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# Correlation Of Physical Activity, Balance And Cognition In Geriatric Population – An Observational Study

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***Abstract:***

***Background: The geriatric population is defined as population aged 60 years and above. There is no United Nations (UN) standard numerical criterion, but the UN agreed cut off is 60+ years to refer to older population Currently India has the second largest aged population in the world. Due to aging process, disease and inactivity many impairments are seen. Amongst these, balance and cognition are significantly impaired in old age. The impairment can lead to dramatic consequences such as dependency, risk of fall, fracture. Complementary and alternative therapies are physical activity, which includes leisure time physical activity, transportation, occupational, household chores play in context of daily and community activities. It prevents risk of poor balance, impaired mobility and focus on increase awareness and proprioception resulting in improved balance and cognition in geriatric population. Physical activity (PA) is also important in prevention of disease, maintenance of independence and improve quality of life (QOL) in older people.***

***Objective: Correlation of physical activity, balance & cognition in geriatric population.***

***Material & Methodology: 100 healthy individuals aged 60 & above irrespective of gender, were included through convenient random sampling. All subjects were assessed by berg balance scale (BBS) by balance, cognition by mini mental state examination scale (MMSE), physical activity by physical activity scale for elders (PASE). It took maximum 20-30 minutes for assessing all outcome measures***

***Results: Correlation was found between physical activity, cognition & balance using Spearman's correlation ratio. There was strong positive correlation between PASE & BBS (r =0.720), MMSE & BBS (r = 0.864) and moderate positive correlation between PASE & MMSE (r = 0.583) which was statically significant at p<0.05.***

***Conclusion: There was significant correlation between physical activity, balance & cognition in Geriatric Population.***

***Keywords: Geriatric population, physical activity, balance, cognition***

## I. INTRODUCTION

The geriatric population is defined as population aged 60 years and above [1]. There is no United Nations (UN) standard numerical criterion, but the UN agreed cut off is 60+ years to refer to older population [2]. It is estimated that presently in there were around 600 million persons who were aged 60 years and above over all over the world. According to Indian Scenario of geriatric population 2011, 99 million out of 1.21 billion are over the age of 60, which was 77 million in 2001. According to an estimate, by 2021, India's elderly population will cross 137 million. Currently, India has the second largest aged population in the world [3,4].

Life expectancy for the elderly in developed and developing countries has increased as a result of improvement in public health and medical advances [5]. Due to the increased longevity and life expectancy, the QOL has been considered as an important issue for aging individuals [6].

The performance of all activities of daily living requires good balance control while at rest or when moving from one position to another [7,8]. Maintenance of the balance function is essential to stay physically active in life [9].

Balance problems in elderly are most commonly due to multi factorial condition which may include age related or disease-related declines in the balance system. Causes of reduced balance in elderly could be weakness in the core stabilizing muscles, altered muscle activation patterns, loss of proprioception, and an inability to control normal postural sway. Balance problems and falls are leading cause of institutionalization in this group [10,11] which may cause major consequences like dependency in activities of daily living (ADL) [12].

The postural and equilibrium components of balance control ensure stability of the body during different activities. The exact demand of the balance control system is determined by both the task and the environment in which it is performed [8]

Due to increased longevity & life expectancy, the QOL has been considered as an important issue for aging individuals [6] The performance for all daily living activities requires a good balance control while at rest and moving from one position to another [7,8].

Coordination of sensory, neural, musculoskeletal system are needed to maintain balance [7,8]. Many of these systems under go deterioration as people age [13,14].

Adequate cognitive functioning is also a crucial factor in maintaining reasonable health costs in aging, because cognitive awareness and efficiency are necessary but not sufficient for good health habits and medication schedules. Absence or deterioration of health habits and medication compliance leads to accidents, falling, and the concomitant pharmacological and physiological emergencies [15]. As physical exercise is essential in maintaining physical function and physiological health, it also appears to be critical in maintaining brain health and cognitive performance in older adults. [16].

Physical function and physical activity are described as a consequence of well-being, which seems especially important for older people. The importance of physical activity influences the physical health and functional status, as well as the life satisfaction, the life appraisal and the ‘‘age well’’ perceptions of older adults [17]. Due to the aging process, disease and inactivity, many impairments are seen. Amongst these, balance and cognition are significantly impaired in old age [18]

These impairments can lead to dramatic consequences such as dependency, risk of fall, fractures, dementia, memory affection and subsequently, anxiety and depression. Complementary and alternative therapies are physical activity which includes leisure time physical activity, transportation. Occupational, as well as household chores play an important role in the context of daily and community activities.

It prevents the balance affection, impaired mobility and focuses on increasing physical and mental awareness and proprioception resulting in improved balance and cognition in geriatric population. Physical activity is also important in prevention of disease, maintenance of independence and improvement of QOL in older people [18].

There are very few studies establishing correlation of physical activity, balance, cognition in elderly individuals. However, there is a lack of sufficient evidence that is dedicated to Indian geriatric population.

Aim: Hence the need of the present study is to find correlation on physical activity, balance and cognition in geriatric population.

## II. METHODOLOGY

This was an observational study and method of sampling was convenient sampling. Normal 100 healthy elderly volunteers residing at Ahmedabad city were selected for the study. Community of 100 healthy people who aged 60 years and above, both male and female willing to participate for this study were selected. Individuals who suffered from muscular-skeleton disease, any recent traumatic injury, history of recent surgery, degenerative disease like osteoarthritis, low back pain, cardiovascular disease like peripheral vascular desices, cardio pulmonary disease and neurogenic conditions like hemiplegia, Parkinson’s disease, ataxia, psychiatric illness, severe visual impairments (cataract) were excluded. Written consent was taken from all subjects.

The individuals chosen for the study were assessed by BBS scale for balance, PASE questionnaire for physical activity & MMSE scale for cognition. It took maximum 30 minutes for assessment of all these outcome measures.

Balance, physical activity and cognition assessment tools in older people most commonly uses simple clinical measures. Different measures have been designed to assess different aspects of balance, physical activity and cognition or a person’s ability under different conditions. These included measures of static and dynamic standing balance, such as stepping, reaching or leaning, and turning [19].

BBS was developed by Berg et.al (1989) which is widely used as clinical assessment tool for measurement of functional balance in elderly [20,21].

BBS it is 14-item scale designed to measure balance of the older adult in a clinical setting. A Ruler, two standard chairs (one with arm rests, one without), Footstool or step, stopwatch or wristwatch, 15 ft. walkway. General instruction in most items, the subject is asked to maintain a given position for a specific time. The subject’s performance warrants supervision the subject touches an external support or receives assistance from the examine.

The Physical Activity Scale for the Elderly (PASE) is an instrument that measures the level of physical activity for individuals aged 65 and older. The PASE is comprised of self-reported occupational, household and leisure items over a one-week period and can be administered by telephone, mail or in-person. The PASE scoring was derived from movement counts from an electronic physical activity monitor, activity diaries and self-assessed activity levels in a general population of non-institutionalized older persons. The PASE can be used to measure physical activity in surveys of older person and to assess the effectiveness of interventions.

To access physical activity, PASE the leisure activity items require participants to first report the number of days per week the activity was performed and then the number of hours per day. PASE scores are calculated from weights and frequency values for each of the 12 types of activities.

Mini Mental State Examination (MMSE) is 30-point questionnaire that is used extensively in clinics and research

setting to measure cognitive impairment. Its include simple questions and problem in number of areas: the time and place of test, repeating lists of words, arithmetic such as the serial sevens, language use and comprehension, and basic motor skills.

## III. STATISTICAL ANALYSIS

Before applying statistical tests, data was screened for normal distribution and outcome measures were analysed by using appropriate statistical test using SPSS version 17 keeping confidence interval at 95%. Spearman's test was applied to find correlation between BBS, PASE and MMSE.

## IV. RESULTS

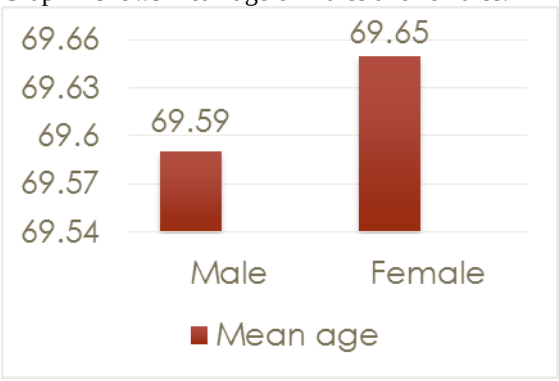
All 100 (46 males and 54 females) completed the balance test, PASE questionnaire and MMSE scale.

The Mean age of subjects was 69.62±5.66 (n=100) {Table 1}

| | MEAN | SD |
|---|---|---|
| **MALE (n=46)** | **69.59** | **5.69** |
| **FEMALE (n=54)** | **69.65** | **5.68** |

*Table 1: Mean Age & SD*

Graph 1 shows mean age of males and females.



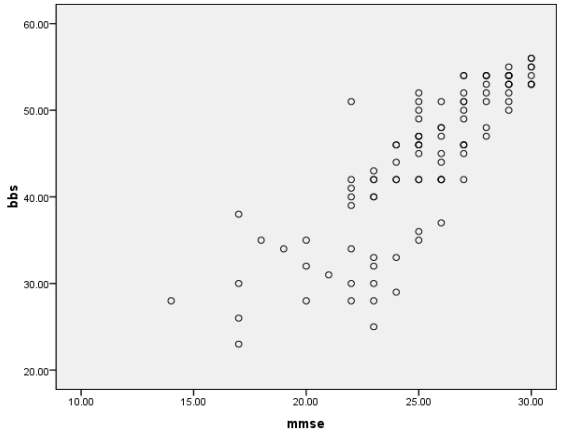

*Graph 1: Mean Age of Males & Females*

Correlation was found between physical activity & balance using Spearman's correlation ratio, it was a strong positive correlation (r = .720) between PASE & BBS which was statically significant at p<0.05. Results also found moderate positive correlation between PASE & MMSE (r =0.583) and strong positive correlation between MMSE & BBS (r =0.864) which was statically significant at p = 0.01. {Table 2}

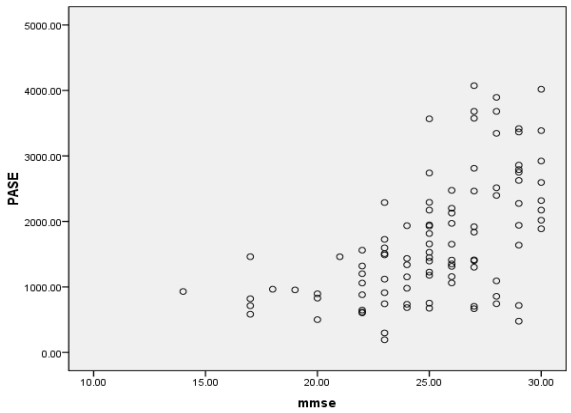
| Correlation By Spearman's Test | r value | p value |
|---|---|---|
| PASE & BBS | 0.720 | 0.01 |
| PASE & MMSE | 0.583 | 0.01 |
| BBS & MMSE | 0.864 | 0.01 |

*Table 2: Correlation between PASE, BBS & MMSE*

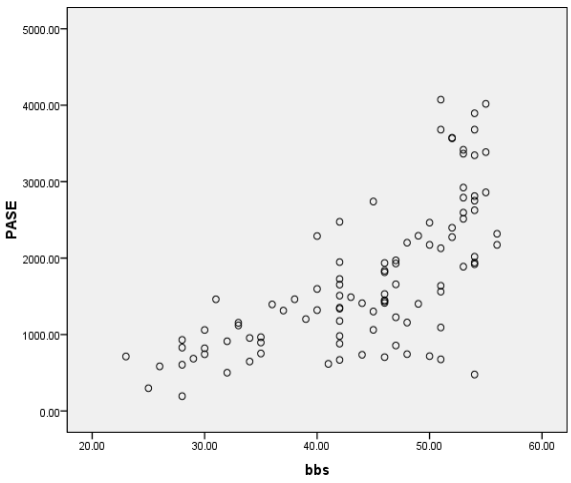
Graph 2,3 & 4 shows scatter diagrams of correlation between MMSE, PASE & BBS.




*Graph 2: Correlation between BBS & MMSE*




*Graph 3: Correlation between PASE & MMSE*




*Graph 4: Correlation between PASE & BBS*

## V. DISCUSSION

Physical activity contributes to the emotional and social equilibrium [22]. In the psychological dimension, physical activity acts in the improvement of self-esteem, self-concept, body image, cognitive functions and socialization, besides decreasing stress, anxiety and medication consumption,

directly influencing on quality of life (QOL) of the individuals [23]

Physical activity effectively improves cognitive health across the human lifespan. According to neuroimaging data, cardiorespiratory fitness not only spares age-related loss of brain tissue (i.e. grey & white matter) during aging but also appears to enhance the structural health of specific brain areas (31, 32). Importantly, the areas of brain most influenced by aerobic fitness are higher order regions involved in the control of cognition and memory. From these data, a picture has emerged suggesting that more active or higher fit individuals are capable of allocating greater attention resources toward the environment & process perceived information more quickly. On the other hand, less active and lower fit individual appears unable to allocate attention resources during stimulus engagement and thus require more resources to monitor their actions.

The results of present study suggest that higher levels of physical activity fitness promote more effective task performance which was supported with Fimando Gómez 2013 et al [24]

Neva j kirk-Sanchez et al concludes in their study in 2013 that there is positive relationship between physical activity & cognition due to moderate intensity physical activity can lead to significant change in brain health & cognitive performance [25].

Results of present study is also supported by Ashley Carvalho et al in 2014, who concluded that physical activity in later life is beneficial for cognitive function in elderly. physical activity will enhance existing cognitive function, as well as prevent or delay progression of cognitive disease [26].

Rosando C et al 2005 seen positive association between physical activity & cognition in geriatric population with natural aging changes [27].

The impact of physical activity on cognition in older adults is more strongly supported by results from intervention studies, which generally show that older adults who have completed a physical activity program that produces significant increases in cardiorespiratory fitness (indexed by direct measures or estimation of VO2max) often show enhanced cognitive performance. Dustman et al [28]

Results of present study is supported by Dehli Kaddacha et al in 2016 who founded that physical activity like yoga are effective in improving balance in geriatric population because of improving muscle strength, flexibility, mobility which helps to improve in balance with aging process [18]

Shumway-Cook and Woollacott 2014, concluded that with aging, attention demands for postural control increase as sensory information decreases. in addition, the inability to allocate sufficient attention to postural control under multitask conditions may be a contributing factor to imbalance and falls in older adults [9]

Arlene et al, 2010 found improvement in fear of fall, balance and lower body flexibility in the population of older adults living and working in a retirement community. They revealed that, the improvement in balance scores may be resulted of improvement in flexibility [29].

Hence physical activity in elder people will increase in muscular strength, ROM which will improve mobility and flexibility leads to increases proprioception which may contribute to improve balance. It will also improve attention which will helps to perceive information quickly which may contribute to improvement in cognition.

## VI. CONCLUSION

The present study concludes that there is correlation between physical activity, balance & cognition in geriatric population. Thus, it can be used in our daily clinical practice. Geriatric individuals can be educated about the importance of physical activity in their sedentary life-style for prevention of balance affection & cognition impairment. Light physical activity can be incorporated in treatment protocol for geriatric population. People should adopt physical activity and exercise as a part of their lifestyle to alleviate the negative impact of aging on the body and the mind.

## FUTURE STUDY

Future studies are required to understand the intensity, duration, and types of exercises that enhance better cognitive functions and balance in older adults.

## ABBREVIATIONS

QOL: -quality of life
UN: -united nations
BBS: - berg balance scale
MMSE:-mini mental state examination
PASE: - physical activity scale for elderly
SD: -standard deviation



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