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Article

The Association of Physical Activity Fragmentation with Physical Function in Older Adults: Analysis from the SITLESS Study

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Abstract: The distribution of physical activity bouts through the day may provide useful information for assessing the impacts of interventions on aspects such as physical function. This study aimed to investigate the associations between physical activity fragmentation, tested using different minimum physical activity bout lengths, with physical function in older adults. The SITLESS project recruited 1360 community-dwelling participants from four European countries (≥65 years old). Physical activity fragmentation was represented as the active-to-sedentary transition probability (ASTP), the reciprocal of the average physical activity bout duration measured using ActiGraph wGT3X+ accelerometers. Four minimum bout lengths were utilised to calculate the ASTP: ≥10-s, ≥60-s, ≥120-s and ≥300-s. Physical function was assessed using the 2-min walk test (2MWT) and the composite score from the Short Physical Performance Battery (SPPB) test. Linear regression analyses, after adjusting for relevant covariates, were used to assess cross-sectional associations. After adjustment for relevant covariates, lower ASTP using ≥10-s bouts were associated with longer 2MWT distances and higher SPPB scores. Lower ASTP using ≥120-s bouts and ≥300-s bouts were associated with longer 2MWT distances but not the SPPB. Less fragmented physical activity patterns appeared to be associated with better physical function in community-dwelling older adults.

Keywords: older adult; accelerometry; physical activity; fragmentation; physical function

1. Introduction

In ageing populations, sufficient levels of physical activity at any intensity have been shown to reduce premature mortality, improve both physical and psychological function by reducing chronic disease risk and generally lead to better health and wellbeing [1–4]. Being physically active into older age confers benefits to the cardiometabolic and musculoskeletal systems which results in a greater number of healthy life years free from chronic disease and disability [2,5]. However, older adults are likely to be the least physically active population segment with many failing to meet the minimal physical activity guidelines [6,7].

Current guidelines recommend that older adults should be achieving ≥150 min of moderate physical activity, ≥75 min of vigorous physical activity or a combination of both every week while also limiting prolonged sedentary behaviour [8–10]. Notably, these recently updated physical activity recommendations are moving away from requiring continuous moderate-vigorous physical activity to meet guidelines and towards a more flexible approach to achieving sufficient moderate-vigorous physical activity by including any bout length [8–10]. For example, evidence in older men has shown similar reduced risks of cardiovascular disease events from accumulating 150 min/week moderate-vigorous physical activity sporadically or in continuous bouts of greater than 10 min [11]. These new guidelines are more likely to be sustainable for individuals who are frailer and less physically fit. Nevertheless, it has been suggested that a more fragmented physical activity pattern containing few sustained physical activity bouts coupled with frequent sedentary breaks may suggest higher levels of frailty and fatigability due to reduced muscle function [12,13].

With accelerometer-based research in older adults continuing to grow, there is an opportunity to extend analyses beyond traditional physical activity variables (i.e., total daily levels and time in certain intensities) and exploring more novel composite variables, and fully analyse their properties in relation to health outcomes [12,14]. An example of a composite variable would be physical activity fragmentation, which can be represented as the active-to-sedentary transitioning probability (ASTP). The ASTP has been previously defined as the probability of transitioning from an active state to a sedentary state and is assessed as the reciprocal of the average physical activity bout duration [15]. Measuring physical activity fragmentation is useful because it allows for the total volume of physical activity to be controlled for when assessing the number of physical activity bouts. These composite variables may prove useful to assess changes in physical function, defined as the ability to perform basic and instrumental activities of daily living [16]. Previous research exploring the utility of measuring physical activity fragmentation in adult and older adult populations have generally been supportive of its use. For example, more fragmented physical activity patterns have been associated with higher fatigability [15,17,18] and increased risk of premature mortality [13].

These findings show there is potential for fragmentation indices to be useful additional measures for researchers. However, to date, there have been few studies which have explored physical activity fragmentation indices in relation to physical function in older adults. The minimum epoch value to classify a physical activity bout in order to calculate fragmentation is also unclear. Researchers have used different minimum bout lengths to classify physical activity in older adults, from ≥5-s [19] to ≥60-s [15,17,20]. In addition, using higher minimum bout lengths such as ≥120-s or ≥300-s may prove to be more useful as these are more reflective of fitness elements such as endurance capacity, and could provide useful indicators of an older adult's performance without completing a physical function test. However, these minimum bout lengths have currently been untested.

The aim of this study was to investigate the associations between physical activity fragmentation, tested using different minimum physical activity bout lengths, with physical function in older adults.

2. Materials and Methods

2.1. Participants and Procedures

The current study uses a cross-sectional design using baseline data from the SITLESS study, which was collected from July 2016 to December 2017. The SITLESS study was a multi-country randomised controlled trial of 1360 community-dwelling older adults (≥65 years old) which investigated the ability of an enhanced exercise referral scheme which included self-management strategies to reduce sedentary behaviour, increase physical activity and improve physical function compared to a traditional exercise referral scheme (ERS) and a control group receiving healthy lifestyle advice. Each country's Research and Ethics Committee provided approval for all study procedures. Written informed consent was given by all participants. Eligibility criteria included being able to walk for ≥2 min without help from another individual; a Short Physical Performance Battery (SPPB) score of ≥4 [21]; not meeting physical activity guidelines (≥30 min on ≥5 days per week) and/or prolonged time spent in self-reported sedentary behaviour (i.e., 6–8 h per day). Individuals were excluded if they had: ≥3 errors on a six-item cognitive impairment questionnaire; medical conditions which may have affected the study design; unstable medical conditions (e.g., fluctuating blood pressure) or symptomatic cardiovascular diseases that prevented physical activity participation; did not intend to attend 75% of the intervention sessions; or already participated in ERS <6 months prior to their initial assessment visit. After determining eligibility, participants completed two study visits during baseline testing to collect the accelerometry (between the two study visits), physical function, demographic and health outcomes. Full information on how the cohort were recruited and the study procedures are described elsewhere [22].

2.2. Physical Activity and Sedentary Behaviour Assessment

The ActiGraph wGT3X+ accelerometer (ActiGraph, LLC, Pensacola, FL, USA) was used to assess sedentary behaviour and physical activity. The normal filter setting was used and a sampling rate of 30 Hz was chosen [23]. Participants wore the accelerometer positioned on the dominant hip using an elastic belt for seven consecutive days during waking hours from the day after the assessment visit. It was removed during water-based activities (e.g., washing or swimming), and during night-time sleeping with on and off times recorded in an activity monitor diary. To remove periods of non-wear time before analysis, the Choi (2011) algorithm was utilized [24]. At least four valid days including one weekend day was required; a valid day needing ≥600 min [25–27]. Maximum daily wear-time was set at 19 h using a pragmatic choice based on participants' diaries and sleep time recommendations for older adults [28]. For participants above the maximum wear-time threshold, their activity monitor diary was compared with the software calculated wear-time. For relevant participants, a log diary with on/off times from their own activity monitor diary was included. Raw data were analysed using ActiLife 6.13.3 software (ActiGraph, LLC, Pensacola, FL, USA) and summarised into 10-s epochs. Using the vertical axis, time in sedentary behaviour was classified at <100 CPM [29] while physical activity time was classified at ≥100 CPM [7]. As these cut points were developed for 60-s epoch lengths, ActiLife software linearly scaled down accordingly to adjust for the 10-s epoch length. To assess physical activity fragmentation, four different minimum bout lengths were utilised: ≥10-s, ≥60-s, ≥120-s and ≥300-s. Physical activity fragmentation, represented as the ASTP, was derived from the reciprocal of the participant's mean physical activity bout length (i.e., (1/mean physical activity bout length in minutes) multiplied by 100). Physical activity bouts were defined as the time spent in consecutive epochs ≥100 CPM (adjusted for the 10-s epoch length) before commencing a sedentary behaviour bout. In order to provide more comparable ASTP scores across the four different minimum bout lengths, the ≥10-s, ≥120-s and ≥300-s bout lengths were normalised to the ≥60-s data. This meant each participant's ASTP calculated using ≥10-s was divided by six and the ASTP calculated using ≥120-s and ≥300-s bouts were multiplied by two and five respectively. Higher ASTP values represented higher physical activity fragmentation and therefore less desirable physical activity patterns (e.g., 60% is less desirable than 30%) [15]. An ASTP value of 100% would suggest that, on average, an individual only accrues their bouts of physical activity at the minimum bout length threshold. To assess total physical activity time (i.e., total volume of physical activity), the percentage of waking time spent in physical activity was utilised.

2.3. Physical Function

The 2-min walk test (2MWT) was used to measure functional endurance capacity. Participants were asked to walk as fast as they could for 2 min over a 15.2-m out-and-back course. At halfway, the following standardised line was given: "You are doing well; you have 1-min left". Participants could slow down during the test if they became fatigued but were encouraged at the beginning of the test to keep walking until the 2 min had ended. The distance recorded at the end of the test was measured in metres to the nearest 0.1 metres with longer distances indicating better functional endurance. The 2MWT has been shown to have sufficient reliability across various age groups [30].

The participants' lower extremity function was assessed using the SPPB. The scores of the test were derived from three timed tasks involving three balance-based positions held for up to 10 s each (i.e., feet together, feet in a semi-tandem position and feet in a full tandem), usual gait speed over 4 metres, and standing up from a seated position five times [31]. Each of these tasks were scored from 0 to 4 (worst to best performance) meaning the overall SPPB scores ranged from 0 to 12. A systematic review has recommended using the SPPB in community-dwelling older adults as an overall measure of physical function in terms of high validity, reliability and responsiveness compared with other measures [32].

2.4. Covariates

Variables which may influence physical activity and physical function in older adults were chosen from several studies [5,13,16,33]. Therefore, the following demographic and health characteristics were controlled for: country (Denmark, Spain, Northern Ireland and Germany); sex (male/female); age (years), body mass index (BMI—kg/m^2); education (cannot read or write/can read and write/primary/secondary/tertiary levels); number of comorbidities (none/1–2/>2); 12-item Short Form Survey (SF-12) physical component (higher score equals better physical health); and SF-12 mental component (higher score equals better mental health) scores were included in all analyses along with daily sedentary behaviour time. In addition, accelerometer wear-time was included as a covariate in analyses involving physical activity fragmentation due to accelerometer wear-time already being accounted for within the physical activity volume variable.

2.5. Statistical Analysis

A cross-sectional analysis was undertaken using the baseline data from the SITLESS clinical trial. The assumptions for linear regression were tested and met. Hierarchical linear regression analyses were conducted to explore whether different minimum bout lengths for determining physical activity fragmentation were statistically associated with physical function measured using 2MWT distance and SPPB score. Table 1 contains information of the composition of the linear regression models. Model 1 included the physical activity variables only. Model 2 included daily sedentary behaviour time for the physical activity-related variables while also including daily accelerometer wear-time for the fragmentation variables only. Model 3 included the relevant variables from the first two models in addition to demographic and health variables: country (to adjust for clustering effect), age, gender, BMI, education levels, number of co-morbidities and SF-12 (physical and mental components). All analyses were conducted using SPSS Statistics (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY, USA). Data are presented as mean ± SD unless otherwise stated. Statistical significance was set at $p < 0.05$. Only complete cases were included.

Table 1. Composition of linear regression models.

Model	PA Fragmentation Variables	PA Volume Variable
1	ASTP using 10-,60-, 120- or 300-s PA bouts	Percentage time in total PA
2	ASTP using 10-,60-, 120- or 300-s PA bouts Daily SB time Daily wear-time	Percentage time in total PA Daily SB time
3	ASTP using 10-,60-, 120- or 300-s PA bouts Daily SB time Daily wear-time Country Sex Age BMI Education Number of comorbidities Physical SF-12 Mental SF-12	Percentage time in total PA Daily SB time Country Sex Age BMI Education Number of comorbidities Physical SF-12 Mental SF-12

Abbreviations: BMI = body mass index; PA = physical activity; ASTP = active-to-sedentary transitioning probability; SB = sedentary behaviour; SF = short form.

3. Results

3.1. Descriptive Data

Table 2 highlights the descriptive statistics for the sample population. Participants were split relatively equally between the four countries, three fifths of the sample were female, mean age was over 75 years old, most participants were classified as being overweight according to BMI, over 75% had completed at least secondary education and 90.5% reported having at least one comorbidity.

Table 2. Participant demographic and health characteristics (*n* = 1360).

	Number	% or Mean ± SD
Country		
Denmark	338	24.9
Spain	356	26.2
United Kingdom	321	23.6
Germany	345	25.4
Sex		
Male	520	38.2
Female	840	61.8
Age, years	1359	75.3 ± 6.3
BMI, kg/m^2	1352	28.9 ± 5.2
Education		
Cannot read or write	5	0.4
Can read and write	36	2.7
Primary education	279	20.8
Secondary education	712	53.2
Tertiary/university education	303	22.6
Unwilling to answer	3	0.2
Other	1	0.1
Number of comorbidities		
No comorbidities	124	9.5
1–2 comorbidities	494	37.7
≥2 comorbidities	692	52.8
Physical SF-12 score	1305	44.8 ± 9.2
Mental SF-12 score	1306	51.7 ± 8.9

Abbreviations: BMI = body mass index; SD = standard deviation; SF = short form.

The data for physical function, sedentary behaviour and physical activity are highlighted in Table 3. Individuals not being able to complete the 2MWT (n = 12), not undertaking any of the three SPPB tasks (n = 16) or not meeting the minimum valid accelerometry wear-time criteria (n = 94) were the reasons for missing data. On average, participants spent almost 80% of waking time being sedentary with daily physical activity time lasting slightly over 3 h.

Table 3. Participants' physical function, sedentary behaviour and physical activity levels. (n = 1360).

	Total (Number)	Mean ± SD
Physical function		
2-Minute Walk Test (metres)	1348	149.6 ± 34.5
Short Physical Performance Battery score (0–12)	1344	9.3 ± 2.4
SB and PA variables		
Daily SB time (minutes)	1266	678.7 ± 75.9
Percentage time in total SB (%)	1266	78.8 ± 7.00
Daily PA time (minutes)	1266	183.3 ± 63.4
Percentage time in total PA (%)	1266	21.2 ± 7.00
Daily wear-time (minutes)	1266	862.1 ± 68.7
ASTP using ≥10-s PA bouts (%)	1266	33.0 ± 7.0
ASTP using ≥60-s PA bouts (%)	1266	51.1 ± 9.5
ASTP using ≥120-s PA bouts (%)	1265	54.5 ± 11.9
ASTP using ≥300-s PA bouts (%)	1205	62.2 ± 15.1

Abbreviations: PA = physical activity; ASTP = active-to-sedentary transitioning probability; SB = sedentary behaviour; SD = standard deviation.

3.2. Regression Analysis

On average, when using any physical activity variable, the final model accounting for covariates (Model 3) explained 53.0% of the variance in 2MWT distances and 39.4% of the variance in SPPB scores (see Supplementary Materials). Lower ASTP using ≥10-s physical activity bouts, along with higher total physical activity volume were statistically significantly associated ($p < 0.05$) with longer 2MWT distances (β = −0.60, t (1195) = −4.27, p = 0.007) and higher SPPB scores (β = −0.04, t (1191) = −3.88, $p < 0.001$) (Table 4). Lower ASTP using ≥120-s and ≥300-s physical activity bouts were statistically significantly associated ($p > 0.05$) with longer 2MWT distances (β = −0.16, t (1194) = −2.65, p = 0.008 and β = −0.11, t (1140) = −2.21, p = 0.028, respectively) but not SPPB scores (Table 4). No statistically significant associations ($p > 0.05$) were found for ASTP using ≥60-s bouts with 2MWT distance (p = 0.159) and SPPB score (p = 0.704).

Table 4. Associations of different sedentary behaviour and physical activity patterns with physical function after adjusting for covariates (Model 3).

Variables	Unstandardized β Coefficients	Standardized β Coefficients	95% CI	p
2-Minute Walk Test (metres; n = 1207)				
ASTP using ≥10-s PA bouts (%)	**−0.60**	**−0.12**	**−0.87 to −0.32**	**<0.001**
ASTP using ≥60-s PA bouts (%)	0.10	0.03	−0.04 to 0.24	0.159
ASTP using ≥120-s PA bouts (%) [a]	**−0.16**	**−0.06**	**−0.28 to −0.04**	**0.008**
ASTP using ≥300-s PA bouts (%) [b]	**−0.11**	**−0.05**	**−0.20 to −0.01**	**0.028**
Total PA (%)	**0.95**	**0.19**	**0.65 to 1.25**	**<0.001**

Table 4. *Cont.*

Variables	Unstandardized β Coefficients	Standardized β Coefficients	95% CI	*p*
SPPB score (n = 1203)				
ASTP using ≥10-s PA bouts (%)	**−0.04**	**−0.12**	**−0.06 to −0.02**	**<0.001**
ASTP using ≥60-s PA bouts (%)	−0.00	−0.01	−0.01 to 0.01	0.704
ASTP using ≥120-s PA bouts (%) [c]	0.00	0.00	−0.01 to 0.01	0.934
ASTP using ≥300-s PA bouts (%) [d]	0.00	−0.02	0.00 to 0.00	0.364
Total PA (%)	**0.07**	**0.20**	**0.04 to 0.09**	**<0.001**

Abbreviations: 95% CI = 95% confidence intervals; PA = physical activity; ASTP = active-to-sedentary transitioning probability; SPPB = Short Physical Performance Battery test; [a] n = 1206 due to 1 participant not completing any 120-s PA bouts; [b] n = 1152 due to 55 participants not completing any 300-s PA bouts; [c] n = 1202 due to 1 participant not completing any 120-s PA bouts; [d] n = 1147 due to 56 participants not completing any 300-s PA bouts; All models were adjusted for country, sex, age, body mass index, education, number of comorbidities, physical SF-12 and mental SF-12. Additionally, ASTP was adjusted for daily sedentary behaviour time and daily wear-time while total percentage time in physical activity was adjusted for daily sedentary behaviour time. Bold signifies statistically significant associations ($p < 0.05$).

Additional information regarding the covariates associated with physical function is provided within the Supplementary Materials. The following characteristics were found to be associated with better 2MWT performance and SPPB scores: being male; younger age; having lower BMI; being more educated; having higher self-rated physical function; and having higher self-rated mental function. Living with a lower number of comorbidities was only found to be significantly associated with better 2MWT performance and not SPPB scores.

4. Discussion

This study investigated associations between physical activity fragmentation, calculated using different minimum bout lengths, with physical function in community-dwelling older adults. Our study has helped to address a recognised limitation in previous research in that the minimum bout length has generally only been defined using a ≥60-s bout duration. It has been suggested that other durations could yield different results [20]. We tested four different minimum bout lengths to calculate ASTP values. Importantly, the association with physical function appeared to be altered depending on how the ASTP value was calculated, alongside the physical function test chosen. Lower ASTP calculated using ≥10-s minimum bouts was associated with better performance in both physical function tests while lower ASTP calculated using ≥120-s and ≥300-s minimum bouts was also associated with better 2MWT performance but not SPPB scores. Total physical activity volume was found to be associated with both physical function tests. These findings add to previous reflections from Chastin and colleagues (2015) who highlighted that while volume metrics, such as total time and numbers of bouts, provide straightforward directions of behaviour change and how this may have occurred, these metrics might be less sensitive to change compared to hybrid metrics such as fragmentation index [34].

The only ASTP value which was associated with both physical function tests was ASTP calculated using ≥10-s physical activity bouts. However, further exploration using Pearson's correlation coefficient revealed that ASTP using ≥10-s physical activity bouts was significantly associated ($p < 0.001$) with total physical activity volume (r = −0.68). Therefore, this suggests that this specific minimum bout length is likely to be too reflective of total physical activity volume to provide any further usefulness.

Lower ASTP using ≥120-s and ≥300-s physical activity bouts resulted in longer 2MWT distances, although no significant associations were found for ASTP using ≥60-s physical activity bouts. These findings suggest that more fragmented physical activity patterns, with reduced longer bout patterns, may be an indirect indicator of reduced functional capacity in older adults. This has been shown in Finnish older adults [35] using the longer 6MWT ($p < 0.001$) and also a different accelerometer (ActiHeart). Physical activity which continues to be fragmented over a prolonged period may also be a good indicator of morbidity status in cancer survivors [17] as well as increased all-cause mortality risk in older adults [13,20]. Our findings are also partially supported by work from the Baltimore Longitudinal Study of Aging in that we found a more fragmented physical activity pattern appeared to be associated with worse physical function [15]. However, our study did not find that ASTP using ≥60-s physical activity bouts was related to the 2MWT whereas Schrack and colleagues (2019) found that more fragmented physical activity using ≥60-s physical activity bouts was associated with slower time in another walk test (i.e., 400 m) as well as slower gait speed and higher perceived fatigability. Our assumption was that physical activity fragmentation calculated using higher minimum bout lengths (i.e., ≥120-s and ≥300-s) would be more reflective of endurance-based activities and this seemed to be the case with regards to the 2MWT. Examples of endurance-based activities relevant for older adults could be walking to the shops or meeting up with a friend at a cafe. These findings support recent recommendations from Leroux and colleagues (2020) regarding the need for interventions to target improvements in endurance which may in turn reduce physical activity fragmentation [36]. However, an important consideration for researchers looking to explore different minimum bout lengths when looking to calculate physical activity fragmentation is that higher thresholds (e.g., ≥300-s) may result in some individuals, particularly those who are frailer and less functionally able, not being included in the analysis because they are likely to be unable to complete continuous physical activity bouts for this length of time.

No significant associations were found for ASTP using ≥60-s, ≥120-s and ≥300-s physical activity bouts with the SPPB. This contrasts with another study which found that more fragmented physical activity using ≥60-s physical activity bouts was associated with lower expanded SPPB scores [15]. Possible reasons for these conflicting findings may include using different accelerometers (ActiGraph versus Actiheart) in different body locations (hip versus chest), epoch lengths to summarise physical activity (10-s versus 60-s), wear-time (waking hours only versus all-day wear-time), using different versions of the SPPB and different types of populations being investigated (exclusively older adult versus mixed adult/older adult samples). The general lack of associations between physical activity fragmentation and the SPPB may also be due to the SPPB being a composite measure of physical function with limited variety in the overall scoring (i.e., 0–12). For example, two participants may have the same overall score but could actually be quite different in terms of their balance ability, gait speed and leg strength. As physical function incorporates numerous elements, it will be important for future research exploring physical activity fragmentation to utilise other testing procedures focusing on aspects such as balance, co-ordination and strength.

Limitations and Strengths

The study used a cross-sectional design, meaning it was impossible to establish whether unfavourable fragmentation patterns caused reduced physical function or vice-versa. Due to high levels of collinearity, it was impossible to control for physical activity intensity in the current analysis meaning this may have impacted the findings. Regardless, there are strengths of the study. These include using a widely used and accepted measurement tool for physical activity (i.e., the ActiGraph), using objective measurements of physical function, considering different methods of calculating fragmentation patterns, including a large sample of older adults from four diverse European countries and controlling for relevant covariates.

5. Conclusions

The findings suggest that after adjusting for relevant covariates, less fragmented physical activity patterns calculated using ≥10-s, ≥120-s and ≥300-s minimum bout lengths were associated with better physical function measured in community-dwelling older adults. However, no significant associations with physical function were found using ≥60-s minimum bout lengths. Assessing physical activity fragmentation may help researchers to understand how their participants are typically accruing their physical activity. This may provide important information on how they may become more active, which could support intervention design/development and lead to improved outcomes such as physical function. There may also be the possibility that measuring physical activity fragmentation could be useful at predicting quality of life, wellbeing outcomes and life-years gained for the purposes of economic modelling; this needs to be determined. Future research investigating the correlates of fragmented physical activity patterns and the potential associations with other important outcomes such as cardiometabolic health in older adults would help to further understanding on the usefulness of physical activity fragmentation as a clinical measure. In addition, pairing the epoch length used to summarise the accelerometry data with the minimum physical activity bout length (e.g., using 120-s epoch length when using ≥120-s minimum physical activity bout length) could be an area for future exploration in this particular area. Longitudinal studies investigating the potential of physical activity fragmentation at predicting physical function during ageing would also be useful to provide further evidence for the utility of measuring physical activity fragmentation.

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/jal2010006/s1. Table S1: Linear model of predictors of 2MWT including ASTP using ≥10-s PA bouts with 95% Confidence Intervals. Table S2: Linear model of predictors of 2MWT including ASTP using ≥60-s PA bouts with 95% Confidence Intervals. Table S3: Linear model of predictors of 2MWT including ASTP using ≥120-s PA bouts with 95% Confidence Intervals. Table S4: Linear model of predictors of 2MWT including ASTP using ≥300-s PA bouts with 95% Confidence Intervals. Table S5: Linear model of predictors of 2MWT including total PA volume with 95% Confidence Intervals. Table S6: Linear model of predictors of SPPB including ASTP using ≥10-s PA bouts with 95% Confidence Intervals. Table S7: Linear model of predictors of SPPB including ASTP using ≥60-s PA bouts with 95% Confidence Intervals. Table S8: Linear model of predictors of SPPB including ASTP using ≥120-s PA bouts with 95% Confidence Intervals. Table S9: Linear model of predictors of SPPB including ASTP using ≥300-s PA bouts with 95% Confidence Intervals. Table S10: Linear model of predictors of SPPB including total PA volume with 95% Confidence Intervals.

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