

The impacts of aerobic and anaerobic exercise on neuropsychiatric symptoms (NPS) for middle aged and older adults with Alzheimer's; A Systematic Review



Sadie Jones, Health Sciences

Introduction

- Alzheimer's disease (AD) will affect up to 14 million Americans in the next twenty-seven years.¹
- AD is can be caused by inheriting a specific gene with the APOE e4 allele.³ Other contributing risk factors of AD include female sex.³ NPS can be evident if an individual exhibits depression, stress, and physical inactivity.¹
- Older adults with AD are at more risk for depression than middle-aged adults due to association between mood, exercise, and lipid metabolomics when participating in aerobic exercise.⁴
- The purpose of this study is to review relevant literature to determine if individuals 45 years or older who participate in aerobic exercise, compared to anaerobic exercise, experience improvement of NPS.

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Data Extraction Table

Author, year	Study type	Study sample size/population	Intervention/Expense	Comparison	Results	Outcome
Schiwal et al, 2020¹	Randomized controlled trial	146 individuals aged from 39 to 64	Those with AD who had high intrinsic motivation or IM to be aerobically active	Those with AD who had low IM to be not as aerobically active	The treatment group increased in IM compared to the control group which was determined by independent samples t-tests. In addition, high vs low IM individuals found that high IM males increased physical activity compared to lower IM males.	The Gray Matters study showed exercise having positive impact on behavioral symptoms, resulting in increased IM over time for participants.
Yu F et al, 2021²	Randomized controlled trial	96 individuals aged from 66-85 years	Those with AD who cycled as a form of aerobic exercise	Those with AD who stretched as a form of anaerobic exercise	When analyzing disease progression for six months, researchers found that there were changes in anaerobic exercise showings less than a 3.2 ± 6.3-point increase. There were no differences in the twelve-month rate of change in memory, executive function, attention, or language, between the cycling and stretching groups. No P-value given.	The study showed that aerobic exercise slowed global cognition decline.
Krause-Sorio et al, 2022³	Randomized controlled trial	11 women with a mean age of 61 years	Those with AD who did yoga as a form of physical exercise	Those with AD who did memory training as a form of mental exercise	The memory enhancement training or MET showed the right hippocampal volume increased to the p-values of 0.31 (0.58) after yoga, but did not survive corrections based on the within-group differences in brain gray matter volume GMV change. In addition, anxiety and depression improved significantly within the yoga group but did not change in the MET group, which indicates that NPS were elevated.	This study found that yoga training may offer superior neuroprotective effects, compared to memory enhancement training in preventing neurodegenerative changes and cognitive decline.
Gaitán et al, 2021⁴	Cohort Study	25 middle aged individuals	The who with AD participating in Enhanced Physical Activity or EPA, which includes 150 min/week actively pursuing moderate vigorous exercise	Those with AD who participate in Usual Physical Activity or UPA, which is very little exercise	Change in klotho protein levels was significantly correlated with change in VO2peak with p = .005 when analyzing Cathepsin B or CTSB, for those who completed EPA.	There was evidence to suggest an increased improvement of cognitive function for those with AD who participated in aerobic exercise.
Sobol et al, 2018⁵	Case-Control Study	55 individuals aged 52-83 years	Those with AD who exercised for 16 weeks, 3 time weekly, for 1 hour	Those with AD who received usual care for 16 weeks	Those in the intervention group had an 85.2% attendance rate and had exercise intensity of 79.6% maximal heart rate. Those in the intervention group had 13% increase in VO2 peak which is associated with alleviating symptoms such as depression. No P-value given.	The study shows that it is possible to improve cardiorespiratory fitness in community in addition to improving the positive effect on mental speed, attention, and neuropsychiatric symptoms in patients with AD.
Morris et al, 2017⁶	Randomized controlled trial	76 older adults with probable AD were enrolled, and 68 participants completed the study	Those with AD who did aerobic exercise for 150 min/week	Those with AD who did stretching and toning control or ST	There was no effect of aerobic activity in the intervention group, which included measures of memory, executive function, or depressive symptoms. The intervention group demonstrated gains in functional ability compared to individuals in the ST group with a p=0.02.	This study found aerobic exercise improves functional ability in individuals with early-stage AD.
Cedervall et al, 2015⁷	Cohort Study	14 individuals with mild AD	Those with AD who perform physical activity for more than 1 hour	Those with AD that are housebound	The study revealed interrelated perspectives on how people with mild AD reason about physical activity, and how physical activity affects selfhood maintenance. No P-value given.	This study explained physical activity, apart from maintaining body functions, can be a way to sustain well-being and selfhood in mild AD.
Litchke et al, 2014⁸	Cohort Study	26 individuals (ages 69 to 98), 19 females and 7 males	Those with AD who participated in multisensory approach to yoga	Those with AD who participate in traditional yoga class format	Those who participated in yoga class for thirty to fifty-five minutes showed changes in physical endurance when exercising. In addition, the standing poses improved balance and resulted in improvement of mood related to aggression by 25%. No P-value given.	This study demonstrates that persons with mild to moderate AD who experienced 12 weeks of specifically designed yoga showed significant improvements in endurance, range of motion, flexibility, balance, anxiety, stress, and depression.

Results

- There were six studies related to the effect of aerobic exercise and AD.^{1,2,4-7}
- Those with with AD who exercised three times weekly for one hour for sixteen weeks had a heart rate exercise intensity of 79.6%, which was associated with alleviating symptoms such as depression.⁵
- The results of anaerobic exercise found that older aged women with AD who participated in yoga as a form of physical exercise demonstrated significant improved memory training.³

Conclusion

- For aerobic exercise, there was a strong correlation of increased functional ability when completing aerobic exercise and stretch and toning.⁶
- Aerobic exercise affected NPS for those between the ages of 52-83 years and resulted in a reduction in oxidative stress and neuroinflammation.⁵
- Anaerobic exercise from a three-month clinical trial of yoga on memory and brain morphometry in women demonstrated an increased risk of developing AD.³

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