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Assessing Physical Activity in Older Adults: Required Days of Trunk Accelerometer Measurements for Reliable Estimation

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We investigated the reliability of physical activity monitoring based on trunk accelerometry in older adults and assessed the number of measured days required to reliably assess physical activity. Seventy-nine older adults (mean age 79.1 ± 7.9) wore an accelerometer at the lower back during two nonconsecutive weeks. The duration of locomotion, lying, sitting, standing and shuffling, movement intensity, the number of locomotion bouts and transitions to standing, and the median and maximum duration of locomotion were determined per day. Using data of week 2 as reference, intraclass correlations and smallest detectable differences were calculated over an increasing number of consecutive days from week 1. Reliability was good to excellent when whole weeks were assessed. Our results indicate that a minimum of two days of observation are required to obtain an ICC ≥ 0.7 for most activities, except for lying and median duration of locomotion bouts, which required up to five days.

Keywords: activities of daily living, ambulatory monitoring, day-to-day variation, amount of physical activity, trunk actigraphy

Higher levels of habitual physical activity in older adults are associated with increased life expectancy (Warburton, Nicol, & Bredin, 2006) and a decreased risk of disabilities (Berk, Hubert, & Fries, 2006; Shah, Buchman, Leurgans, Boyle, & Bennett, 2012; Warburton et al., 2006) and falling (Chan et al., 2007; Graafmans, Lips, Wijlhuizen, Pluijm, & Bouter, 2003; Heesch, Byles, & Brown, 2008; Warburton et al., 2006). Consequently, physical activity is often targeted in health and fall prevention interventions (Cameron et al., 2010; Gillespie et al., 2009). To assess the effect of these interventions, it is essential to have valid and reliable measures of physical activity in daily life. Moreover, since physical activity and health status are related, an observed decline in daily physical activity might signify health issues, and could thus be a potential indicator of functional impairments or increased fall risk.

Questionnaires are the most frequently used method to assess physical activity in daily life. Even for validated questionnaires, self-reports of daily activity are subjective and can be affected by recall bias (Atallah, Lo, King, & Yang, 2010; Gjoreski, Lustrek, & Gams, 2011). Moreover, these questionnaires apparently fail to capture irregularly performed physical activity at lower intensities, comprising most of the activities in older adults (Tudor-Locke & Myers, 2001; Westerterp, 2008). Alternatively, accelerometry (also called actigraphy) can be used to objectively quantify physical activity in daily life (Taraldsen, Chastin, Riphagen, Vereijken, & Helbostad, 2012). Although there is not yet a consensus on the best placement of these accelerometers, placement on the hip or lower back is most commonly used for monitoring daily activity with a single monitor. Placement on the lower back results in left-right symmetric accelerations and appears to be more accurate in the detection of falls, bodily orientation, gait characteristics, low level activities, and transitional activities (Atallah et al., 2010; Gjoreski et al., 2011; Sumukadas, Laidlaw, & Witham, 2008). Trunk accelerometry with a single accelerometer on the lower back can be used to identify different types of physical activities (de Groot & Nieuwenhuizen, 2013; Dijkstra, Kamsma, & Zijlstra, 2010a, 2010b; Langer et al., 2009) and quantify spatiotemporal gait characteristics (Houdijk, Appelman, Van Velzen, Van der Woude, & Van Bennekom, 2008).

A difficulty in assessing the amount of physical activity is its day-to-day variation (Hart, Swartz, Cashin, & Strath, 2011; Nicolai et al., 2010). Therefore, to obtain reliable estimates of the amount and type of activity, repeated measurements on different days are necessary. Previous studies indicated that a minimum of one to six days of measurements are required to obtain reliable estimates of walking duration, time in supine orientation, overall intensity of daily activities, and energy expenditure expressed in kcal and MET per minute (Gretebeck & Montoye, 1992; Hart et al., 2011; Levin, Jacobs, Ainsworth, Richardson, & Leon, 1999; Matthews, Ainsworth, Thompson, & Bassett, 2002; Nicolai et al., 2010). However, most of these studies did not include older adults. The studies that did analyzed a limited selection of variables obtained during day-time only, i.e., activity counts, walking duration, and time in upright position (Hart et al., 2011; Nicolai et al., 2010). Nighttime activities might provide additional information, as they might pose an increased risk of injurious falls (Lehtola, Koistinen, & Luukinen, 2006) and interruptions of sleep might be a marker of health issues (Foley, Ancoli-Israel, Britz, & Walsh, 2004). Moreover, daily activities exist of more than walking and lying, and particularly the quantity and quality of gait and of sit-to-stand and stand-to-sit movements have been found to relate to mortality and fall risk (Hausdorff, Rios, & Edelberg, 2001; Najafi, Aminian, Loew, Blanc, & Robert, 2002; Studenski et al., 2011; Toebes, Hoozemans, Furrer, Dekker, & van Dieen, 2012; Weiss et al., 2010). Although previous research suggests that for total walking duration, time spent lying and energy expenditure for one to six days of measurements are required, the number of days required for reliable assessment of other activities such as the number of transitions to standing and total sitting duration remains to be elucidated.

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The aim of this study was to investigate the minimum number of days required to reliably assess the amount of physical activity using a trunk-mounted accelerometer in older adults on a group and individual level. We investigated the total duration of locomotion, lying, sitting, standing and shuffling, movement intensity, the number of locomotion bouts per day, the median and maximum locomotion bout duration within a day, and the number of transitions to standing.

Methods

Inclusion

The current study is part of an ongoing study concerning fall risk assessment in older adults (FARAO) performed at VU University Amsterdam. Participants were community dwelling or living in a residential home and were recruited in Amsterdam (The Netherlands) and surrounding areas via general practitioners, pharmacies, hospitals, and residential care facilities. The inclusion criteria were: (a) being between 65 to 99 years of age; (b) a mini mental state examination score of at least 19 points out of 30; (c) the ability to walk 20 m without cardiovascular or respiratory symptoms. The medical ethical committee of the VU medical center approved the protocol (#2010/290) and all participants signed informed consent forms.

Measurements

One hundred and two participants participated in this study. Descriptive characteristics were obtained using the Mini Mental State Examination (Folstein, Folstein, & McHugh, 1975), 16-item FES-I (Yardley et al., 2005), LASA fall risk profile (Peeters et al., 2010), and the 30-item Geriatric Depression Scale (Yesavage et al., 1983). The participants wore a triaxial accelerometer (DynaPort MoveMonitor; McRoberts, The Hague, The Netherlands) at the lower lumbar spine at the height of L5 by use of the supplied elastic belt around their waist. The accelerometer was worn for two periods of eight consecutive days, on average 24.6 (SD 14.0) days apart. They were instructed to wear the accelerometer at all times, except during water activities such as showering. On the first and last day of the two measurement periods, the accelerometer was delivered to and collected from the participant; hence the data on these days did not comprise 24-hours of measurements. These first and last days were excluded, which left data from six consecutive days of 24 hours for analysis. To have a valid measure of the amount of daily activity, the accelerometer has to be worn during a vast majority of the day (Herrmann, Barreira, Kang, & Ainsworth, 2013, 2014). Using the manufacturer's wear detection algorithm, which is based on a threshold on the power of the signal (Niessen, Pijnappels, van Dieën, & Van Lummel, 2013), nonwearing time per day was detected. Participants were excluded when this wear detection algorithm indicated that they wore the accelerometer less than 75% of the time each day in accordance with earlier literature (Hart et al., 2011; Matthews et al., 2002; Waschki et al., 2012; Watz, Waschki, Meyer, & Magnussen, 2009). In Figure 1, the effect of exclusion based on a minimum wear criterion is shown. We also tested our results with a minimum wear time of 90% (Herrmann et al., 2013, 2014) as a cut-off value, and this did not influence results (Appendix A).

Data Analysis

Movement intensity was calculated as the root sum square of the 0.2 to 10 Hz band-pass filtered accelerations in all three measured directions (van Hees, van Lummel, & Westerterp, 2009). Based on the manufacturer's algorithm that uses this movement intensity, as well as frequency analysis, step detection, sensor displacement and orientation, the acceleration data were classified into five types of physical activities, i.e., locomotion, lying, sitting, standing, and shuffling. This activity classification algorithm is described in more detail in the supplementary materials of Dijkstra et al. (2010a). Per day, the total time spent in each activity and the average movement intensity were calculated using Matlab (Version 7.12; The MathWorks BV, Natick, USA). In addition, the total number of transitions to standing, i.e., sit-to-stand and locomotion-to-stand movements, was calculated. For locomotion, the number of steps, number of locomotion bouts, and duration of these bouts were also investigated. A typical example of the locomotion bout duration within a day is presented in Figure 2, and the median and maximum bout durations were investigated in this study.

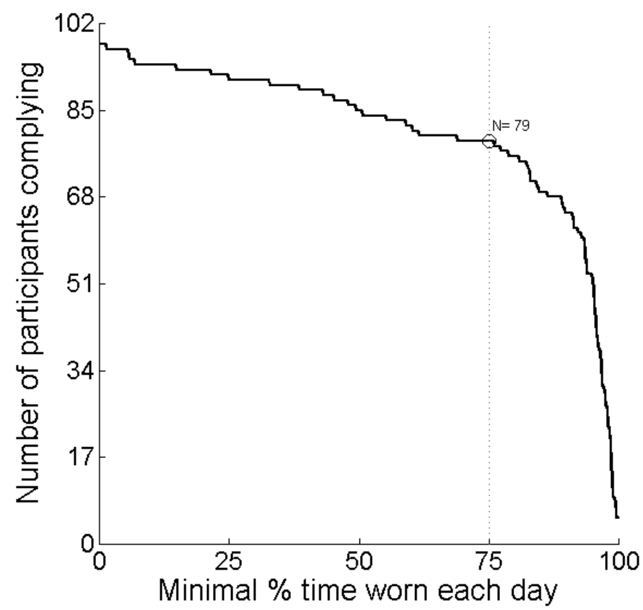

Figure 1 – Number of participants that complied with the criteria for a specific percentage wear time per day.

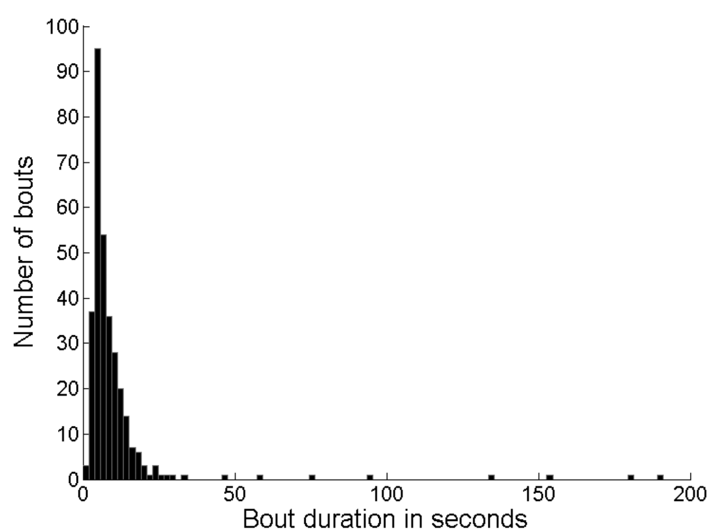

Figure 2 – Typical example of the distribution of locomotion bout duration within a day.

Statistical Analysis

The distributions of the physical activity measures were examined and corrected using a square root transformation when required. Descriptive statistics are presented without correction for straightforward interpretation. The amount of physical activity, expressed in the physical activity measures under study, was compared between both measurement periods using paired *t* tests. To quantify the number of days required to obtain a reliable estimate of the amount of physical activity, measured values of physical activity of one to six days of the first measurement period were averaged and compared with the six-days average of the second period by means of intraclass correlation coefficients (ICC[2.1], absolute agreement) and corresponding smallest detectable differences (SDD) expressed as percentage of the mean. Since the amount of daily physical activity does not differ between days of the week in older adults (Hart et al., 2011; Nicolai et al., 2010), all combinations of one to six consecutive days of the first period were investigated. This resulted in an unequal number of ICCs and SDDs per number of included days (i.e., 6 combinations for one day, 5 for two consecutive days, 4 for three consecutive days, 3 for four consecutive days, 2 for five consecutive days, and 1 for six consecutive days). These ICCs and SDDs were averaged to investigate the effect of number of included days. An ICC exceeding 0.7 was considered adequate on a group level (Aaronson et al., 2002) and was used to identify the number of measurement days required to reliably assess each variable. SDDs provide information on the within-subject variations, and therefore reflect reliability on the individual level. A saturation of the SDD was taken as indicator of the required number of days on an individual level. Statistical significance was set at $P < .05$.

Results

Of the 102 older adults included in this study, 79 participants (77%) wore the accelerometer for more than 75% of the time each day and were included in our analysis. They wore the accelerometer on average 23.7 hours per day (i.e., 98.8% of the time). Their characteristics and a summary of their average daily physical activity are shown in Table 1.

The amount of daily physical activity in both measurements periods was similar (all $P \geq .13$ as denoted in Table 1). When comparing both measurement periods, ICCs ranged from 0.70 to 0.96, and SDDs ranged from 1.8% to 41.2% (Table 1).

Table 1 Descriptive Characteristics (*n* = 79) and Reliability Based on Two Six-day Measurement Periods

Descriptive	Average	*p*	ICC	SDD
Age (years)	79.1 (7.9)			
Height (m)	1.66 (0.09)			
Weight (kg)	71.5 (10.6)			
BMI (kg/m^2)	26.2 (4.1)			
Mini Mental State Examination (score)	27.4 (2.7)			
Falls Efficacy Scale International (score)	22.6 (6.1)			
LASA fall risk profile (score)	7.6 (4.8)			
Geriatric Depression Scale (score)	6.1 (4.6)			
Grip strength (kg, mean of left and right)	23.6 (8.8)			
Sex (female/male)	59/20			
Home situation (community dwelling/residential care)	56/23			
Mobility impairments (no/yes)	55/24			
Walking aid (no/yes)	56/23			
Daily physical activities				
Sitting duration (hr)	9.67 [5.50–13.68]	.28	0.83	3.7
Shuffling duration (hr)	0.32 [0.02–1.33]	.76	0.91	5.8
Lying duration (hr)	9.95 [7.11–14.90]	.39	0.76	3.2
Standing duration (hr)	2.43 [0.50–5.75]	.31	0.93	4.2
Transfers to standing (N)	728 [42–2378]	.63	0.93	5.1
Locomotion duration (hr)	0.95 [0.01–2.94]	.34	0.91	12.5
Locomotion number of steps (N)	4698 [33–19057]	.57	0.91	12.9
Locomotion bouts (N)	336 [6–967]	.13	0.94	11.4
Median of locomotion duration (s)	6 [4–9]	.73	0.70	1.8
Maximum of locomotion duration (s)	194 [8–1719]	.19	0.83	41.2
Average movement intensity (m/s^2)	0.26 [0.09–1.07]	.84	0.96	2.6

Note: Average = the mean (std) or median [range]; *p* = p-value of the paired-test of the averages of both measurement weeks; ICC = intraclass correlation coefficient of the averages of both measurement weeks; SDD = smallest detectable difference expressed as percentage of the mean.

A minimum of two days was required to obtain an ICC exceeding 0.70 for all measures, except for total time spent lying and median locomotion bout duration, which required a minimum of three and five days, respectively (Figure 3 and Table 2). The smallest detectable differences were relatively large for all measures when only analyzing one day, but improved markedly when including more days and saturated after including four days (Figure 4).

Discussion and Conclusion

In this study we investigated the number of days of trunk-mounted accelerometer measurements needed to reliably estimate physical activities in older adults. Our results indicate that for all physical activity measures under study, a period of six consecutive days of 24 hours results in good to very good reliability. Moreover, we found that two consecutive days of measurements were sufficient to obtain reliable results on a group level for all measures, except for the duration of lying and median locomotion bout duration.

To reliably assess the duration of lying, a minimum of three consecutive days was required. A possible explanation for this higher number of days could be inaccuracy of the wearing detection. Since this detection is based on a fixed threshold (Niessen et al., 2013), periods of quiet lying could have been erroneously classified as nonwearing. Indeed, 57% of the nonwearing periods occurred between two periods of lying, had a median duration of 18 minutes (interquartile range of 21 minutes), and 72% of those periods occurred during nighttime. However, additional analysis in which all nonwearing episodes embedded between lying that lasted less than 50 minutes were considered to be lying, did not alter our results. An alternative explanation could be that the amount of lying in the daily life of older adults is not very consistent over days, as time to go to bed might vary over days. For the reliable assessment of the median duration of locomotion bouts, a minimum of five consecutive days was required for reliable estimation. This relatively large number could be caused by the limited variance between subjects, affecting ICCs but not SDDs.

Overall, the SDDs saturated when including four or more days, indicating that for reliable assessment of daily physical activities on the individual level a minimum of four days would be desirable. Our results indicate that, on an individual level, differences of 2% to 41% can be detected. It depends on the minimal clinically-relevant differences whether these are adequate for evaluation purposes on an individual level. All in all, the estimated number of days required for reliable estimation of our specific parameters in a group of older adults is in accordance with earlier research (Hart et al., 2011; Nicolai et al., 2010), and slightly lower than has been previously found for younger adults (Gretebeck & Montoye, 1992; Levin et al., 1999; Matthews et al., 2002).

To obtain reliable estimates of daily physical activity, it is important that the trunk accelerometer is worn during a representative part of the day. In this study, we instructed our participants to wear the monitor at all times (except during water activities) and analyzed data of participants that wore the accelerometer at least 75% of each 24-hour day. Seventy-seven percent of the older adults

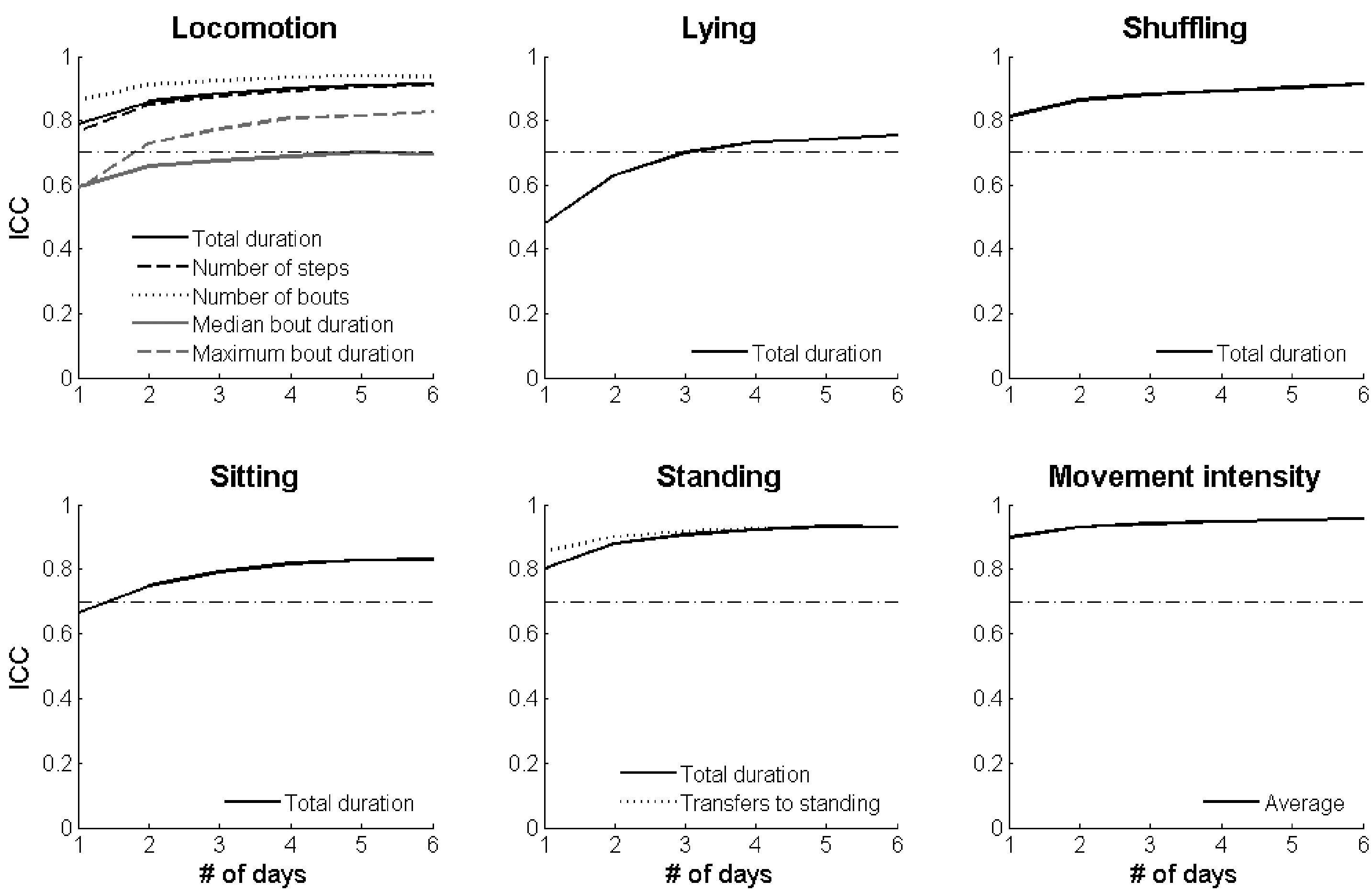

Figure 3 – Intraclass correlation coefficients (ICC) between measurements with a varying number of consecutive days and the reference period of six days.

Table 2 Test-Retest Reliability and Smallest Detectable Differences

Daily Physical Activities	N days	ICC	SDD
Sitting duration	2	0.75 [0.69–0.78]	5.4 [3.2–10.2]
Shuffling duration	1	0.81 [0.78–0.84]	36.3 [10.7–80.0]
Lying duration	3	0.70 [0.56–0.78]	10.6 [3.9–23.4]
Standing duration	1	0.80 [0.75–0.85]	15.3 [5.5–62.9]
Transfers to standing	1	0.86 [0.80–0.89]	30.8 [6.5–103.8]
Locomotion duration	1	0.79 [0.66–0.86]	59.9 [14.3–381.6]
Locomotion number of steps	1	0.77 [0.62–0.86]	71.4 [17.6–452.0]
Locomotion bouts	1	0.86 [0.79–0.91]	31.0 [8.9–172.2]
Median of locomotion duration	5	0.70 [0.70–0.70]	1.9 [1.8–2.1]
Maximum of locomotion duration	2	0.73 [0.69–0.77]	91.1 [31.7–239.4]
Average movement intensity	1	0.90 [0.88–0.93]	20.8 [4.2–78.8]

Note: Test-retest reliability and smallest detectable difference of physical activities when the minimum number of included measurement days resulting in an ICC ≥ 0.7 was used. Range of ICCs and SDDs over the available number of combinations of consecutive days is given in between brackets.

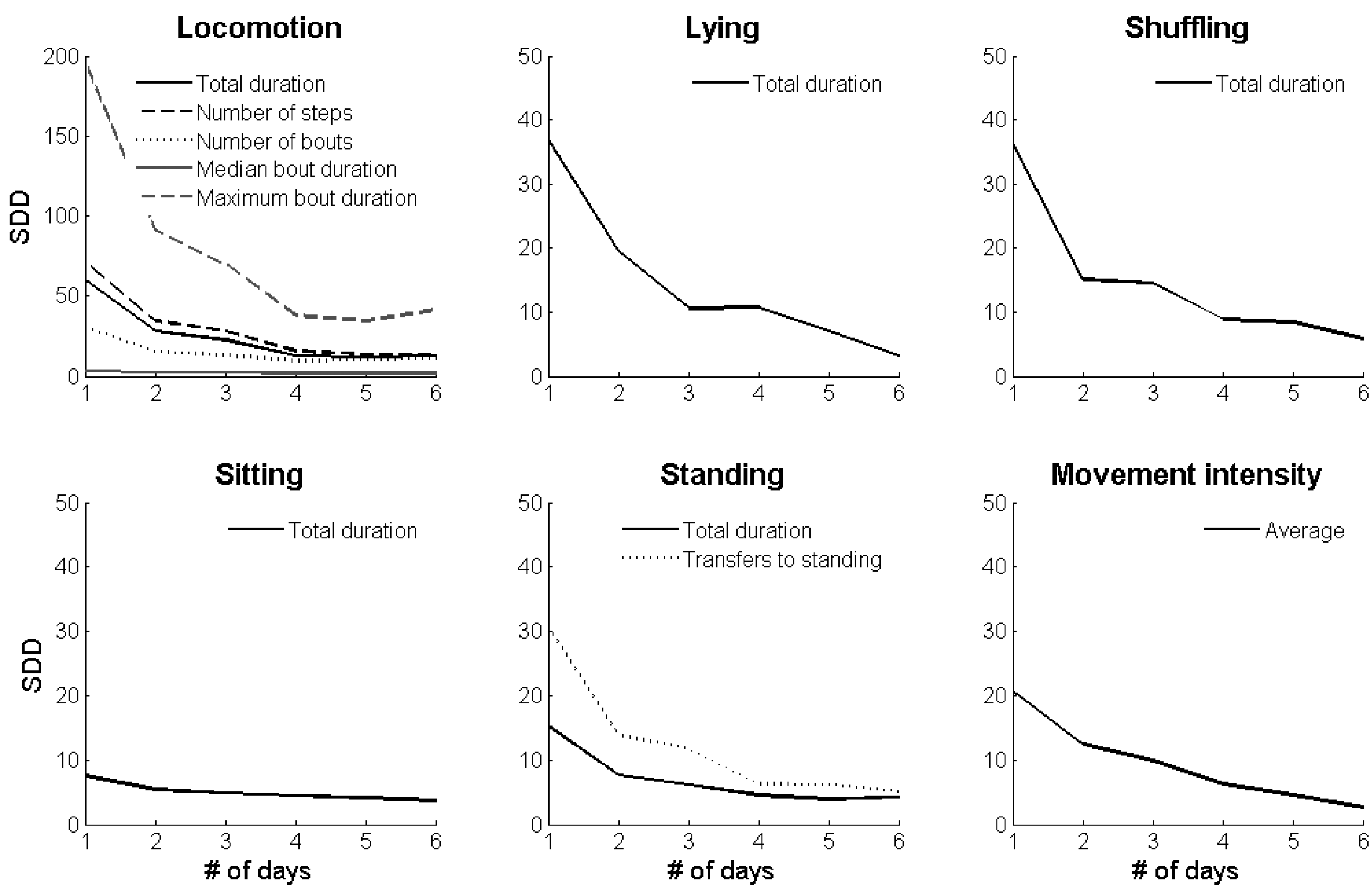

Figure 4 – Smallest detectable differences (SDD) expressed in percentage of the mean dependent on the number of consecutive days.

complied with this criterion in both periods, and their data were used for analysis. The compliance was slightly higher during the first period (86%) when compared with the second period (78%), as could be expected. However, week averages of physical activity did not differ, suggesting that participants did not consciously increase their daily activity in the first period because of wearing the accelerometer for the first time. We also investigated the influence of a different cut-off value for nonwearing (i.e., a minimum of 90% wear time per day). This excluded an additional 14 participants, but did not affect the results (see Appendix A). According to the current study, a measurement period of four days seems advisable. Of the 102 older adults that participated in this study, 91% and 89% of the 102 older adults complied with wearing the accelerometer at least 75% of the time on four days in periods 1 and 2, respectively, indicating that daily life measurements using trunk-mounted accelerometers are feasible in the older population.

For adequate estimation of the amount of daily physical activity, both reliability and validity are essential. Validity of the used physical activity classification algorithm has been studied in both laboratory (de Groot & Nieuwenhuizen, 2013; Dijkstra et al., 2010a, 2010b; Langer et al., 2009) and home environments (Dijkstra et al., 2010a, 2010b). The mean age of the participants in the study of de Groot and Nieuwenhuizen (2013) was 33 years, while the mean age in the studies by Langer et al. (2009) and Dijkstra et al. (2010a, 2010b) was over 65, in line with our target population. De Groot and Nieuwenhuizen (2013) used a reference method based on stopwatch timed instructions to change activity, while Langer et al. (2009) and Dijkstra et al. (2010a, 2010b) used video recordings to time activities performed. The classification of locomotion and lying was consistently shown to be valid (sensitivity ≥ 80% and specificity ≥ 76%). For sitting and standing, results differed between studies. De Groot and Nieuwenhuizen (2013) observed 82% of standing to be erroneously classified as sitting, while Langer et al. (2009) and Dijkstra et al. (2010a, 2010b) observed a fair classification of both sitting and standing (i.e., 57% to 97% correct in the laboratory and 73% to 83% in a home environment). The number of repetitions and total durations of standing was very short in the study by de Groot and Nieuwenhuizen (2013). Consequently, a limited number of misclassifications, which may have resulted from errors in the reference method, would have had large effects.

To our knowledge, the current study is the first to provide information regarding the reliability of different types of physical activities during 24-hour measurements in a large group of older adults. Our results therefore contribute in the selection of an optimal measurement strategy in terms of measurement days needed and for further research and for use in clinical settings. Future research should establish clinical relevance by evaluating the effect of prevention interventions on physical activity and the use of a decline in daily physical activities as a prognostic factor. Beside these strengths, this study also has some limitations. The group under study was a convenience sample of volunteers, which could have introduced a selection bias toward relatively healthy older adults. As a possible result, relatively few males were included when compared with females (20 vs. 59), and most participants were community dwelling (56 vs. 23 living in residential care facilities). We observed no difference between males and females in any of the daily activity measures under study. While community-dwelling older adults were overall more active than older adults living in residential care facilities, this did not largely influence our conclusions regarding the number of days required for reliable estimation (see Appendix B). Despite the potential selection bias toward healthy older adults, the amount of physical activity in the group under study was quite low; only 21% of the total 948 measured days exceeded the recommended 8000 steps/day criteria (Tudor-Locke et al., 2011). Daily activities were investigated during two nonconsecutive periods of six days. This may have led to a conservative error in the estimation of reliability when compared with the assessment of two consecutive periods, as variations between the measured periods were probably higher due to true individual changes and seasonal variations. Although older adults might be less active in winter than in summer, our data were averaged over two full years and an average over seasons was obtained. Larger studies should investigate whether seasonal changes alter day-to-day variability in older adults, as this might affect the number of required days for reliable estimates of daily physical activity. Results were averaged over all different combinations of consecutive days. As a result, precision of the reliability estimates for a lower number of included days was higher (a higher number of observations) than that for a higher number of included days. However, using this approach, if present, day-to-day variations were cancelled out, making our results applicable to all potential start days of the measurements.

In conclusion, our results indicate that a minimum of two consecutive days of trunk accelerometer measurements were required to reliably assess the total duration of locomotion, sitting, standing and shuffling, movement intensity, the number of locomotion bouts per day, maximum locomotion bout duration within a day, and the number of transitions to standing on a group level. For lying and median locomotion bout duration, three and five days were required, respectively. On an individual level, measurements of at least four consecutive days resulted in a saturation of the smallest detectable differences.

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Appendix A

Results When Inclusion was Based on at Least 90% Wear Time (N = 65)

Daily Physical Activities	N days	ICC	SDD
Sitting duration	2	0.73 [0.67–0.76]	6.3 [3.4–9.5]
Shuffling duration	1	0.82 [0.79–0.84]	29.8 [9.7–83.6]
Lying duration	3	0.70 [0.57–0.77]	10.5 [4.3–21.2]
Standing duration	1	0.80 [0.74–0.86]	17.6 [5.8–97.2]
Transfers to standing	1	0.86 [0.82–0.89]	29 [6.1–117.5]
Locomotion duration	1	0.78 [0.65–0.87]	60.8 [11.8–443.8]
Locomotion number of steps	1	0.76 [0.60–0.86]	72.9 [14.2–527.1]
Locomotion bouts	1	0.86 [0.78–0.91]	30.8 [6.3–189.9]
Media of locomotion duration	6	0.65 [0.65–0.65]	2.3 [2.3–2.3]
Maximum of locomotion duration	2	0.73 [0.70–0.78]	87.8 [31.9–291.6]
Average movement intensity	1	0.91 [0.89–0.94]	19.9 [3.8–72.9]

Note: Test-retest reliability and smallest detectable difference of physical activities when the minimum number of included measurement days resulting in an ICC ≥ 0.7 was used. Range of ICCs and SDDs over the available number of combinations of consecutive days is given in between brackets.

Appendix B

Results Stratified by Residential Care or Community-Dwelling Older Adults

Daily Physical Activities	N days	ICC	SDD
Older adults in residential care (N = 23)			
Sitting duration	2	0.75 [0.54–0.87]	3.1 [1.9–5.5]
Shuffling duration	1	0.88 [0.84–0.94]	19.3 [7.0–66.8]
Lying duration	2	0.71 [0.59–0.86]	7.6 [2.8–15.8]
Standing duration	1	0.79 [0.72–0.86]	14.7 [7.3–21.0]
Transfers to standing	1	0.92 [0.87–0.94]	11.1 [6.0–34.6]
Locomotion duration	1	0.89 [0.87–0.92]	20.4 [10.5–32.8]
Locomotion number of steps	1	0.89 [0.86–0.92]	25.7 [10.8–45.1]
Locomotion bouts	1	0.93 [0.91–0.95]	9.6 [4.6–21.3]
Median of locomotion duration	1	0.75 [0.67–0.84]	1.7 [1.1–2.7]
Maximum of locomotion duration	3	0.72 [0.62–0.80]	64.1 [34.2–119.5]
Average movement intensity	1	0.93 [0.89–0.96]	11.1 [4.2–28.9]
Community-dwelling older adults (N = 56)			
Sitting duration	2	0.73 [0.70–0.78]	5.9 [3.5–9.6]
Shuffling duration	1	0.73 [0.68–0.80]	37.6 [8.3–105.8]
Lying duration	4	0.71 [0.63–0.77]	8.2 [3.6–18.8]
Standing duration	1	0.81 [0.76–0.86]	15.1 [6.1–50.5]
Transfers to standing	1	0.79 [0.70–0.84]	33.6 [9.2–135.5]
Locomotion duration	1	0.70 [0.52–0.82]	68.2 [11.0–379.1]
Locomotion number of steps	2	0.79 [0.73–0.87]	38.9 [9.5–123.9]
Locomotion bouts	1	0.81 [0.68–0.88]	36.3 [9.5–193.7]
Median of locomotion duration	6	0.63 [0.63–0.63]	2.3 [2.3–2.3]
Maximum of locomotion duration	3	0.74 [0.73–0.74]	63.9 [27.5–171.4]
Average movement intensity	1	0.89 [0.85–0.93]	16.9 [4.3–47.5]

Note: Test-retest reliability and smallest detectable difference of physical activities when the minimum number of included measurement days resulting in an ICC ≥ 0.7 was used. Range of ICCs and SDDs over the available number of combinations of consecutive days is given in between brackets.