



Supplementary Materials:

Sleep Quality and Physical Activity as Predictors of Mental Wellbeing Variance in Older Adults during COVID-19 Lockdown: ECLB COVID-19 International Online Survey

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Supplementary file 1

Sample size

The study sample size was estimated using the following predictive equation [1]: $N = (Z_{\alpha/2})^2 s^2/d^2$, where “N” is the number of needed participants (*i.e.*, old adults), “ $Z_{\alpha/2}$ ” is the normal deviate for a two-tailed alternative hypothesis at a level of significance, “s” is the standard deviation (SD) and “d” is the accuracy of estimate or how close to the true mean. Given the novel nature of our study, the “s” was collected from a previous study including 1809 adults [18–34 years (31.5%), 35–49 years (39.8%), and >50 years (28.7%)] and aimed to describe how positive health behaviors (physical activity, sleep) and negative health behaviors (alcohol use, tobacco use, drug use) changed during March to mid-April 2020 [2]. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) [3]. In the aforementioned study, the mean±SD of the total sample PSQI scores was 6.5±3.3. The consideration of a “ $Z_{\alpha/2}$ ” equal to 1.96 (*i.e.*, an error rate of 0.05%) and an arbitrarily “d” equal to an error of estimation less than 0.32 (5% of the mean of 6.5), to provide an estimated sample size of $N = (1.96)^2 (3.3)^2 / (0.32)^2 = 409$ participants. The assumption of 20% for missing data, data entry errors, or the occurrence of a cognitive decline/impairment gave a revised sample of 511 old adults [$511 = 409 / (1.00 - 0.20)$].

Supplementary file 2

Data Privacy and Consent of Participation

The ECLB-COVID-19 study gave special care to data privacy and security and protection of the collected data against any unauthorized access by third parties. During the informed consent process, surveyed participants were ensured (i) all data would be used only for research purposes (ii) answers were anonymous and confidential according to Google’s privacy policy. Participants were not permitted to provide their names or contact information. Additionally, participants were able to stop study participation and leave the questionnaire at any stage before the submission process; if doing so, their responses would not be saved. Responses were saved only by clicking on the provided “submit” button. Participants were requested to be honest in their responses [4].

Survey Questionnaires

The ECLB-COVID-19 is a multi-country electronic survey designed to assess eventual changes in multiple lifestyle behaviours during the COVID-19 outbreak. Therefore, a collection of validated and/or crisis oriented brief questionnaires were included. These questionnaires assessed demographic information, mental wellbeing (Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS) [5], mood and feeling (Short Mood and Feelings Questionnaire (SMFQ), life satisfaction (Short Life Satisfaction Questionnaire for Lockdowns (SLSQL) [6], social participation (Short Social Participation Questionnaire for Lockdowns (SSPQL) [6], PA (International Physical Activity Questionnaire Short Form (IPAQ-SF) [4], diet behaviours (Short Diet Behaviours Questionnaire for Lockdowns (SDBQL) [4], sleep quality (Pittsburgh Sleep Quality Index (PSQI) and some key questions assessing the technology-use behaviours (Short Technology-use Behaviours Questionnaire for Lockdowns (STBQL)), and the need of psychosocial support. Reliability of the shortened and/or newly adopted questionnaires was tested by the project steering group through piloting, prior to survey administration. These brief crisis-oriented questionnaires demonstrated good to excellent

test–retest reliability coefficients ($r = 0.84–0.96$). A multi-language validated version already existed for the majority of these questionnaires and/or questions. However, for questionnaires that did not already exist in multilingual versions, we followed the procedure of translation and back-translation, with an additional review for all language versions from the international scientists of our consortium. As a result, a total number of 64 items were included in the ECLB-COVID-19 online survey in a differential format (*i.e.*, each item or question requested two answers, one regarding the period pre- and the other regarding the period during- lockdown). The participants were guided to compare the situations. A copy of the complete ECLB-COVID19 survey's questionnaires has been previously published as supplementary file (<https://doi.org/10.1371/journal.pone.0240204.s001>).

Supplementary file 3

SWEMWBS

SWEMWBS is a short version of the Warwick–Edinburgh Mental Wellbeing Scale (WEMWBS) [5]. The SWEMWBS uses seven of the WEMWBS's 14 statements about thoughts and feelings, which relate more to functioning than feelings suggesting an ability to detect clinically meaningful change [8]. The seven statements are positively worded with five response categories from 'none of the time (score 1)' to 'all of the time (score 5)'. The SWEMWBS was recently validated for the general population and is scored by first summing the scores for each of the seven items, which are scored from 1 to 5 [9]. The total raw scores are then transformed into metric scores using the SWEMWBS conversion table [9]. Total scores range from 7 to 35 with higher scores indicating higher positive mental wellbeing [9]. The cut points for SWEMWBS are 17 or less for probable depression, 18–20 for possible depression, 21–27 for average mental wellbeing and 28–35 high mental wellbeing [9].

PSQI

The sleep quality was assessed by the PSQI [10]. The PSQI questionnaire is reliable and valid assessment tool in older adults [11]. The questionnaire was composed of 19 questions representing one of the seven components of sleep quality: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication intake, and daytime dysfunction. Each component score was rated on a 3-point scale, leading to a sum of up to 21 points. PSQI scores > 5 and ≤ 5 indicated, respectively, poor and good sleep qualities.

IPAQ-SF

According to the official IPAQ-SF guidelines [7], data from the IPAQ-SF are summed within each item (*i.e.*, vigorous intensity, moderate intensity and walking) to estimate the total amount of time spent engaged in PA per week. Total weekly PA (MET-min-week⁻¹) was estimated by adding the products of reported time for each item by a Metabolic equivalent of task (MET) value that was specific to each category of PA. We assigned two different sets of MET values. The first set was the original values (original IPAQ) based on the official IPAQ guidelines for young and middle-aged adult (18–65 years old): vigorous PA = 8.0 METs, moderate PA = 4.0 METs and walking = 3.3 METs. The other set used modified values (modified IPAQ), which we had devised for use with older adults (>65 years old), as reported by Stewart et al. [12] and Yasunaga et al. [13]: vigorous PA = 5.3 METs, moderate PA = 3.0 METs and walking = 2.5 METs. Additionally, we added the total PA (sum of performed vigorous, moderate and walking activity) as a fourth item and sitting time as fifth item [4,14,15].

Based on the IPAQ recommendations for scoring protocol, participants of the study were classified in three different groups of PA considering the MET-min/wk of the sum of walking, moderate-intensity physical activities, and vigorous-intensity physical activities: lowly active (<600 MET-min/wk); moderately active ($600 \text{ MET-min/wk} \leq \text{PA} < 3000 \text{ MET-min/wk}$) and highly active ($\geq 3000 \text{ MET-min/wk}$) (<http://www.ipaq.ki.se>).

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