

Differences between Weekly Physical Activity among People with Alzheimer's Disease in Greece

Research Article

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Abstract

Objective: Dementia is one social challenge with global prevalence. Creating personalized programs that enhance physical activity (PA) is an efficient approach for patients suffering from Alzheimer's disease (AD), and a distinction between sexes to organize such programs is needed. Therefore, the present study focuses on differences in PA between male and female patients with AD and compared the number of performed steps in these patients during week and weekend days.

Methods: In total, 21 patients with AD, who attended the daily center for dementia of the Psychogeriatric Association for Alzheimer in Athens and met the established criteria based on information obtained from neuropsychiatric examinations, were included in this study. The Mini-Mental State Examination Test was conducted, and data concerning the daily performed steps were obtained by using a portable pedometer, which the participants wore for 7 days.

Results: The cognitive status and physical activity among male and female individuals were found to be similar. The results were similar for both week and weekend days. However, there was a significant correlation between the Mini-Mental State Exam scores and daily steps. Our findings suggest that PA is independently associated with sexes and weekdays in patients with mild to severe dementia.

Conclusion: PA is an important factor in everyday life. Our findings suggest that there are no differences between the sexes regarding their physical activity. However, there was a significant link between the cognitive status and PA. Because of the small number of included participants, additional research is required to generalize our findings.

Keywords: Dementia; Gender; Greek, Pedometer; Physical activity; Steps, Week-days; Weekend day

Introduction

Determining the level of physical activity (PA) in the elderly is an important research topic, as it is crucial for organizing personalised therapeutic programs. Older people usually experience limited motor skills in relation to their adult lives; however, in dementia cases, this restriction is even harder. Previous researches examining the PA levels for persons with dementia have suggested that patients with dementia

were less active than those without cognitive impairment, and only a few of them met the PA levels for function maintenance [1,2]. Although PA expressed based on the performed daily steps for individuals suffering from neurodegenerative diseases, such as Alzheimer's disease (AD), can provide useful information, research data are limited and differences between sexes constitute an area that has not yet been adequately explored.



Individuals with different sexes may have differences in multiple factors reflecting on the risk factors for dementia, the prevalence, and even the expression of dementia [3]. PA in midlife is associated with a reduced risk of dementia in women [3]. PA seems to be very important as it is considered as a modifiable enhancer of the motor level with extensions to the cognitive status of a patient [4]. In contrast, it has been suggested that PA alleviates the negative impact of aging on cognitive function. Moreover, when cognitive impairment occurs, it has an effect on the improvement and maintenance of patient's functionality [4,5]. PA and daily performed steps reveal the indirect positive effects on quality of life and depression prevention in patients with dementia, while other researches have presented the important role of physical exercise and gait in improving the executive functioning and autonomy in such patients [6,7]. Studies on the differences in PA between healthy older individuals have been performed in Greece. Interestingly, they have stated that women presented higher levels of activity revealing a positive impact on quality of life [8,9]. Conversely, a previous study revealed that the levels of PA decreased progressively with age, with women presenting a greater decline [10]. Sex differences in physical inactivity have been associated with the burden of dementia supporting low PA on both sexes, with women being in the first line [11]. To date, however, there are no corresponding research data for the elderly with dementia in Greece to share evidence regarding the possible differences among sexes concerning PA on week or weekend days.

This work aims to fill this research gap by exploring the correlation between sex and PA. Moreover, it goes one step further by exploring the correlation between PA and day of the week in patients with dementia. If sex or day is correlated positively with PA, then, personalized programs could be organized and applied, thus, strengthening the most undervalued points of patients with dementia in Daily Care units.

Methods

Ethical Approval

The study was approved by the Ethical Committee of the Alzheimer's Center, Daily-care unit, "Nestor" Psychogeriatric Association, Athens, Greece prior to study initiation. A written consent was required for the participation in the protocol from the caregiver of each patient. Whenever a patient or caregiver did not wish to participate anymore, he/she could withdraw.

Data Selection and Data Collection

The study was conducted at the Alzheimer's Center, Daily-care unit, "Nestor" Psychogeriatric Association, Athens, Greece during November 2021. The center examines patients suffering from dementia, especially Alzheimer's. From the initial number of 46 patients following the occupational therapy program in the center during the winter month, 38 were diagnosed with AD. Among them, only 30 patients who met the following criteria were included: 1) Clinical diagnosis of AD according to the standardized diagnostic criteria; 2) The mini-mental state examination was conducted to determine participants cognitive level and a Mini-Mental State Exam (MMSE) score $\geq 6/30$ points was accepted for inclusion in the research protocol; 3) age between 65 and 85 years; 4) ability to move independently (even if they had to use a cane) and the caregiver had to be eligible to assist the individual whenever needed; 5) pharmaceutical stability with no psychiatric disorder; 6) and history of following the activities of a Daily care center for Alzheimer's Disease in Athens.

From the initially-included 30 individuals, we excluded six owing to the difficulty of their caregivers in a daily reminder to wear the ped-

ometer. Moreover, one patient who had a fall and could not participate because of a hip fracture and other two who withdrew from the program before its completion did not participate. Therefore, 21 patients with dementia were included in the study and were divided into two groups according to their sex (female group [Group A; n=11] and male group [Group B; n=10]). (Table 1)

Somatometric characteristics, weight, and gait length were recorded and integrated into the pedometer settings. A medium assistive technology device, a pedometer (walking style II pedometer; Omron, Kyoto, Japan), was used to determine their daily performed steps. Male and female individuals and carriers were educated on pedometer's use. Data were collected after the 7th day in a single database.

Data Analysis

The collected data were statistically processed with SPSS version 25 (IBM Corp., Armonk, NY, USA). The level of significance was set at $p < 0.05$.

Regarding the analysis of PA through the steps recorded by the pedometer, the T-test was used for dependent samples. To examine the effect of the level of PA on each dependent research variable, a one-factor analysis of variance (ANOVA) analysis was performed.

Results

Overall results

The mean age of the participants was 72.8 ± 3.7 years while the mean MMSE score was 12.67 ± 4.77 points. The mean numbers of performed steps of all participants during the weekdays and weekends were 1132.32 ± 96 and 1184.62 ± 35 steps, respectively. The patients' characteristics are presented in Table 1. Correlation of body measurements and daily physical activity within 7-days are presented in Table 2, with no statistically significant difference between the parameters, except for the height of the participants (Table 1&Table 2).

Table 1: Patients' characteristics.

Descriptives	Females = Group A	Males = Group B
Age (years)	73.27	72.4
MMSE	11.55	13.9
Weight (kg)	69.18	75.9
Height (cm)	164.09	180.7
BMI	25.71	23.32

MMSE = Mini-mental state examination, BMI = Body mass index

Main Specific Results

Sex did not have a statistically significant effect on the average number of steps over the weekend ($F_{2,19}=2,073$; $p=0.166$) and on the average number of steps on weekdays ($F_{2,19}=1,654$; $p=0.214$), but neither on the average number of steps performed in the whole week ($F_{2,19}=1,782$; $p=0.198$). No significant statistical difference was found in the performed steps between weekdays and weekend days ($F_{2,19}=0.512$; $p=0.615$).

On the other hand, MMSE scores were presented to be related to the daily performed steps. Moreover, there was a significant correlation between age and MMSE scores. (Table 3). Females and Males were divided in two groups, A and B respectively and differences between them are presented analytically in Table 4, 5. (Table 4 & Table 5).



Table 2: Correlation of body measurements and daily physical activity within 7-days .

	t	df	p-value (2-tailed)	Mean Differ- ence	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Age	0.537	14.285	0.599	0.873	1.625	-2.606	4.351
MMSE	-1.137	18.662	0.27	-2.355	2.072	-6.696	1.987
Height	-6.173	18.552	.000***	-16.609	2.691	-22.25	-10.968
Weight	-1.99	14.51	0.066	-6.718	3.376	-13.936	0.499
BMI	2.064	15.408	0.056	2.398	1.162	-0.726	4.869
Steps Day 1	-1.703	13.624	0.111	-620.909	364.5	-1404.712	162.894
Steps Day 2	-1.146	14.609	0.27	-602.409	525.653	-1725.43	520.612
Steps Day 3	-1.473	12.413	0.166	-702.264	476.912	-1737.549	333.022
Steps Day 4	-0.478	18.285	0.639	-193.491	405.172	-1043.776	656.794
Steps Day 5	-1.114	18.084	0.28	-657.664	590.421	-1897.679	582.352
Steps Day 6	-1.587	15.28	0.133	-791.918	498.887	-1853.576	269.74
Steps Day 7	-1.319	17.739	0.204	-601.264	455.76	-1559.79	357.263

*** Significant result = $p < 0.0001$. MMSE – mini mental state examination. BMI – body mass index

Discussion

Dementia is affecting approximately 47 million individuals worldwide, and it is expected to affect approximately 150 million individuals by 2050 [12]. It leads to deterioration, burden, and worsens the quality of life (QoL), not only for the affected people but also for their relatives. The increased incidence of dementia and the reduced QoL increase the costs for hospitalization and care, and not last for institutionalization [12]. There are a few types of dementia, from which AD is the most common, representing approximately 60–80% of cases of patients with dementia.

AD is a neurodegenerative disease, usually presenting with cognitive impairment, psychiatric symptoms, and difficulties in performing daily activities. The cognitive function could be from mildly to extremely severely impaired. Fratiglioni, et al. [13] suggested three factors that could moderate the poor prognosis of patients with AD. These factors include social interactions as well as cognitive and physical activities, from which the last one has the greater impact [5, 13-15]. Moreover, recent randomized control trials and meta-analyses have reported that regular daily activity and exercise reduce and prevent cognitive decline in patients with AD and healthy controls, respectively. In a current meta-analysis, Jia, et al. [5] reported that the frequency of the daily exercise did not affect the outcome, while generally speaking, PA improves the cognitive abilities in patients with AD. Moreover, Toots et al [16] performed a randomized clinical trial, including 186 patients with dementia. Interestingly, they reported that intensive PA and exercise improved the cognitive ability of patients living outside nursing homes.

The literature, indeed, supports the fact that there are differences between sexes, regarding the appearance, history, and prognosis of patients with AD. For instance, there is a theory concerning the protective role of the hormone estrogen in women against AD and the high possibility of developing AD in cases of women with reduced estrogen levels [17,18]. Moreover, it is believed that the higher incidence of AD

among women is based on greater longevity. Other specific sex-based factors include pregnancy, hormone therapies, menopause, and thyroid disease. Moreover, factors contributing to the onset of AD, including diabetes mellitus type 2, sleep disturbance, occupation, education, stress, diet, and obesity, are considered controversial causes based on the patients' sex [18,19].

In general, women exercise less than men. A few studies have suggested that PA might benefit more women aged >55 years compared to men of that age. This theory is confirmed and explained by the fact that sex alters cognitive function, including set-shifting, performance, and improved attention and memory.

Finally, Aarsland, et al. [20], in their comparative study on more than 6000 Mexican and Korean individuals, showed that PA was linked statistically to the cognitive status of the patients, as measured using the MMSE among the Koreans ($p=0.0047$; odds ratio, 0.0866; 95% confidence interval, 0.0266–0.1467). This finding was supported by Clemmensen, et al. [21] in a cross-sectional randomized trial, in which they found that the cognitive function, as measured with the MMSE score and Symbol Digit Modalities Test, was statistically related to the daily performance.

In this study, we also present a significant correlation between the cognitive function, as measured with the MMSE score, and daily steps. Nevertheless, we did not observe any significant difference between individuals of different sexes, regarding their cognitive status and overall performance. Patients with dementia present many difficulties in performing activities of daily life, especially in their walking performance. Both women and men seem to adopt a low motivated life attitude. Moreover, patients with severe AD present a low activity pattern throughout the week, with no difference between weekdays or weekend days, a fact that could be attributed to the lack of differentiation between the days of the week for patients with significant dementia. Especially, they consider that “every day is like a past day.” The change that could be proposed focuses on greater caregiver's in-



volvement in motivation and mobilization for both male and female patients with dementia. Another observation is the equality of the body mass indices of participants, suggesting that female patients with AD might have obesity, which contributes to the decline of cognitive function and it disherits their PA.

Although our findings are in agreement with those of the reported works, it encompasses a small number of participants, which was a significant limitation. Therefore, this issue limited the generalizability of our findings.

Conclusion

AD is the most common form of dementia and affects a large part of the population. PA is believed to be one of the most important preventive factors for cognitive decline, as well as one of the most important factors for therapy. According to our findings, there is no difference between female and male patients with dementia regarding their PA. However, we found a significant relation between daily performance and cognitive function in general, which could be of great interest for physicians worldwide.

Compliance with Ethical Standards

Conflicts of interest: The authors have no conflict of interest to declare.

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Ethics approval: The study was approved by the Ethical Committee of the Alzheimer's Center, Daily –care unit, “Nestor” Psychogeriatric Association, Athens, Greece. Written informed consent was obtained from the patients prior to participation.

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Key Messages

- Sex does not differentiate PA in patients with dementia.
- Patients with severe dementia have the same PA among week and weekend days

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- Age Sex MMSE Steps day 1Steps day 2Steps day 3Steps day 4 Steps day 5Steps day 6Steps day 7Height

