

Article

Three Days of ActiGraph[®] Use Are Sufficient to Determine the Time Spent in Sedentary Behavior, and in Moderate and Moderate-to-Vigorous Physical Activity, in People with Major Depressive Disorder

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Abstract: Modifications to daily sedentary behavior (SB) and participation in moderate-to-vigorous physical activity (MVPA) may provide beneficial results in the prevention and management of mental disorders, such as Major Depressive Disorder (MDD). This cross-sectional research investigated the minimum number of follow-up days needed to reliably estimate the time spent in SB and MVPA from accelerometer data in people with MDD. SB and physical activity (PA) were assessed using an accelerometer, and classified as time spent in SB and in different PA intensities (light—LPA, moderate—MPA, vigorous—VPA, MVPA, or total—TPA). The minimum days of use were calculated using Spearman–Brown analyses, considering only variables with an ICC > 0.8 (cut point—considered acceptable). In the results, 98 people with MDD showed no differences between the days of the week, and an ICC > 0.8 for SB, MPA, and MVPA (for 2–3–4–5–6 vs. 7). Thus, Spearman–Brown analyses were performed considering 2 days (minimum days with ICC > 0.8) and 7 days (maximum days of original test with ICC > 0.8). Our results suggest that a minimum of 3 days of accelerometer use is necessary to reliably estimate the time of SB, MPA, and MVPA. This finding has a significant practical application, allowing data collection using a reduced duration of accelerometer wear. The optimization of time needed in this context permits the utilization of accelerometers among a greater number of individuals, possibly

affecting the sample size of MDD patients in research and decreasing acquisition costs in this scientific area.

Keywords: physical activity; sedentary behavior; mental disorders; depression

1. Introduction

Physical activity (PA) refers to any form of bodily movement that exceeds the resting metabolic rate (1.5 METs). Current recommendations are for individuals to maintain optimal health include engaging in 150 to 300 min of moderate-intensity PA (MVPA) per week [1]. Additionally, sedentary behavior (SB) refers to any waking behavior while in a lying, sitting, or reclining position, and it can negatively impact health, especially when performed for more than 6–8 h a day [2].

Decreasing daily time in SB and increasing daily time in MVPA are beneficial for preventing and treating mental disorders [3–7], and this potential has been highlighted in people with Major Depressive Disorder (MDD) [8–11]. Subjects with MDD present emotional symptoms, such as depressed mood, psychomotor agitation or lethargy, insomnia or hypersomnia, fatigue, irritability, anhedonia, decreased appetite, and suicidal ideation and behavior [8]. There are approximately 280 million cases around the world [12], and the first-line treatment includes drug therapy in conjunction with cognitive-behavioral psychotherapy [9]; however, more than one-third of people with MDD do not present an adequate response [13,14]. Therefore, it is necessary to combine the traditional treatment with a reduction in SB time and sufficient MVPA [15,16].

Assessing SB and MVPA accurately is fundamental, and objective methods, including electronic equipment, such as accelerometers, are essential in this context [17]. Accelerometers present advantages compared to questionnaires, especially with respect to accuracy, since they do not depend on the patient recalling their routine and reporting their activities, which have been indicated as a source of bias [18]. Positioning the accelerometer on the right hip within an elastic belt secured around the waist, at the center of mass, is suggested as the most effective approach to monitor the body's comprehensive movement [17]. On the other hand, measuring SB and PA with an accelerometer can be challenging, especially due to the need to use the device for seven days, for a minimum of 10 h a day, on at least four days [19]. In fact, 30 to 60% of research participants asked to wear an accelerometer did not reach a minimum of 10 h per day of use time [20,21]. The symptoms of people with MDD (e.g., irritability or fatigue) may impact data collection, because of the potential impact that these symptoms can have on the choice not to use the device.

The existing evidence supports the validity of accelerometry data with 4 or more days of use [19,22], or even with 3 days of use for a healthy population [23]. Some studies tested the number of days required for the reliable estimation of SB and PA considering different populations and regions of use for the accelerometers, such as in pregnancy (wrist-worn) [24], adult workers (waist-worn) [25], and older adults (right hip-worn) [26]. However, to the best of our knowledge, no studies have been carried out that investigate the number of days required for reliable estimation of SB and PA in people with MDD. Evidence that a reduced number of days of accelerometer use demonstrates agreement with longer periods of use for time spent in SB or PA could facilitate future studies and evaluations in people with MDD. In fact, evaluating the reliability of the time in SB and MVPA over a measurement period of 7 days and determining if there are differences in the time of SB and MVPA considering fewer days (e.g., 3 days) is relevant and could provide an alternative to overcome this difficulty. If the results of the current study validate the reliable

use of accelerometers over a 3-day or lower period, this could have significant potential applications in clinical or public health settings. For instance, optimizing time in this context enables the use of accelerometers among larger populations, reducing acquisition costs.

Thus, the present study aimed to determine the minimum time of use, in days, needed to reliably measure accelerometer-based SB time and MVPA time in people with MDD. This elucidation may provide health professionals with greater confidence in the measurements of the time spent in SB and MVPA of MDD. Furthermore, data collection requiring fewer days of wear by the same patient could promote the use of accelerometers across more individuals and reduce related acquisition expenses.

2. Materials and Methods

2.1. Study Design and Participants

This was a cross-sectional observational study that included people diagnosed with MDD (according to the Mini International Neuropsychiatric Interview—MINI) [27,28]. The local ethics committee (protocol number 4.782.125) approved the study. All participants signed the informed consent form, and the research followed the Declaration of Helsinki [29]. Participants (convenience sample) were recruited from an outpatient clinic (Sao Paulo city, Brazil) through posters and leaflets.

The inclusion criteria were persons who (a) were aged 18 years or older; (b) had no physical disabilities; (c) had no musculoskeletal injuries; (d) had a diagnosis of MDD by the team of psychiatrists at the clinic where the study was performed; (e) had confirmation of the diagnosis of MDD by a psychiatrist (by the MINI) [27,28]; and (f) used of the accelerometer for the seven-day period for at least six hundred minutes/day (detailed information is provided in the section “PA and SB assessment”). The exclusion criterion was individuals presenting another mental illness, such as schizophrenia, bipolar disorder, or substance abuse disorder.

After the diagnosis was confirmed by the MINI, an interview was performed to determine the characteristics of the sample (age, education, etc.). Depressive symptoms were measured using the Montgomery–Asberg Depression Scale (MADRS) [30]. At the conclusion of the interview, the subject was given an accelerometer, which they were asked to begin using the following morning when they woke up. In addition, time spent in SB and PA was measured using an ActiGraph® accelerometer (model GT9X, Pensacola, FL, USA) during a seven-day period, with at least six hundred minutes of daily use.

2.2. Mini International Neuropsychiatric Interview—MINI

The MINI was used to screen people for symptoms of MDD. This tool is a structured diagnostic interview questionnaire for psychiatric disorders in the DSM-5 and ICD-10 [28]. The MINI is a short tool (20–30 min to apply), making it practical for diagnosing psychiatric people in daily clinical practice. The questions are constructed to allow only “yes” or “no” answers. The questionnaire explores all inclusion and exclusion criteria and progression for the 23 diagnostic categories of the DSM-5, and demonstrated satisfactory reliability for all diagnostic sections [31].

2.3. Montgomery–Asberg Depression Scale (MADRS)

The MADRS score consists of ten items. Nine items are based on patient reports (sadness, inner stress, decreased sleep, decreased appetite, distraction, fatigue, arrhythmia, pessimism, and suicidal ideation), and one item on clinical observations. The higher the score, the greater the occurrence of depressive symptoms, with the final score ranging from 0 to 60 [30].

2.4. Physical Activity and Sedentary Behavior Assessment

The ActiGraph® GT9X accelerometer (ActiGraph®, LLLC, Pensacola, FL, USA), used in this study, is an electronic device able to measure body acceleration in three planes: vertical, anterior–posterior, and medio-lateral. In addition, the device quantifies the frequency, duration, and intensity of these movements. The ActiGraph® also records the frequency and duration of each SB episode [32], when the participant is usually in a lying, sitting, or reclining position. Among the measures provided by the ActiGraph®, we used the time spent in SB, light PA (LPA), moderate PA (MPA), vigorous PA (VPA), and MVPA. Total PA (TPA), which included the time spent in PA at any intensity, was calculated by summing the LPA, MPA, and VPA.

Data collection, wear time validation, and scoring are the three critical actions required to measure SB and PA with the ActiGraph®. For data collection, participants were instructed to wear the ActiGraph® for seven days, securing it to the right side of the waist with an elastic strap, for at least six hundred minutes of daily use. Participants were instructed to remove the device only for sleeping at night and/or during water-based activities [19].

After wearing and returning the ActiGraph®, the data were validated in Actilife software, Version 6.13.4 (ActiGraph's premier actigraphy data analysis software) to determine the wear time validation according to the parameters of Choi et al. (2011) [33]. Periods with consecutive values of 0, with a 2 min spike tolerance, for 60 min or longer, were interpreted as “accelerometer not worn time” and excluded from the analysis. The validation considered only seven days of use, with six hundred or more minutes per day.

Finally, the scoring was performed using Actilife software, according to the parameters of Freedson (2011) [34] as a reference to classify SB (0–199 counts), LPA (200–2686 counts), MPA (2687–6166 counts), and VPA (>6166 counts). The times spent in each PA intensity category (LPA, MPA, VPA, MVPA, and TPA (minutes per week)) and SB (minutes per day) were used as the outcomes of interest. It is important to highlight that Freedson (2011) [34] utilized healthy participants to establish cut-points for classifying PA intensity; however, this parameter has been applied to various clinical groups without precise references for SB and PA.

2.5. Clinical History and Sociodemographic Adjustment Variables

A structured questionnaire was applied to characterize the sample and collect the following data: (1) General information: name, sex, contact address, age, date of birth; (2) Number of depressive episodes in life; (3) Anthropometric measurements: weight, height (self-reported); and (4) Education: years of schooling. The body mass index was calculated considering the formula $BMI = \text{weight (kg)} / \text{height (m)}^2$ (dividing the weight in kilograms by the height in meters squared).

2.6. Statistical Analysis

All statistical analyses were performed using IBM SPSS software (version 20.0; SPSS Inc., Chicago, IL, USA) and statistical significance was set at $p\text{-value} < 0.05$. To describe the sample characteristics, percentages were used for categorical descriptive variables, and the mean and standard deviation (mean $\pm$ SD) were used for continuous descriptive variables. To examine the variability of SB, LPA, MPA, VPA, and MVPA time over a 7-day measurement period, descriptive analyses were performed for participants who wore the accelerometers for the full 7 days. An ANOVA test was performed to assess the differences on each day of the week (Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday), weekdays (mean of Monday, Tuesday, Wednesday, Thursday, and Friday), or weekend days (mean of Saturday and Sunday) for the time of SB and PA (LPA, MPA, VPA, and MVPA). A $p\text{-value}$ of ≤ 0.05 was adopted. In addition, Pearson correlations of SB,

LPA, and MVPA between the days of use (1, 2, 3, 4, 5, 6, or 7 days) were utilized. The correlation was interpreted as follows: ≤ 0.4 = weak correlation; > 0.4 and < 0.7 = moderate correlation; and ≥ 0.7 = strong correlation. Intraclass correlation coefficient (ICC) (intra-rater reliability) [35] values from 7 days vs. 1, 2, 3, 4, 5, or 6 days were used.

Finally, to determine the number of monitoring days needed to achieve measurement reliability, as previously suggested [36], the number of days with an $ICC \geq 0.8$ was used to calculate the Spearman–Brown prediction formula [37]. We reinforce that an $ICC \geq 0.8$ is a premise of this statistical strategy. In other words, if the variable does not reach an $ICC \geq 0.8$, it is not possible to reduce the number of days of the original protocol. The formula described below has already been used in other research with accelerometers (number of days required for reliable estimation of SB and PA) [24–26]:

$$N = [ICC_d (1 - ICC_d)] \times [(1 - ICC_e)/ICC_e]$$

N = number of days needed.

ICC_d = desired level of reliability (0.80).

ICC_e = estimated level of reliability.

To calculate the ICC_e, the following formula was used:

$$ICC_e = k (\text{conf orig}) / (1 + (k - 1) \times \text{conf orig})$$

ICC_e = reliability of a test “k” times, relative to the original test.

conf orig = reliability of the original test (Cronbach’s Alpha).

k = factor by which the test duration is changed. To find k, divide the number of items in the new test by the number of items in the original test. For example, if the test has seven items in the original form and two in the new form, the k will be $2/7 = 0.292$.

3. Results

Of the 143 participants initially screened, six participants were excluded because they had no diagnosis of MDD. Thus, 137 participants were interviewed and received the accelerometer. During data collection, 2 participants lost the accelerometer, and 37 participants (low symptoms, N = 7, moderate symptoms, N = 28, or severe symptoms, N = 4) did not wear it for long enough (seven days of use, with six hundred or more minutes per day), meaning that 39 subjects were not included in the analysis. The general characteristics of the participants who were not included were not different from the included participants (age, BMI, overall symptoms of depression, and number of depressive episodes).

Finally, 98 participants (compliance of 71% over 7 days of data) presented valid data according to the required parameters (used for seven days with at least six hundred minutes of daily use), as shown in Figure 1.

Table 1 details the characteristics of the sample included in the study. Briefly, the sample was predominantly female (93.9%), middle-aged (54.1 ± 11.0 years), and with low (5.9 ± 3.3 points–N = 19), moderate (21.7 ± 4.3 points–N = 66), or severe (35.3 ± 3.3 points–N = 13) symptoms of depression. The mean MADRS score was 20.4 ± 9.8 points, and depressive episodes in life presented a mean of 2.9 ± 1.4 episodes.

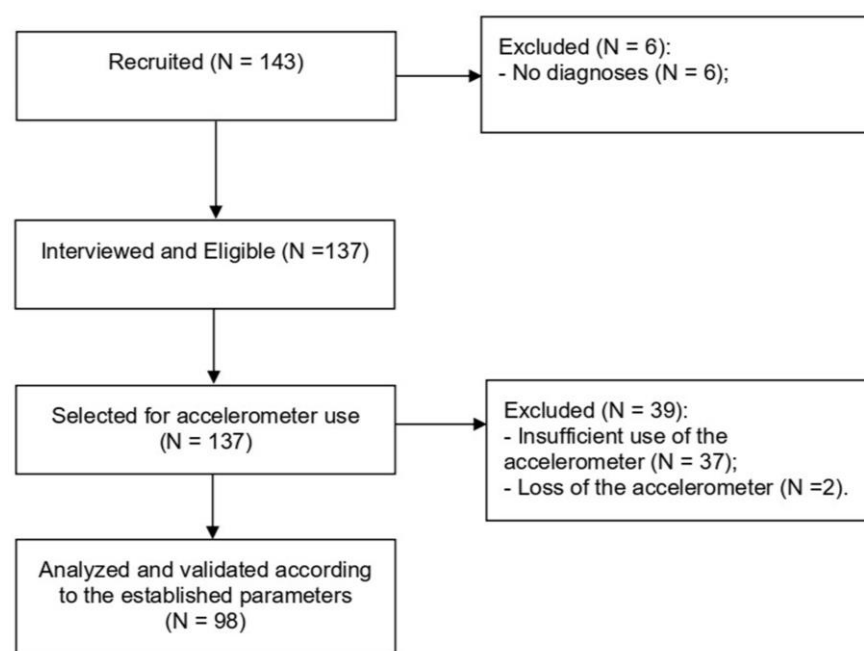


Figure 1. Flow chart of recruitment and inclusion.

Table 1. Sample characteristics.

Variable	MDD Participants (n = 98)	Range
Female	93.9% (N = 92)	--
Age (years)	54.1 ± 11.0	24–71
Weight (kilograms)	75.1 ± 17.5	47–120
Body mass index (kg/m ²)	29.8 ± 5.1	20–38
Symptoms of Depression—MADRS ≤10 points	5.9 ± 3.3 (N = 19)	0–10
Symptoms of Depression—MADRS >10 and <30 points	21.7 ± 4.3 (N = 66)	10–29
Symptoms of Depression—MADRS ≥30 points	35.3 ± 3.3 (N = 13)	30–41
Overall symptoms of Depression—MADRS	20.4 ± 9.8 (n = 98)	0–41
Number of depressive episodes	2.9 ± 1.4	1–6
Years of education	9.0 ± 3.6	6–16
Days worn	7 ± 0	--
Wearing time per day (hours)	13.7 ± 3.3	11.8–17.1
SB (minutes per day)	429 ± 152	193–1080
LPA (minutes per week)	2846 ± 749	1837–4160
MPA (minutes per week)	346 ± 168	21–813
VPA (minutes per week)	14 ± 21	0–87
MVPA (MPA + VPA) (minutes per week)	360 ± 191	21–819
TPA (LPA + MPA + VPA) (minutes per week)	3206 ± 649	2082–4417

Number of females is expressed as a percentage (%). Age, weight, height, body mass index, symptoms of depression, and years of education are expressed as mean ± standard deviation. MDD = major depressive disorder; kg = kilograms; m² = square meter measurement. MADRS = Montgomery–Asberg depression rating scale. Range = minimum and maximum value.

Figure 2 presents the mean and SD of SB, LPA, MPA, VPA, MVPA, and TPA. The comparisons using the ANOVA test showed no differences ($p > 0.05$) between the days for SB, LPA, MPA, VPA, and MVPA.

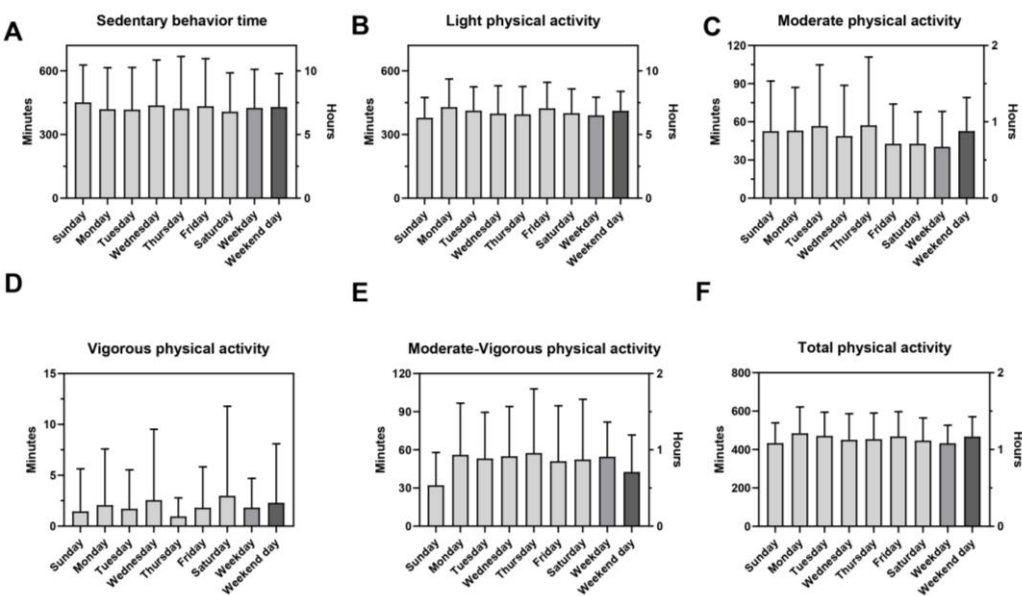


Figure 2. Comparisons between each day of the week (Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday), Weekdays (mean of Monday, Tuesday, Wednesday, Thursday, and Friday), or Weekend days (mean of Saturday and Sunday) for the time of sedentary behavior (A) and physical activity—Light (B), Moderate (C), Vigorous (D), Moderate-to-Vigorous (E), and Total (F). ANOVA test. Data presented as mean and standard deviation.

Figure 3 presents the Pearson correlations and intraclass correlations (ICC) between the days of use (1, 2, 3, 4, 5, 6, or 7 days) for the time of SB (Figure 3A) and MVPA (Figure 3B) ($p \leq 0.05$). Correlations ≥ 0.80 were observed between 7 days and 2, 3, 4, 5, and 6 days for SB ($p \leq 0.05$) and MVPA ($p \leq 0.05$).

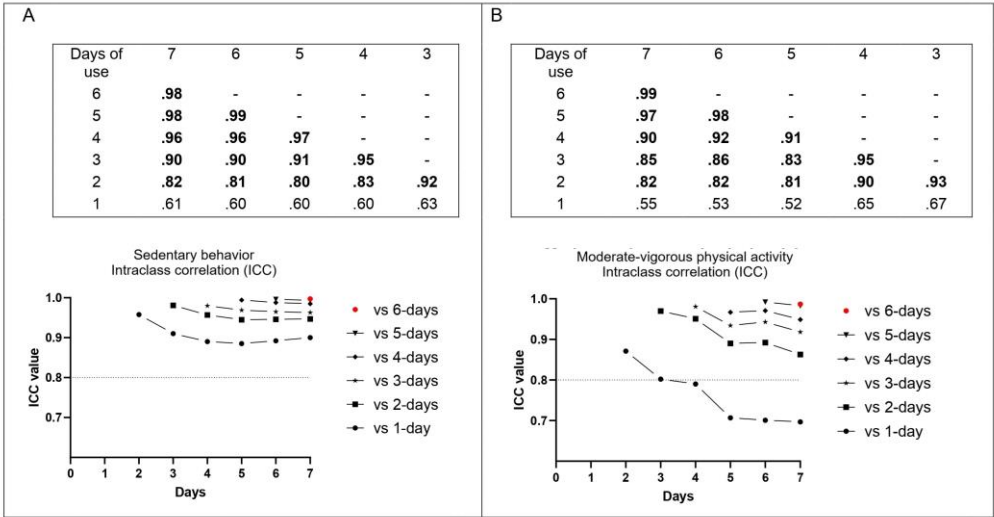


Figure 3. Pearson correlations between each day of use (1, 2, 3, 4, 5, 6, or 7 days) for the time of sedentary behavior (A) and moderate-to-vigorous physical activity (B). For all correlations, we verified statistical significance ($p < 0.05$). The interpretation of the correlation was: ≤ 0.4 = weak correlation; > 0.4 and < 0.7 = moderate correlation; ≥ 0.7 = strong correlation. Correlations ≥ 0.8 are highlighted (bold). Intraclass correlations (ICC) between each day of use (1, 2, 3, 4, 5, 6, or 7 days) for the time of sedentary behavior and moderate-to-vigorous physical activity. ICC > 0.8 was considered acceptable.

Figure 4 presents the Pearson correlations and ICC values between the days of use (1, 2, 3, 4, 5, 6, or 7 days) for the time of LPA (Figure 4A), MPA (Figure 4B), VPA (Figure 4C),

and Total PA (Figure 4D). For LPA ($p \leq 0.05$), correlations ≥ 0.80 were verified between 7 days and 4, 5, and 6 days. For MPA ($p \leq 0.05$), we verified correlations ≥ 0.80 between 7 days and 2, 3, 4, 5, and 6 days. For VPA ($p \leq 0.05$), we verified correlations ≥ 0.80 between 7 days and 5 and 6 days. For TPA ($p \leq 0.05$), we verified correlations ≥ 0.80 between 7 days and 5 and 6 days.

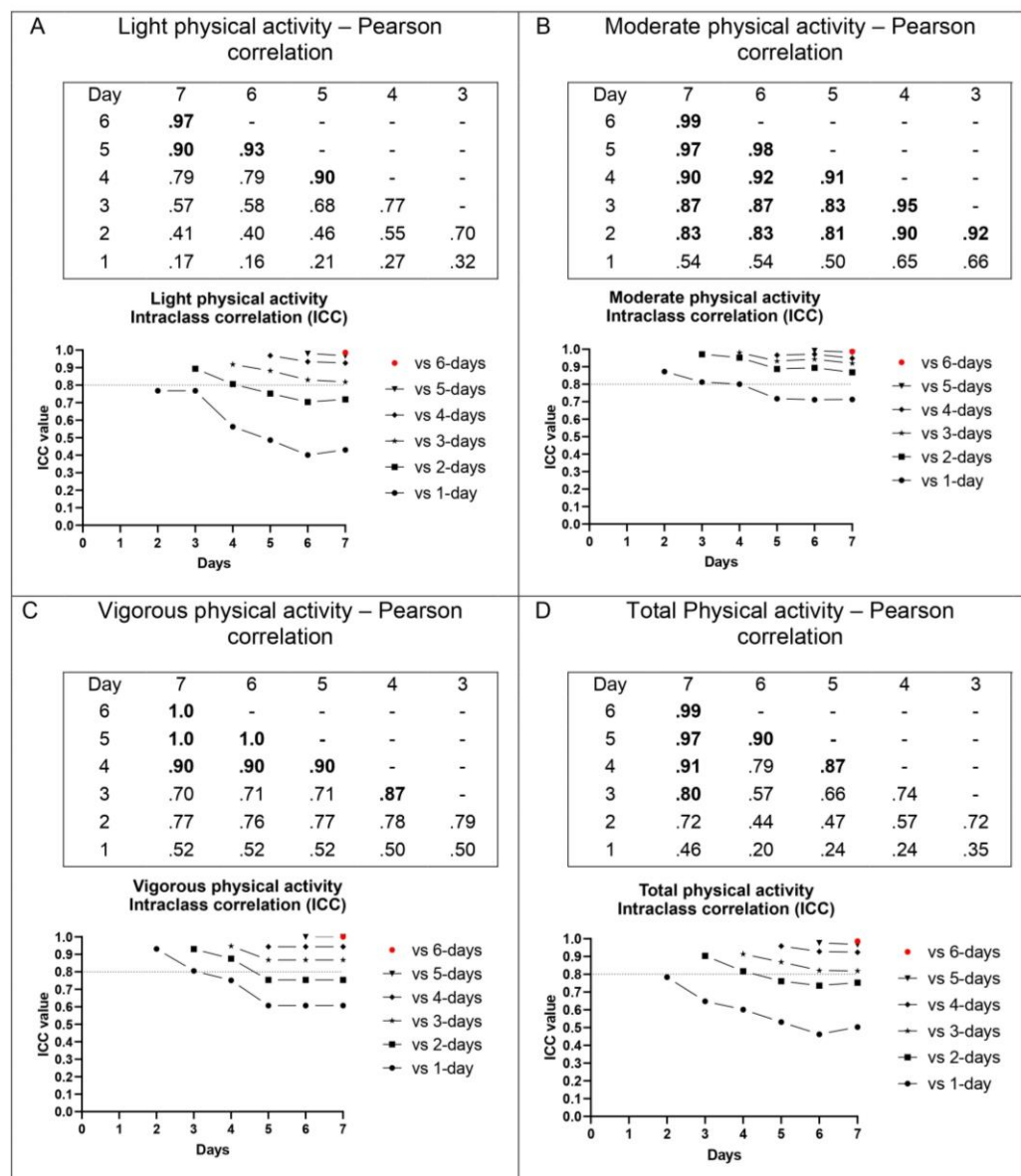


Figure 4. Pearson correlations between each day of use (1, 2, 3, 4, 5, 6, or 7 days) for the time of light, moderate, or vigorous physical activity. For all correlations, we verified statistical significance ($p < 0.05$). The interpretation of the correlation was: ≤ 0.4 = weak correlation; > 0.4 and < 0.7 = moderate correlation; ≥ 0.7 = strong correlation. Correlations ≥ 0.8 are highlighted (bold). Intraclass correlations (ICC) between each day of use (1, 2, 3, 4, 5, 6, or 7 days) for the time of light (A), moderate (B), vigorous (C), and total physical activity (D). ICC > 0.8 was considered acceptable.

Table 2 presents the Spearman–Brown prediction formula values from 2 days (lowest number of days with ICC > 0.8) and 7 days (number of days in the original test) to determine the number of monitoring days needed to achieve measurement reliability for an ICC ≥ 0.8 . Considering the calculation of the Spearman–Brown prediction formula from 2 vs. 7 days of accelerometer use, 3 days is sufficient to achieve measurement reliability for SB and MVPA.

Table 2. Calculation of Spearman–Brown prediction formula from 2 vs. 7 days of accelerometer use.

Variable	K	Cronbach's Alpha	ICCe = $K \times (\text{conf orig}) / (1 + (K - 1) \times \text{conf orig})$	ICCd	Number of Days Necessary
SB	2/7 = 0.29	0.948	$0.839 = 0.29 \times (0.948) / (1 + (0.29 - 1) \times 0.948)$	0.80	0.8
MPA	2/7 = 0.29	0.865	$0.647 = 0.29 \times (0.865) / (1 + (0.29 - 1) \times 0.865)$	0.80	2.2
MVPA	2/7 = 0.29	0.861	$0.639 = 0.29 \times (0.861) / (1 + (0.29 - 1) \times 0.861)$	0.80	2.3

Note: K = factor by which the test duration is changed (number of items in the original test by the number of items in the new test; conf orig = reliability of the original test (Cronbach's Alpha). ICCe = estimated level of reliability. ICCd = desired level of reliability (0.80).

The calculations showed that 3 days is sufficient to achieve measurement reliability for SB and MVPA, being very similar to 4 days, with differences ranging from -0.1% SB to 1.0% for MVPA (1.5% LPA, 1.3% MPA, 5.3% VPA, and 1.5% TPA). Table 3 presents the time spent in SB, LPA, MPA, VPA, MVPA, and TPA (LPA + MPA + VPA) considering 3 and 4 days of accelerometer use.

Table 3. Time spent in sedentary behavior and physical activity variables considering 3 days and 4 days of accelerometer use.

	SB	LPA	MPA	VPA	MVPA	TPA
3-days	341 ± 174	365 ± 114	39 ± 26	2 ± 5	41 ± 28	406 ± 121
4-days	341 ± 160	370 ± 117	40 ± 25	2 ± 4	42 ± 27	412 ± 128

Note: SB = sedentary behavior; LPA = Light physical activity; MPA = Moderate physical activity; VPA = Vigorous physical activity; MVPA = Moderate-to-vigorous physical activity; TPA = Total physical activity (sum of LPA + MPA + VPA). Data presented as mean and standard deviation.

4. Discussion

In the current study, we investigated the minimum number of monitoring days required for the reliable measurement of PA and SB using accelerometers in people with MDD. The comparisons of the values for weekdays and weekend days, and 1, 2, 3, 4, 5, 6, or 7 days, did not show statistically significant differences for SB, LPA, MPA, VPA, or MVPA, and TPA (sum of LPA, MPA, and VPA). Additionally, a strong correlation with statistical significance (≥ 0.8) and an adequate ICC (> 0.8) were verified between 7 days and 6, 5, 4, 3, and 2 days in SB, MPA, and MVPA. For LPA, VPA, and TPA, the ICC values were < 0.8 . Finally, when adequate ICC values (> 0.8) were identified, the Spearman–Brown analyses indicated that a minimum of 3 days is necessary to reliably estimate the time of SB, MPA, or MVPA, as shown in our sample of people with MDD.

SB and MVPA are associated with mental and physical health outcomes, and a threshold of SB time from 360 to 480 min was shown to increase the risk of all-cause mortality [2]. Even though the SB value fluctuated (10%) when comparing 7 days to 6, 5, 4, 3, 2, or 1 day, our group reached a mean of 341 min (7 days). Considering MVPA, current recommendations for adults are approximately 22 min per day or 150 min per week [1]. The difference in MVPA over the days was lower ($\cong 7\%$), as shown in Figure 2, with a strong correlation between 7 days and 6, 5, 4, 3, and 2 days. Additionally, our study did not find weekday–weekend differences in PA and SB, different from other studies [38,39]. Thus, our findings suggest that data can be collected with or without weekends, which could optimize the use of this tool.

Studies that investigate the reduction in the minimum days needed for a reliable measure of PA and SB have already been performed with children and adults (wrist-worn) [40], in pregnancy (wrist-worn) [24], with older adults (right hip) [26], with older care home residents (right hip-worn) [41], and with adults and older adults (wrist-worn) [42], with different results observed in different groups. For example, the possibility of reducing the number of days of use was verified by Sasaki et al. [26] (SB = 3 days), Ricardo et al. [40] (MVPA = 3 days), and Dillon et al. [42] (SB = 2 days; light PA = 3 days). However, in

the same studies, for other variables, the number of days required was above 4 days, such as Sasaki et al. [26] (MVPA = 5 days), Ricardo et al. [40] (light PA = 6 days), and Dillon et al. [42] (vigorous PA = 6 days). Our study showed the possibility of reducing the days for SB, MPA, and MVPA; however, due to the low correlation (<0.8) and low ICC (<0.8) for LPA and VPA, reducing accelerometer usage days is not advisable.

In our sample, compliance with a minimum of 10 h per day and 7 days per week was 71%, which is comparable to the NHANES study data (National Health and Nutrition Examination Survey). In fact, the NHANES study from 2003 to 2006 [43] verified compliance of 40–70%, considering 6 or more days and $10 \text{ h} \cdot \text{day}^{-1}$ for participants using hip-worn accelerometers [20]. Wrist-worn accelerometers could improve compliance, as shown in NHANES from 2011 to 2012, which boosted compliance to 70–80%, considering 6 or more days and $10 \text{ h} \cdot \text{day}^{-1}$ [20]. In this way, wrist-worn accelerometers could be an alternative to increase compliance in people with MDD and populations with other mental diseases, such as bipolar disorder or schizophrenia, which should be better investigated in future studies. However, to the best of our knowledge, no studies have been carried out that investigate the number of days required for a reliable estimation of SB and PA in people with MDD. It is important to highlight that while the findings of NHANES studies are in favor of the use of hip-worn accelerometers, other studies used accelerometers on the wrist [24], waist [25], and right hip [26], which demonstrates the lack of consensus about the area of use.

Despite the numerous studies available on the subject of the minimum number of days needed to measure SB and PA, it is important to highlight the lack of standardization of equipment in investigations. In the current study, we used a recent model of the ActiGraph® GT9-X, while other studies used other models, such as the ActiGraph wGT3X-BT [24,26], ActiGraph® wGT3X+ [42], and GENEActiv® Accelerometer [40,42]. It is crucial to highlight that our results may be influenced by the fact that the ActiGraph® GT9-X is a new generation of ActiGraph, which may present improvements in the accuracy and reliability of measurements, compared with previous models (wGT3X-BT, wGT3X+, and GENEActiv). In fact, Lee and Shiroma [44] showed that monitor types, monitor setup, fixation methods, calibration methods, and data processing procedures, together with further developments in measurement methodology, represent emerging challenges in this research area, especially for the standardization of data.

It is relevant to consider that the ActiGraph® device designates a cut-off of <100 counts per minute on the vertical axis to classify SB, which may exaggerate sedentary duration due to upright activities (e.g., standing) that exhibit minimal movements still within this threshold [45]. The activPAL® accelerometer, a device from a different technology of ActiGraph®, can accurately record the time of sitting/lying, standing, and stepping, as well as transitions from a seated to an upright position. Consequently, future research may explore potential differences in MDD and SB with regard to ActivPAL®. Despite these limitations, we believe our study adds valuable information to the investigation of MDD considering SB and MVPA measurements using the ActiGraph® device, since wearing the equipment for a period of 7 days commonly represents a logistical challenge to people and researchers.

Regarding the variables LPA and VPA, which did not achieve an $\text{ICC} > 0.8$, it is essential to consider the extensive ranges of these variables: LPA (1837–4160 min) and VPA (0–87 min). PA variables with extensive ranges, like LPA and VPA, need an increased duration of data collection for more accurate results. Regarding the non-significant results across weekdays and weekends for SB and PA, we contemplated potentially consistent routines throughout all days of our sample. A preliminary investigation [46] comparing PA patterns on weekdays and weekends among young adults revealed that a high percentage of the sample exhibited comparable activity levels on both weekdays and weekends.

In our sample, almost 30% of the participants used the accelerometer incorrectly. This is consistent with earlier studies that found that 30 to 60% of research participants did not use the device for at least 10 h a day [20,21]. Future research can try certain techniques to prevent this incorrect use, such as sending calls or messages to individuals to encourage them to continue using the device.

The subjects were predominantly female (93.9%), considering that women exhibit a higher odds ratio (1.95) for serious depression diagnoses or depressive symptoms compared to men [47], and an increased probability of accessing any treatment [48], which could contribute to the higher participation of women in our research. Despite the expected difference, we recognize that future research should better explore male and female differences.

An important limitation of the current study is the accelerometer's incapacity to assess aquatic activities, such as swimming, or other non-standard movements, which could impact our findings. Psychiatric medication or depression severity was not considered in our analysis. In addition, we did not include other measures on SB, such as patterns of SB (e.g., how sedentary time is accumulated) or sleep variables—which may be important to show the minimum number of monitoring days required for reliable measurement and could be investigated in future studies—as well as psychiatric medications during the 7-day activity monitoring period. Finally, because our data collection only included outpatients, our findings cannot be extrapolated to inpatients.

5. Conclusions

Our results show, in a sample of MDD with a predominance of female participants, no differences for SB and PA (LPA, MPA, VPA, and MVPA) between the days of the week. The Spearman–Brown analyses demonstrated an ICC > 0.8 for SB, MPA, and MVPA (for 2-3-4-5-6 vs. 7). In this way, our data indicate that 3 days is sufficient to accurately estimate the duration of SB, MPA, and MVPA, presenting a significant practical application that allows data collection with reduced accelerometer wear duration. The optimization of time in this context permits the utilization of accelerometers among a greater number of individuals, possibly affecting the sample of MDD patients in research and decreasing acquisition costs in this scientific area. The key message is that SB, MPA, and MVPA in individuals with MDD may be evaluated using three days of data from the ActiGraph® GT9-X. Future research may investigate additional mental diseases utilizing different instruments to assess PA and SB.

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