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Research Protocol: Effect Of Aerobic Exercises On Cognitive Performance Among Elders- A Randomized Controlled Trial

¹Gnana Leonarld D, ²Dr. Malarvizhi S ³Dr. Maria Thresea ⁴Dr. Annal Angeline G

¹PhD Scholar, ² Professor cum HOD- Medical and Surgical Nursing Department, Assistant Registrar, ³ Professor cum Vice Principal ⁴ Professor cum Principal

^{1,2,4} College of Nursing- Pondicherry Institute of Medical Sciences (Affiliated to Pondicherry University, Puducherry) ³ Mother Theresa Post Graduate & Research Institute of Health Sciences (Affiliated to Pondicherry University, Puducherry)

Corresponding Author: Gnana Leonarld D, LCQ-13, Lowry Adventist College Campus, Dooravaninagar, Beside KR Pura Metro Station, Bengaluru-560016, Karnataka, India.

Abstract: Background: As adults age cognitive function declines. Physical exercise has emerged as a viable approach to prevent cognitive decline and the incidence of associated disorders such as dementia. Regardless of cognitive state, supervised physical activity can improve cognitive performance in persons over 50 years. Aim: The primary objective of the study is to determine the effect of aerobic exercise on cognitive performance of elders above 60 years of age. Methods: About 260 elders will be recruited using simple random sampling technique. Out of these 130 elders each will be randomly allocated into experimental group and control group respectively. A single blinded randomly controlled trial- parallel group design will be used for the study. After the pretest assessment of elders in both the groups, elders in the experimental group will be taught and encouraged to practice aerobic exercise for 12 weeks (3 months). During this period elders in the control group will continue with their usual activities. After 12 weeks post test assessment will be conducted in both the groups. And the elders in the control group will be taught and encouraged to practice aerobic exercises thereafter. Results: Data will be analyzed using inferential and descriptive statistics. Results will be prepared by the researcher using tables and figures according to the objectives of the study. Conclusion: The researcher will make conclusions based on the outcome of the study. It is assumed that the cognitive performance of the elders in the experimental group will be improved at the end of 12 weeks of practicing aerobic exercise.

Index Terms - Component, formatting, style, styling, insert.

1. INTRODUCTION

All forms of knowing and awareness, such as perceiving, conceiving, remembering, reasoning, judging, imagining, and problem solving, are referred to as cognitive processes. It is one of the three conventionally recognised elements of mind, together with affect and conation.[1]

Cognitive function is a general phrase that encompasses the mental processes involved in reasoning, information manipulation, and knowledge acquisition. Language skills, perception, memory, learning, attention, and decision-making are all areas of cognitive processes.[2]

The mental skills required to do any task, no matter how simple or complex, are known as cognitive talents. Our cognitive capacities steadily decline with age. Age-related cognitive deterioration is a common occurrence. However, dementia will develop in certain persons as a result of a significant decline in cognitive abilities. It may become impossible to handle routine daily duties as a result. The rate at which the brain and other parts of the body deteriorate with age varies widely among individuals. Identifying the risk factors for, and mechanisms of, individual differences in age-related cognitive decline is amongst the

greatest challenges to improving the health of older people. The spectrum of deterioration goes from normal cognitive ageing to the dementias. The biochemical underpinnings of cognitive ageing throughout the range, delayed information processing, and multitasking are unclear, creating a huge explanatory vacuum in this growing health issue. [3]

Mental capacities change throughout life, first as a result of brain maturation and later with aging of brain cells and their billions of complex interconnections. As people age, their movements and reflexes slow and their hearing and vision weaken. Certain cognitive abilities show at least a small decline with advanced age in many, but not all, healthy individuals.[4]

Many of our cognitive capacities begin to gradually deteriorate as we become older. These include deficits in short-term working memory, processing speed, memory and information retrieval, problem-solving skills, and concentration. Modifying the several modifiable risk factors that are frequently linked to the onset of dementia may be able to halt or even stop cognitive decline. Certain activities can be carried out and steps made to slow down and, in certain situations, even improve cognitive deterioration in healthy older adults.[5]

As adults age cognitive function declines. Physical exercise has emerged as a viable approach to prevent cognitive decline and the incidence of associated disorders such as dementia. Regardless of cognitive state, supervised physical activity can improve cognitive performance in persons over 50 years. Programs that combine resistance training and aerobic exercise, take place as often as possible throughout the week, and involve at least 45 minutes of moderately intense exercise may be beneficial.[6]

2.NEED & SIGNIFICANCE:

The United Nations General Assembly has declared 2021-2030 as the Decade of Healthy Ageing.[7] The United Nations Decade of Healthy Ageing (2021-2030) is a global collaboration, aligned with the last ten years of the Sustainable Development Goals that brings together governments, civil society, international agencies, professionals, academia, the media, and the private sector to improve the lives of older people, their families, and the communities in which they live. Initiatives undertaken as part of the Decade will seek to: change how we think, feel and act towards age and ageing; facilitate the ability of older people to participate in and contribute to their communities and society; deliver integrated care and primary health services that are responsive to the needs of the individual; and provide access to long-term care for older people who need it.[8]

The population of those 65 and older is expanding more quickly than any other age group on a global scale. One in six persons worldwide will be over 65 (16%) by 2050, up from one in eleven in 2019 (9%), according to data from World Population Prospects: the 2019 Revision. In Europe and North America, one in four people may reach 65 years of age or older by 2050. For the first time in history, those 65 and older have outnumbered children less than five years worldwide in 2018. According to projections, the population of people 80 years of age or older will quadruple from 143 million in 2019 to 426 million in 2050.[9]

In Asia as a whole, the proportion of the elderly is expected to increase from 10.5 percent to 22.4 percent during 2012–2050. In East Asia, the proportion of the elderly is expected to be 34.5 percent by 2050. Japan (41.5 percent), South Korea (38.9 percent), China (34 percent) may be expected to report the highest proportions of the elderly population in the region by 2050. The South Asian Association for Regional Cooperation (SAARC) countries, however, is likely to have only about 21 percent population above 60 years by 2050. Within the SAARC, Bangladesh (22.4 percent), Bhutan (24.1 percent), Maldives (31.2 percent) and Sri Lanka (27.4 percent) are estimated to overshoot the SAARC average for the statistic by 2050. [10]

Between 2012 and 2050, the percentage of elderly people in Asia is predicted to rise from 10.5% to 22.4%. By 2050, the percentage of elderly people in East Asia is predicted to reach 34.5%. By 2050, it's possible that China (34 percent), South Korea (38.9 percent), and Japan (41.5 percent) will have the largest percentages of the senior population in the region. However, by 2050, only over 21% of the population of the South Asian Association for Regional Cooperation (SAARC) countries is expected to be over 60. By 2050, the SAARC average is predicted to be exceeded by Bangladesh (22.4 percent), Bhutan (24.1 percent), Maldives (31.2 percent), and Sri Lanka (27.4 percent). [11]

According to a cross-sectional study, the prevalence of cognitive impairment in South India was 31.0% (34.7% for women and 23.4% for men); age, gender, literacy, and economic level all showed significant disparities.[12] People who were exposed to sedentary conduct had a 30% increased chance of developing

dementia than people who had not observed such behaviour. A number of chronic conditions that were linked to cognitive decline and dementia risk were also linked to sedentary activity.[13]

Exercise and physical activity have been identified as promising strategies to enhance cognitive function in senior citizens. However, the mechanisms underlying these cognitive benefits are not well known, and there are currently no guidelines for physical activity that seek to improve cognitive function.[14]

3. AIM AND SCOPE OF THE STUDY:

3.1 Novelty:

The effect of aerobic exercises on cognitive performance among elders in Indian perspective is assessed.

3.2 Purpose of the study:

The purpose of the study is to elicit the effect of aerobic exercises on cognitive performance among elders.

3.3 Problem statement:

A Study to Assess the Effect of Aerobic Exercises on Cognitive Performance Among Elders residing at Old Age Homes, Bengaluru Urban District, Karnataka, India.

3.4 Research question:

“Does Aerobic Exercises Have an Effect on Cognitive Performance among Elders?”

3.5 Objectives:

- 1) To assess the level of cognitive performance of elders in experimental and control group before practicing aerobic exercises.
- 2) To determine the effect of aerobic exercises on cognitive performance among elders staying at old age home.
- 3) To associate the pretest level of cognitive performance with the selected socio- demographic variables of elders staying at old age home.

3.6 Hypothesis:

1H₁- There is a significant difference between the mean cognitive performance scores of elders before and after practicing aerobic exercises in the experimental group as compared to the control group.

2H₁- There is a significant association between the level of cognitive performance before practicing aerobic exercises among elders and their selected socio-demographic variables.

4. CONCEPTUAL FRAMEWORK:

Conceptual framework for the study is based on Modified Ernestine Weidenbach's Helping Art Theory (1964).

5. METHODOLOGY:

- **Approach :** Quantitative approach
- **Study design:** Randomized Controlled Trial- Parallel Group design
- **Setting :** Old Age homes, Bengaluru Urban District, Karnataka
- **Population:** Elders who are above 60 years of age
- **Target population:** Elders who are above 60 years of age
- **Accessible population:** Elders who are above 60 years of age staying in old age homes, Bengaluru Urban District, Karnataka.
- **Sample:** Elders staying in old age homes who fulfil the inclusion criteria

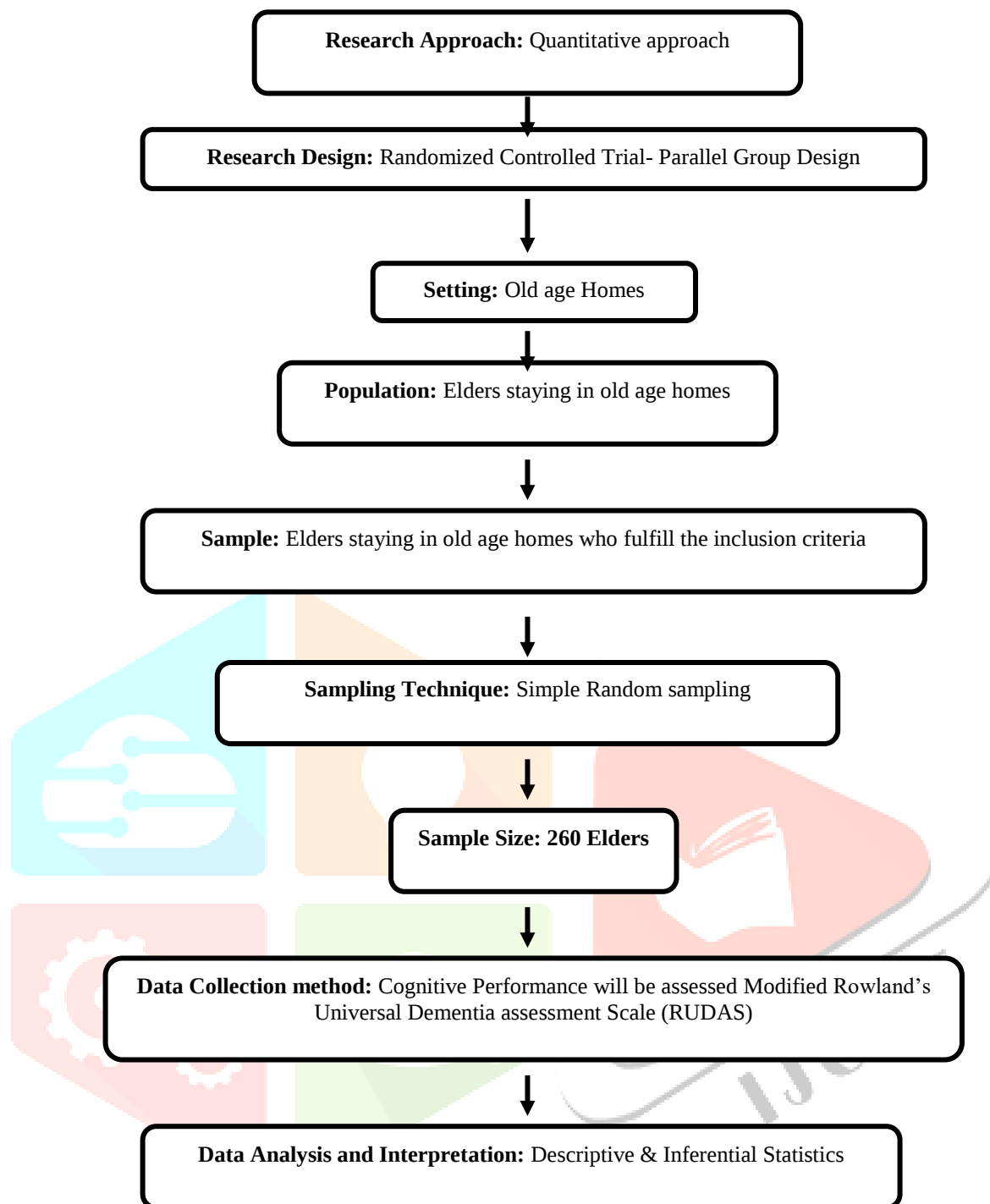


Fig 1: SCHEMATIC REPRESENTATION OF RESEARCH METHODOLOGY

5.1 Sampling:

a) Sample size calculation:

Sample size:

- The sample size for the study is 260 elders (130 in experimental group and 130 in control group)
- Sample size estimation was determined using the following formula:

$$n = \frac{(\sigma_1 + \sigma_2)^2 [Z_{(1-\alpha/2)} + Z_{(1-\beta)}]^2}{(m_1 - m_2)^2}$$
- The sample size was determined based on previous similar studies done by Holthoff et al⁴².
- The level of significance (α) was kept at 0.01 and the power (β) at 0.1.
- The standard deviation of the outcome variable in group I (σ_1) was 2.2 and the standard deviation of the outcome variable in group II (σ_2) was 2.13.

b) Sampling Technique: Simple Random sampling for selecting the old age homes.

Simple Random Sampling: (Lottery Method) for assigning old age homes to experimental & Control group

Sampling criteria:

Inclusion Criteria	Exclusion Criteria
Elders who are willing to participate in the study	Elders With physical disabilities that interferes with activities to be followed
Elders who are aged 60 –70 years of age	Elders with psychiatric illnesses who are aggressive, uncooperative and violent
Both male and female elders	Elders who are under those medications which suppresses movements
Elders who are able to walk for 30 minutes	Elders with sensory impairment such as visual and hearing impairment
Elders who are able to sit	Elders who are bed ridden

5.2 Tools and Techniques:

Section I: Socio demographic variables

Demographic variables in the study include: Age, gender, educational status, Marital status, Habit of alcohol consumption, Habit of smoking, Practice of Exercise, Engagement in social activities, having children, Diet, Co-morbidities, Hours of sleep, Duration of stay in old age home.

Section II: To assess the cognitive performance of elders Rowland's Universal Dementia assessment Scale (RUDAS) will be used. The different domains of cognitive function assessed, the tasks used to assess these domains and the corresponding scoring points for each domain are as follows:

Cognitive domains	Tasks	Sub-total score
Visuospatial Orientation	Assessed by asking the participants to identify different parts of the body	5
Praxis	Assessed by asking the participants to copy actions	2
Visuo-constructional drawing	Assessed by asking the participants to draw a given figure	3
Judgement	Assessed by asking the participants to express what will be their action in a given scenario	4
Memory Recall	Assessed by asking the participants to recall certain number of grocery items that was taught to them earlier	8
Language	Assessed by asking the participants to mention the names of animals starting with a specific alphabet	8
	Total Score	30

Scoring:

S. No	Score	Interpretation
1	25-30	Normal Cognitive function
2	20-24	Mild Cognitive Impairment
3	15-19	Moderate Cognitive Impairment
4.	Less than 15	Severe Cognitive Impairment

5.3 Data Collection procedure:

Ethical clearance will be obtained from Institutional Ethical Committee. Old age homes will be selected using stratified random sampling technique. Permission will be obtained from the concerned authorities of old age homes. A written consent will be obtained from the study participants after explaining about the data collection procedure. An information sheet containing information about the research project will also be given to the participants. All doubts regarding the intervention or the data collection procedure will be clarified. Study samples will be recruited for experimental and control group from separate old age homes using simple random sampling method (lottery method.) An initial assessment of the cognitive performance of the elders in both the experimental and control group will be done using Rowland's Universal Dementia Assessment Scale (RUDAS) After this elders in experimental group will be taught and encouraged to practice aerobic exercises by the principal investigator. Elders in the control group will be asked to carry on with their usual activities. To ensure that the intervention is practiced by the participants, the investigator would personally supervise the elders for the first few days. Once the participants become familiarized with the intervention, the participants would be organized into small teams and team leaders will be assigned to supervise the intervention from thereon. The researcher would visit the old age homes once in a week thereafter. Post test assessment of cognitive performance of elders in the experimental group and control group will be conducted after four months. There will be one interim assessment of cognitive performance at the end of two months. Elders in the control group will be taught and encouraged to practice aerobic exercises after the post test assessment of cognitive performance.

Stages	Experimental Group	Control Group
Pre-test	Cognitive performance of elders assessed using modified Rowland's Universal Dementia assessment Scale (RUDAS)	Cognitive performance of elders assessed using modified Rowland's Universal Dementia assessment Scale (RUDAS)
Intervention	Aerobic Exercises which includes: Warm up exercises and stretching exercises such as slow marching, slow marching with arm swing and arm lift for 10 minutes. Brisk walking for 20 minutes in the first month, 25 minutes in the second month and 30 minutes in the 2 months. Cool down exercises including slow marching and stretching as in the warm up session for 5 minutes. Each session may last for about 30 -45 minutes, practiced for a total of 4 months.	Usual Activities

Post-test	Cognitive performance of elders assessed using modified Rowland's Universal Dementia assessment Scale (RUDAS)	Cognitive performance of elders assessed using modified Rowland's Universal Dementia assessment Scale (RUDAS)
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5.4 Plan for Data Analysis:

Data will be analyzed by descriptive and inferential statistics.

S. NO	OBJECTIVES	POSSIBLE METHODS OF ANALYSIS PLANNED
1.	To assess the level of cognitive performance of elders in experimental and control group before practicing aerobic exercises.	Frequency and percentage distribution
2.	To determine the effect of aerobic exercises on cognitive performance among elders staying at old age home.	Independent t test & paired t test
3.	To associate the pretest level of cognitive performance with the selected socio- demographic variables of elders staying at old age home.	Chi Square Test

6. ETHICAL CONSIDERATIONS:

Ethical considerations:

- Ethical clearance will be obtained from the Institutional Ethical Committee.
- Formal administrative permission will be obtained from the concerned authorities of Old age homes.
- Informed consent will be obtained from the elders those who are willing to participate in the study before the administration of the questionnaire.
- All participants will be given adequate explanation in the language comprehensible to them, the details of the study and the level of risk/ benefit associated with it.
- Privacy and confidentiality of the data will be maintained throughout the study.

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