

Editorial

Reimagining healthy movement in the era of the COVID-19 pandemic

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Abstract

Does the timing of when children, youth and adults participate in physical activity, sedentary behaviour (e.g. screen time) and sleep matter when it comes to their overall health? This special issue of *Health Promotion and Chronic Disease Prevention in Canada* includes four papers that present evidence and recommendations on the timing of movement behaviours: three separate systematic reviews exploring the associations between health indicators and the timing of physical activity, sedentary behaviour and sleep; and a commentary that discusses the importance of this evidence in terms of practice, policy and research.

This editorial sets the stage for this special issue, reflecting on the challenges posed by COVID-19-related public health restrictions on healthy movement. Perhaps now is the optimal time to reimagine how and when we engage in physical activity, sedentary behaviour and sleep to support our health.

Keywords: *movement behaviours, timing, health outcomes, adaptations, public health restrictions*

Does when we move, when we are sedentary, and when we sleep affect our health?

The Canadian 24-Hour Movement Guidelines were introduced to help optimize health by encouraging people of all ages to move more, reduce sedentary time and sleep well.¹ Yet, ParticipACTION's report cards on physical activity, the most comprehensive assessments of physical activity, sedentary behaviour and sleep in Canada, show that large proportions of Canadians still do not meet the 24-Hour Movement Guidelines.^{2,3}

The health benefits associated with integrative movement behaviours may vary depending on the time of day when we participate in these activities. Associations

between physical activity and risk of cardiovascular disease, have been reported to differ depending on when the activity was performed (i.e. morning, afternoon, evening). For example, in one study, patients with cardiovascular disease who exercised in the evening were at lower risk of acute myocardial infarction than those who did sports-related physical activity in the morning.⁴

The timing of sedentary behaviour may also matter; there is some evidence that screen-based sedentary behaviour in the evening is deleterious compared with screen-based sedentary behaviour earlier in the day.⁵ The benefits of a good night's sleep may also differ depending on timing. For example, later sleep timing was reported to be associated with increased

odds of self-reported depressive symptoms among children and youth.⁶

To date, the timing of movement behaviours—and particularly that of physical activity, sedentary behaviour and sleep in relation to various health outcomes—has not been comprehensively reviewed. Recommendations are limited due to lack of evidence in this area. Hence, the rationale for this special issue of *Health Promotion and Chronic Disease Prevention in Canada*, on the timing of 24-hour movement behaviours.

Timing of movement behaviours and health outcomes: a short summary of the findings

This special issue sheds light on the relationship between physical activity, sedentary behaviour and sleep timing as it relates to health. The shift to using an integrated approach to movement behaviours¹ allows us to understand that daily physical activity, sedentary behaviour and sleep are interdependent, and the timing of one movement behaviour is likely to influence another. The three systematic reviews in this special issue collectively describe 125 studies with 465 518 unique participants (all searches current to January 2021). Janssen et al.⁷ included studies of adults and described the timing of physical activity in relation to adiposity, cardiometabolic markers, cardiovascular disease, cancer, fat-free mass, mental health, mortality, physical functioning and mobility, and sleep.⁷ Study results varied and the quality of evidence was mostly

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low. The authors suggest that people should be physically active when it suits them best.⁷

Saunders et al.⁸ focussed on the effect of timing of screen- and non-screen sedentary behaviour on children's and youth's sleep health. The results indicated that evening/bedtime screen use was associated with reduced sleep duration and quality.⁸ While the quality of evidence in the included studies was generally low, the authors concluded that children and youth should limit screen use before bedtime to improve sleep health.⁸

Dutil et al.⁹ also limited their search to children and youth. The studies included in their systematic review described sleep timing as it related to accidents and injuries, adiposity, cardiometabolic risk factors, cognitive function and academic achievement, eating behaviours, emotional regulation, and quality of life and well-being.⁹ Findings suggest that later sleep timing may be associated with poorer cognitive function and academic performance, eating behaviours and emotional regulation in children and youth.⁹ Evidence for this review was also considered low.⁹ The authors recommended earlier sleep timing for children and youth and adjusting bedtime to sleep the recommended amount.⁹

Finally, a commentary by Tomasone and colleagues¹⁰ provides recommendations on practice, policy and research and a communications toolkit to support Canadians in optimizing movement behaviours throughout the day. The commentary gives suggestions by setting (e.g. education, workplace, health and community service settings).¹⁰ Tomasone et al.¹⁰ also offer “how to” tips for implementing the recommendations. This practical advice comes when many people living in Canada have been less active and more sedentary because of pandemic-related restrictions. This timely issue can help support Canadians in making their “whole day matter.”¹¹

When we moved, were sedentary, and slept may have changed during COVID-19

Pivot! Over the last 2 years, Canadians have undergone changes to how and when they were physically active, sedentary and slept.^{11,12,13} As such, this special issue may be particularly relevant in the

context of the COVID-19 pandemic. The Canadian 24-Hour Movement Guidelines¹ were first introduced because research consistently demonstrated that ample physical activity, reduced sedentary time and screen use and adequate sleep were associated with enhanced physical and mental health.¹⁴ But since the start of the COVID-19 pandemic, many children and youth^{11,12} and adults¹³ in Canada have not been adequately active, have not been sleeping enough and have been too sedentary (with screens). Undoubtedly, COVID-19 has thrown us many challenges, including significant health and economic consequences.¹⁵ Now, 2 years after the declaration of the pandemic, we have gained a better understanding of its collateral health consequences, including in relation to physical inactivity, excessive screen use and changed sleep schedules. Concerningly, pandemic-related changes in movement behaviours have been associated with poorer mental and physical health outcomes.¹⁶

Many individuals had to change their schedules and routines at some point during the COVID-19 pandemic. Many of us attended online school or worked from home and were restricted from attending recreational and sports programs (with gyms temporarily closed), and more of us were sedentary and using screens because of pandemic-related restrictions.¹⁷ Evidence has shown that Canadian children and their caregivers largely adhered to public health measures, such as staying home and limiting social gatherings; however, adherence to public health measures was associated with reduced physical activity and increased screen time among children and youth,¹⁸ and increased screen time has been associated with depression, anxiety, hyperactivity and irritability among young people.¹⁹

Overall, Canadians have been less active, and *when* they were active also changed. We relied less on structured activities and indoor programs at pre-scheduled times. Some people took this opportunity to change their work day and be active outdoors, in nature;²⁰ others embraced exercise apps or virtual programs when it suited them.²¹ Bed and wake times may have shifted with more people attending classes and working from home.²² With easing restrictions, we may be able to re-establish the routines and schedules we had before the pandemic or create new ones. And with this switch, now might be

the ideal time to consider how and when Canadians can get moving to optimize our health.

Reimagining movement in the context of COVID-19: Recommendations

The COVID-19 pandemic may have long-lasting implications on our schedules and routines. Daily routines are either primary (i.e. those necessary for maintaining biological needs, such as eating, hygiene and sleep) or secondary (i.e. those to do with motivations and preferences, such as leisure, physical activity, practices with work and study).²³ During the COVID-19 pandemic, schedules and routines were notably disrupted.²⁴ Fewer children and youth were engaging in organized physical activity and sport, and more adults working fully or partly from home over the course of the COVID-19 pandemic. Is there an opportunity for children, youth and adults to consider new ways to integrate movement into their day? For example, caregivers of children and youth may build in time for unstructured physical activity and play throughout their day.²⁵ Adults may take more activity breaks throughout their day or may select active ways to commute.²⁶ To integrate healthy movement, reduce sedentary behaviour and improve sleep in our daily lives, we have a few simple recommendations:

- Add movement at the start of your day—try walking, wheeling or cycling to school or work;
- Spend time outdoors—try natural play-scapes or loose parts play, find new trails and outdoor spaces;
- Use activity as a way to engage with family or friends, connect and re-connect;
- Add movement breaks and set screen time reminders with the use of apps;
- Designate screen-free zones at home, such as bedrooms, and screen-free times, for example, during meals;
- Create consistent nighttime routines, with no screen use;
- Set-up for the morning the night before, prepare items to reduce the morning rush;
- Apply harm reduction principles to address screen time, yet remain pragmatic and empathetic;²⁷

- Use a family- or friend-based approach to create goals together and support each other—play together and model healthy movement behaviours;²⁸
- Seek support, particularly if you are experiencing more barriers and/or need more targeted or individualized strategies (e.g., children and youth living with a disability).²⁹

Recognizing the limitations of this special issue and next steps

This special issue of *Health Promotion and Chronic Disease Prevention in Canada* provides a comprehensive overview on how the timing of movement may be related to various health outcomes. However, it is important to recognize the limitations of the included papers.

While the reviews were conducted using evidence-based and rigorous systematic review methodologies, the authors were not able to conduct meta-analyses due to the heterogeneity of the included studies, their methods and reported outcomes. As Janssen et al.⁷ primarily included studies of adults, it would be advantageous for future studies and reviews to explore benefits of different timing of physical activity among children and youth. Conversely, Saunders et al.⁸ and Dutil et al.⁹ included studies exclusively with children and youth (a previous review is available on sleep timing and health in adults³⁰); future reviews may wish to expand their searches on the timing of sedentary behaviours and various health outcomes to adults.

In addition, future studies and reviews may try to not limit the search by outcome but include studies that investigate the timing of sedentary behaviours with additional health indicators. It may also be worthwhile to investigate the moderating effects of age, sex/gender, race/ethnicity, socioeconomic status, family structure, disability and other factors to provide more specific recommendations and design appropriate interventions for those who may be experiencing barriers to healthy movement. Given the literature emerging in this area, it may also be worthwhile to investigate the role and timing of physical activity, sedentary behaviour and sleep to counter symptoms of long COVID.^{31,32}

Conclusion

The three systematic reviews in this special issue synthesize evidence about the

timing of movement behaviours in relation to health. The commentary offers practical advice and resources on optimizing movement behaviours across the day and in various settings. This special issue is thus timely and important, particularly in the era of COVID-19. Now may be the time for people living in Canada to consider (or reconsider) what healthy movement looks like in our daily lives—to improve how and when we are active, sedentary and sleep.

Conflict of interest

The authors have no conflict of interest to declare.

Authors' contributions and statement

SAM, LMV, CSB and LAR contributed to the conceptualization of the work; SAM drafted the manuscript; SAM, LMV, CSB and LAR contributed to editing and revising the manuscript critically for important intellectual content; all co-authors reviewed and approved the final manuscript.

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