. standing up every so often) are becoming more important.[4,6]

Health risks of sitting too long

Extensive periods of inactivity are linked to obesity, but this relationship is complex. Many studies have found that young people who watch more TV have higher dietary energy intakes, through consuming energy-dense foods and drinks whilst watching TV, or this might possibly be due to advertising or psychosocial effects.[6,7] Unbroken sitting time is thought to switch off important processes in the body, for example those involved in the utilisation of fats and carbohydrates, possibly because of the absence of muscle contraction.[8] These adverse health effects may be why sedentary behaviour is associated with an increased risk of metabolic syndrome, CVD, type 2 diabetes, certain cancers and all-cause mortality in adults, and CVD markers in adolescents.[2,6,9] Inactivity is also known to disturb bone mineralisation, reduce bone density (which increases the risk of osteoporosis), and possibly cause deep vein thrombosis and muscular discomfort, such as back pain.[4,6,8]

Stand up, move more, more often

The risks mentioned above can be reduced by taking short breaks from sedentary activities. Even small actions expend more energy than remaining still. Simply standing up and walking at a normal pace for 2–5 minutes each hour (e.g. to get a drink or talk to a colleague), during an 8-hour desk job is estimated to burn approximately 60–130 kilocalories.[10]

Furthermore, research in Australia found that adults who frequently interrupted their sedentary time had a better metabolic profile (healthier weight, blood fat and blood glucose levels) than adults who stayed still.[8] Again this finding was independent of recorded levels of moderate to vigorous physical activity.

The minimum intensity and duration of beneficial interruption of inactivity, and the underlying mechanism, are not yet known. But even changing from a seated to a standing posture is thought to switch on important beneficial processes such as those involved in fat metabolism.[11]

Reducing screen-time

Media platforms are growing; television, games consoles, computer games, internet surfing, and social media are highly attractive pastimes, and can contribute to a sedentary lifestyle. An analysis across 10 European cities by the EU-funded HELENA study (Healthy Lifestyle in Europe by Nutrition in Adolescence) found that European adolescents spend 9 hours per day in a sedentary state. This is equivalent to 70% of their waking hours (slightly higher than reported in the USA).[12] This proportion of time is believed to increase into adulthood.[13] The HELENA study found that 60% of European adolescents watched TV for more than two hours per day at the weekend. Extended TV viewing was more likely amongst adolescents with televisions in their bedroom (over half), and those who were less engaged with academic tasks.[13]

The American Academy of Pediatrics has recommended a restriction on screen-based media use for children and adolescents of 1–2 hours per day, and to remove media from their bedrooms.[14] Such viewing may displace other interactive activities crucial for natural development, and is therefore ill-advised for children under two years.[6,15]

Children could be motivated by using behavioural interventions such as TV turn-off challenges, and

rewarding screen-reduction with physical activities such play and games.[6,15]

Moving more

Given our evolving environment, sedentary pursuits are predicted to increase.[2,4] While participating in moderate-intensity physical activity is important, it is just as critical to reduce and interrupt sitting time with light-intensity activities. Limited research has explored strategies to break up sedentary activity. In future, we may start to see office spaces adapted for more movement, active workstations (standing, treadmill), or active lessons at school. Maybe new technology can play a positive role by encouraging people to move more, more often.[6,15]

Further information

EU project HELENA

References

1. World Health Organization (2011). New physical activity guidance can help reduce risk of breast, colon cancers.
2. Hamilton M et al. (2007). Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease. Diabetes 56(11):2655–2667.
3. Scientific Advisory Committee on Nutrition (SACN) (2011). Dietary Reference Values for Energy. London, UK.
4. Tremblay MS et al. (2010). Physiological and health implications of a sedentary lifestyle. Appl Physiol Nutr Metab 35(6):725–740.
5. Ainsworth BE et al. (2011). The Compendium of Physical Activities Tracking Guide. Arizona State University, USA.
6. Marshall S & Ramirez E. (2011). Reducing sedentary behavior: A new paradigm in physical activity promotion. Am J Lifestyle Med 5(6):518–530.
7. Rey-López JP et al. (2011). Food and drink intake during television viewing in adolescents: the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study. Public Health Nutr 14:1563–1569.
8. Healy GN et al. (2008). Breaks in sedentary time. Diabetes Care 31(4):661–666.
9. Martínez-Gómez D et al. (2010). Sedentary behavior, adiposity, and cardiovascular risk factors in adolescents. The AFINOS study. Revista Espanola de Cardiologia 63(3):277–285.
10. Swartz A et al. (2011). Energy expenditure of interruptions to sedentary behavior. Int J Behav Nutr Phys Act 8(69).
11. Bey L & Hamilton MT. (2003). Suppression of skeletal muscle lipoprotein lipase activity during physical inactivity: a molecular reason to maintain daily low-intensity activity. J Physiol 551(2):673–682.
12. Ruiz JR et al. (2011). Objectively measured physical activity and sedentary time in European adolescents. Am J Epidemiol 174(2):173–184.
13. Rey-López JP et al. (2010). Sedentary patterns and media availability in European adolescents: The HELENA study. Prev Med 51(1):50–55.
14. American Academy of Pediatrics (2011). Children, adolescents, and television. Pediatrics 107(2):423–426.
15. Salmon J. (2010). Novel strategies to promote children's physical activities and reduce sedentary

behaviour. J Phys Act Health 7(Suppl 3):S299–S306.