

A critical appraisal of “Aerobic exercise for Alzheimer’s disease: A randomized controlled pilot trial”

By

Martin A. Santiago Casas, SPT

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Department of Physical Therapy

Angelo State University

Member, Texas Tech University System

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Abstract

My goal while appraising this article was to determine the effectiveness and validity of the study itself while also determining the clinical implications this research can have on the field of physical therapy. As future physical therapist, I will need to be able to discern what evidence is credible and relevant versus what is not. Morris 2017 is a research article explaining the effects of aerobic exercise on memory and cognitive functioning. It is through my appraisal that I determined that this research study was designed in a way to lead to future implications for the role of physical therapy in populations with Alzheimer's disease. Although the experiment was testing for multiple outcome measures, they are all potentially clinically significant and can lead to future studies. While nothing was entirely conclusive, this research study suggests aerobic exercise can improve memory function and brain health.

Key words

Memory, outcome measure, geriatric, bias, experimental design

Introduction

Alzheimer's disease is an insidious pathology that deteriorates the brain, memory, cognitive functioning, and even somatic functionality of those are diagnosed. Although this disease primarily affects older populations, it rapidly increases the physiological and mental decline much faster than the natural rate. The severity of the symptom progressions combined with the lack of preventative measures and significantly effective treatment methods leaves much opportunity to research how to mitigate Alzheimer's disease. The goal of the experiment explained in 2017 Morris et al. was to investigate any potential benefits aerobic exercise has on patients with Alzheimer's disease. Because aerobic exercise is generally a low-cost and widely available treatment method, the implications for physical therapy and its role in geriatric populations could be significantly increased. It is my goal to interpret the implications of this study's results and answer the question: does aerobic exercise significantly improve cognitive functioning in patients with Alzheimer's Disease in comparison to sedentary individuals with the same impairment?

Methods

Before arriving to my current research question, I initially was searching for the various treatment options for Alzheimer's disease and how they compare to exercise. I first began searching for the answer to my question by using the database PubMed. I initially did a broad search using keywords such as "exercise and dementia", "benefits of physical activity", "prescription medications for Alzheimer's disease" "treatments for Alzheimer's disease". After reading through various articles, I refined my question to specifically determine the affects aerobic exercise has on the cognitive functioning of patients with Alzheimer's disease. From that

point, I was able to narrow down my search using filters that could give me more specific information about my interest. The filters I used included “full-free texts”, “meta-analysis”, and “randomized control trial”. I was mainly looking for studies that had minimal bias and were available at no cost to me. For my search inclusions, I was mainly looking for aerobic exercise as it generally a more practical intervention option than other forms of exercise. I also did not feel the need to make any population exclusions because Alzheimer’s disease is mainly prevalent in older populations, and I was not interested in between differences within the pathological population. With my search criterion, I hit 23 articles that I believed to be sufficient in finding the answer to my refined research question.

After analyzing the 23 research articles, I determined 2017 Morris et al. to be an article with implications on the future studies of Alzheimer’s disease and deemed it worth a critical appraisal. The study took place between 2014-2015 in Kansas, USA while the article was published in 2017 by PLOS one and authored by Jill Morris et al. I chose this article to critically appraise because I determined the study to be designed appropriately for what the study was aiming to achieve. Despite being a pilot study, the research plan was executed with high quality and resulted in potentially significant clinical applications. In general, randomized control trials are difficult to carry out in a practical manner. Although the methods by which the subjects were assessed in this study were extensive, I believe such testing can represent a new clinical standard if we want to better understand how to treat Alzheimer’s disease.

Results

Summary of the study

This experiment aimed to determine if physical exercise can potentially be an effective treatment option for patients with Alzheimer's by improving cognition and memory. The experiment was carried out over the course of 26 weeks on 76 patients with Alzheimer's disease participating. The control group was provided non-aerobic stretching and tone control each week, while the experimental group was provided 150 min of supervised aerobic exercise per week. To assess patient memory, executive functioning, depression, and functional ability, neuropsychological tests and surveys were conducted at the beginning of the study, 13 weeks in, and on the last week of the study. To assess any physical changes in patients, cardiorespiratory tests and brain MRIs were performed at the beginning of the study and the last week of the study. The study determined there were no significant differences in memory or executive function between the two groups. However, further analysis of the results found that increases in cardiorespiratory fitness (peak VO₂) had a significant correlation with functional ability, memory performance, and decreased brain atrophy.

Appraisal of the study introduction

The introduction is written coherently and provides a strong initial argument for the need for additional and more effective treatment options for Alzheimer's disease. The authors also did well in providing credible literary sources that backup the potential reasonings for why aerobic exercise has the potential to be a viable treatment option. Using the data from these supporting sources, the authors establish a solid foundation of background knowledge on the effects of Alzheimer's and how exercise can influence the physiology of the brain. The researchers also clearly indicate what the variables and outcome measures are and what they hypothesize the relationship will be.

The only drawback of the introduction in this article is that it is lacking keywords. The keywords would be beneficial for directing the reader to any reference points within the article that can give insight as to what information the article contains throughout.

Appraisal of the study methods

From beginning to end, the experimental procedure for this study was executed with high standards and care. For starters, the subjects recruited were heavily screened to ensure consistency of sociodemographic, clinical, and prognostic characteristics. The subjects were then randomized and stratified by age and sex while also blinded from outcome assessors to minimize any potential bias. The groups were also managed the same way aside from the experimental intervention. The intervention of aerobic exercise was also standardized by way of a protocol manual meant to be used by exercise trainers. To ensure this protocol was carried out properly, the research staff performed bi-weekly visits to the experiment locations to monitor subjects and trainers. The last strength to be identified in the methodology of this experiment are the outcome measures and the instruments used to measure them. All assessments were described in detail as well as the evidence backing the validity of each measuring tool.

Despite being an overall strong experimental procedure, the methods section in this article is lacking in the description of the intervention of the experimental group. The reader can understand that the intervention is aerobic exercise, but there is no supplemental detail to define what the training sessions consisted of. Because of this lack of detail, this experimental design cannot be replicated to be 100% accurate as the original. It would have been helpful to provide information on type of exercises, rest intervals, frequency, and progressions.

Appraisal of the study results

The results section of Morris 2017 are written clearly and have easy to understand tables that provide supplemental statistics. The information provided directly address the research question by identifying the outcome differences and/or similarities between the control group and

experimental group. With any significant differences between the groups, the p-value as well as the confidence interval were also provided.

The one weakness of the results provided was the lack of a minimal clinically important difference (MCID) for any significant differences between the control and experimental groups.

Without an MCID, the reader is left to either assume the clinical significance or insignificance of the statistical findings or do additional research on his/her own.

Appraisal of the study discussion

The authors were thorough, explanatory, and objective in their discussion section. They attempted to provide an explanation for the experimental conclusions and use credible literature to back their explanations. If any question was left unanswered, they used the lack of information as an opportunity to make inferences that can potentially be used as future hypothesis for similar studies on Alzheimer's disease. The authors were fully aware the experiment was not perfect and were forthright in the limitations in the experimental design and how these limitations can be addressed with future experiments. Lastly, and maybe most important, the authors addressed the clinical significance of the study in that cardiorespiratory fitness can be an indicator of memory function and brain volume.

The only weakness worth mentioning about the discussion section is the potentially weak literatures cited. There weren't many, but a few references could be considered outdated although the information may not be disproven.

Discussion

This study has potential clinical implications for the field of physical therapy because the results suggest that cardiorespiratory gains are beneficial to memory and brain volume. As movement specialists, physical therapists have primed knowledge on how exercise affects the body. To aid in patient recovery of functionality, we can use our knowledge and skills to manufacture exercise programs that can potentially rehabilitate functioning of the brain and the body. Especially because Alzheimer's is a disease that primarily affects geriatric populations who are more commonly afflicted with other impairments and pathologies, physical therapists can be highly valued for their expertise in modification and application of safe exercise. Thus, the findings in Morris 2017 provides an argument that physical therapy can be a beneficial treatment option for patients with Alzheimer's disease. If we can learn more about how the brain responds to fitness level and various forms of exercise, cognitive impairments such as Alzheimer's disease may be able to be effectively treated with appropriate aerobic exercise programming.

Based on the findings of this study, I believe the intervention aerobic exercise as a treatment option for patients with Alzheimer's disease should be used. The potential benefits of increased memory function and increased brain volume far outweigh the risks of any adverse effects. If the exercise is carried out in an appropriate and safe manner, the risk of injury would be minimal. As far as the evidence suggests, there are no negative outcomes to professionally prescribed aerobic exercise. After becoming a professional physical therapist who excels in the biomechanics and physiological processes that take place in the human body, prescribing a healthy dose of aerobic exercise should be relatively simple for most patients even if they have mild cognitive impairments such as Alzheimer's disease. Even if the benefits of enhanced memory and increased brain volume are not clinically significant, cardiorespiratory gains would be beneficial to patients' overall health.

All in all, Morris 2017 is a valuable research article that is a great starting point for investigating the effects of aerobic exercise on patients with Alzheimer's disease. Although it is difficult to design a practical randomized control trial to measure multiple experimental outcomes, this study was managed well and did not contain any significant bias worth mentioning. This study's findings should be considered valid in creating inferences for future studies. While not entirely conclusive, the findings also create a potential argument for why physical therapists should have a role in health care specifically for patients with dementia.