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## Commentary

## Physical activity and sedentary behavior in people with spinal cord injury: Mitigation strategies during COVID-19 on behalf of ACSM-EIM and HL-PIVOT

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## ABSTRACT

People with spinal cord injury (SCI) face unique challenges during the COVID-19 pandemic, including greater risk of poor COVID-19-related outcomes, increased social isolation, and restricted access to important services. Furthermore, COVID-19 related restrictions have decreased already low levels of physical activity (PA) in this population. Therefore, the purpose of this commentary is to: 1) address the impact of COVID-19 on PA and sedentary behavior (SB) in people with SCI; 2) provide potential SB reduction strategies to guide future research; and 3) provide recommendations to increase PA and reduce SB on behalf of the American College of Sports Medicine Exercise is Medicine (ACSM-EIM) and Healthy Living for Pandemic Event Protection (HL-PIVOT) using a social-ecological model targeting the individual-, social environment-, physical environment-, and policy-level determinants of behavior in people with SCI.

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Physical distancing recommendations to mitigate the spread of COVID-19 have become commonplace. These constraints, however, have negative impacts on health and well-being, especially among vulnerable populations, including people with spinal cord injury (SCI).<sup>1</sup> Despite increased vaccine delivery, people with SCI continue to face unique challenges during the COVID-19 pandemic, including greater risk of poor COVID-19-related outcomes (e.g., a higher mortality rate than the general population,<sup>2–4</sup> increased social isolation, and restricted access to important services such as physical therapy<sup>5,6</sup>). Additionally, COVID-19 restrictions have further reduced already low levels physical activity (PA) in people with SCI.<sup>7</sup>

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During COVID-19 and beyond, the SCI community needs guidance in establishing COVID-19-safe recommendations for engaging in healthy lifestyle behaviors to promote PA and reduce sedentary behavior (SB).<sup>8,9</sup> Importantly, SB and PA are distinct lifestyle behaviors, which are independently associated with cardiometabolic disease risk in the general able-bodied population.<sup>10,11</sup> As such, SB (while awake, any behaviors performed in a seated or reclined position  $\leq 1.5$  Metabolic Equivalents<sup>12</sup>) may also be an independent cardiometabolic risk factor for people with SCI.<sup>8</sup> Therefore, activity guidelines for people with SCI, their caregivers, and healthcare team may need to expand to include strategies helping to reduce SB.<sup>8,13</sup> This commentary will 1) address the impact of COVID-19 on PA and SB in people with SCI, 2) provide potential strategies to reduce SB to guide future research, and 3) provides recommendations for to promote PA and reduce SB reduction based on a socio-ecological model.

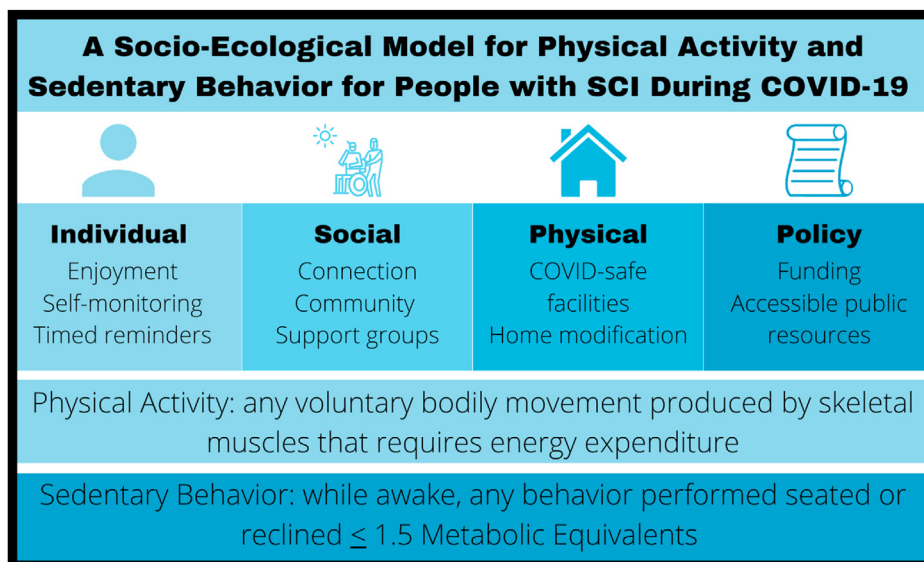


Fig. 1. A socio-ecological model for physical activity and sedentary behavior for people with Sci during COVID-19 including definitions and recommendations.

*Promoting healthy movement behavior in people with SCI during COVID-19*

Prior to COVID-19, barriers to engaging in PA among people with SCI were complex and present at multiple levels, including individual, social environment, physical environmental, and policy levels. Example barriers include attitudes or past experience with PA, social isolation, and access to gyms with knowledgeable exercise professionals or appropriate equipment.<sup>14,15</sup> Perhaps unsurprisingly, with the COVID-19 related social restrictions, there has been a decrease in self-reported recreation- and occupation-based PA among individuals with SCI when comparing pre-versus post-lockdown levels.<sup>7</sup> Arguably, this low PA trend is more likely to be reversed if the multiple levels of barriers (i.e., individual, social/physical environment, policy) unique to people with SCI are considered.

In addition to addressing increased PA engagement, it is important to consider mitigation of SB for people with SCI. SB is an independent risk factor for poor health, including increased cardiometabolic diseases, as well as poor mental health.<sup>16</sup> Of concern, emerging evidence indicates that cardiometabolic diseases, which are more frequent in persons with SCI<sup>17</sup> are associated with more severe COVID-19 outcomes (e.g., increased incidence of hospitalization, ICU admission and death).<sup>18</sup> Furthermore, Hall et al.<sup>19</sup> suggests that we are currently in the midst of two pandemics: COVID-19 and a SB pandemic. While COVID-19 may be a watershed moment that changes the structure and connected nature of society, this commentary seeks to identify specific strategies for PA promotion and SB mitigation for individuals with SCI during the COVID-19 pandemic and beyond.

*Healthy movement behavior promotion in SCI during COVID-19: A socio-ecological framework*

The socio-ecological model allows us to contextualize the multiple levels of influence on behavior, including individual (e.g., self-efficacy, enjoyment), social-environment (e.g., social support), physical-environment (e.g., home), and policy (e.g., legislation) levels.<sup>20</sup> Contextualizing the key influences upon movement behaviors among persons with SCI allows us to provide practical

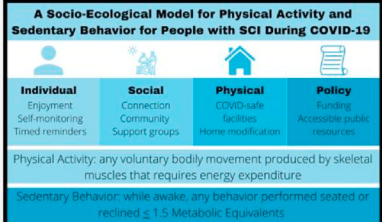
recommendations to increase PA and decrease SB during and beyond COVID-19 (Fig. 1). To guide the recommendations which follow, it is important to clearly define PA and SB with respect to SCI. PA can be defined as activities one chooses to engage in during free time such, including ambulatory activities and resistance training.<sup>21</sup> SB can be defined as any waking behavior in a seated or reclining posture ( $\leq 1.5$  METS).<sup>12</sup> However, due to the nature of SCIs, one may not be able to feasibly modify their position out of a seated or reclining posture. Therefore, “muscular inactivity” may be a more appropriate, but less commonly used term to describe SB in people with SCI.<sup>8</sup> It is also important to note the controversy present in the field regarding SB reduction for people with SCI due to the postural challenges of the injury. However, PA and SB are independent factors targeted by separate recommendations for able-bodied populations. Additionally, both PA and SB are included in the most recent guidelines by the World Health Organization for people with disabilities.<sup>13</sup> Therefore, the following recommendations attempt to integrate promotion of PA and reduction of SB in safe feasible recommendations during COVID-19 (see Fig. 2).

*Individual domain*


Identifying ways to interrupt SB and achieve recommended PA guidelines<sup>14</sup> that the individual enjoys while abiding by COVID-19 restrictions are critical. Potentially enjoyable activities include light PA (e.g., playing with a pet/gardening), using arm cycle ergometry,<sup>22</sup> or modified yoga.<sup>23</sup> With respect to SCI, an important consideration is the large differences in function and fitness between individuals with tetraplegia and paraplegia.<sup>24,25</sup> Therefore, type of SCI needs to be considered to ensure the activity recommended is appropriate. Additionally, the use of goal setting, self-monitoring, and self-management techniques to improve self-efficacy (e.g., PA tracking via smartphone app or setting timed reminders to move) is a critical component of behavior change. To interrupt SB, timed reminders could be used to with light activities throughout the day via use of a standing frame or electrical stimulation. Some individuals with SCI may be able to apply for a grant<sup>26</sup> for a standing frames or electrical stimulation equipment therefore alleviating a potential financial burden. Individuals with higher lesions (i.e., tetraplegia) could work with caregivers to schedule time to access or use other methods of movement such as functional electrical stimulation for engagement in PA/SB mitigation.

### GOAL SETTING FOR ENGAGING IN HEALTHY MOVEMENT BEHAVIORS USING A SOCIO-ECOLOGICAL MODEL

Prescription for healthy movement behaviors including engaging in physical activity and reducing sedentary behavior are **not** "one-size fits all". The purpose of this worksheet is to serve as a resource to better understand barriers to healthy lifestyle behaviors, and to serve as a template to help you achieve your healthier lifestyle behavior goals.

| INTERVENTION         |                |                    |                           | PROXIMAL OUTCOMES  |  |  |  |
|----------------------|----------------|--------------------|---------------------------|--|--|--|--|
| Category             | Outcome        | Strategy           |                           | <b>A Socio-Ecological Model for Physical Activity and Sedentary Behavior for People with SCI During COVID-19</b><br> |  |  |  |
| Intra-Individual     | Attitude       | Overcome barriers  | Motivational interviewing |  |  |  |  |
|                      | Self-Efficacy  | Monitor            | Self-monitoring           |  |  |  |  |
| Inter-Individual     | Social Norms   | Perceived positive | Modeling                  |  |  |  |  |
|                      | Social Support | Perceives support  | Mobilizing networks       |  |  |  |  |
| Physical Environment | Accessibility  | Awareness          | Education                 |  |  |  |  |
|                      | Safety         | Perceived safe     | Facilitation              |  |  |  |  |



**BENEFITS**

- 1 • Reach or maintain a healthy weight
- 2 • Strengthen muscles and bones
- 3 • Improve mental health
- 4 • Prevent cardiometabolic disease
- 5 • Sleep better
- 6 • Prevent adverse COVID-19 outcomes

Identify your own goal for achieving healthy lifestyle behaviors and write it down. Next, think about what level of the socio-ecological model is involved in achieving that goal. Finally, brainstorm a tool you can use to help to achieve your goal. Check-in with your goals overtime to track your own progress in achieving healthy lifestyle behavior engagement!

| Goal Activity   | Model Level  | Tool  |
|---|--|---|
| <b>Example:</b><br>Stand with standing frame every hour | <i>Individual level (self-efficacy &amp; self-monitoring) and environmental level (standing frame)</i> | <i>Use of smart watch for timed reminders to increase self-efficacy and use of standing frame inside the home</i> |
| <b>Your example:</b>                                    |  |   |

Fig. 2. A goal setting resource for people with SCI to achieve healthy lifestyle behavior engagement using the socio-ecological model.

#### Social environment domain

To combat isolation, virtual platforms can be utilized to challenge family or friends to SB interruption challenges or to participate in PA classes.<sup>23</sup> For example, individuals within SCI support groups could challenge one another to engage musculature for at least 1 min every hour or by reminding one another to break-up a sedentary bout with resistance band exercises. With respect to PA, loneliness is negatively associated with PA in people with SCI.<sup>27</sup> Virtual platforms could target loneliness and promote PA via on-line peer mentorship<sup>28</sup> or other online community-based support groups.<sup>29</sup> Additionally, the care-giver/care-receiver relationship is critical for support<sup>30</sup> and during COVID-19 care-givers may consider sheltering in place with the individual with SCI to combat loneliness therefore providing social support to engage in PA/mitigate SB. As other family members may be working virtually, it may be feasible to adjust living conditions to include others for greater safe, social engagement such as providing PA assistance or engaging in a SB reduction together (e.g., engaging musculature via arm ergometer or electrical stimulation or by using a standing

frame). Furthermore, time spent at rehabilitation clinics are commonly one of the only opportunities people with SCI have to interact with others outside of the home. Opening rehabilitation facilities to encourage social interaction<sup>31</sup> with COVID-19 safe precautions (cleaning, masks, social distancing) are important to help people with SCI engage in PA.

#### Physical environment domain

Barriers to engaging in activity include safety concerns and lack of access to facilities, particularly during the COVID-19 pandemic. Fortunately, the available evidence indicates that behavioral interventions have increased unsupervised PA at both home and gym settings in people with SCI,<sup>32</sup> suggesting that physical environments may be potentially modifiable to promote healthy movement behavior. The physical environment can be modified to include: 1) installing grab-bars for standing and completing self-care thereby breaking up SB; 2) identifying appropriate height surfaces of furniture/counters that provides support for completing simple tasks potentially reducing SB/increasing PA; 3) placing



resistance bands/other equipment around the home to make it easier to replace SB with PA; and 4) utilizing online PA classes which removes the significant transportation barrier for this population. Depending on the level and severity of the lesion, not all individuals with SCI can participate in PA without access to proper care or adapted exercise equipment, therefore policy change is needed to make at-home accommodations to improve the accessibility PA promotion and SB mitigation more feasible.

#### Policy domain

As COVID-19 continues, it is important that policy makers consider the impact that lockdown has on individuals with SCI. We call upon policymakers to pass legislation specifically to aid individuals with SCI, and also primary care facilities so that there is greater access to the care that individuals with SCI need during the pandemic. Care and engagement with PA for individuals with SCI occurs at major healthcare centers like hospitals or local rehabilitation clinics. Public officials should consider greater aid for small businesses and rehabilitation clinics within larger healthcare settings that could support safe increasing PA engagement and remove barriers for people with SCI to ensure public buildings are achieving the recommendations set forth by WHO's Global Disability Action Plan 2014–2021.<sup>33</sup> Additionally, public officials can modify public resources such as parks to ensure they are inclusive and accessible for people with SCI. For example, public officials could make sure assistive technology, such as Access Earth, Accomable, and Google Maps all have accurate data on accessible buildings and locations.<sup>34</sup>

#### Exemplar daily recommendation

People with SCI spend much, or all day, sitting.<sup>13</sup> Therefore, it is especially important for people with SCI to replace SB with PA. We urge healthcare providers, exercise professionals, and caregivers to encourage people with SCI to examine their daily schedule and prioritize time to replace SB with strategies that contribute towards recommended PA guidelines.<sup>14</sup> Individuals are encouraged to disperse activities of daily living throughout the day to interrupt periods of prolonged SB. Engaging in multiple 10-min bouts of PA throughout the day may be more feasible than a single 30-min bout of PA and it is important to remember that some PA is better than doing none. The World Health Organization guidelines suggest that adults living with disabilities should engage in at least 150–300 minutes of moderate intensity PA or 75 minutes of vigorous intensity PA per week for substantial health benefits.<sup>13</sup> Additionally, multicomponent PA with varied types of both aerobic and resistance training especially targeting functional capacity are recommended.<sup>13</sup> At first, people with SCI should focus on increasing the duration of PA and then overtime seek to improve intensity and/or frequency. People with SCI can also increase self-efficacy by utilizing their social network, or activity tracker/smart phone to set daily goals and track progress over the course of the day.

#### Conclusion

COVID-19 has created broad challenges to sustaining population physical health. We urge providers, policy makers, caregivers, and people living with SCI alike to identify enjoyable forms of PA and SB interruptions strategies considering the individual, social and physical environments, and policy level determinants of behavior to encourage healthy behaviors during COVID-19 and beyond.

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#### Conflicts of interest

None.

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