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UNRAVELING THE INTERPLAY BETWEEN COGNITIVE FUNCTION AND PHYSICAL ACTIVITY IN OLDER ADULTS WITH LOW SOCIO-ECONOMIC STATUS

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Abstract

Background: *Mild cognitive impairment is an intermediate stage between normal cognitive aging and dementia, characterized by noticeable decline in memory, attention and executive functioning. Given the demographic transition toward an older population, there has been a parallel rise in cognitive health issues. Impaired cognition may progress towards irreversible conditions significantly affecting independence and quality of life.*

Objective: *The objective of the research was to investigate how physical activity impacts cognitive function in the elderly population.*

Methodology: *Sample of 123 participants with age group of 55-85 years was included for the survey, according to inclusion criteria. For the selection of participants, convenience sampling is used. MOCA scale and PASE scale were used to collect data about the cognitive function and physical activity respectively. An informed consent was signed by the participants stating that personal information of participants is confidential.*

Results: *SPSS version 22 was used to define the interplay between cognitive ability and physical activity. According to the findings, a significant correlation exists between cognitive function and physical activity ($p < 0.001$) among geriatric population.*

Conclusions: *The findings underscore the beneficial effect of physical activity on cognitive function in the elderly population. Promoting regular physical activity may serve as accessible strategy to prevent or delay cognitive decline*

INTRODUCTION

Cognitive Impairment is the clinical condition characterized by a marked decline in cognitive abilities that are normal age-related cognitive decline but has no impact on day-to-day functioning [1]. It is considered an intermediate stage between the normal cognitive changes associated with aging and the more severe cognitive decline seen in conditions such as Alzheimer's disease and other problems related to memory, attention, orientation etc. [2].

As the world population continues to age, the prevalence of conditions related to cognitive decline has emerged as a significant public health concern [3]. Mild cognitive impairment (MCI) is one of such conditions that has attracted considerable attention

due to its potential implications for the development of dementia. Understanding the nature, progression, and risk factors related to mild cognitive impairment is crucial to prevention, intervention, and early detection strategies [4].

Distinguishing between aging with MCI and normal aging can be challenging, as age-related cognitive changes can also cause some level of cognitive decline. However, MCI represents a more significant decline than expected for a person's age and educational level. It is essential to differentiate MCI from normal aging, as it serves as a potential prodromal stage for dementia. People with cognitive impairment have a higher risk of progressing to Alzheimer's disease. The precise reasons behind cognitive decline remain not fully understood. Many potential risk factors and underlying mechanisms are identified [5].

Early and accurate detection of MCI is crucial to provide appropriate interventions and improve outcomes. Various assessment tools and clinical criteria have been devised to aid in diagnosing cognitive impairment, encompassing comprehensive cognitive tests, medical assessments, and discussions with both patients and caregivers. Additionally, neuroimaging techniques like magnetic resonance imaging (MRI) and positron emission tomography (PET) can assist in identifying structural and functional brain alterations linked to cognitive impairment [6].

Although there is currently no definitive cure for MCI, research has shown that certain lifestyle modifications and interventions can help slow or stabilize the progression of cognitive decline. These interventions often include cognitive training exercises, PA, a healthy diet, social engagement, and management of underlying medical conditions. Also, medications may be prescribed to control specific symptoms or attack the underlying causes [7].

In conclusion, MCI is the intermediate cognitive stage that lies in between normal age-related cognitive decline and more severe forms of dementia. Early detection, accurate diagnosis, and appropriate interventions are essential to effectively manage MCI. Ongoing research aims to better understand the risk factors, underlying mechanisms, and potential preventive strategies for MCI. By addressing MCI immediately, individuals and healthcare professionals can work together to improve the condition's impact on the quality of life for individuals who suffer from it, and potentially delay or prevent progression to more severe cognitive impairments [5].

Cognitive function is a process of thinking and understanding. Cognition is a key to successful health and aging. Age-related illnesses can harm cognition in a number of different ways. A significant percentage of human intelligence may be seen in the creation, storage, and recall of memories, which are fundamental aspects of cognition [8]. For example, it may come naturally to recall your birthday, but it may require some mental work to memorize someone else's. The majority of what we think of as "brainwork"—cognition, mental imagery, highly complicated processing of visual data, and the ability to generate and understand information—happens in the cortex [9].

Physical activity plays an important role in mild, severe or no cognitive impairment. The study aims to explore the relationship between mild cognitive impairment (MCI) and physical activity in geriatric individuals. By understanding the connection between inadequate physical exercise and cognitive impairment, the research seeks to provide valuable insights that can help people prevent or delay the onset of MCI and dementia. The findings of this study may contribute to promoting healthier lifestyles and cognitive well-being in the aging population.

MATERIAL AND METHODS

It was a cross-sectional observational. Inclusion criteria consisted of Older adults of age group ranging from 45-65 with mild cognition, participants who are ambulatory with poor diet balance and low socio-economic status [10]. Participants with history of other neurological conditions and surgical procedures were excluded from the study [11]. Convenience sampling technique was used. Total sample size was calculated by WHO calculator as 123 [12]. Data collection tools were Montreal Cognitive Assessment (MoCA) [13] and Physical Assessment Scale for Elderly (PASE) Questionnaire [14].

Data Collection Procedure:

An observational study was done in which total 123 participants were selected according to our inclusion criteria. An informed consent was taken from each participant, stating that his or her information should

be confidential and were only used for research purpose only. And they have full right of disengagement from our study at any time. Data was collected from Shalimar Park and Bint-e-Fatima Old Age Home. Data was collected after the approval of research committee of university of management and technology.

Results

The table 1 shows the age of participants, gender and socioeconomic status. In which 59 of participants were aged between 55-65 years, 43 of participants were aged between 66-75 years and 21 of participants were aged between 76-85 years range. 83 participants of this study were male while 40 participants of this study were female. 103 of participants of study were with lower socio-economic status and 11 participants of study were with middle socio-economic status and other 9 participants were with upper socio-economic status.

Table 2 demonstrates the physical activity of participants which they consume throughout their whole day by using Physical Assessment Scale for Elderly (PASE). According to this survey we reached on results where there is 54.5% of participants shown low physical activity while 24.4% of participants have high physical activity and 21.1% have shown normal physical activity. This is also shown in figure 1. In table 3 and figure 2 cognition function rate is assessed by using Montreal Cognitive Assessment (MoCA) scale. According to results 53.7% of participants have mild cognition function, 39.8% of participants have normal cognition function and 6.5% have shown low cognition function.

Table 4 shows that Chi Square test was used to measure association between cognitive function and physical activity in older adults. Significant association was observed as p value < 0.001.

Table 1: Demographics of participants

Variable	Category	Frequency	Percentage (%)
Age	55–65	59	48.0
	66–75	43	35.0
	76–85	21	17.1
	Total	**123**	**100.0**
Gender	Female	40	32.5
	Male	83	67.5
	Total	**123**	**100.0**
Socioeconomic Status	Lower	103	83.7
	Middle	11	8.9
	Upper	9	7.3
	Total	**123**	**100.0**

Table 2: Physical assessment scale for elderly

Physical Activity Level	Frequency	Percentage (%)
Low	67	54.5
Normal	26	21.1
High	30	24.4
Total	**123**	**100.0**

Table 3: Montreal Cognitive Assessment

Cognitive Function Level	Frequency	Percentage (%)
Mild Cognitive Impairment	66	53.7
Normal Cognition	49	39.8
Low Cognitive Function	8	6.5

Total	**123**	**100.0**

Table 4: Relationship between Physical Activity and Cognitive Function

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.915	4	.000
Likelihood Ratio	35.755	4	.000

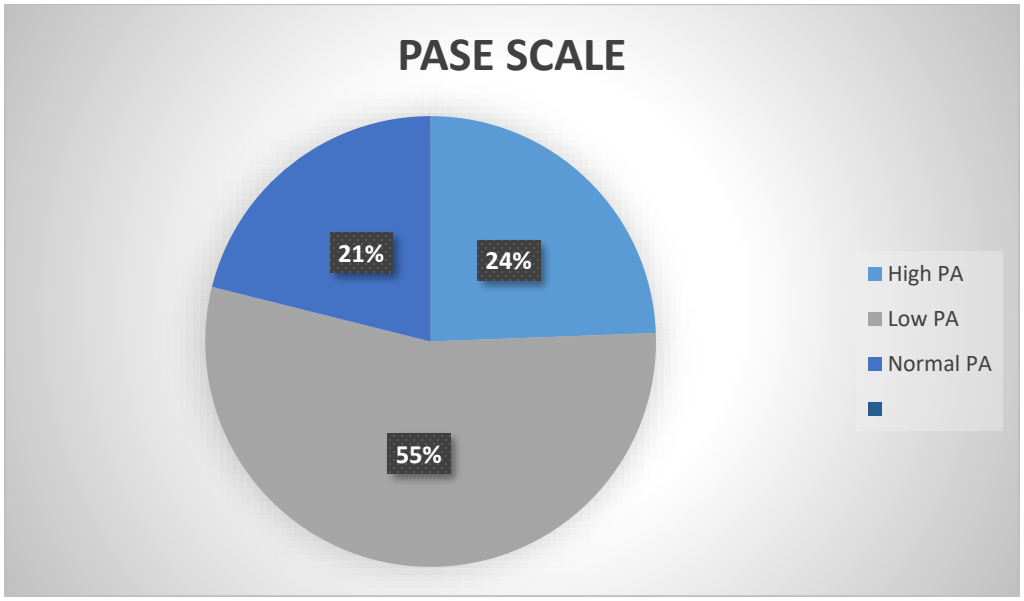


Figure 1: Pie chart of PASE scale

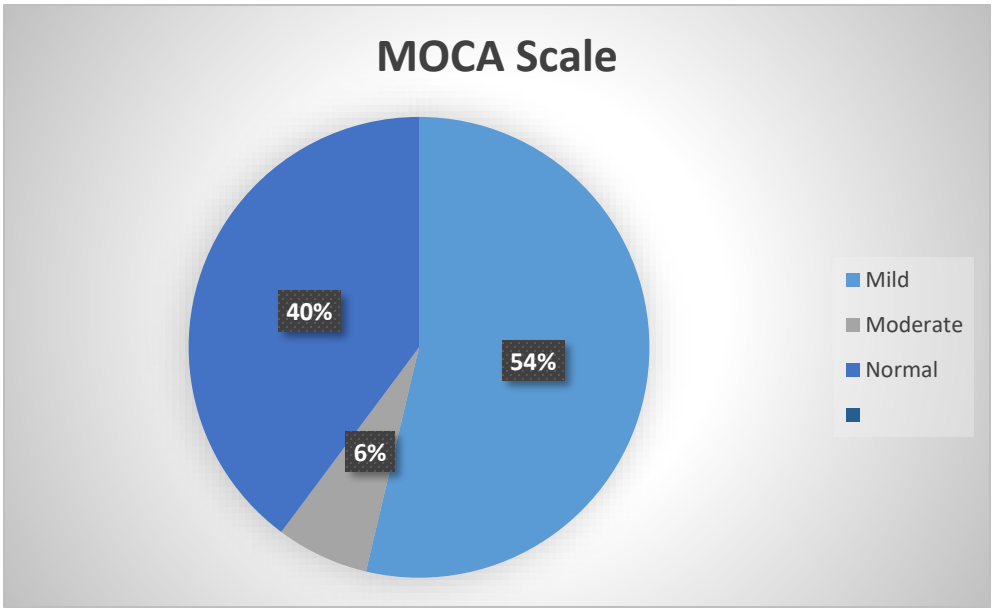


Figure 2: Pie chart of MOCA scale

Discussion:

The aim of this cross-sectional study was to investigate the relationship between physical activity and cognitive impairment in individuals with low socioeconomic status. The sample size, determined using the WHO calculator, was 123, including both males and females based on inclusive and exclusive criteria. Data were collected using the MOCA (Montreal Cognitive Assessment Scale) and PASE (Physical Activity Scale for Elderly) scales to assess cognitive function and physical activity, respectively. SPSS version 22 was used to analyze the data, and the chi-square test was applied to measure the association between cognitive impairment levels (normal, mild, and moderate) and levels of physical activity (high, low, and normal). Participants aged 55 to 85 years were included in the study.

A previous study that used MMSE scores (SMD=1.12 CI: 0.66˜1.59) also supported this relationship. In this study subgroup analysis were given different frequency physical activity i.e., high, and low frequency interventions to generate different cognition effects. The results according to study that there is no as such difference to high physical activity have more effect on cognition than low physical intervention. It is not necessary that physical activity can affect cognitive impairment [15].

The present study used PASE (physical assessment scale in elderly) to determine the physical activity in which there are total 11 questions which gives true information about their physical activity. According to the survey we reached on results that 54.5% population have low physical activity while 24.4% people have high physical activity and 21.2 % people have normal physical activity. These results are supported by a study in which they used cyclist to show effects of physical activity on wellbeing and cognitive function [16].

The findings revealed that 53.7% of the population had mild cognitive impairment, consistent with previous studies. Prior research supported the positive impact of physical activity and exercise on cognitive function in older adults, using the MOCA scale (13-25) and home-based interventions led by well-trained physiotherapists. Their study also analyzed reduced physical activity, balance, cognition, mood, and quality of life, utilizing a mixed methods approach to deliver the interventions. In contrast, the present study found that individuals with low socioeconomic status were more susceptible to cognitive impairment, with a positive association between physical activity and cognitive function [17].

A key observation from the study indicated that while formal education and social engagement served as protective factors against mild cognitive impairment,

physical activity levels alone were not statistically significant predictors. Instead cardiorespiratory fitness, muscular strength and agility emerged as meaningful correlates of cognitive function measured by Korean mini mental state examination [18]. The findings align with emerging evidence that aerobic and strength based activities significantly support executive function through cerebral perfusion, neural plasticity and metabolic health. Furthermore the study underscores the role of lifelong educational engagement and structured exercise in building cognitive resilience, particularly in settings with lower socioeconomic resources and patients where access to these activities may be limited [19].

Conclusion:

The study concluded that the people with high Physical activity have good cognition in contrast to people with normal or low physical activity who have mild or moderate cognitive impairment. Even some people have very low physical activity, but their cognition was scored well on MOCA scale.

Recommendations:

More cross-sectional surveys be conducted in order to increase the generalizability of the findings because this study was only able to gather data from some parks and an old age home from Lahore, Pakistan. For more reliable results, it is also important to take psychological aspects and some external factors into account when assessing cognitive function.

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