Observing Longitudinal Physical Activity And Sitting Patterns Throughout COVID-19 Restrictions Amongst UK Adults

Dr. Terun Desai*[1], Dr. Keith Sullivan[1], Dr. Alison Phillips[2], Dr. Katie Newby[1] and Dr. Lindsay Bottoms[1]
[1]School of Life and Medical Sciences, University of Hertfordshire, Hatfield, UK
[2]Department of Psychology, Iowa State University, Ames, IA, USA
t.desai@herts.ac.uk

Abstract

Purpose: The COVID-19 global pandemic presented an insight into observing the changes in physical activity (PA) and sitting patterns of free-living adults during a unique period of intermittent enforced home confinement and free-living conditions. Evidence unequivocally indicates physical inactivity, facilitated by home confinement, is associated with greater risk of disease and mortality. This study aimed to monitor longitudinal PA and sitting patterns throughout the enforced COVID-19 restrictions, uniquely including all three UK national lockdowns between April 2020 and January 2021.

Methods: 580 adults (41 ±21 y; 22% ♂ / 77% ♀ / 1% Other) participated in a longitudinal, observational study, encompassing all three UK national lockdowns between 19/4/20 – 23/1/21, using self-reported online surveys either daily or weekly for 6 months, then monthly to reduce survey fatigue. Pre-COVID data was based on the week prior to the first national lockdown. Participants recalled time engaging in PA and sitting per day for each diary completed throughout the study. Data was used to calculate MET-mins/week for total, low, moderate and vigorous activity, then averaged for each month. Friedman's ranking test analysed differences between months for PA and sitting time.

Results: Total, low, moderate and vigorous MET-mins/wk were significantly different across months (p < 0.001) and tended to decline month-on-month. PA levels were similar between lockdowns 2 and 3. Sitting time significantly increased ($\chi^2(8) = 18$, $p = 0.02$) across lockdowns 1-3, but decreased when restrictions were lifted.

Conclusions: To avert the negative health impacts of 'twindemics' linking future disease pandemics and the physical inactivity pandemic, strict movement restrictions should be carefully considered in future given our data shows increased physical inactivity.

Introduction

The COVID-19 global pandemic presented an insight into observing the changes in PA and sitting patterns of free-living adults during a unique period of intermittent enforced home confinement and free-living conditions. Increasing evidence points to another pandemic, physical inactivity, which is associated with significantly heightened risk of disease and mortality (Blair, 2009; Mattioli et al., 2020). Hence, enforced home confinement may contribute to increased physical inactivity and radical physiological changes contributing to worsening population and individual health in a vicious circle (Narici et al., 2020).

There is a plethora of data available examining a solitary timepoint or short-term PA patterns before, during and after the first lockdown alone. One systematic review analysing 64 studies, highlighted reductions in PA and increased sedentary behaviour (Stockwell et al., 2021). However, longitudinal data spanning all three national lockdowns in the UK is very limited. Mitchell et al. (2022) reported reductions in PA levels during and after the first lockdown. This study aimed to monitor PA and sitting patterns throughout the enforced COVID-19 restrictions, including all three UK national lockdowns between April 2020 and January 2021.

Aims

- Observe PA and sitting patterns before and after COVID-19 restrictions were implemented amongst UK adults.
- Compare PA and sitting patterns of UK adults across the three periods of national lockdown in the UK.

Methods

- 580 adults living in the UK volunteered to complete online surveys (Qualtrics) in a longitudinal observational study between 19/4/2020 – 23/1/2021.
- Participant demographics: Gender: 22% ♂ / 77% ♀ / 1% Other; Age: 41 ±21 yrs; Living Status: 11% Alone / 89% With Others; Ethnicity (Fig 1).
- UK public recruited via Google Ads, social media (Twitter) and staff/students at one UK university.
- Inclusion criteria: Aged 18+ yrs and living in UK. Exclusion criteria: Instructed to self-isolate due to 'extremely high risk'/shielded patient.
- A 43-item survey was distributed to participants determining PA and sitting (frequency and duration) behaviours before and after COVID-19 restrictions were implemented.
- PA type, duration, frequency and intensity (low: <3 MET, moderate: 3-6 MET, vigorous ≥6 MET) was determined.
- Further questions were asked about habit formation based on Self-Report Behavioral Automaticity Index (Gardner et al., 2012) and anxiety based on Generalised Anxiety Disorder 2-item (GAD-2).
- Survey frequency was adapted throughout the study to minimise survey fatigue at participants' discretion (Fig 2).
- Data was used to calculate MET-mins/week for total, low, moderate and vigorous activity, then averaged for each month. Friedman's ranking test analysed differences between months for PA and sitting time.

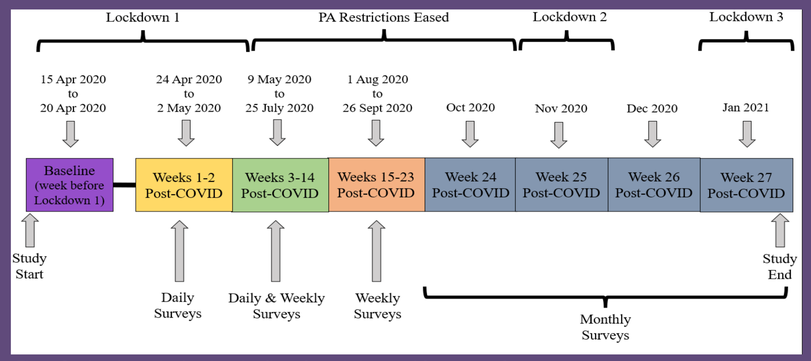

Fig 2. Study schematic showing timeline of restrictions and frequency of surveys.

SCAN ME

Fig 1. QR code for ethnicity breakdown and pre-lockdown PA habits

Results

- Total ($\chi^2(8) = 708$, $p < 0.001$), low ($\chi^2(8) = 608$, $p < 0.001$), moderate ($\chi^2(8) = 828$, $p < 0.001$) and vigorous ($\chi^2(8) = 467$, $p < 0.001$) MET-mins/week were significantly different across months and tended to decline month-on-month (Figs 3-6).
- Interestingly, PA levels based on total MET-mins per week were similar between lockdown 2 (496 ±1261) and 3 (495 ±1068). The composition of activity differed with more moderate intensity activities occurring during lockdown 2, whereas low and vigorous intensity activities contributed more to total METS during lockdown 3.
- Sitting time significantly increased ($\chi^2(8) = 18$, $p = 0.02$) progressively from lockdown 1 to 3, and decreased when restrictions were lifted, as expected (Fig 7).

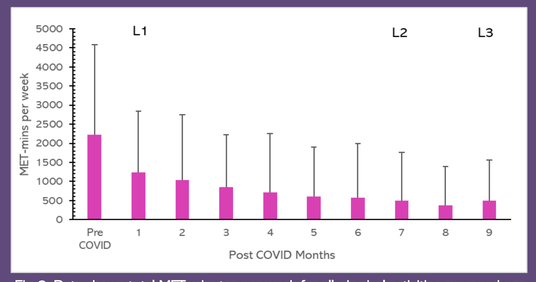

Fig 3. Data shows total MET minutes per week for all physical activities averaged per month, pre-COVID and for 9 months post-COVID restrictions. Error bars show SD and lockdowns 1-3 are denoted above.

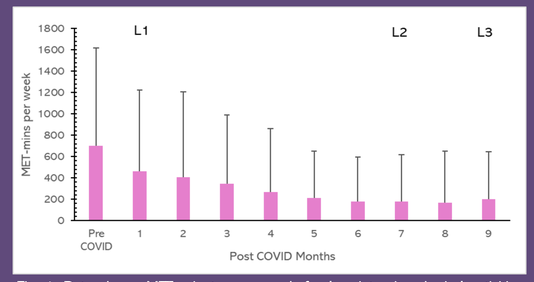

Fig 4. Data shows MET minutes per week for low intensity physical activities averaged per month, pre-COVID and for 9 months post-COVID restrictions. Error bars show SD and lockdowns 1-3 are denoted above.

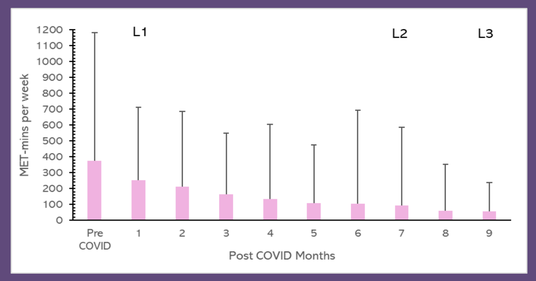

Fig 5. Data shows MET minutes per week for moderate intensity physical activities averaged per month, pre-COVID and for 9 months post-COVID restrictions. Error bars show SD and lockdowns 1-3 are denoted above.

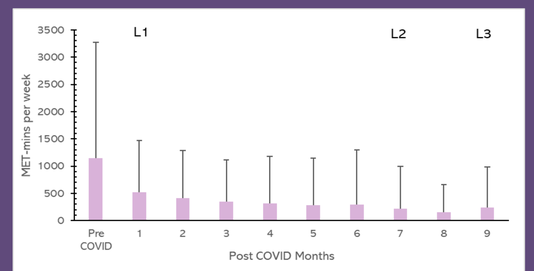

Fig 6. Data shows MET minutes per week for vigorous intensity physical activities averaged per month, pre-COVID and for 9 months post-COVID restrictions. Error bars show SD and lockdowns 1-3 are denoted above.

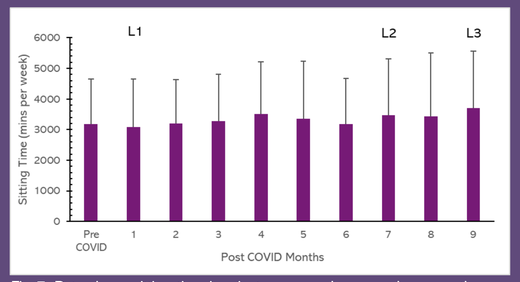

Fig 7. Data shows sitting time in minutes per week averaged per month, pre-COVID and for 9 months post-COVID restrictions. Error bars show SD and lockdowns 1-3 are denoted above.

Discussion/Conclusion

- Our data reports significant changes in longitudinal PA and sitting behaviours across 9 months of varying degrees of COVID enforced restrictions, uniquely including all 3 national lockdowns.
- Although there was no difference between lockdowns 2 and 3 for PA measured by total MET-mins, it was interesting to note the different intensities of PA characterising lockdowns 2 and 3. Given the negative mental effects of restrictions (Pieh et al., 2021), we hypothesise that participants engaged in more low (longer outdoor walks) and vigorous (outdoor running) activities during lockdown 3, to overcome increased cumulative pressures on mental wellbeing. This highlights the positive correlation between PA, mental wellbeing and sociability, as PA patterns in lockdowns for low intensity activities were usually completed with others which contrasts with pre-lockdown PA habits (Fig 1).
- Interpretation of our data should acknowledge skewness in the participant demographics with females and white ethnicity dominating the cohort. Research has previously shown females to engage in less PA compared to males (OHID, 2022) due to barriers such as childcare responsibilities, fatigue related to menstrual cycle (Moreno and Johnston, 2014). In contrast, participants of white ethnicity have the highest PA rates in the UK and are more likely to participate in PA (OHID, 2022), suggesting future research should focus on ethnic minority populations as these groups are at risk of diseases whereby sedentary behaviour is a major risk factor.
- Salutogenesis is becoming ever more important and topical, and our findings show the requirement for careful consideration of PA restrictions on a population-level scale. It is recommended, where possible that strict restrictions on PA should not be enforced unless absolutely necessary given our data and other published literature shows significantly increased sitting time during lockdowns compared to periods when PA and movement restrictions were eased.

Future Research

The following are projects we intend to research with our dataset:

- Effect of COVID-19 restrictions on individuals' changes in PA (amount and type).
- Effect of individual-level changes (injury, illness, job change) on changes in PA (amount and type).
- Effect of demographic characteristics on PA over time (and changes in PA due to COVID restrictions)
- Role of habit strength on PA behaviours over time.
- Effects of intrinsic motivation and anxiety on PA and habit strength over time.
- Compare findings against similar populations from other countries, accounting for differences in national restrictions.
- Examine PA and sitting behaviours over an extended follow-up duration (2-3 years) after 3rd lockdown to determine habit change.

@uhsportsscience @UHSportsScience

References

Blair (2009). *Br J of Sports Med*, *43*(1), pp.1-2.
Gardner *et al.* (2012). *Int J of Behavioral Nutr and PA*, *9*(1), pp.1-12.
Mattioli *et al.* (2020). *Eur. J. Clin. Nutr.* *74*, pp.852–855.
Mitchell *et al.* (2022). *Plos One*, *17*(8), p.e0273530.
Moreno & Johnston (2014). *Am J of Lifestyle Med*, *8*(3), pp.164–166.
Narici *et al.* (2021). *Eur J of Sport Science*, *21*(4), pp.614-635.
OHID. (2022). *Physical activity data tool: statistical commentary, Jan 2022.*
Pieh *et al.* (2021). *Psychosomatic Medicine*, 83(4), pp.328-337.
Stockwell *et al.* (2021). *BMJ Open Sport & Exercise Medicine*, *7*(1), p.e000960.