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MEASURING PHYSICAL ACTIVITY USING ACCELEROMETRY IN A COMMUNITY SAMPLE WITH DEMENTIA

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To the Editor: Physical activity (PA) reduces the risk of dementia[1] and extends the lifespan.[2] Although most prospective studies assess PA according to self-report, these measures are

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limited in scope and susceptible to social desirability biases. Despite the prospect that PA may alleviate cognitive impairment, few studies have objectively assessed PA in cognitively impaired individuals. Herein the feasibility of objectively measuring PA and adherence to wearing an activity-monitoring device in a cognitively impaired sample was assessed.

Participants were recruited from the Pittsburgh Alzheimer's Disease Research Center (ADRC). Details of clinical adjudication have been described.[3,4] Participants and care-givers signed an informed consent/assent approved by the University of Pittsburgh institutional review board and were remunerated $50. A control group of 28 cognitively normal adults, age matched to the impaired group, were also enrolled.

Information on the number of subjects recruited, consented, and returning the device was documented. Participants were given a PA monitoring device (BodyMedia, SenseWear, Pittsburgh, PA), an accelerometer designed to be worn on the arm, at the time of their ADRC visit and were asked to return the device in a prepaid envelope after 7 days of data collection. Caregivers were required to be present at the ADRC visit, so results are reported only from subjects with caregivers. Caregivers were important in maintaining adherence and were provided information and instructions on the device. The device collected information on number of steps, estimates of metabolic equivalent of tasks (METs), and active energy expenditure (EE) and has been extensively validated.[5] Minutes of moderate and intense PA were estimated from standard criteria based on METs.

Fifty-two cognitively impaired individuals were approached, and 47 (90.4%) were recruited. At least 3 days of accelerometry are necessary for assessing PA.[6] Of the 39 participants (83%) completing the study with at least 3 days of data, 26 were diagnosed with Alzheimer's disease (AD) and 13 with mild cognitive impairment (MCI). Nine lived alone (4 AD, 5 MCI) and 30 with a caregiver. The AD group was less educated than the MCI or control group ($P = .005$) and slightly older than the MCI group ($P = .05$) (Table 1).

Of the eight cognitively impaired individuals not completing the study, four were diagnosed with AD, three with MCI, and one with impairment without subjective memory complaints. Those not completing the study (mean age 78.2 ± 9.5) were older but statistically equivalent to those finishing the study (mean age 74.2 ± 10.3; $P = .70$). The reasons for not finishing the study were that the monitoring device was lost or not returned (n = 2), was returned without data (n = 2), was returned but was worn for fewer than 3 days (n = 3), and was returned prematurely for unknown reasons (n = 1).

The cognitively normal adults (n = 28) had a 100% adherence rate for wearing the device for at least 3 days. The daily percentage of time wearing the device did not differ between the cognitively normal and impaired groups ($t(1,65) = 0.89$; $P = .40$), nor did it differ between the diagnostic subgroups ($t(1,37) = 0.81$; $P = .42$).

This study demonstrates that it is feasible to use PA monitoring devices in individuals with cognitive impairment. There was interest in and a commitment to wearing the device for at least 3 days, and most wore the device for 7 days (Table 1). Demonstrating feasibility of PA monitoring devices in a cognitively impaired population is fundamental for designing randomized trials of PA, but despite the high level of interest in participating, adherence was lower in the cognitively impaired population (83%) than in the cognitively normal adults (100%). These numbers should be considered when designing future trials and power analyses to assess adherence and sample sizes.

PA monitoring devices have been validated in samples across the lifespan[7] and are used to assess risk of falls,[8] quality of life,[9] and sleep[10] in elderly adults. The current study demonstrated the feasibility of objectively assessing PA in a community sample of

individuals with dementia. Given the cross-sectional nature of the study, the small sample size, and the limited information on comorbidities, it will be necessary for future studies to systematically and comprehensively assess and control for potential confounders between groups. Nonetheless, this study demonstrates that there is interest in using this type of technology to monitor activity and lifestyle in cognitively impaired individuals. Future studies could use this technology for monitoring activity, sleep, and physical exertion in elderly adults with the aim of developing non-pharmacological interventions to enhance cognition or prevent further cognitive decline.

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Table 1

Physical Activity and Demographic Information According to Group

Factor	Alzheimer's Disease Group	Mild Cognitive Impairment Group	Control Group
Completing the study, n	26	13	28
Not completing the study, n	4	3	0
Age, mean ± SD	76.8 ± 9.3	70.5 ± 12.6	75.0 ± 7.5
Female, %	30.8	61.5	53.6
Years of education	14.2 ± 2.3	17.1 ± 2.2	16.7 ± 3.4
Caucasian, %	88.5	76.9	92.8
Body mass index, kg/m^2, mean ± SD	26.4 ± 5.3	28.1 ± 4.1	27.3 ± 4.6
Days wearing the device, mean ± SD	6.6 ± 1.0	6.2 ± 1.3	7.2 ± 1.3
Percentage of time wearing the device, mean ± SD	95.6 ± 7.1	97.4 ± 4.2	96.9 ± 3.3
Total steps per day, mean ± SD	2,658.8 ± 2,207.0	5,889.7 ± 2,867.4	6,470.2 ± 4,715.8
Metabolic equivalents per hour, mean ± SD	1.1 ± 0.2	1.1 ± 0.2	1.2 ± 0.3
Active energy expenditure, J, mean ± SD	198.2 ± 238.8	213.6 ± 189.22	632.2 ± 1,008.7
Minutes of moderate physical activity per day, mean ± SD	40.7 ± 43.4	41.6 ± 30.9	86.2 ± 118.5

SD = standard deviation.