

Assessment of Physical Fitness and Exercise Tolerance in Residents of Nursing Homes with Mild Dementia

Ocena sprawności fizycznej i tolerancji wysiłkowej u pensjonariuszek Domów Pomocy Społecznej z otępieniem lekkiego stopnia

Małgorzata Fortuna¹, Antonina Kaczorowska², Jacek Szczurowski³

① Faculty of Health and Physical Culture Sciences, Witelton Collegium State University in Legnica, Poland

② Institute of Health Sciences, University of Opole, Poland

③ Institute of Environmental Biology, Division of Anthropology, Wrocław University
of Environmental and Life Sciences, Wrocław, Poland

Abstract

Introduction. Aging, Alzheimer's disease, and other forms of dementia will become an increasingly serious public health problem with the global population demographic trend. Progressive dementia leads to a decrease in the ability to perform daily activities. Decline in intellectual and other cognitive functions is one of the most common changes in the aging process. People with dementia are more prone to limiting their activities, which promotes sarcopenia, reduced functional function and tolerance to physical exertion. Systematic, properly selected physical activity decreases the regression processes in the above areas.

Aim. The aim of the study was to assess whether the early stage of dementia in the subjects is a factor reducing the level of physical fitness and exercise tolerance.

Material and Methods. 74 women aged 80–84, residents of the nursing home, were examined. The subjects were divided. The first group consisted of 30 people diagnosed with mild dementia based on the assessment of the Mini Mental State Examination test. The second group consisted of 44 people without symptoms of dementia. Both groups underwent a Short Physical Performance Battery test to assess fitness and a 6-minute walk test to assess exercise tolerance.

Results. The mean value of the body mass index was in the first group (25.9 ± 2.2), in the second group was (25.3 ± 3), the difference was insignificant $p < 0.7$. The mean value of the Short Physical Performance Battery test in the first group was (6 ± 2.1), in the second group it was (6 ± 2.4), the difference was insignificant $p < 0.2$. The mean value of the 6-minute walk test in the first group was (234 ± 91), in the second group was (222 ± 85), an insignificant difference of $p < 0.6$. The differences for all the analyzed traits are statistically insignificant, the studied groups of women did not differ significantly in terms of the analyzed features.

Conclusions. Dementia diagnosed at the mild level is not a factor significantly reducing the level of physical fitness and exercise tolerance. It is important to choose the right physical activity program aimed at this group. (JNNN 2025;14(1):3–7)

Key Words: dementia, exercise tolerance, geriatrics, physical fitness

Streszczenie

Wstęp. Wraz ze światowym trendem demograficznym populacji starzenie się, choroba Alzheimera i inne formy demencji stanowią coraz poważniejszy problem zdrowia publicznego. Postępująca demencja prowadzi do spadku zdolności do wykonywania codziennych czynności. Obniżanie funkcji intelektualnych i innych funkcji poznawczych jest jedną z najczęściej występujących zmian w procesie starzenia. Osoby z demencją są bardziej podatne na ograniczanie swojej aktywności, co sprzyja sarkopenii, ograniczeniu sprawności funkcjonalnej i tolerancji na wysiłek fizyczny. Systematyczna odpowiednio dobrana aktywność fizyczna spowalnia procesy regresu w powyższych obszarach.

Cel. Celem pracy była ocena, czy występujący wczesny etap demencji u badanych jest czynnikiem obniżającym poziom sprawności fizycznej i tolerancji wysiłkowej.

Materiał i metody. Przebadano 74 kobiety w wieku 80–84 lata, pensjonariuszki Domów Pomocy Społecznej. Badane podzielono. Pierwszą grupę stanowiło 30 osób ze zdiagnozowaną demencją lekkiego stopnia na podstawie oceny Mini Mental State Examination test. Grupę drugą stanowiły 44 osoby bez objawów demencji. W obydwu grupach przeprowadzono test Short Physical Performance Battery służący do oceny sprawności oraz 6-minutowy test marszu w celu oceny tolerancji wysiłkowej.

Wyniki. Średnia wartość wskaźnika masy ciała w grupie pierwszej ($25,9 \pm 2,2$), w grupie drugiej ($25,3 \pm 3$), różnica nieistotna $p < 0,7$. Średnia wartość Short Physical Performance Battery test w grupie pierwszej ($6 \pm 2,1$), w grupie drugiej ($6 \pm 2,4$), różnica nieistotna $p < 0,2$. Średnia wartość 6-minutowego testu marszu w grupie pierwszej (234 ± 91), w grupie drugiej (222 ± 85), różnica nieistotna $p < 0,6$. Dla wszystkich analizowanych cech różnice są nieistotne statystycznie — badane grupy kobiet nie różniły się znacząco pod względem analizowanych cech.

Wnioski. Demencja zdiagnozowana na poziomie lekkiego stopnia nie stanowi czynnika obniżającego istotnie poziom sprawności fizycznej i tolerancji wysiłkowej. Istotne jest odpowiednie dobranie programu aktywności fizycznej skierowanej dla tej grupy. (PNN 2025;14(1):3–7)

Słowa kluczowe: demencja, tolerancja wysiłkowa, geriatrya, sprawność fizyczna

Introduction

Dementia is a term used to describe the progressive changes in brain function as a result of many diseases. These changes include changes in the broad and free use of speech, memory, perception, cognitive skills. As a consequence, there is a change in personality, gradual limitation of activity and reduced participation in various social roles. These diseases lead to a decrease in the ability to perform daily activities [1]. Aging, Alzheimer's disease, vascular dementia and other forms of dementia will become an increasingly serious public health problem with the global population demographic trend. The world wide number of persons with dementia in 2000 was estimated at about 25 million persons. According to the study, 54% of those affected by dementia were women [2]. Around thirty million people currently suffer from dementia. This is a trend that has been growing over the years. The number of people affected by this disease is likely to double every twenty years. Most people with dementia live in developing countries. This is above 60% of all patients. It is emphasized that dementia is one of the most common causes limitations of physical performance, physical and mental performance, morbidity and mortality among the elderly people and we have to face the obvious consequences. Most likely, this is related to the increase in the average life expectancy and the demographic decline in these countries. Progressive dementia leads to a decrease in the ability to perform daily activities. Decline in intellectual and other cognitive functions is one of the most common changes in the aging process. People with dementia are more prone to limiting their activities, which promotes sarcopenia, reduced functional function and tolerance to physical exertion. Systematic, properly selected physical activity decreases the regression processes in the above areas [1,3,4]. Dementia is a broad social problem, especially in the aging process. In this study, an attempt was made to assess whether in the early stage of dementia in the group of examined women there are already visible

limitations in terms of physical fitness and exercise tolerance. These results may provide valuable guidelines for programming therapeutic procedures, especially planning physiotherapy and physical activity in this group of people.

The aim of the study was to assess whether the early stage of dementia in the subjects is a factor reducing the level of physical fitness and exercise tolerance.

Material and Methods

74 women aged 80–84, residents of the nursing home, were examined. The study was carried out in accordance with ethical principles, in accordance with the Declaration of Helsinki. The consent to conduct the research was obtained from the Bioethics Committee of the Opole Medical School, Poland (permission no. KB/202/FI/2019). All patients provided informed consent and were informed that they could withdraw from the study at any stage. The surveyed seniors gave their voluntary and informed consent to participate in the study. In all subjects, the BMI (body mass index) was determined. The subjects did not report obesity or diseases that would prevent or significantly limit participation in the research. The research was carried out in 22 Nursing Homes in south-western Poland. The subjects were divided into two groups. The first group was consisted of 30 people diagnosed with mild dementia based on the assessment of the Mini Mental State Examination test [5]. The second group was consisted of 44 people without symptoms of dementia. Both groups underwent a SPPB test (Short Physical Performance Battery) to assess fitness and a 6-minute walk test to assess exercise tolerance. The SPPB test assessed physical fitness in three areas: lower limb strength, static balance, and gait speed. In order to assess the endurance and strength of the lower limbs, the subject got up from a chair with his upper limbs crossed over the chest. With

one positive attempt to sit down and get up from the chair, the subject performed this activity five times as quickly as he could. The total time of the completed task was presented for the interpretation of the results. To assess static equilibrium, the subject tried to maintain balance for ten seconds in three different positions: Parallel position, step position so that the heel side of one foot touches the big toe of the other foot, and foot behind the foot so that the heel of one foot stands in front of and touches the toes of the other foot. The subject took the next position if the previous one did not cause him any problems and the subject was able to hold it for ten seconds. To assess the speed of walking, the subject covered four meters in a straight line in the shortest possible time. The recorded time of the distance covered was used to interpret the results. The interpretation of the SPPB test was made on the basis of the point table of interpretation of the results obtained during subsequent trials. In each area of the SPPB test, the subject could receive zero to four points, where zero indicates that he or she is unable to perform the task and four indicates the highest possible efficiency. The total score ranged from zero to twelve points and defined the level of efficiency [6]. During the six-minute walk test, the subjects were asked to cover the longest distance possible in six minutes. The distance was given in meters. The test was carried out on a level and non-slippery surface. The route of the march was marked around a rectangle with sides of twenty meters and five meters [7].

Descriptive statistics were used. The mean, standard deviation (SD), median (Me) for the examined parameters were calculated (Table 1, Table 2). The nature of the parameter distributions was examined in terms of compliance with the model normal distribution (normality of the distribution). The Shapiro–Wilk test was used for the analysis. The distributions of all traits were not consistent with the model distribution. Therefore, to study the differences in the values of average traits between the two groups analyzed, a nonparametric equivalent of the Student's T-test for independent groups, i.e. the U–Mann–Whitney test, was used.

Table 1. Basic statistics for group 1 — women with mild dementia (80–84 years old) (N=30)

Variable	M	Me	SD
Age	81.47	80.00	1.89
BMI	25.87	26.50	2.23
6-minTest	234.43	198.50	90.92
NPPB	5.97	5.00	2.14

M — average, Me — median, SD — standard deviation

Table 2. Basic statistics for group 2 — women without dementia (80–84 years old) (N=44)

Variable	M	Me	SD
Age	81.70	81.00	1.82
BMI	25.32	27.30	2.97
6-minTest	222.25	205.00	84.90
NPPB	6.61	6.00	2.35

M — average, Me — median, SD — standard deviation

Results

The mean value of the body mass index was in the first group (25.9 ± 2.2), in the second group was (25.3 ± 3), the difference was insignificant $p < 0.7$. The mean value of the Short Physical Performance Battery test in the first group was (6 ± 2.1), in the second group it was (6 ± 2.4), the difference was insignificant $p < 0.2$. The mean value of the 6-minute walk test in the first group was (234 ± 91), in the second group was (222 ± 85), an insignificant difference of $p < 0.6$ (Table 3).

Table 3. Results of the study of the difference in the values of average traits — Mann–Whitney U test

Variable	U	Z	p
Age	609.0	−0.61	0.54
BMI	620.0	0.45	0.65
6-minTest	610.5	0.54	0.59
NPPB	552.5	−1.20	0.23

U, Z — indicators of Mann–Whitney U test, p — test probability

The differences for all the analyzed traits are statistically insignificant. The studied groups of women did not differ significantly in terms of the analyzed features.

Discussion

Regression process related to the intellectual and functional area begins in patients diagnosed with dementia. Intellectual and other cognitive functions decline within 2 to 10 years [1]. Patients with dementia begin to withdraw from systematic activity. Progressive muscle atrophy is observed in this group of patients. Loss of muscle mass can be slowed down in the aging process in people with dementia by training programs. Properly conducted exercises can improve balance, reduce the occurrence of falls, improve the adaptation of the circulatory system to physical exertion, the quality and effectiveness of sleep, reduce the frequency and severity of behavioral disorders [8]. It seems particularly important

to introduce a systematic training program in people diagnosed with early symptoms of dementia in order to slow down the development of dementia as effectively as possible. These actions will delay the occurrence of further regression changes in the process of dementia development. This will improve the quality of life of these patients. An appropriate program should be implemented as soon as possible in order to slow down the decline in cognitive and intellectual functions. On the other hand, the progressive process of cognitive and intellectual decline leads to the limitation of the possibility of conscious, systematic physical activity. Researchers indicate that cognitive decline is associated with a decrease in the level of physical performance [9]. This study shows that in the group of women with mild dementia there are no significant differences in the level of fitness and exercise tolerance with the group of women without these symptoms. Therefore, it can be predicted that the implementation of systematic activity may slow down changes in cognitive decline in people with dementia. At the same time, this prevention can maintain fitness and exercise tolerance at a higher level. It is known that limiting activity leads to a decrease in physical fitness and exercise tolerance. As a further consequence, this causes limitations in social roles, social isolation, and a total reduction in the quality of life [10]. Research by other authors shows that systematic physical activity can reduce the risk of dementia, so it is also a kind of primary prevention of dementia in seniors [11]. On this basis, it can be assumed that training programs implemented as early as possible in patients with dementia may slow down its further progression, and may even reduce the symptoms already occurring in diagnosed patients. Research conducted by other authors proves that cognitive performance can be improved through systematic physical training and at the same time increase physical fitness [12]. The authors' work shows that six months of training at a high level of aerobic intensity in people with early symptoms of dementia improved cognitive functions [13]. Particular attention is paid to aerobic training, which gives the most beneficial effects in improving cognitive functions in the elderly [14]. Regular physical activity improves the level of fitness and physical performance. It can be undertaken at any age point and leads to better results in subsequent measurements assessing these traits [15,16]. There is a need to implement programs to increase physical activity in nursing homes, which is also suggested by this study. These studies indicate average values obtained in the 6-minute walking test at the level of 234.4 ± 90.9 in the group of people with dementia and 222.3 ± 84.9 in the group of women aged 80–84 years without symptoms of dementia. The authors' research conducted in Poland on the population of women aged 80–85 years indicates average values obtained in this test at the level of 366.8 ± 140 . They

were people living independently (not community dwelling, hospitals, nurse homes etc.) [17]. Therefore, it can be assumed that the elderly are not sufficiently active in nursing homes, achieving lower results in this study. Studies by other authors assessing level of physical fitness have also proven significant differences in outcomes between the group of seniors living independently and the group of residents living in nursing homes. In these studies, the Senior Fitness was used to assess physical fitness. Seniors living in nursing homes have such a significantly reduced level of functional fitness, compared with their peers living independently [18]. The need to implement appropriately selected activities is shown by seniors in nursing homes, especially residents with diagnosed initial symptoms of dementia. It is necessary to strive to create the most effective training programs based on regularity, appropriate selection of exercises and intensity, which requires further research.

Conclusions

Dementia diagnosed at the mild level is not a factor significantly reducing the level of physical fitness and exercise tolerance.

Residents of the nursing home in the studied groups have a relatively low level of exercise tolerance.

It is important to choose the right physical activity program aimed at these groups.

Implications for Nursing Practice

In order to improve the quality of life of seniors, therapeutic and care intervention should be implemented to enable residents of nursing homes to become active in the form of exercise programs. This is especially true for the group of people who show early changes towards mild dementia. The initial stage of dementia does not limit residents in the area of physical fitness and exercise tolerance. Investing in maintaining these two features at the highest possible level can be assumed that it will cause a slower development of regression-related changes in these patients.

References

- [1] Plassman B.L., Langa K.M., Fisher G.G. et al. Prevalence of dementia in the United States: the aging, demographics, and memory study. *Neuroepidemiology*. 2007;29(1–2): 125–132.
- [2] Ferri C.P., Prince M., Brayne C. et al. Global prevalence of dementia: a Delphi consensus study. *Lancet*. 2005; 366(9503):2112–2117.

- [3] Wimo A., Winblad B., Agüero-Torres H., von Strauss E. The magnitude of dementia occurrence in the world. *Alzheimer Dis Assoc Disord.* 2003;17(2):63–67.
- [4] Mechling H. Dementia and physical activity. *Eur Rev Aging Phys Act.* 2008;5:1–3.
- [5] Folstein M.F., Folstein S.E., McHugh P.R. “Mini-mental state”. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975;12(3):189–198.
- [6] Zasadzka E., Pawlaczyk M., Wieczorowska-Tobis K. Test Short Physical Performance Battery jako narzędzie służące do oceny sprawności fizycznej osób starszych. *Gerontol Pol.* 2003;4:148–153.
- [7] Rikli R.E., Jones C.J. The reliability and validity of a 6-minute walk test as a measure of physical endurance in older adults. *J Aging Phys Act.* 1998;6:363–375.
- [8] Mechling H., Brach M. *Fit für 100. Förderung der Mobilität und Selbstständigkeit für Hochaltrige. Praxisleitfaden zur Einrichtung von Bewegungsangeboten für alle Bereiche der Altenhilfe.* Deutsche Sporthochschule, Köln 2007.
- [9] Morley J.E. The top 10 hot topics in aging. *J Gerontol A Biol Sci Med Sci.* 2004;59(1):24–33.
- [10] Wahle M., Häller S., Spiegel R. Validation of the NOSGER (Nurses’ Observation Scale for Geriatric Patients): reliability and validity of a caregiver rating instrument. *Int Psychogeriatr.* 1996;8(4):525–547.
- [11] Brunner C., Spiegel R. Eine Validierungsstudie mit der NOSGER (Nurses’ Observation Scale for Geriatric Patients), einem neuen Beurteilungsinstrument für die Psychogeriatric. *Zeitschrift für Klinische Psychologie.* 1990;19(3):211–229.
- [12] Daly J.M., Bay C.P., Levy B.T., Carnahan R.M. Caring for people with dementia and challenging behaviors in nursing homes: A needs assessment geriatric nursing. *Geriatr Nurs.* 2015;36(3):182–191.
- [13] Baker L.D., Frank L.L., Foster-Schubert K. et al. Effects of aerobic exercise on mild cognitive impairment: a controlled trial. *Arch Neurol.* 2010;67(1):71–79.
- [14] Angevaren M., Aufdemkampe G., Verhaar H.J., Aleman A., Vanhees L. Physical activity and enhanced fitness to improve cognitive function in older people without known cognitive impairment. *Cochrane Database Syst Rev.* 2008; (2):CD005381.
- [15] Deskur-Śmielecka E., Józwiak A., Bosacka M. Wpływ krótkotrwałego programu rehabilitacyjnego o małej intensywności na wydolność fizyczną u pacjentów w podeszłym wieku. *Gerontol Pol.* 2011;19(1):21–28.
- [16] Ignasiak Z., Kaczorowska A., Katan A., Domaradzki J. Sprawność ruchowa kobiet w starszym wieku oceniana testem Fullertona. *Fizjoterapia.* 2009;17(2):48–53.
- [17] Ignasiak Z., Sebastjan A., Sławińska T. et al. Functional fitness normative values for elderly polish population. *BMC Geriatr.* 2020;20(1):384.
- [18] Kaczorowska A., Sebastjan A., Kołodziej M., Fortuna M., Ignasiak Z. Selected Elements of Lifestyle and the Level of Functional Fitness in Older Women. *Int J Environ Res Public Health.* 2022;19(4):2066.

Corresponding Author:

Małgorzata Fortuna

Faculty of Health and Physical Culture Sciences,
Witelon Collegium State University in Legnica
Sejmowa 5a street, 59-220 Legnica, Poland
e-mail: malgorzata.fortuna@collegiumwitelona.pl

Conflict of Interest: None**Funding:** None

Author Contributions: Małgorzata Fortuna^{A–C, E–H},
Antonina Kaczorowska^{B, C, E–H}, Jacek Szczurowski^{B–F}

A — Concept and design of research, B — Collection and/or compilation of data,
C — Analysis and interpretation of data, D — Statistical analysis, E — Writing
an article, F — Search of the literature, G — Critical article analysis, H — Approval
of the final version of the article

Received: 14.06.2024**Accepted:** 2.07.2024