

Evidence Energizer: Screen Time and Physical Activity Levels for Early Years, Children and Youth



TYPES OF MOVEMENT BEHAVIOURS

Term	Definition
Discretionary screen time	Total time spent engaging in screen-based behaviours during discretionary time, including watching television (TV), using the computer for non-school or occupational activities, motorized transportation, playing video games, or any combination of different screen-based activities. This can be achieved using a variety of devices including, but not limited to: TVs, computers, tablets, smartphones, and cell phones (1).
Physical activity	Any bodily movement produced by skeletal muscles that requires energy expenditure (2). Physical activity is broken down into different modes and intensities, such as vigorous physical activity (VPA), moderate to vigorous physical activity (MVPA), and moderate physical activity (MPA).
Physical inactivity	Absence of physical activity. Defined as not meeting established physical activity guidelines (e.g., <60 minutes of MVPA per day for children and youth ages 5-17) (2).
Sedentary behaviour	Any waking behaviour characterized by an energy expenditure ≤ 1.5 metabolic equivalents while in a sitting or reclining posture (1).
Sedentary time	Total duration of sedentary behaviour. This can be accumulated in prolonged bouts of sedentary behaviour or broken up throughout the day (3).

INTEGRATION OF SCREEN TIME & PHYSICAL ACTIVITY

Behaviours should not be thought of in isolation, but on a continuum, and in various combinations over a 24-hour period.

Meeting the Canadian 24-Hour Movement Guidelines for Children and Youth appears to be the most important for health benefits, optimal health benefits appear to come from replacing sedentary behaviour with moderate- to vigorous-intensity physical activity.

Supporting Rationale:

- Canadian physical activity guidelines recommend at least 60 minutes of moderate- to vigorous-intensity physical activity (MVPA) per day for children and youth, including incorporation of vigorous physical activities, and muscle and bones strengthening activities at least three days per week (4).
- Sedentary behaviour guidelines only exist for children <18 years of age and focus on screen time. These guidelines recommend that time spent sedentary be minimized and time spent in discretionary screen time be limited to no more than 2 hours per day (for children and youth) (4).
- The Canadian 24-hour Movement Guidelines for the Early Years (0-4 years), suggest that infants (<1 year) should be physically active several times in a variety of ways, particularly through floor-based play; toddlers (1-2 years) need at least 180 minutes of physical activity of any intensity, including energetic play (i.e., moderate- to vigorous-intensity), spread throughout the day; preschoolers (3-4 years) need at least 180 minutes of physical activity of any intensity spread throughout the day, with at least 60 minutes of energetic play (i.e., moderate- to vigorous-intensity) (5).
- The majority of children and youth are physically inactive as only 14% of children, and 5% of youth accumulate at least 60 minutes of MVPA at least six days of the week (6).
- 70% of preschoolers accumulate at least 180 minutes of activity per day, and 44% get at least 30 minutes of MVPA most days of the week (7).

- Within the children and youth age group, the most active group is boys aged 5-11 years (18% met physical activity guidelines) and the least active group was girls aged 12-17 years (3% met physical activity guidelines) (8).
- Youth born outside of Canada are also less likely to be active than their Canadian peers, however, immigrants who had been in Canada for >2 years are more active than newer immigrants (9).
- Physical activity is most often prescribed via the FITT principle (i.e., Frequency, Intensity, Time, and Type), sedentary behaviour can also be prescribed using the SITT principle (Sedentary behaviour frequency, Interruptions, Time, and Type) (10).
- For all ages, less screen time is better, however sedentary screen time is not recommended for toddlers or infants (i.e., ≤2 years) (5).
- Being active is associated with better measures of overall health and well-being including decreased risk for overweight or obesity, higher fitness, decreased anxiety and depression, better scores related to academic achievement and cognitive development, and improved psycho-social health (11,12).
- Screen time is consistently negatively associated with a range of physical and psychosocial health indicators among all children and youth (13,14).
- Excessive time spent in various sedentary behaviours can co-exist in a lifestyle that includes sufficient levels of MVPA, children can be active and sedentary at the same time (10).
- A child can engage in high amounts of sedentary behaviour (e.g., reading, playing quietly, doing homework), and still meet screen time guidelines (i.e., less than two hours of screen time per day) (10).
- The 'whole day' matters for good health and everyone should aim to limit their sedentary time and engage in sufficient physical activity (4,15).
- Individuals with high physical activity levels tended to be better off than those with low physical activity levels, regardless of time spent sedentary (16).

Screen-based activities (e.g., active or augmented reality video games) should not replace traditional physical activities (e.g., free play, outdoor activities, organized sports).

Technology should not be ignored - families and schools should use it in tandem with traditional teaching methods to engage students. Gamification and augmented reality games hold promise for hard to reach, or hard to engage groups.

Supporting Rationale:

- Traditional active video games (i.e., played indoors on stationary gaming consoles) are not currently recommended as a means of meeting physical activity guidelines, despite acutely increasing energy expenditure above resting when compared to playing passive video games ([17](#), [18](#)).
- Active video games have not been found to positively impact body weight ([19](#)).
- Video games alone, may not be effective for increasing physical activity, but as part of a multi-component intervention, they may increase adherence and enjoyment from participants ([19](#)).
- Active video games may lead to increased physical activity self-efficacy, and therefore physical activity participation ([20](#)).
- Active video games have promising results among special populations where technology can assist with recovery, including outcomes related to psychological therapy, physical therapy, and to a lesser extent, disease self-management ([21](#)).
- With new technologies and increasing popularity of gamification there is potential for screen time to play a prominent role in facilitating behaviour change, including increasing habitual physical activity ([22](#)).
- Smartphones have great potential for physical activity promotion, as they are a source of pleasure and entertainment for many people ([1](#)).
- Apps designed to increase physical activity were most effective when they were multi-component interventions, at least 8 weeks in duration, and included a focus on improving

self-efficacy (by goal setting, and self-monitoring), and included positive reinforcement for good behaviour (23).

- Augmented reality games like Pokémon Go, hold potential for enhancing physical activity, especially in hard to reach populations - younger, less educated, single, and heavier (i.e., more likely to have obesity) (24).
- Although, Pokémon GO was able to initially increase step count, it returned to pre-game levels after a short period, thus questioning the long-term engagement and effectiveness (24).
- Screen time can be used to enhance social support and connection, community participation, and civic engagement (25).
- Social media can be used to harness health communication and can be useful for people who are looking for tailored health information (e.g., disease specific information, information about sexuality) or who are seeking welcoming communities and social support (25-29).
- Children can learn to memorize and repeat from a computer, however learning from an adult is associated with a better understanding about meaning and content (30).

Most children exceed current screen time guidelines. Screens aren't going away, but responsible screen use should be encouraged beginning at an early age.

Interventions to reduce sedentary behaviour (and screen time) among children and youth should be multi-component and include parents (and families), teachers, and caregivers.

Limitations on screen time use should not be used as a punishment, but as part of a regular, healthy, active routine

Supporting Rationale:

- The Canadian Health Measures Survey (CHMS) shows that children were sedentary 7 hours and 38 minutes and youth were sedentary for 9 hours and 16 minutes, daily (6).

Other reviews have shown that boys are more sedentary than girls, with boys engaging in more screen time, and girls engaging in more quiet activities (e.g., reading or colouring) (31).

- Canadian Health Measures Survey showed that 15% of preschoolers (3-4 years old) meet screen time guidelines of <1 hour per day of discretionary screen time (8).
- 24% of children and youth (aged 5-17 years) met guidelines of <2 hours per day of recreational screen time (8).
- During the afterschool period (on average from 3-6pm), 41% of children, and 57% of youth from around the world spent their time engaged in sedentary behaviours; however, only 26% of the total sedentary time was spent engaged in screen-based behaviours, with the remaining time spent engaging in social activities, doing homework, or using motorized transport) (32).
- A review of North American Indigenous populations found that screen time was no worse among Indigenous youth than other Canadians, but that screen time use was exponentially higher among American Indigenous youth than American youth (33).
- Young children today are watching less traditional TV, and engaging in more content via smartphones and tablets (30).
- Limiting sedentary behaviour, and specifically screen time, is associated with more optimal measures of body composition, fitness, self-esteem, self-worth, pro-social behaviour, and academic achievement (14, 34).
- In adolescent girls higher levels of screen time were associated with depression and poor social support (35).
- Screen time, is consistently negatively associated with a range of physical and psychosocial health indicators among all children and youth (13,14), including hyperactivity/inattention problems, internalizing problems, and lower psychological well-being and perceived quality of life (36).
- Effective interventions to limit screen time benefit from setting a specific target for reduced screen time, using screen-time limiting devices, providing feedback or counseling, and including high levels of parental involvement (37).

- Interventions designed to limit screen time also appear more likely to succeed when targeting children who are under the age of six (38) and/or with overweight or obesity (37, 39).
- When attempting to limit sedentary behaviour, encouraging TV turn-off periods, and implementation of sit-stand desks in the classroom, appear most promising (40)
- Sit-stand desks resulted in an additional 4.8-9.6 kcal/hour expended, or about 60 kcal per school day (41).

Schools should continue to use technology to enhance learning experiences, but not to replace activities that promote physical activity.

Being active outdoors is associated with numerous health benefits including increasing physical activity levels. Children and youth should be encouraged to go outside in a variety of weather conditions including rain, snow, hot, and cold.

Supporting Rationale:

- Children who spend more time outside accumulate as much as 20% more steps per day than children who spend their time indoors (42).
- Active play outdoors seems to be especially beneficial, not only in increasing overall physical activity, but also in shaping friendships and improved emotional well-being (8).
- Most Canadian schools report having age- and stage-specific physical activity and sport programs (77%) and provide a range of physical activities for students (73%) (8).
- Slovenian schools lead the way in physical activity programming, physical education is required in all primary and secondary school curriculums and schools are obliged to offer extracurricular sport programs free of charge for all children. As a result, 86% of boys and 76% of Slovenian girls aged 6-18 get the recommended 60 minutes of moderate- to vigorous-intensity physical activity per day (43).
- The 2015 ParticipACTION Report Card on Physical Activity for Children and Youth included a Position Statement on Active Outdoor Play which states that “Access to active play in nature and outdoors—with its risks— is essential for healthy child development.

We recommend increasing children's opportunities for self-directed play outdoors in all settings—at home, at school, in child care, the community and nature", and had a role in the loosening of school yard policies, and ball hockey bans across Canada (44).

- School policies that have been shown to be effective in promoting physical activity include devoted space for physical activity, access to physical activity, overall school climate/support for physical activity, perceived teacher support, and physical activity programming based on skill building or mastery (45).
- School factors that negatively contribute to physical activity include poor changing facilities, lack of bicycle storage, lack of play space, outdated equipment, and serious/competitive nature of physical activity programming (45).

Building infrastructure alone is not enough to get children active; children should be encouraged to engage in outdoor active play in a variety of environments.

Families should work together with children and youth to develop family media plans that include incorporating physical activity and limiting screen use throughout the day.

Supporting Rationale:

- There are clear benefits for health care providers, parents, and community groups to integrate CSEP's 24-hour movement behaviour guidelines into practice (46).
- The proportion of parents, teachers, and children that are aware of physical activity guidelines is much higher than the proportion that are aware of screen time guidelines (47,48).
- 35% of Canadian municipalities with >1000 residents have a formal strategy for physical activity and sport and more than half of municipalities consider physical activity and sport higher priority for health (8).
- 64% of Canadian municipalities offer targeted physical activity programming for children, and 53% offer programming for families (8).
- 20% of parents still report that crime, safety, and poorly maintained sidewalks are an issue in their community (8).

- Parents who believe their neighborhood is safe are more likely to let their children walk or bike to school, and these children are generally more active than children whose parents believe their neighborhood is unsafe (8).

References

1. Sedentary Behaviour Research Network. Letter to the Editor: Standardized use of the terms “sedentary” and “sedentary behaviours.” *Appl Physiol Nutr Metab Physiol Appliquée Nutr Métabolisme*. 2012 Jun;37(3):540-2
2. Health topics - physical activity [Internet]. World Health Organization. [cited 2017 Sep 12]. Available from: http://www.who.int/topics/physical_activity/en/
3. Tremblay MS, Aubert S, Barnes JD, Saunders TJ, Carson V, Latimer-Cheung AE, et al. Sedentary Behavior Research Network (SBRN) – Terminology Consensus Project process and outcome. *Int J Behav Nutr Phys Act*. 2017;14:75.
4. Tremblay MS, Carson V, Chaput J-P, Connor Gorber S, Dinh T, Duggan M, et al. Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *Appl Physiol Nutr Metab*. 2016 Jun 1;41(6 (Suppl. 3)):S311-27.
5. Tremblay M, Chaput J, Adamo K, Aubert S, Barnes J, Choquette L, et al. Canadian 24-Hour Movement Guidelines for the Early Years (0-4 years): An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *BMC Public Health*. 2017;17(Suppl 5):874.
6. Directly measured physical activity of children and youth, 2012 and 2013. Ottawa, Ontario, Canada: Statistics Canada; 2015. Report No.: 82-625-X.
7. Colley RC, Garriguet D, Adamo KB, Carson V, Janssen I, Timmons BW, et al. Physical activity and sedentary behavior during the early years in Canada: a cross-sectional study. *Int J Behav Nutr Phys Act*. 2013 May 4;10:54.
8. ParticipACTION. Are Canadian kids too tired to move? The 2016 ParticipACTION Report Card on Physical Activity for Children and Youth. Toronto, Ontario: ParticipACTION; 2016.
9. Kukaswadia A, Pickett W, Janssen I. Time Since Immigration and Ethnicity as Predictors of Physical Activity among Canadian Youth. *PLOS ONE*. 2014;9(2):e89509.
10. Tremblay MS, Colley RC, Saunders TJ, Healy GN, Owen N. Physiological and health implications of a sedentary lifestyle. *Appl Physiol Nutr Metab*. 2010 Nov 23;35(6):725-40.
11. Timmons BW, LeBlanc AG, Carson V, Connor Gorber S, Dillman C, Janssen I, et al. Systematic review of physical activity and health in the early years (aged 0-4 years). *Appl Physiol Nutr Metab*. 2012 Jul 5;37(4):773-92.
12. Poitras VJ, Gray CE, Borghese MM, Carson V, Chaput J-P, Janssen I, et al. Systematic review of the relationships between objectively measured physical activity and health indicators in school-aged children and youth. *Appl Physiol Nutr Metab*. 2016 Jun;41(6 Suppl 3):S197-239.
13. LeBlanc AG, Spence JC, Carson V, Gorber SC, Dillman C, Janssen I, et al. Systematic review of sedentary behaviour and health indicators in the early years (aged 0-4 years). *Appl Physiol Nutr Metab*. 2012;37(4):753-72.
14. Carson V, Hunter S, Kuzik N, Gray CE, Poitras VJ, Chaput J-P, et al. Systematic review of sedentary behaviour and health indicators in school-aged children and youth: an update. *Appl Physiol Nutr Metab*. 2016 Jun 1;41(6 (Suppl. 3)):S240-65.

15. Chaput J, Carson V, Gray CE, Tremblay MS. Importance of All Movement Behaviors in a 24 Hour Period for Overall Health. *Int J Environ Res Public Health*. 2014 Dec 4;11(12):12575-18
16. Saunders TJ, Gray CE, Poitras VJ, Chaput J-P, Janssen I, Katzmarzyk PT, et al. Combinations of physical activity, sedentary behaviour and sleep: relationships with health indicators in school-aged children and youth. *Appl Physiol Nutr Metab*. 2016 Jun 1;41(6 (Suppl. 3)):S283-93.
17. Chaput J-P, LeBlanc AG, McFarlane A, Colley RC, Thivel D, Biddle SJ, et al. Active Healthy Kids Canada's Position on Active Video Games for Children and Youth. *Paediatr Child Health*. 2013 Dec;18(10):529-32.
18. LeBlanc AG, Chaput J-P, McFarlane A, Colley RC, Thivel D, Biddle SJH, et al. Active Video Games and Health Indicators in Children and Youth: A Systematic Review. *PLOS ONE*. 2013 Jun 14;8(6):e65351.
19. Mack I, Bayer C, Schäffeler N, Reiband N, Brözl E, Zurstiege G, et al. Chances and Limitations of Video Games in the Fight against Childhood Obesity-A Systematic Review. *Eur Eat Disord Rev J Eat Disord Assoc*. 2017 Jul;25(4):237-67.
20. Pakarinen A, Parisod H, Smed J, Salanterä S. Health game interventions to enhance physical activity self-efficacy of children: a quantitative systematic review. *J Adv Nurs*. 2017 Apr 1;73(4):794-811.
21. Primack BA, Carroll MV, McNamara M, Klem ML, King B, Rich M, et al. Role of Video Games in Improving Health-Related Outcomes: A Systematic Review. *Am J Prev Med*. 2012 Jun;42(6):630-8.
22. Sedentary Behaviour Research Network. Letter to the Editor: Standardized use of the terms "sedentary" and "sedentary behaviours." *Appl Physiol Nutr Metab*. 2012 Jun;37(3):540-2.
23. Schoeppe S, Alley S, Van Lippevelde W, Bray NA, Williams SL, Duncan MJ, et al. Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: a systematic review. *Int J Behav Nutr Phys Act [Internet]*. 2016 Dec 7;13. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5142356/>
24. Howe KB, Suharlim C, Ueda P, Howe D, Kawachi I, Rimm EB. Gotta catch'em all! Pokémon GO and physical activity among young adults: difference in differences study. *The BMJ [Internet]*. 2016 Dec 13;355. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5154977/>
25. Council on Communications And Media. Media and Young Minds. *Pediatrics*. 2016 Oct 21;e20162591.
26. Council on Communications And Media. Media Use in School-Aged Children and Adolescents. *Pediatrics*. 2016 Oct 21;e20162592.
27. Krueger EA, Young SD. Twitter: A Novel Tool for Studying the Health and Social Needs of Transgender Communities. *JMIR Ment Health [Internet]*. 2015 May 7 [cited 2016 Dec 5];2(2). Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4465794/>
28. Moorhead SA, Hazlett DE, Harrison L, Carroll JK, Irwin A, Hoving C. A New Dimension of Health Care: Systematic Review of the Uses, Benefits, and Limitations of Social Media for Health Communication. *J Med Internet Res*. 2013;15(4):e85.

29. Naslund JA, Aschbrenner KA, Marsch LA, Bartels SJ. The future of mental health care: peer-to-peer support and social media. *Epidemiol Psychiatr Sci.* 2016 Apr;25(2):113-22.
30. Reid Chassiakos YL, Radesky J, Christakis D, Moreno MA, Cross C, COUNCIL ON COMMUNICATIONS AND MEDIA. Children and Adolescents and Digital Media. *Pediatrics.* 2016 Nov;138(5).
31. Saunders TJ, Vallance JK. Screen Time and Health Indicators Among Children and Youth: Current Evidence, Limitations and Future Directions. *Appl Health Econ Health Policy.* 2017 Jun;15(3):323-31.
32. Arundell L, Fletcher E, Salmon J, Veitch J, Hinkley T. A systematic review of the prevalence of sedentary behavior during the after-school period among children aged 5-18 years. *Int J Behav Nutr Phys Act.* 2016 Aug 22;13:93.
33. Foulds HJA, Rodgers CD, Duncan V, Ferguson LJ. A systematic review and meta-analysis of screen time behaviour among North American indigenous populations. *Obes Rev Off J Int Assoc Study Obes.* 2016 May;17(5):455-66.
34. Tremblay M, LeBlanc A, Kho M, Saunders T, Larouche R, Colley R, et al. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *Int J Behav Nutr Phys Act.* 2011 Sep 21;8(1):98.
35. Costigan SA, Barnett L, Plotnikoff RC, Lubans DR. The Health Indicators Associated With Screen-Based Sedentary Behavior Among Adolescent Girls: A Systematic Review. *J Adolesc Health.* 2013 Apr;52(4):382-92.
36. Suchert V, Hanewinkel R, Isensee B. Sedentary behavior and indicators of mental health in school-aged children and adolescents: A systematic review. *Prev Med.* 2015 Jul;76:48-57.
37. Schmidt ME, Haines J, O'Brien A, McDonald J, Price S, Sherry B, et al. Systematic Review of Effective Strategies for Reducing Screen Time Among Young Children. *Obesity.* 2012 Jul 1;20(7):1338-54.
38. Wahi G, Parkin PC, Beyene J, Uleryk EM, Birken CS. Effectiveness of Interventions Aimed at Reducing Screen Time in Children: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Arch Pediatr Adolesc Med.* 2011 Nov 1;165(11):979-86.
39. Azevedo LB, Ling J, Soos I, Robalino S, Eills L. The effectiveness of sedentary behaviour interventions for reducing body mass index in children and adolescents: systematic review and meta-analysis. *Obes Rev.* 2016 Jul 1;17(7):623-35.
40. Altenburg, T. M., Kist-van Holthe, J., & Chinapaw, M. J. M. (2016). Effectiveness of intervention strategies exclusively targeting reductions in children's sedentary time: a systematic review of the literature. *The International Journal of Behavioral Nutrition and Physical Activity*, 13, 65. <http://doi.org/10.1186/s12966-016-0387-5>
41. Benden ME, Zhao H, Jeffrey CE, Wendel ML, Blake JJ. The Evaluation of the Impact of a Stand-Biased Desk on Energy Expenditure and Physical Activity for Elementary School Students. *Int J Environ Res Public Health.* 2014 Sep 10;11(9):9361-75.

42. ParticipACTION. The biggest risk is keeping our kids indoors. The 2015 Report Card on physical activity for children and youth. Toronto, Ontario; 2015.
43. Tremblay MS, Barnes JD, González SA, Katzmarzyk PT, Onywera VO, Reilly JJ, et al. Global Matrix 2.0: Report Card Grades on the Physical Activity of Children and Youth Comparing 38 Countries. *J Phys Act Health*. 2016 Nov 1;13(11 Suppl 2):S343-66.
44. Tremblay MS, Gray C, Babcock S, Barnes J, Bradstreet CC, Carr D, et al. Position Statement on Active Outdoor Play. *Int J Environ Res Public Health*. 2015 Jun 8;12(6):6475-505.
45. Morton KL, Atkin AJ, Corder K, Suhrcke M, Sluijs EMF. The school environment and adolescent physical activity and sedentary behaviour: a mixed-studies systematic review. *Obes Rev*. 2016 Jan 18;2(17):142-58.
46. Latimer-Cheung AE, Copeland JL, Fowles J, Zehr L, Duggan M, Tremblay MS. The Canadian 24-Hour Movement Guidelines for Children and Youth: Implications for practitioners, professionals, and organizations. *Appl Physiol Nutr Metab*. 2016 Jun 1;41(6 (Suppl. 3)):S328-35.
47. LeBlanc AG, Berry T, Deshpande S, Duggan M, Faulkner G, Latimer-Cheung AE, et al. Knowledge and awareness of Canadian Physical Activity and Sedentary Behaviour Guidelines: a synthesis of existing evidence. *Appl Physiol Nutr Metab*. 2015 Mar 5;40(7):716-24.
48. LeBlanc AG, Berry T, Deshpande S, Duggan M, Faulkner G, Latimer-Cheung A, et al. Knowledge, awareness, and uptake of Canadian physical activity and sedentary behaviour guidelines. *Appl Physiol Nutr Metab*. 2014;39(S1):27.