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## Is Exercise Beneficial to the Functionality of Elderly Individuals?

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# **Is Exercise Beneficial to the Functionality of Elderly Individuals?**

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies  
Philadelphia College of Osteopathic Medicine  
Suwanee, Georgia

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## **ABSTRACT**

**OBJECTIVE:** The objective of this selective EBM review is to determine whether or not exercise improves the functionality of elderly individuals.

**STUDY DESIGN:** A review of three peer-reviewed studies published between 2012 and 2018.

**DATA SOURCES:** One unblinded randomized controlled trial, one blinded randomized control trial, and one matched-control group with randomized groups to show if exercise is beneficial to the functionality; focusing mainly on physical health, of elderly individuals.

**OUTCOMES MEASURED:** The outcome measured in this study is the quality of life of the patients in regards to their physical health from questionnaires filled out by the participants.

**RESULTS:** The studies conducted by Lok N et al, Langois et. al, and Janyacharoen T, et. al proved that there is a statistically significant correlation between exercise and increased functionality of elderly individuals (all  $p < 0.05$ ).

**CONCLUSIONS:** The results of these studies are conclusive and support the correlation of exercise and increased functionality of elderly individuals.

**KEY WORDS:** Quality of life, elderly, and exercise

## INTRODUCTION

As people age, there is an increased incidence of frailty, or state of vulnerability<sup>1</sup>, seen in the aging process. These changes will limit the functionality of elderly individuals to perform activities of daily living.<sup>2</sup> Activities of daily living include physical health, housekeeping, cognition, and finance.<sup>1</sup> Population aging is accelerating rapidly worldwide, from 461 million people older than 65 years in 2004 to an estimated 2 billion people by 2050.<sup>3</sup> In the last 12 months of life, average medical spending is \$59,000, accounting for 16.8 percent of spending at ages 65 and over and for 6.7% of spending at all ages.<sup>4</sup> The cost depends on the assisted living facility, the services offered, and amount of services required on a monthly basis. According to Genworth Financial, the average cost of assisted living in 2018 was \$4,000 per month.<sup>5</sup> Due to their frailty and overall decreased functionality, elderly patients in the overall population of the US consist of 81.9% of residents in home health agencies and 83.5% of nursing home residents.<sup>6</sup> Elderly individuals see doctors on average twelve times per year, and nearly 80 percent see a primary clinician at least once per year.<sup>6</sup>

Aging is unavoidable for all of the population and with increased age there is increased risk for adverse outcomes such as falls, hospitalization, death, and disability.<sup>1</sup> Aging causes a decrease in exercise capacity, poor muscle strength, restricted flexibility, and decreased bone mass.<sup>2</sup> Therefore, various conditions affect the elderly which decrease their functionality such as osteoporosis and osteoarthritis. For the elderly, treatment options are palliative, or to increase comfort towards end of life, including admission to assisted living, home health agencies, or service animals. There are medicinal options such as bisphosphates and calcium for bone mass and NSAIDs and opioids for pain. Treating the underlying causes and comorbid conditions proved to be helpful in increasing functionality. Exercise proved to help with the decrease in

muscle mass and range of motion in the elderly. Currently there is no concrete evidence of what method would increase the quality of life of elderly individuals; however, articles suggest that there is an increase in functionality if the patient uses a scheduled exercise regimen. Specifically, elderly individuals enrolled in exercise regimens will increase their physical health.

## **OBJECTIVE**

The objective of this selective EBM review is to determine whether or not “Is exercise beneficial to the functionality of elderly individuals?”

## **METHODS**

One unblinded randomized controlled trial, one blinded randomized control trial, and one matched-control group with randomized groups was evaluated in this review. These studies consisted of aged individuals averaging 65 years of age or older that could perform physical exercise at low risk. Janyachoen, et. al, used an open labeled randomized control trial. Over the course of 12 weeks, an ancient boxing instructor led the experimental group workouts three times per week. These workouts consisted of a 5-minute warm up, 30 minute dance, and 5 minute cool down. The control group was told to continue their daily routines without instruction. Both groups completed a pre and posttest at the beginning and end of the experiment using the World Health Organization Quality of Life-BREF-Thai version (QOL), which is completed by the individual for comparison and data collection.<sup>6</sup>

Lok, et. al. conducted a single blind randomized controlled trial to compare the effectiveness of physical activity for 10 weeks. This program consisted of 10 weeks of physical activity. Four times per week the experimental group completed a 10-minute warmup, 20-minutes of rhythmic exercises, 10-minutes of cool down, and 30-minutes of walking. The control group did not have any instruction during the duration of the experiment. The experiment and

control group were to complete a pre and posttest through the SF-36 Quality of Life Questionnaire.<sup>7</sup>

Langlois et. al conducted a matched-control group design with randomly assigned participants. The training program consisted of 12 weeks of one-hour exercise sessions three days a week. Each session contained 10 minutes of warm ups, 10-30 minutes of aerobic workouts, 10 minutes of strength training, and 10 minutes of cool down exercises. The control group was instructed to maintain their current level of activity. Pre and posttest assessments were completed by the individual one week before and after the experiment using the Quality of Life Systemic Inventory Questionnaire.<sup>1</sup>

All the studies mentioned above were found through Pubmed and Cochrane using the keywords: quality of life, elderly, and exercise. Articles are selected based on clinical relevance to the question and if considered patient oriented (POEMS). Inclusion criteria for these articles were randomized control trials with the exclusion criteria of patients under the age of 60. The statistics reported used Z-Scores, p-values (<0.05 considered clinically significant) and mean +/- standard deviation. Table 1 below shows the characteristics and demographics of the studies included in this review.

**Table 1 - Demographics & Characteristics of Included Studies**

Study	Type	# Pts	Age (yrs)	Inclusion	Exclusion	W/D	Intervention
Janyacharoen, et.al. <sup>6</sup>	Open labeled RCT	56	68.6 +/- 6.8yrs	60 years old able to walk without assistance. No regular exercise in the past 2 months	Neurological impairment, Mini Mental Status Exam (MMSE) scored less than 24, severe CVD, persistence	0	12-week ancient boxing instructor led. 5 minute warm up, 30 minute dance, 5

					joint pain, musculoskeletal impairment, meds that affect balance, or pain scale greater than 5/10		minute cool down. 3x per week.
Lok, et. Al <sup>7</sup>	Single-blind RCT	80	>65 years	Written informed consent and a score of at least 10 via the Beck Depression Inventory	Sensory disability, physical impairment or disability that will affect participation, participating in a similar program, and failing to participate in at least 2 sessions.	0	10 weeks of physical activity. 10-minute warmup, 20 minute rhythmic exercises, 10 minute cool down, and 30 minute walking. 4x/week
Langlois, et. Al <sup>1</sup>	Matched control group with random assignment	83	61-89	Geriatric assessment to make sure they can perform in exercise: 2/3 frailty criteria	Those limited to take a physical exercise program, signs of dementia (<25 on MMSE), or depression (>10 on Geriatric depression scale)	11	12 weeks of 1hr exercise 3x/week. 10 min warmup, 10-30-minute aerobics, 10 min strength, 10 minute cool down.

**OUTCOMES MEASURED**

The outcomes measured were based on a patient oriented evidence that matters (POEM). This evidence based medicine (EBM) review measured the outcome of improvement in functionality in elderly individuals. The groups each completed a questionnaire that focused on the individual’s perception on multiple aspects, but for the purpose of this review only the responses regarding the physical health of the individual were used. Among the three review

articles, functionality was measured using the World Health Organization Quality of Life-BREF-Thai version (QOL), which is completed by the individual for comparison and data collection. The QOL contained four domains including physical, psychological, social relationship, and environment aspect and has a score of 25 in each domain which totals to 100 indicating the QOL of the individual. Both groups completed a pre and posttest at the beginning and end of the experiment using the World Health Organization Quality of Life-BREF-Thai version (QOL), which is completed by the individual for comparison and data collection.<sup>6</sup> Another questionnaire completed was the SF-36 Quality of Life Questionnaire which focused on the physical health, physical role, pain and general health perception of the individual to be completed by the individual and totaled. Lower scores of the SF-36 indicated a lower quality of life. The experiment and control group were to complete a pre and posttest through the SF-36 Quality of Life Questionnaire.<sup>7</sup> The final questionnaire used to assess the functionality of the individual was the Quality of Life Systemic inventory questionnaire to assess the capacity to achieve personal goals in 28 life domains and provide quality of life scores in nine dimensions. Pre and posttest assessments were completed by the individual one week before and after the experiment using the Quality of Life Systemic Inventory Questionnaire.<sup>1</sup> These tests were given at the beginning of the experiment and at the end of the trial for comparative data and statistical analysis.

## **RESULTS**

All studies included elderly individuals that underwent an assessment to ensure that they could complete the exercise program at a low risk. All three studies had an experiment group and a control group for comparison. Janyacharoen, et. al, used an open labeled randomized control trial with the control group receiving education with “regard to the exercise and home program to aid in daily practice”.<sup>6</sup> Lok, et. al. conducted a single blind randomized controlled trial to



compare the effectiveness of their activity program with the control group receiving no intervention.<sup>7</sup> Langlois et. al conducted matched-control group design which participants were randomly assigned with the control group and told to continue maintaining their personal level of exercise.<sup>1</sup>

Janyacharoen, et. al used mean +/- standard deviation for comparison of the “physical domain” to evaluate the results of the intervention. Week 0 showed baseline values at 22.3 +/- 2.4 with week 12 showing values of 25.6 +/- 3.2. These values showed a precise change with the with a p=0.029 which showed statistical significance that these results were not due to chance.<sup>6</sup>

Lok, et. al used Z-scores calculated from mean scores for comparison of the “physical health” of the two groups to evaluate the results of the intervention. Tat baseline the experimental group scored a 50. Post intervention the scores increased to 70 with a Z-score of 2.809. Comparing to the Z-score to the control, there is a calculated p = 0.001 that shows statistical significance.<sup>7</sup>

Langlois et. al used Z scores calculated from F-scores which showed a Z-score change in the individual’s perception of physical health to 0.44. This shows the clinical intervention to be narrow with a p = 0.04. The p value of 0.04 means there is statistical significance and these values were less likely due to chance.<sup>1</sup> Table 2 shows the comparison of the three interventions.<sup>1</sup>

**Table 2: Summary of Results**

<b>STUDY</b>	<b>Control group</b>	<b>Intervention Group</b>	<b>p-value</b>
Janyacharoen, et. al <sup>6</sup>	Week 0 mean/Standard deviation = 22.7 +/- 3.0 Week 12 mean/standard deviation = 21.2 +/- 2.3	Week 0 mean/Standard deviation = 22.3 +/- 2.4 Week 12 mean/standard deviation = 25.6 +/- 3.2	0.029
Lok, et. al <sup>7</sup>	Z value = 48.157	Z value = 2.809	0.001
Langlois et. al <sup>1</sup>	Z-score change = -0,24	Z-Score change = 0,21	0.04

The study by Janyacharoen, et. al was conducted with elderly individuals from a local community center. Those included were individuals older than 60 years old, can walk at least 10 meters without assistance, and have not engaged in regular exercise in the past two months. Patients were excluded if they presented with neurological impairment, Mini-Mental State examination score less than 24, severe cardiovascular disease, and significant impairment that would not allow them to complete the program. No patients were reported to be withdrawn from this study.<sup>6</sup> Lok, et. al conducted their experiment using individuals from a nursing home whom were at least 65 years old and excluded those who have sensory disabilities, impairment that would not allow them to complete the program, individuals who have completed a similar trial, and those who fail to participate in two sessions of the program. No patients were reported to be withdrawn from this study.<sup>7</sup> Langlois et. al completed their program in an outpatient setting with individuals aged 61-89 and excluded those who showed limitations or impairment to complete the program, signs of dementia, or depression. 11 patients were withdrawn from this study due to schedule conflicts and medical and personal conflicts.<sup>1</sup> There were no reported adverse events or safety concerns during the duration and completion of the experiments.

## **DISCUSSION**

Aging is an inevitable progression of life. Without proper care, the ability to complete everyday tasks such as walking up stairs and cleaning will become more difficult. Current treatment regimens are not specific to increase the overall functionality of the individual, but rather to target one of the various conditions, such as osteoporosis and progressed arthritis, that may be causing decreased functionality. If physically able, completing an exercise routine will help combat the decreased functionality that occurs during the aging process.

The objective of this systematic review is to see if exercise increases the functionality of elderly individuals. Although all three articles chose different trial methods such as blinded vs. unblinded vs. matched, all three articles showed statistical significance in the improvement of functionality of elderly individuals participating in the exercise programs. Janyacharoen, et. al study stated a significant improvement in the physical functioning and the style of exercise, Thai boxing, is more suited for elderly individuals and is inclusive of other ethnicities interested in boxing.<sup>6</sup> Lok, et al. stated even though in the beginning the control group and experimental group scored the same in the physical health there was a significant increase in the physical health of individuals completing the exercise.<sup>7</sup> Langolis et. al showed similar results, however the exercises were individualized and adapted to the needs of the participant, which were noted to be a benefit to increased scores.<sup>1</sup> Overall, all three articles confirmed an increase in functionality in the elderly individuals who exercised regularly.

Although there is major benefit to the findings within the articles and they were all shown to be safe and effective, there were limitations to these studies. One limitation is all three studies were completed in a 10-12-week regimen. These may show an increase in functionality; however, it does not show longevity in the studies and if there will be longer lasting effects. Also, all three groups chose people who were healthy and could complete the exercise; therefore, these studies do not show if this specific modality would help those with disabilities. The selection process of individuals was also subjective as there was no standardized selection process and left mainly to the physician to choose individuals for the study. This selection process will allow the physician to discard any individuals with a potential to skew scores, although they may be considered healthy, in order to maximize results. Lok et. al, noted that since the study was completed in a nursing home, the results could not be generalized to the

major population.<sup>7</sup> Lok et. al study also noted a possibility of interaction due to the close quarters, which could skew results.<sup>7</sup> All three of the studies used a different method of exercise, which is helpful to show any exercise will benefit the elderly but does not show a standard for the data. Finally, three different types of questionnaires allow for varied responses. This variation is a limitation, as they all were scored differently, which proves difficult when comparing data.

## **CONCLUSION**

Based on the results of the three studies, exercise has shown to increase the functionality of elderly individuals physical health. The p-values showed a statistical significance and the results were not due to chance and are reliable. Even though the three studies had their own exercise regimen and selection process, each study proved there is an improvement in the individuals' functionality.

As simple as a regulated exercise regimen seems, it shows major benefit to individuals who complete such a regimen. Although this systemic review only focused on the physical health of the individuals, there is also an increase in overall quality of life including mental health. Therefore, whether in an inpatient setting or at home, elderly individuals should partake in regular exercise to maintain their functionality. All three studies did show improvement in the functionality of the elderly individuals, but due to the time restraint there was no mention of longevity of the studies. Future studies should include longer length of study to see if there is a continuing increase in those who complete the study. Future studies should standardize their selection process in order to decrease the subjectivity of the physician. There should be adaptability in the study to show if there is a benefit to individuals with disabilities in order to increase inclusivity. Overall, exercise is beneficial to the functionality of elderly individuals.

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