

## ORIGINAL ARTICLE

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## A STUDY TO ANALYZE THE RELATIONSHIP BETWEEN THE DECLINE OF COGNITION AND FINE MOTOR SKILLS IN ELDERLY POPULATION

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## ABSTRACT

**Background:** The fine motor skills and cognition will be reduced upon the aging. But, there is no clear idea of the association between the age-oriented reduction of cognition and fine motor skills. In this study trying to establish the relationship between the decline of cognition and fine motor skills in elderly individuals.

**Methods:** It was an observational study performed with 45 normal elderly subjects, of which there were 23 males, 22 females, aged between 61 and 75 years. Pearson Correlation was used to find out the correlation between the data of PGI (post-graduation institute) memory scale and Purdue pegboard score, and 2-tailed t-test was used to find significant changes between data.

**Results:** There is a statistically significant correlation ( $p = 0.000$ ) between fine motor skills and the ten sub-test of Post-Graduation Institute (PGI) memory scale which explains that all the components are equally important in performing fine motor skills and the negative correlation between age with memory and fine motor skills. The positive correlation between PGI memory scale score and fine motor scores individually ( $p = 0.000$ ).

**Conclusion:** There is a positive correlation between the decline of Cognition and Fine motor skills in elderly individuals. And it proves that the changes in cognition will influence the fine motor skills.

**Keywords:** cognition, fine motor skills, PGI memory scale (post-graduation institute memory scale), Purdue pegboard.

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## INTRODUCTION

Aging is the molecular level reorganizing in all living and nonliving materials over time of period. Aging in human beings refers to an interconnected cellular level change of structure and function of all tissues. The brain function is improving in aging in some aspects while another function is getting reduced [1].

Aging affects the structural changes in the brain, so the function of neurons getting reduced in all aspects (attention, psychomotor speed, delayed visual memory) [2]. The cognitive function such as language, attention, executive function, and psychomotor speed is reduced with aging, but the visuospatial abilities, memory and overall cognition will not have the direct effect of aging [3].

The fine motor skills are very important for daily living activities, and the nigrostriatal system controls it. The age-related changes in the nigrostriatal system are reducing the fine motor abilities and slowing the motor function speed [4]. Though the fine movements of hands are reducing depends upon the aging, but the performance for the difficult task is not showing a linear relationship between aging and motor function [5].

There is a significant difference between young and old subjects in executing simple to the complex motor task; this shows there is a reduction of the motor function depends upon the aging [6].

The motor function combined with proper cognitive the function is required for optimal motor coordination in all the activities [7]. The attention plays a major role to produce the effective fine motor skills [8]. The cognitive function is very important for all the types of motor function for receive moving, analyzing the commands and recruiting appropriate muscles fibers for better performance [9].

The fine motor skills fulfill the daily living activities of human beings, and cognition is one of the major factors to produce the motor skills.

The decline in structural and functional aspects of all human tissues cells are known facts, And in the view of cognition and fine motor skills are also involved in aging. The fine motor skills will be reduced over time of period and cognitive functions too. But the association between these two functions are not established, so this study was conducted to find out the relationship between the age-oriented changes of cognition and fine motor skills in the elderly population. The result of this study may be useful in geriatric rehabilitation.

## METHODOLOGY

The cross-sectional study was conducted with the aim to find the relationship between the decline of cognition and the fine motor skills in the elderly population at physiotherapy department OPD, Sri Ramachandra Medical Centre and elderly homes in Chennai. There was a total of 45 elderly aged 60 to 75 years, both genders and those who had a basic level of education were recruited for the study by using non-probability purposive sampling technique. The study excluded the samples from those who had a neu-

rological problem involving higher mental function and upper limbs, the musculoskeletal problem in upper limbs, psychological disability, and any visual impairments. The fine motor skill is analyzed using the Purdue pegboard which was developed by Joseph Tiffin 1968 used for evaluating manual dexterity for the selection of employees for industrial jobs. But in recent years it has been used in neuropsychological assessment to provide information about soft/subtle neurological signs. Purdue pegboard which is a wooden board and has two central rows of 25 small holes and reservoirs for pins, collars, and washers across the top. There are a total of 50 pins, 20 collars, and 40 washers. And he proved through the Reliability studies with various groups and scores on the Purdue Pegboard yielded correlations ranging from .60 to .91. Validity coefficients on 14 studies ranged from .07 to .76 [10]. The PGI(post-graduation institute) memory scale is used for measuring cognitive function and this battery of memory tests constructed and standardized in 1977. It contains ten subtests which were not unduly dependent on intelligence and was equally valid for both sexes. It is applicable, acceptable to illiterate and unsophisticated subjects which constituted the majority of subjects in Indian hospitals. Compared to the Wesler memory scale the administration of the PGI(post-graduation institute) memory scale is simple and similar to other memory tests in the aspect of the clinical evaluation of memory in the adult population [11]. This scale contains ten subtests included forward and backward digit spans, 1 min delayed recall of a word list, immediate recall of sentences, retention of similar word pairs, retention of dissimilar pairs, and visual retention and visual recognition, recent memory, remote memory and mental balance test. Depending upon the need these subtests are utilized for measuring the cognitive aspects of the persons [12]. It is used in the evaluation of the cognitive function of depressed patients and proved that Cognitive changes of the depressed patients reduce the short and long-term memory and it leads to alterations in the decision-making process and impairing the information processing of the patients [13]. SPSS software (version 15) was used for analyzing the data based on the objectives.

## RESULTS

SPSS software version 15 was used for analyzing the data. Pearson Correlation was used to find out the correlation between the data of PGI(post-graduation institute) memory scale and Purdue pegboard score, and 2-tailed t-test was used to find significant changes between data. There were a total of 45 samples in this study among them 33.33% of the samples were between 60 to 65 years of age, and 33.33% samples were between 66 to 70 years and remaining were the age group 71 to 75. There were 51.1% of the samples were males, and the remaining (48.8%) were females.

Table I shows, There is a decrease in the PGI memory scale score as the age increases with a statistically significant difference showing a p-value of 0.000. Table II shows, There is a decrease in the assembly score of both hands as the age increases with a statistically significant difference showing

a p-value of 0.000. The reduction in the fine motor performance of the dominant hand, non-dominant hand and both hands score as the age increases with a statistically significant difference showing a p-value of 0.000.

**Table 1: CORRELATION BETWEEN AGE AND PGI MEMORY SCALE**

	MEAN	STD. DEVIATION	r VALUE	p VALUE
AGE	67.89	4.297	-0.852	0.000 (SIG)
PGI SCORE	60.82	10.500		

**Table 2: CORRELATION BETWEEN AGE AND ASSEMBLY SCORE (PURDUE PEG BOARD)**

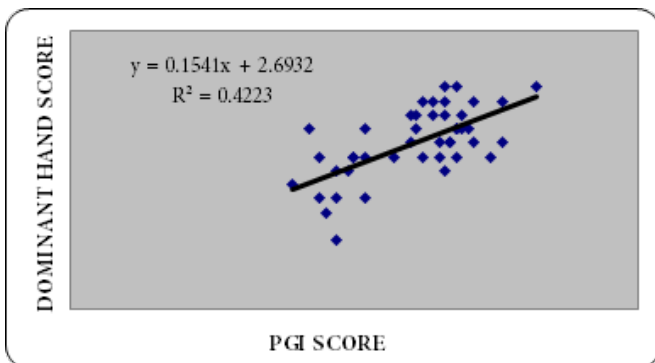
	MEAN	STD.DEVIATION	r VALUE	p VALUE
AGE	67.89	4.297	-0.833	0.000 (SIG)
ASSEMBLY SCORE	23.47	4.501		

Table III shows, There is a decrease in PGI(post-graduation institute) memory scale score and assembly of both hand performance as the age increases showing a positive correlation between cognition and fine motor skills with a statistically significant p-value of 0.000. There is a decrease in PGI(post-graduation institute) memory scale score with the dominant hand, non-dominant hand and both hands performance as the age increases showing a positive correlation between cognition and fine motor skills with a statistically significant p-value of 0.000.

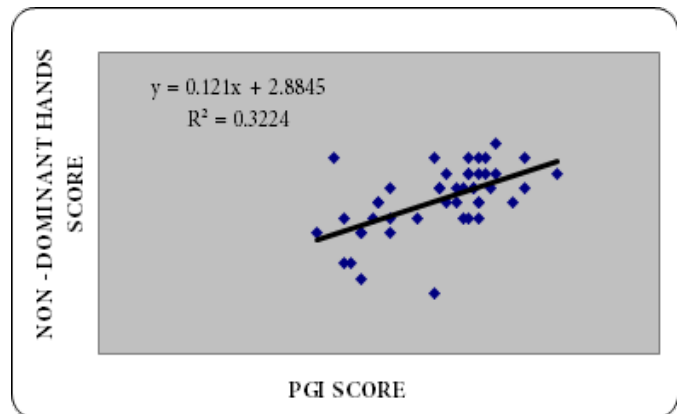
**Table 3: CORRELATION BETWEEN PGI MEMORY SCALE SCORE AND ASSEMBLY SCORE (PURDUE PEG BOARD)**

	MEAN	STD.DEVIATION	r VALUE	p VALUE
PGI SCORE	60.82	10.500	0.727	0.000 (SIG)
ASSEMBLY SCORE	23.47	4.501		

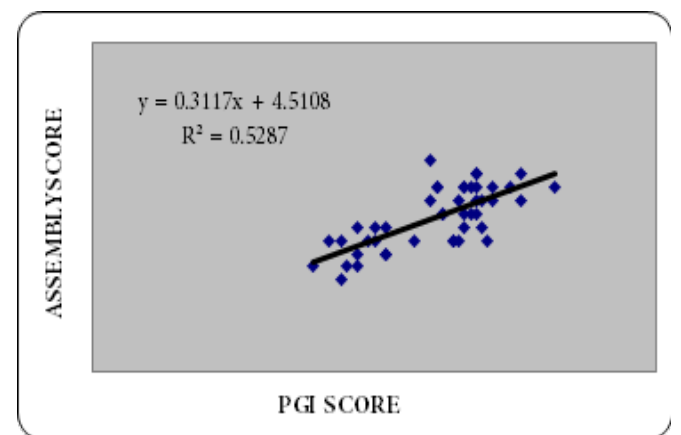
**Diagram I: CORRELATION BETWEEN PGI SCORE AND DOMINANT HAND SCORE**



**Diagram 2: CORRELATION BETWEEN PGI MEMORY SCALE SCORE AND NON DOMINANT HAND SCORE**



**Diagram 3: CORRELATION BETWEEN PGI MEMORY SCALE SCORE AND ASSEMBLY SCORE**



## DISCUSSION

The purpose of this study was to analyze the relationship between the decline of cognition and fine motor skills in the elderly population. The subjects included were 45 elderly individuals with age ranging from 61-75 with a mean age of 67.89. According to the findings of this study, the cognition and fine motor skills are getting reduced simultaneously related to the aging.

According to Edward Coffey et al. (2001) stated that there would be reduced cognitive function related to the structural changes in the brain. Aging influence in the structural changes of the brain and that leads to functional deterioration (attention, language, memory, information processing speed) of the brain. Apart from the cognitive declining, the motor function also getting degraded due to aging in the aspect of the limited function of all tissue cells, So this states that the fine motor skills will be reduced when the age increases. This study analyzed the relationship of aging and fine motor skills, and this result correlates with the study of Smith cd et al. (1989) proved that the fine motor skills are reduced with the human aging. In this study results, the cognition and fine motor skill measurements decline depends upon the age.

The cognitive function is a basic component for the production of the fine motor skills. The interpretation of the results shows that as age increases there is a uniform decrease in both cognition and fine motor skills. As fine

motor skills are attention demanding, the decline in skills could be attributed to the decline in the cognitive function of the individual as the age increases Tabbarah M et al., 2002 [14]. As per this finding, the decline in cognition may also be attributed to the decline of fine motor skills in elderly individuals. As the cognition and fine motor skills are interlinked, the effect of the decline in both may be mutual as explained Rogar A et al., 2007 [15]. In this study, it shows a statistically significant correlation (p-value = 0.000) between fine motor skills by Purdue pegboard and the ten subtests of PGI memory scale. So cognitive function reduced according to the age and at the same time the fine motor skills too, the reduction of fine motor skills may not directly involve with the structural changes of the brain aging, but the cognitive changes will affect the production of fine motor skills. According to the results of this study, the cognition and fine motor skills are interlinked in the functional deterioration of aging. So this result emphasizes that clinicians should focus on the cognitive function of the patients to promote the better fine motor skills in physical rehabilitation.

#### LIMITATIONS

Sample size could have been large in this study. This study had restricted the subjects' age from 61-75 years. But, subjects above 75 could also be considered for better analysis of aging.

#### CONCLUSION

There is a positive correlation between the decline of Cognition and Fine motor skills in elderly individuals. The results of this study may help in Geriatric Rehabilitation where we need to concentrate on rehabilitating cognition as well as fine motor skills together to have an overall outcome.

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