The Impact of COVID-19 Pandemic on Physical Activity in Sighted and Visually Impaired Children

Dragoș Adrian MANIU[a], Emese Agnes MANIU[b*], Sorina POP[c], Emilia Florina GROSU[b]

[a]*Babeş-Bolyai University Cluj-Napoca, Faculty of Physical Education and Sport, 7 Pandurilor Street, Cluj Napoca, 400376*
[b]*Babeş-Bolyai University Cluj-Napoca, Doctoral School in Physical Education and Sport, 7 Pandurilor Street, Cluj Napoca, 400376*
[c]*Colegiul Național George Coșbuc, 70-72 Avram Iancu street, Cluj Napoca, 400083*

Abstract
The introduction of restrictions due to Covid 19 as well as the closing of schools has considerably influenced the participation in physical activities of both sighted and blind children.
The purpose of this study was to investigate the effects of the COVID 19 restrictions on the participation in physical activities in sighted and blind children.
Physical activity level was measured with the Physical Activity Index (PAI), before, during and after pandemic. 79 sighted students and 34 visually impaired students aged 13-15, from 2 local schools participated in the study.
COVID-19 pandemic restrictions such as closing schools, restricting access to gyms, parks, playgrounds had a negative impact on the participation in physical activities for both groups.
During the pandemic lockdown the Physical Activity Index showed significantly lower scores for both of the groups, p≤0, 05.

***Keywords**: COVID-19 pandemic, physical activity index, sighted and visually impaired children.*

* Corresponding author. Tel.04 0746047831
E-mail address: emesita2004@yahoo.com

1. Introduction

Physical activity defines any form of body movement produced by skeletal muscles that uses energy. Physical activity is a scientifically proven source of health benefits. By physical activity we mean any type of movement, from exercise and sports to recreational activities such as walking, cycling, dancing or ordinary household activities such as gardening, cleaning the house (WHO, 2020).

According to the World Health Organization (WHO), globally, one in four adults and more than 80% of adolescents have an insufficient level of physical activity. Nearly 5 million deaths could be avoided annually if the world's population were more physically active. People who are insufficiently physically active have a 20 to 30% higher risk of death compared to people who have an appropriate level of physical activity (WHO, 2020). According to the Romanian National Institute of Public Health, at least 25 diseases of the body and nervous system can be prevented, improved or treated through physical activity.

The COVID-19 pandemic has brought many challenges to our health and the activities that support a healthy lifestyle. During the pandemic, participation in physical activities was limited due to restrictions. For people with visual impairments, participation in physical activities was almost impossible due to the lack of accessibility to public areas such as parks, outdoor sports fields, mountain trails, etc. (Tison et al., 2020).

Sedentary behaviours and lack of physical activity have become more widespread during the COVID-19 pandemic. The studies reviewed showed significant increases in time spent in inactivity (Srivastav et al., 2021; Ruiz-Roso et al., 2020; Biviá-Roig et al., 2020; Dunton Do B & Wang, 2020; Romero-Blanco et al., 2020; Castañeda-Babarro et al., 2020; Ammar et al., 2020), screen time (eg, video games, television viewing, and computer use) (Elran-Barak, Mozeikov, 2020; Pietrobelli, 2020; Majumdar, 2020; Zheng et al., 2020; Pišot et al., 2020; Azizi et al., 2020), time spent on social networks (Sun et al., 2020; Elran et al., 2020), total sedentary time (Zheng et al., 2020; Pišot et al., 2020), duration of time spent at home (Sun et al., 2020) and online work time (Zheng et al., 2020).

The purpose of this study was to investigate the effects of the COVID 19 restrictions on the participation in physical activities in sighted and blind children.

2. Material and methods

2.1. Study group

The study included 79 sighted students (46 girls and 33 boys) and 34 visually impaired students (14 girls and 20 boys) aged 13-15, from 2 local schools.

2.2. Measurements

Physical activity level was measured with the Physical Activity Index.

The physical activity index contains 3 parameters regarding the intensity (Effort that leads to rapid breathing ang sweating, Effort increasing the respiratory rate and sweating, Effort above average, Moderat effort, Easy effort) duration (over 30 min, 20-30 min, 10-20 min, below 10 min) and frequency (Daily or almost daily, 3-5 times weekly, 1-2 times weekly, several times monthly, less than once monthly) of physical activity. PAI is obtained by multiplying the scores of each parameter.

The interpretation is as follows:

- 80-100 points very active lifestyle, superior physical condition category,
- 60-80 points active and healthy person, very good physical condition category,
- 40-60 points acceptable, reasonable physical condition category,
- 20-40 points insufficiently active, relatively sedentary, poor physical condition category, below 20 sedentary, very poor physical condition category.

Statistical analysis

Statistical analysis was performed using MedCalc Statistical Software version 20.111 (MedCalc Software bv, Ostend, Belgium; https://www.medcalc.org; 2022). Continuous data were tested for normality of distribution using the Shapiro-Wilk test and characterized by the median

and the 25th and the 75th percentiles. Qualitative data were expressed as absolute and relative frequency. We used the t-test for paired values, differences between measurement were verified with the ANOVA for repeated measurements test or two-way ANOVA for repeated measurements, whenever appropriate. A p value of <0.05 was considered statistically significant.

3. Results

3.1. Physical Activity Index for the sighted group. Comparation between the COVID 19 lockdown and before and after COVID 19 PAI values.

Table 1. Physical Activity Index for the sighted group

		Before COVID 19	COVID 19 lockdown	After COVID 19
N	Valid	79	79	79
	Missing	0	0	0
Percentiles	25	36.00	8.00	30.00
	mediana	48.00	27.00	48.00
	75	80.00	60.00	80.00

Following the data analysis, we observed statistically significant differences in the PAI values before the COVIDX 19 pandemic and during the pandemic. We also observed statistically significant differences in PAI values during the pandemic and after the pandemic, p≤0, 05 for the sighted group. We did not observe significant differences between PAI values before and after the pandemic (table 1, 2).

Table 2. PAI for the sighted group. Comparation between the COVID 19 lockdown and before and after COVID 19 PAI values.

Pairwise Comparisions						
Sample 1	Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
COVID 19 lockdown – before COVID 19		-.734	.159	-4.614	.000	.000
COVID 19 lockdown – after COVID 19		.861	.159	5.410	.000	.000
Before COVID 19 – after COVID 19		.127	.159	.796	.426	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.
[a]Significance values have been adjusted by the Bonferroni correction for multiple tests.

3.2. Physical Activity Index for the visually impaired group. Comparation between the COVID 19 lockdown and before and after COVID 19 PAI values.

Table 3. Physical Activity Index for the visually impaired group

		Before COVID 19	COVID 19 lockdown	After COVID 19
N	Valid	34	34	34
	Missing	0	0	0
Percentiles	25	20.00	1.00	30.00
	mediana	38.00	20.00	56.00
	75	80.00	48.00	85.00

Following the data analysis, we observed statistically significant differences in the PAI values before the COVIDX 19 pandemic and during the pandemic. We also observed statistically significant differences in PAI values during the pandemic and after the pandemic, p≤0, 05 for the visually impaired group. We did not observe significant differences between PAI values before and after the pandemic (table 3, 4).

Table 4. PAI for the visually impaired group. Comparation between the COVID 19 lockdown and before and after COVID 19 PAI values.

Pairwise Comparisons					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
COVID 19 lockdown – before COVID 19	.868	.243	3.577	.000	.001
COVID 19 lockdown – after COVID 19	-1.118	.243	-4.608	.000	.000
Befor COVID 19 – after COVID 19	-.250	.243	-1.031	.303	.908

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.
[a.] Significance values have been adjusted by the Bonferroni correction for multiple tests.

3.3. The influence of gender on Physical Activity Index

Taking into account the influence of the gender variable, we did not observe statistically significant differences between boys and girls in the values of the PAI questionnaire before, during and after the pandemic for both of the groups (table 5, 6).

Table 6. The influence of gender on Physical Activity Index for the sighted group

Multivariate Tests[a]								
	Effect	Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[c]
factor1	Pillai's Trace	.363	21.668[b]	2.000	76.000	.000	43.336	1.000
	Wilks' Lambda	.637	21.668[b]	2.000	76.000	.000	43.336	1.000
	Hotelling's Trace	.570	21.668[b]	2.000	76.000	.000	43.336	1.000
	Roy's Largest Root	.570	21.668[b]	2.000	76.000	.000	43.336	1.000
factor1* gender	Pillai's Trace	.031	1.210[b]	2.000	76.000	.304	2.420	.257
	Wilks' Lambda	.969	1.210[b]	2.000	76.000	.304	2.420	.257
	Hotelling's Trace	.032	1.210[b]	2.000	76.000	.304	2.420	.257
	Roy's Largest Root	.032	1.210[b]	2.000	76.000	.304	2.420	.257

a. Design: Intercept + gen Within Subjects Design: factor1; b. Exact statistic; c. Computed using alpha = .05

Table 6. The influence of gender on Physical Activity Index for the visually impaired group

Multivariate Tests[a]								
	Effect	Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[c]
factor1	Pillai's Trace	.512	16.294[b]	2.000	31.000	.000	32.588	.999
	Wilks' Lambda	.488	16.294[b]	2.000	31.000	.000	32.588	.999
	Hotelling's Trace	1.051	16.294[b]	2.000	31.000	.000	32.588	.999
	Roy's Largest Root	1.051	16.294[b]	2.000	31.000	.000	32.588	.999
factor1* gender	Pillai's Trace	.061	1.010[b]	2.000	31.000	.376	2.021	.210
	Wilks' Lambda	.939	1.010[b]	2.000	31.000	.376	2.021	.210
	Hotelling's Trace	.065	1.010[b]	2.000	31.000	.376	2.021	.210
	Roy's Largest Root	.065	1.010[b]	2.000	31.000	.376	2.021	.210

a. Design: Intercept + gender Within Subjects Design: factor1; b. Exact statistic; c. Computed using alpha = .05

3.4. The influence of age on Physical Activity Index

Taking into account the influence of the age variable, we did not observe an influence of age upon the PAI questionnaire values before, during and after the pandemic for both of the groups (Table 7, 8).

Table 7. The influence of age on Physical Activity Index for the sighted group.

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[d]
factor1	Pillai's Trace	.327	18.243[b]	2.000	75.000	.000	36.486	1.000
	Wilks' Lambda	.673	18.243[b]	2.000	75.000	.000	36.486	1.000
	Hotelling's Trace	.486	18.243[b]	2.000	75.000	.000	36.486	1.000
	Roy's Largest Root	.486	18.243[b]	2.000	75.000	.000	36.486	1.000
factor1* age	Pillai's Trace	.102	2.047	4.000	152.000	.091	8.189	.601
	Wilks' Lambda	.898	2.072[b]	4.000	150.000	.087	8.289	.607
	Hotelling's Trace	.113	2.096	4.000	148.000	.084	8.383	.612
	Roy's Largest Root	.111	4.207[c]	2.000	76.000	.019	8.413	.722

a. Design: Intercept + age Within Subjects Design: factor1; b. Exact statistic; c. The statistic is an upper bound on F that yields a lower bound on the significance level; d. Computed using alpha = .05

Table 8. The influence of age on Physical Activity Index for the visually impaired group

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Noncent. Parameter	Observed Power[d]
factor1	Pillai's Trace	.497	14.323[b]	2.000	29.000	.000	28.647	.997
	Wilks' Lambda	.503	14.323[b]	2.000	29.000	.000	28.647	.997
	Hotelling's Trace	.988	14.323[b]	2.000	29.000	.000	28.647	.997
	Roy's Largest Root	.988	14.323[b]	2.000	29.000	.000	28.647	.997
factor1* age	Pillai's Trace	.194	1.076	6.000	60.000	.387	6.455	.391
	Wilks' Lambda	.806	1.100[b]	6.000	58.000	.374	6.598	.399
	Hotelling's Trace	.240	1.120	6.000	56.000	.363	6.717	.404
	Roy's Largest Root	.238	2.377[c]	3.000	30.000	.090	7.130	.538

a. Design: Intercept + age Within Subjects Design: factor1; b. Exact statistic; c. The statistic is an upper bound on F that yields a lower bound on the significance level; d. Computed using alpha = .05

4. Discution

People's everyday movement and physical activity routines were significantly changed by COVID-19. In comparison to pre-COVID eras, people all throughout the world reported decreases in daily physical activity

and increases in sedentary time (such as watching TV or using electronic devices) and time spent at home. During the COVID-19 pandemic, sedentary behaviour and lack of physical activity increased. (Park et al., 2022).

In general, there was a significant decline in physical activity levels during COVID-19, with reductions in light (Di Sebastiano, 2020), moderate and/or vigorous (Srivastav, 2021; Ruiz-Roso, 2020; Biviá-Roig, 2020; Di Stefano, 2021; López-Sánchez, 2021; Castañeda-Babarro, 2020) and total physical activity (Elran-Barak, 2020, Dunton, 2020; Amar, 2020; López-Sánchez, 2021) occurring, though one study found that university students engaged in more moderate, vigorous, and total physical activity while confined (Romero-Blanco, 2020). Other studies supported the significant effect of COVID-19 on public health, showing a significant decline in the proportion (Gallo, 2020) or number (López-Bueno, 2020) of participants who met the advised physical activity level (for adults, at least 150 minutes of moderate-intensity aerobic activity, according to the Centers for Disease Control and Prevention) during the pandemic.

Additionally, COVID-19 has caused significantly lower daily step counts (Hemphill, 2020; Vetrovsky, 2020), lower levels of outdoor physical activity and play (De Lannoy, 2020), and lower levels of exercise and sports (Assaloni, 2020; Pietrobelli, 2020), whereas several studies have shown significantly higher levels of physical activity with family (Azizi, 2020), labor/physical work (such as gardening) (Pišot, 2020), and leisure time (Bourdas, 2020). Two investigations found conflicting effects of COVID-19 on outdoor leisure activities. While a European study found a considerable rise in outdoor recreational activity during the pandemic (Venter, 2020), a US study found a significant decline in outdoor recreation participation (Rice, 2020).

Despite the fact that many people struggle to exercise for a number of time, economical, and motivational reasons (Ebben & Brudzynski, 2008; Tappe et al., 1989), people who are blind or have visual impairments confront additional obstacles to exercise (Capella-McDonnall, 2007; Matoso & Portela, 2020). Sports participation among visually impaired youngsters who are sedentary needs to be promoted. Children who are visually

impaired should practice sport more than once or twice a week in order to achieve normal physical parameters (Maniu et al., 2018).

According to studies conducted around the world, people with disabilities have been particularly negatively impacted by lockdowns and social exclusion (Jalali et al., 2020; Mbazzi et al., 2020; Safta-Zecheria, 2020).

In our study the physical activity level showed a significant decrease during the pandemic for both of the studied groups. After the pandemic the physical activity levels have returned to pre-pandemic values.

5. Conclusions

The COVID 19 pandemic negatively influenced the physical activity levels of sighted and visually impaired children.

Physical activity levels are similar before and after COVID 19 lockdown.

Age doesn't influence the physical activity levels before, during and after pandemic for sighted and visually impaired children.

Gender doesn't influence the physical activity levels before, during and after pandemic for sighted and visually impaired children.

In our study the physical activity level showed a significant decrease during the pandemic for both of the studied groups. After the pandemic the physical activity levels have returned to pre-pandemic values.

References

Assaloni, R., Pellino, V.C., Puci, M.V., Ferraro, O.E., Lovecchio, N., Girelli, A., et al. (2020). Coronavirus disease (Covid-19): how does the exercise practice in active people with type 1 diabetes change? A preliminary survey. *Diabetes Res Clin Pract.*, 166:108297.

Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., et al. (2020). Effects of COVID-19 home confinement on physical activity and eating behaviour Preliminary results of the ECLB-COVID19 international online-survey. *Nutrients*, 12:1583.

Azizi, A., Achak, D., Aboudi, K., Saad, E., Nejjari, C., Nouira, Y., et al. (2020). Health-related quality of life and behavior-related lifestyle changes due to the COVID-19 home confinement: Dataset from a Moroccan sample. *Data Brief*, 32:106239.

Biviá-Roig, G., La Rosa, V.L., Gómez-Tébar, M., Serrano-Raya, L., Am-Cuenca, J.J., Caruso, S., et al. (2020). Analysis of the impact of the confinement resulting from COVID-19 on the lifestyle and psychological wellbeing of Spanish pregnant women: an Internet-based cross-sectional survey. *Int J Environ Res Public Health*,17:5933.

Bourdas, D.I., Zacharakis, E.D. (2020). Evolution of changes in physical activity over lockdown time: Physical activity datasets of four independent adult sample groups corresponding to each of the last four of the six COVID-19 lockdown weeks in Greece. *Data Brief*, 32:106301.

Capella-McDonnall, M. (2007). The need for health promotion for adults who are visually impaired. *Journal of Visual Impairment and Blindness*, 101(3), 133–145.

Castañeda-Babarro, A., Arbillaga-Etxarri, A., Gutiérrez-Santamaría, B., Coca A. (2020). Physical activity change during COVID-19 confinement. *Int J Environ Res Public Health*,17:6878.

De Lannoy, L., Rhodes, R.E., Moore, S.A., Faulkner, G., Tremblay, M.S. (2020). Regional differences in access to the

outdoors and outdoor play of Canadian children and youth during the COVID-19 outbreak. *Can J Public Health*, 111:988-94.

Di Sebastiano, K.M., Chulak-Bozzer, T., Vanderloo, L.M., Faulkner, G. (2020). Don't walk so close to me: physical distancing and adult physical activity in Canada. *Front Psychol*.,11:1895.

Di Stefano, V., Battaglia, G., Giustino, V., Gagliardo, A., D'Aleo, M., Giannini, O., et al. (2021). Significant reduction of physical activity in patients with neuromuscular disease during COVID-19 pandemic: the long-term consequences of quarantine. *J Neurol*., 268:20-6.

Dunton, G.F., Do, B., Wang, S.D. (2020). Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the US. *BMC Public Health*, 20:1351.

Ebben, W., Brudzynski, L. (2008). Motivations and barriers to exercise among college students. *Journal of Exercise Physiology Online*, 11, 1–11.

Elran-Barak, R., Mozeikov, M. (2020). One month into the reinforcement of social distancing due to the COVID-19 outbreak: subjective health, health behaviors, and loneliness among people with chronic medical conditions. *Int J Environ Res Public Health*, 17:5403.

Gallo, L.A., Gallo, T.F., Young, S.L., Moritz, K.M., Akison, L.K.T. (2020). The impact of isolation measures due to COVID-19 on energy intake and physical activity levels in Australian university students. *Nutrients*, 12:1865.

Jalali, M., Shahabi, S., Bagheri Lankarani, K., Kamali, M., Mojgani, P. (2020). COVID-19 and disabled people: Perspectives from Iran. *Disability and Society*, 35(5), 844–847.

Hemphill, N.M., Kuan, M.T., Harris, K.C. (2020). Reduced physical activity during COVID-19 pandemic in children with congenital heart disease. *Can J Cardiol*., 36:1130-4.

López-Sánchez, G.F., López-Bueno, R., Gil-Salmerón, A., Zauder, R., Skalska, M., Jastrzębska, J., et al. (2021). Comparison of physical activity levels in Spanish adults with chronic conditions before and during COVID-19 quarantine. *Eur J Public Health*, 31:161-6.

Majumdar, P., Biswas, A., Sahu, S. (2020). COVID-19 pandemic and lockdown: cause of sleep disruption, depression, somatic pain, and increased screen exposure of office workers and students of India. *Chronobiol Int*., 37:1191-200.

Maniu, E. A., Maniu D. A., & Grosu, V. T. (2018). The influence of adapted sport activities and performance sport on spirometric values for children and adolescents with visual impairment: 4th International Conference of the Universitaria-Consortium (ICU). The Impact of Sport and Physical Education Science on Today's Society. Iasi, ROMANIA: NOV 23-24.

Matoso, G. P., Portela, B. S. (2020). Level of physical activity and perceived barriers to its practice in adults with visual impairment. *Revista Brasileira de Atividade Física & Saúde*, 24, 1–7.

Mbazzi, F. B., Nalugya, R., Kawesa, E., Nimusiima, C., King, R., van Hove, G., Seeley, J. (2020). The impact of COVID-19 measures on children with disabilities and their families in Uganda. *Disability and Society*.

Park, A.H., Zhong, S., Yang, H., Jeong, J., Lee, C. (2022). Impact of COVID-19 on physical activity: A rapid review. J Glob Health, 12:05003.

Pietrobelli, A., Pecoraro, L., Ferruzzi, A., Heo, M., Faith, M., Zoller, T., et al. (2020). Effects of COVID-19 lockdown on lifestyle behaviors in children with obesity living in Verona, Italy: a longitudinal study. *Obesity (Silver Spring)*, 28:1382-5.

Pišot, S., Milovanović, I., Šimunič, B., Gentile, A., Bosnar, K., Prot, F., et al. (2020). Maintaining everyday life praxis in the time of COVID-19 pandemic measures (ELP-COVID-19 survey). *Eur J Public Health*, 30:1181-6.

Rice, W.L., Mateer, T.J., Reigner, N., Newman, P., Lawhon, B., Taff, B.D. (2020). Changes in recreational behaviors of outdoor enthusiasts during the COVID-19 pandemic: analysis across urban and rural communities. *J Urban Econ*, 6:a020.

Ruiz-Roso, M.B., Knott-Torcal, C., Matilla-Escalante, D.C., Garcimartín, A., Sampedro-Nuñez, M.A., Dávalos, A., et al. (2020). COVID-19 lockdown and changes of the dietary pattern and physical activity habits in a cohort of patients with type 2 diabetes mellitus. *Nutrients*, 12:2327.

Romero-Blanco, C., Rodríguez-Almagro, J., Onieva-Zafra, M.D., Parra-Fernández, M.L., Prado-Laguna, M.D.C., Hernández-Martínez, A. (2020). Physical activity and sedentary lifestyle in university students: changes during confinement due to the COVID-19 pandemic. *Int J Environ Res Public Health*, 17:6567.

Safta-Zecheria, L. (2020). Challenges posed by COVID-19 to the health of people with disabilities living in residential care facilities in Romania. *Disability and Society*, 35(5), 837–843.

Srivastav, A.K., Sharma, N., Samuel, A.J. (2021). Impact of Coronavirus disease-19 (COVID-19) lockdown on physical activity and energy expenditure among physiotherapy professionals and students using web-based open E-survey sent through WhatsApp, Facebook and Instagram messengers. *Clin Epidemiol Glob Health*, 9:78-84.

Sun, S., Folarin, A.A., Ranjan, Y., Rashid, Z., Conde, P., Stewart, C., et al. (2020). Using smartphones and wearable devices to monitor behavioral changes during COVID-19. *J Med Internet Res*., 22: e19992.

Tappe, M. K., Duda, J. L., Ehrnwald, P. M. (1989). Perceived barriers to exercise among adolescents. *Journal of School Health*, 59(4), 153–155.

Tison, G.H., Avram, R., Kuhar, P., Abreau, S., Marcus, G.M., Pletcher, M.J., et al. (2020). Worldwide effect of COVID-19 on physical activity: a descriptive study. *Ann Intern Med*., 173:767-70.

Venter, Z.S., Barton, D.N., Gundersen, V., Figari, H., Nowell, M. (2020). Urban nature in a time of crisis: recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. *Environ Res Lett*, 15:104075.

Vetrovsky, T., Frybova, T., Gant, I., Semerad, M., Cimler, R., Bunc, V. et al. (2020).The detrimental effect of COVID-19 nationwide quarantine on accelerometer-assessed physical activity of heart failure patients. *ESC Heart Fail*, 7:2093-7.

World Health Organization (2020). Guidelines on physical activity and sedentary behaviour. Geneva.

Zheng, C., Huang, W.Y., Sheridan, S., Sit, C.H.P., Chen, X.K., Wong, S.H.S. (2020). COVID-19 pandemic brings a sedentary lifestyle in young adults: a cross-sectional and longitudinal study. *Int J Environ Res Public Health*, 17:6035.