Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Annals of Physical and Rehabilitation Medicine 65 (2022) 101649

Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com

Letter to the editor

Effect of the COVID-19 pandemic lockdown on physical activity of individuals with a spinal cord injury in Belgium: Observational study

ARTICLE INFO

Article history:
Received 20 October 2021
Accepted 19 February 2022

Keywords:
COVID-19 pandemic
Physical activity
Social participation
Spinal cord injury
Adaptive sports
Disability

Dear editor

Physical activity is vital to health; hence, the World Health Organization (WHO) recommends that adults engage in 150 to 300 min of moderate-intense PA weekly [1]. For individuals with a physical disability (PD), PA rehabilitates impairments, autonomy and quality of life (QoL) [2]. It also prevents the risk of developing secondary complications [2]. Unfortunately, individuals with PD, such as wheelchair users, tend to adopt physically inactive lifestyles [3], due in part to lack of easily accessible PA opportunities [4].

This access to PA was further complicated during the COVID-19 pandemic: admittance to PA-facilitating environments was constrained worldwide. In Belgium specifically, sport facilities were instructed to close from March 12 to June 8, 2020. They were closed once again in the beginning of November 2020 until May 1, 2021 [5].

Prohibiting this access affected PA-related behaviours. A review identified significant decreases in PA levels among adults worldwide due to the pandemic [6]. However, some authors called for nuance: according to their results, individuals who were physically active before the lockdown actually managed to increase their PA level during confinement [7,8]. Such findings were observed only among healthy individuals, and no study investigated whether this was also the case among individuals with PD.

In fact, in general, little research has examined the impact of the pandemic on PA levels of individuals with PD. To our knowledge, only one study looked at the impact of the COVID-19 pandemic on PA levels of individuals with spinal cord injury (SCI) [9]. This gap of knowledge requires remediation.

The primary aim of our study was to investigate how the COVID-19 lockdown affected PA levels of 2 groups: active and inactive Belgians with a SCI. The secondary aim was to identify the effect of the lockdown on social participation, QoL, pain and fatigue in the same population. We hypothesized that the lockdown decreased PA level, especially among inactive individuals; decreased social participation and QoL; and increased pain and fatigue.

The study's protocol was approved by the local ethics committee (2020/10MAR/149) and was registered at ClinicalTrials.gov (NCT04625309). The STROBE guidelines were followed.

The research sample consisted of 18- to 70-year-old community dwellers with SCI who were living in Belgium and used a manual wheelchair. Moreover, the spinal lesion had to have occurred a minimum of 6 months before enrolment.

Participants were recruited via a convenience sampling from adaptive sports associations, physiotherapists, physicians, and associations for individuals with PD. The first meeting took place between September and November 2020, before the second lockdown in Belgium. Participants were contacted again during the second lockdown, between February and April 2021, to participate in a second meeting. Both meetings occurred via an online platform.

During the first meeting, participants were asked to provide demographic data, including birth year, weight, height, lesion level, time since SCI, and self-reported minutes of PA per week. They also answered medical questions about health problems encountered in the last 6 months and weekly hours of physiotherapy. Finally, they completed the 6 items of the indoor, outdoor and even-surface mobility of the Spinal Cord Independence Measure (SCIM) to obtain a score ranging from 0 (dependent) to 30 (independent).

Participants were then asked to complete the following questionnaires in French: the Physical Activity Scale for Individuals with a Physical Disability (PASIPD), a 10-cm visual analog scale (VAS) to rate upper-limb pain, the Reintegration to Normal Living Index (RNLI), the EUROHIS-QOL 8-item and the Fatigue Severity Scale (FSS). These questionnaires were completed once more during the second meeting.

For analysis, the participants were divided into 2 groups based on the self-reported number of minutes of PA they performed each week before the lockdown. The active group consisted of participants who practiced a minimum of 150 min/week of moderate-intensity PA (intensity 3 to 6 metabolic equivalent of task [MET]) or 75 min/week of vigorous-intensity PA (intensity > 6 MET), therefore meeting the WHO recommendations for PA [1]. The inactive group consisted of individuals who did not meet the recommendations.

The data were analysed with SPSS v27. First, the 2 groups were compared for demographic and medical data. The Shapiro-Wilk test was used to test distribution normality. For quantitative variables, normally distributed data are reported as mean (SD) and non-parametric data as median (interquartile range). Nominal and categorical data are reported as number (%). Then, data were analysed by

https://doi.org/10.1016/j.rehab.2022.101649

using independent-samples Student *t*-test and Mann-Whitney and chi-squared tests. Second, to evaluate the effect of the lockdown in each group, the questionnaire data before and during the second lockdown were analysed by using the Wilcoxon test for dependent samples. Indeed, the discrete nature of the questionnaire data warranted the use of non-parametric tests. Effect sizes were estimated by the correlation coefficient (r), where $r = |Z| / \sqrt{N}$. According to Cohen's guidelines, the effect size was large with $r > 0.5$, medium with $r = 0.3–0.5$, and small with $r < 0.3$ [10]. $P<0.05$ was considered statistically significant.

In total, 34 participants were recruited: 20 in the active group and 14 in the inactive group. All but one participant participated in both meetings. This participant, in the inactive group, did not respond to the call-back for the second meeting.

Except for age and proportion of recent health issues, the demographic data were similar in both groups (Table 1). The active group reported a median of 382.5 (interquartile range 292.5–810) min/week of leisure PA and the inactive group a median of 30 (0–120) min/week. Within the inactive group, 2 individuals participated in 180 and 720 min of PA per week although they were not eligible for the active group, and this PA was light intensity, thereby not complying with the WHO recommendations.

During the second lockdown, the active group showed significantly decreased leisure PA, by 15.21 MET hr/day ($p = 0.00$), and household PA, by 0.53 MET hr/day ($p = 0.02$) (Table 2). The effect size was large ($r = 0.60$) for the PASIPD-leisure domain but medium ($r = 0.36$) for household PA. The MET hr/day for work PA remained at 0. The total PASIPD score also significantly decreased from 27.77 to 15.44 MET hr/day ($p = 0.00$). The effect size for this change was large ($r = 0.54$). The inactive group did not show significant changes in PA level for the domains of the PASIPD. However, the total PASIPD significantly decreased by 4.22 MET hr/day during the second lockdown ($p = 0.03$). The effect size for this decrease was medium ($r = 0.43$).

For secondary outcomes, only social participation showed significant changes due to the second lockdown: RNLI scores decreased by 14.5 points ($p = 0.00$) and 19 points ($p = 0.00$) for the active and inactive groups (Table 2). The effect size for this change was large for both groups ($r = 0.60$ and 0.52, respectively). In contrast, pain intensity, QoL and fatigue were not significantly affected by the second lockdown, remaining stable in both groups.

Our results demonstrate that individuals with SCI significantly reduced their PA level during Belgium's second COVID-19 lockdown. These findings add knowledge regarding the impact of the lockdown among individuals with PD, which has received little attention. Indeed, only one other study investigated the PA of individuals with SCI during the lockdown. This Spanish study observed similar results to ours: their sample of 20 individuals with thoracic SCI showed decreased total PA by 18.4 MET hr/day, with particularly great reductions in leisure PA as well [9]. Similarly, other populations of individuals with PD also showed reduced PA level due to the lockdown: adults with Parkinson's disease reduced their total PA level by > 2000 MET min/week [11] and patients with neuromuscular disease reported a decrease of 500 MET min/week [12].

Our findings were further able to identify that PA levels of individuals with SCI who were active before the second lockdown in Belgium were more affected than were levels for individuals who were inactive. To our knowledge, this is the first study among a sample of participants with PD to investigate this. Although these findings agree with Chambonnière et al., who found that active older French adults showed greater decrease in PA during the lockdown than their

Table 1
Demographic and medical data for participants with spinal cord injury.

Variable	Total sample ($n = 34$)	Active group ($n = 20$)	Inactive group ($n = 14$)	P value
Age (years)	49.5 (13.1)	45.2 (10.8)	55.6 (13.9)	0.02
Sex				
Men	23 (68%)	16 (80%)	7 (50%)	0.07
Women	11 (32%)	4 (20%)	7 (50%)	
Lesion level				
C4	2 (6%)	1 (5%)	1 (7%)	0.96
C6	2 (6%)	1 (5%)	1 (7%)	
C7	2(6%)	1 (5%)	1 (7%)	
D5	3 (10%)	2 (10%)	1 (7%)	
D10	5 (14%)	3 (15%)	2 (15%)	
D12	10 (29%)	6 (30%)	4 (28%)	
L1	2 (6%)	2 (10%)	0 (0%)	
L2	1 (3%)	0 (0%)	1 (7%)	
L3	2 (6%)	1 (5%)	1 (7%)	
L4	5 (14%)	3 (15%)	2 (15%)	
Time since lesion (years)	18.5 (6–32.5)	20.5 (15.6)	23.1 (19.6)	0.67
Reported leisure PA time per week (min)	255 (82.5–495)	382.5 (292.5–810)	30 (0–120)	$<10^{-4}$
BMI (kg/m^2)	24.1 (5.0)	24.2 (5.5)	23.9 (4.5)	0.91
Employment				
full time	8 (23%)	6 (30%)	2 (14%)	0.36
half time	7 (21%)	3 (15%)	4 (29%)	
part time	2 (6%)	2 (10)	0 (0%)	
none	17 (50%)	9 (45%)	8 (57%)	
Smoker				
Yes	7 (21%)	4 (20%)	3 (21%)	0.92
No	27 (79%)	16 (80%)	11 (79%)	
Health issue (past 6 months)				
Yes	12 (35%)	4 (20%)	8 (57%)	0.03
No	22 (65%)	16 (80%)	6 (43%)	
SCIM-motor	9 (7; 9)	9 (8; 9)	7.36 (1.55)	0.87
Physiotherapy				
Yes	28 (82%)	15 (75%)	13 (93%)	0.18
No	6 (18%)	5 (25%)	1 (7%)	
Reported physiotherapy time per week (min)	120 (60; 157.5)	102.5 (89.5)	114.6 (65.9)	0.67

Data are mean (SD) or median (IQR) unless otherwise indicated.
BMI, body mass index; PA, physical activity; SCIM, Spinal Cord Independence Measure; IQR, interquartile range.

Table 2
Pre- versus during second lockdown comparisons in the physically active and less physically active groups.

Variable	Active group		Pre- vs lockdown comparison: active group statistics	Inactive group		Pre- vs lockdown comparison: inactive group statistics
	Pre-lockdown ($n = 20$)	During lockdown ($n = 20$)		Pre-lockdown ($n = 14$)	During lockdown ($n = 13$)	
PASIPD-leisure PA (MET hr/day)	20.47 (11.86–31.18)	5.26 (1.89–8.37)	$Z = -3.81$ $p < 10^{-4}$ $r = 0.60$	6.50 (3.90–10.66)	3.84 (3.27–8.17)	$Z = -1,10$ $p = 0.27$ $r = 0.22$
PASIPD-household PA (MET hr/day)	2.40 (1.95–7.98)	1.87 (0.84–4.14)	$Z = -2.25$ $p = 0.02$ $r = 0.36$	1.84 (0.17–3.71)	0.65 (0.17–1.95)	$Z = -1.69$ $p = 0.09$ $r = 0.33$
PASIPD-work PA (MET hr/day)	0.00 (0–1.60)	0.00 (0–9.31)	$Z = 0.89$ $p = 0.37$ $r = 0.14$	0.00 (0–1.00)	0.00 (0–0.00)	$Z = -0.18$ $p = 0.85$ $r = 0.04$
PASIPD-total (MET hr/day)	27.77 (16.30–40.78)	15.44 (4.25–20.16)	$Z = -3.39$ $p < 10^{-3}$ $r = 0.54$	9.49 (6.87–13.95)	5.16 (3.74–8.90)	$Z = -2.20$ $p = 0.03$ $r = 0.43$
Pain intensity (VAS)	2.0 (0–5.1)	1.5 (0–2.8)	$Z = -1.58$ $p = 0.12$ $r = 0.25$	3.0 (0–6.1)	3.0 (0–6.5)	$Z = -0.66$ $p = 0.51$ $r = 0.13$
Social participation (RNLI)	95.0 (82.3–105.1)	80.5 (68.5–92.0)	$Z = -3.82$ $p < 10^{-3}$ $r = 0.60$	103.5 (92.8–110.0)	84.0 (71.0–97.0)	$Z = -2.69$ $p = 0.01$ $r = 0.52$
Quality of life (EUROHIS-QOL 8)	32.0 (28.0–34.0)	31.0 (27.3–34.8)	$Z = -1.38$ $p = 0.17$ $r = 0.22$	31.0 (29.0–35.3)	30.0 (26.5–33.0)	$Z = -1.77$ $p = 0.07$ $r = 0.34$
Fatigue (FSS)	2.72 (1.81–4.44)	3.10 (1.69–4.39)	$Z = 0.68$ $p = 0.49$ $r = 0.11$	2.89 (2.43–4.78)	4.11 (2.17–4.95)	$Z = -0.38$ $p = 0.70$ $r = 0.07$

Data are median (interquartile range).
EUROHIS-QOL 8, European Health Interview Surveys-Quality of Life 8 items; FSS, Fatigue Severity Scale; MET hr/day, metabolic equivalent of task hr/day; PA, physical activity; PASIPD, Physical Activity Scale for Individuals with a Physical Disability; RNLI, Return to Normal Living Index; VAS, visual analog scale.
Z, standardized test statistic; p, p-value; r, effect size.

inactive peers [13], it contradicts other trials of healthy populations, observing an increase in PA level among active individuals [7,8]. The different results obtained in the present study could suggest that populations with mobility impairments more strongly depend on PA-facilitating environments to be active. Healthcare professionals should be aware of this situation to contemplate ways to provide PA to their patients with PD during (potential) future lockdowns.

Social participation decreased evenly in the active and inactive groups, which confirms the results from a previous study of participants with chronic SCI, showing a significant decrease in the social dimension of the community integration questionnaire [14].

Of note, QoL remained high during the lockdown in both groups. Other trials of individuals with PD also did not find reduced QoL due to the lockdown [14,15]. In contrast, a review reported a decrease in QoL in healthy adults worldwide, owing to social distancing [16]. This finding indicates that individuals with PD may have had greater resilience to the lockdown. Indeed, past experience with life-altering events possibly enables better coping with the lockdown situation [15].

Finally, upper-limb pain and fatigue were not affected by the lockdown in both groups. Regarding pain, this trial is the first to evaluate this factor among patients with SCI. Miro et al. found increased pain intensity during the late stages of the lockdown among individuals with chronic pain in Spain [17]. However, although pain is the primary symptom of these patients, this is rarely the case for SCI. Therefore, pain measurement in people with SCI may be less subject to variations. Although we found no difference in fatigue with and without activity, other trials of adults with Parkinson's disease or multiple sclerosis found worsened fatigue during the lockdown [18,19]. Again, this difference may stem from fatigue being more dominant after Parkinson's disease and multiple sclerosis but less so after SCI [20].

The results should be considered with caution. The restricted sample size, recruitment procedure, and uneven participants in the groups raise issues of external validity. The age gap between the groups, and greater presence of recent medical complications in the less active group potentially affected the results. Moreover, 2 individuals in the less active group practiced light-intensity PA, which may have mitigated the differences between the groups. Lastly, the use of questionnaires raises concerns of social desirability bias. However, such patient-reported outcome measures are validated for research.

To conclude, the COVID-19 lockdown significantly decreased PA levels of individuals with SCI in Belgium. The effect size was greater for individuals who were active before the second lockdown in Belgium than their less active peers. Healthcare professionals should take this finding into consideration and monitor PA levels of their patients with PD during future lockdowns. Furthermore, social participation decreased in equal measure for active and less active individuals with SCI. The lockdown did not affect pain, fatigue or QoL in this population.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Conflict of interest

None declared.

References

[1] Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med 2020;54:1451. https://doi.org/10.1136/bjsports-2020-102955.
[2] Saunders DH, Sanderson M, Hayes S, Johnson L, Kramer S, Carter DD, et al. Physical fitness training for stroke patients. Cochrane Database Syst Rev 2020;3: CD003316 https://doi.org/10.1002/14651858.CD003316.pub7.

[3] Warms CA, Whitney JD, Belza B. Measurement and description of physical activity in adult manual wheelchair users†. Disabil Health J 2008;1:236–44 https://doi.org/10.1016/j.dhjo.2008.07.002.
[4] Declerck L, Stoquart G, Lejeune T, Vanderthommen M, Kaux J-F. Barriers to development and expansion of adaptive physical activity and sports for individuals with a physical disability in sports clubs and centres. Sci Sports 2021;36:202–9 https://doi.org/10.1016/j.scispo.2020.12.002.
[5] Actualité Covid-19. Ligue Handisport Francoph n.d. https://www.handisport.be/actualite-covid/(accessed December 10, 2021).
[6] Caputo EL, Reichert FF. Studies of Physical Activity and COVID-19 During the Pandemic: a Scoping Review. J Phys Act Health 2020;17:1275–84 https://doi.org/10.1123/jpah.2020-0406.
[7] Lesser IA, Nienhuis CP. The impact of COVID-19 on physical activity behavior and well-being of Canadians. Int J Environ Res Public Health 2020;17 https://doi.org/10.3390/ijerph17113899.
[8] Symons M, Meira Cunha C, Poels K, Vandebosch H, Dens N, Alida Cutello C. Physical activity during the first lockdown of the COVID-19 pandemic: investigating the reliance on digital technologies, perceived benefits, barriers and the impact of affect. Int J Environ Res Public Health 2021;18:5555. https://doi.org/10.3390/ijerph18115555.
[9] Marco-Ahulló A, Montesinos-Magraner L, González Ll-M, Morales J, Bernabéu-García JA, García-Massó X. Impact of COVID-19 on the self-reported physical activity of people with complete thoracic spinal cord injury full-time manual wheelchair users. J Spinal Cord Med 2021:1–5 https://doi.org/10.1080/10790268.2020.1857490.
[10] Fritz CO, Morris PE, Richler JJ. Effect size estimates: current use, calculations, and interpretation. J Exp Psychol Gen 2012;141:2–18 https://doi.org/10.1037/a0024338.
[11] Shalash A, Roushdy T, Essam M, Fathy M, Dawood NL, Abushady EM, et al. Mental health, physical activity, and quality of life in Parkinson's disease during COVID-19 pandemic. Mov Disord Off J Mov Disord Soc 2020;35:1097–9 https://doi.org/10.1002/mds.28134.
[12] Di Stefano V, Battaglia G, Giustino V, Gagliardo A, D'Aleo M, Giannini O, et al. Significant reduction of physical activity in patients with neuromuscular disease during COVID-19 pandemic: the long-term consequences of quarantine. J Neurol 2021;268:20–6 https://doi.org/10.1007/s00415-020-10064-6.
[13] Chambonniere C, Lambert C, Tardieu M, Fillon A, Genin P, Larras B, et al. Physical activity and sedentary behavior of elderly populations during confinement: results from the FRENCH COVID-19 ONAPS survey. Exp Aging Res 2021:1–13 https://doi.org/10.1080/0361073X.2021.1908750.
[14] García-Rudolph A, Saurí J, López Carballo J, Cegarra B, Wright MA, Opisso E, et al. The impact of COVID-19 on community integration, quality of life, depression and anxiety in people with chronic spinal cord injury. J Spinal Cord Med 2021:1–10 https://doi.org/10.1080/10790268.2021.1922230.
[15] Dalise S, Tramonti F, Armienti E, Niccolini V, Caniglia-Tenaglia M, Morganti R, et al. Psycho-social impact of social distancing and isolation due to the COVID-19 containment measures on patients with physical disabilities. Eur J Phys Rehabil Med 2021;57:158–65 https://doi.org/10.23736/S1973-9087.20.06535-1.
[16] Melo-Oliveira ME, Sá-Caputo D, Bachur JA, Paineiras-Domingos LL, Sonza A, Lacerda AC, et al. Reported quality of life in countries with cases of COVID19: a systematic review. Expert Rev Respir Med 2021;15:213–20 https://doi.org/10.1080/17476348.2021.1826315.
[17] Miró J, Sánchez-Rodríguez E, Ferreira-Valente A, Pais-Ribeiro J, Ciaramella A. Effects of COVID-19 social distancing measures in individuals with chronic pain living in spain in the late stages of the lockdown. Int J Environ Res Public Health 2021;18:11732. https://doi.org/10.3390/ijerph182211732.
[18] van der Heide A, Meinders MJ, Bloem BR, Helmich RC. The impact of the COVID-19 pandemic on psychological distress, physical activity, and symptom severity in Parkinson's disease. J Park Dis 2020;10:1355–64 https://doi.org/10.3233/JPD-202251.
[19] Demir CF, Bilek F, Balgetir F. Neuropsychiatric changes during the COVID-19 pandemic in multiple sclerosis patients. Arq Neuropsiquiatr 2020;78:570–5 https://doi.org/10.1590/0004-282×20200122.
[20] Anton HA, Miller WC, Townson AF. Measuring fatigue in persons with spinal cord injury. Arch Phys Med Rehabil 2008;89:538–42 https://doi.org/10.1016/j.apmr.2007.11.009.

Louise Declerck[a]
Céline Loiselet[b]
Jean-François Kaux[c,d]
Thierry Lejeune[a,e,*]
Marc Vanderthommen[d]
Gaëtan Stoquart[a,e]

[a] *Université catholique de Louvain, Secteur des Sciences de la Santé, Institut de Recherche Expérimentale et Clinique, Neuromusculoskeletal Lab (NMSK), Brussels, Belgium*
[b] *Faculté des Sciences de la motricité, Université Catholique de Louvain, Louvain-la-neuve, Belgium*
[c] *Département de médecine et de traumatology du sportif SportS[2], FIFA Medical Centre of Excellence, FIMS Collaborative Centre of Sports Medicine and ReFORM IOC Research Centre for Prevention of Injury and Protection of Athlete Health, Centre hospitalier universitaire de Liège, Liège, Belgium*
[d] *Département des sciences de la motricité, Université de Liège, Liège, Belgium*
[e] *Cliniques universitaires Saint-Luc, Service de médecine physique et réadpatation, Brussels, Belgium*

*Corresponding author at: Université catholique de Louvain, SSS/IREC/NMSK, Avenue Mounier 53, Bte B1.53.07, B-1200 Brussels, Belgium.
E-mail address: thierry.lejeune@uclouvain.be (T. Lejeune).

Received 20 October 2021
Accepted 19 February 2022