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Research Article

CORRELATION OF VISUAL SELECTIVE ATTENTION WITH BALANCE IN GERIATRIC POPULATION-A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Visual Selective Attention is the brain function that controls processing of retinal input based on prioritization of relevant and de-prioritization of irrelevant stimuli. Balance is the ability to maintain the body's position in equilibrium. Age related decline is seen in both, Visual Selective Attention and Balance in geriatric population. This study is an attempt to establish a correlation between the two.

Objective: To correlate Visual Selective Attention and Balance in geriatric population.

Methodology: This was a cross sectional study. 60 subjects with age group 65-75 years were selected. Two tests were performed on them. Trail Making Test A and B was done to assess Visual Selective Attention and Timed Up and Go test (TUG) was done to assess Balance. Data was collected and statistically analysed using Pearson's Correlation Coefficient.

RESULTS: There was a positive correlation between TUG score and trail making scores of trail making test in geriatric population. ($p<0.0001$)

Conclusion: There was a positive correlation between visual selective attention and balance in geriatric population.

INTRODUCTION

Visual Selective Attention

Visual selective attention is the brain function that controls the processing of retinal input based on whether it is relevant or important i.e. prioritization of relevant and de-prioritization of irrelevant stimuli. Visual selective attention improves our perception and performance, by modifying sensory inputs at an early age of processing .Increased age leads to decreased visual selective attention[12].

One of the most widely used assessments to measure visual selective attention is the Trail-Making Test. It is a neuropsychological test used to measure the cognitive domains of processing speed, sequencing, mental flexibility and visual-motor skills. It comprises of part-A and part-B. Part-A is presumed to be a test of visual search and motor speed skills, whereas part-B is considered to be a test of higher level cognitive skills such as mental flexibility[1].

Balance

'Balance' is a generic term used to describe the dynamic process by which the body's position is maintained in equilibrium. It is greatest when the body's centre of mass (COM) or centre of gravity (COG) is maintained over its base of support (BOS). Maintaining balance requires co ordination of input from vestibular, somatosensory and visual systems[11].

Age-related decline in ability of above systems to receive and integrate sensory information contributes to poor balance in older adults. The 'Timed Up & Go' test(TUG Test) is a simple screening test that is a sensitive and specific measure of probability for falls among older adults. It is a reliable and valid test for quantifying balance in geriatric population. Time taken to complete the test is strongly correlated to level of functional mobility .Functional mobility is the term used to reflect the balance and gait maneuvers used in everyday life(e.g. getting in and out of a chair, walking, turning)[13].

The ability to rapidly locate objects of interest in the environment is a fundamental aspect of seeing. Older adults commonly report problems in locating objects, especially in novel environments and visual clutter, and experience a higher incidence of mobility problems such as falls and motor vehicle crashes. Studies have indicated that many older adults have deficits in selective and divided attention, exhibit a slowing in the field of visual processing. Despite having moderate to

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excellent visual field sensitivity and good acuity, many older adults have difficulty locating objects of interest in the environment[20].

MATERIALS AND METHODOLOGY

***Type* of *Study*:** Cross Sectional Study.
***Population*:** Geriatric Population.
***Duration of Study*:** One Year.

Sample Design

Type of Sampling: Convenient sampling.
Sample Size: 60.
Location: Metropolitan city.

Selection Criteria

Inclusion Criteria

- Subjects willing to participate.
- Age group:65-75yrs
- Subjects with normal or corrected to normal vision
- Community dwelling elderly
- MMSE score>26

Exclusion Criteria

- Subjects with vestibular disorders
- Somatosensory and proprioceptive loss
- Neurological disorders
- Musculoskeletal disorders<6 months
- Visual disorders such as glaucoma,cataract, retinopathy
- Subjects with congenital deformities
- Subjects with neuropathies
- Illiterate

Materials

- Chair with armrest
- Pencil
- Pen
- Paper
- Stopwatch
- Measuring tape

Procedure

The subjects willing to participate will be screened as per the inclusion and exclusion criteria.

An informed consent will be taken from the subjects selected for the study. The Trail-Making Test and TUG Test will then be administered. The data will be collected and statistically analysed using Pearson's Correlation Coefficient.

The Trail Making Test

Place the part-A sheet practice side up, flat on the table in front of the subject.

Provide the subject with a pencil and say: On this page (point to 1)are some numbers. Begin at number 1 and draw a line from one to two (point to 2), two to three, three to four and so on until you reach the end.

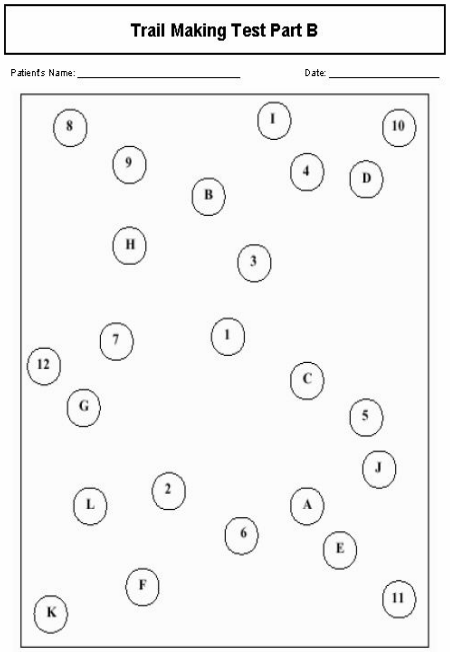
Draw the lines as fast as you can. Do not lift the pencil from the paper. Provide any necessary feedback to the subjects to elicit successful performance. After completion of practice tria turn the page over and present the test.

Tell the subject on this page are more numbers (1-25).Do this the same way you did the practice .Work as fast as you can. Start timing and continue timing even if the subject makes errors until the subject reaches the end. Write the total seconds on the test sheet. For part-B, Place the practice sheet for part-B same as for part-A

The subjects are informed that this sheet contains both numbers and letters. Begin at number one and draw a line from one to ,A to two, two to B, B to three and so on until you reach the end. After completion of practice trial turn the page over and start the test which consists of numbers 1-13 and letters A-L. Instructions are given same as in part-A. Note the total seconds on test sheet.

TUG Test

The subject will start in a seated position in a firm chair with arms and back resting against the chair. The subject stands up on command walks 3 meters toward a wall at normal walking speed, turn without touching the wall ,return to the chair, turn, and sit down. Tape is used to mark the walking distance and turning point. Timing with a stopwatch begins when the patient is instructed with "go" and ends when the patient returns to the start position seated in the chair.



RESULTS

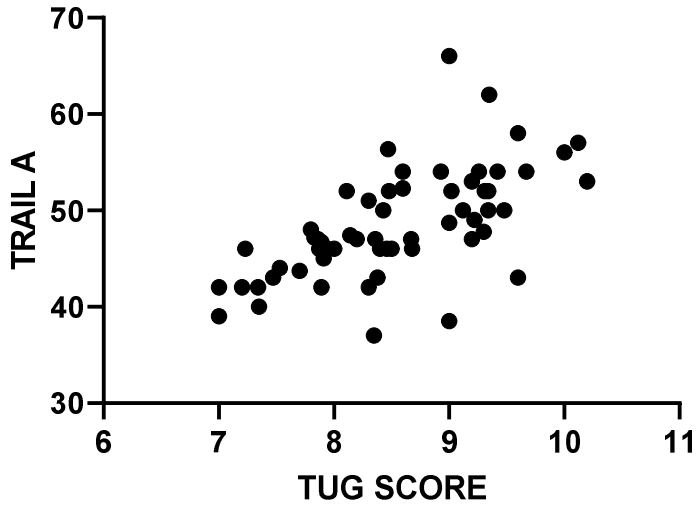
1. There is positive correlation between TUG Score and Trail A Score of TMT in geriatric population with p value <0.0001 and is statistically significant.
2. There is positive correlation between TUG Score and Trail B Score of TMT in geriatric population with p value <0.0001 and is statistically significant.
3. There is positive correlation between TUG Score and Trail A+B Score of TMT in geriatric population with p value <0.0001 and is statistically significant.

Table 1 Normality of data was done using the Shapiro Wilk test and data was found to be normally distributed.

Variables	Mean	Standard Deviation
Age	69.25	3.14
BMI	22.02	2.06

Table 2

Variables	Mean	Standard deviation
Tug score	8.53	0.80
Trail a score	48.41	5.64
Trail b score	112.90	15.12
Trail a+b score	161.3	0.62



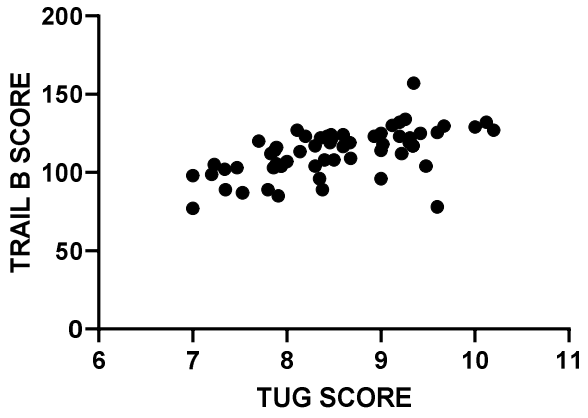
Graph 1 Correlation of tug score and trail a score of trail making test in geriatric population

Table 3

Variables	Mean	Sd	R value	P value	95% confidence interval
Tug score	8.53	0.80			
Trail a score	48.41	5.64	0.6325	<0.0001	0.4509 to 0.7637

Interpretation

Pearson's Correlation Coefficient shows the scatter diagram where the relationship indicates positive correlation.



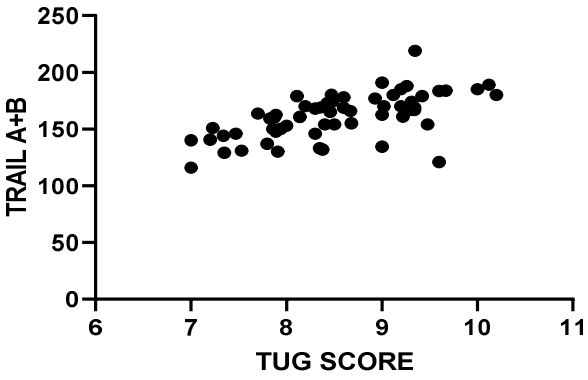
Graph 2 Correlation of Tug Score and Trail B Score of Trail Making Test in Geriatric Population

Table 4

Variables	Mean	Sd	R value	P value	95% confidence interval
Tug score	8.53	0.80			
Trail b score	112.90	15.12	0.5762	<0.0001	0.3775 to 0.7242

Interpretation

Pearson's Correlation Coefficient shows the scatter diagram where the relationship indicates positive correlation.



Graph 3 Correlation of Tug Score and Trail Making Test in Geriatric Population

Table 5

Variables	Mean	Sd	R value	P value	95% confidence interval
Tug score	8.53	0.80			
Trail a+b score	161.30	0.62	0.6188	<0.0001	0.4329 to 0.7542

Interpretation

Pearson's Correlation Coefficient shows the scatter diagram where the relationship indicates
positive correlation between visual selective attention and balance in geriatric population.

DISCUSSION

The purpose of this study was to examine the relationship between visual selective attention and balance in geriatric population. In this study, 60 subjects with age group 65-75 years were included. Trail Making Test was used to assess Visual Selective Attention and Timed Up and Go test was used to assess balance in them. The results showed that there is positive correlation between TUG score (8.53±0.80) and TMT score (161.3±0.62).

Visual Selective Attention is a cognitive process in which a person attends to one or a few sensory inputs while ignoring the other ones. It helps us to focus on only the one, which we want, filtering out other distractions. In a study conducted by Cynthia Owsley, stated that Selective Attention decreases with increasing age. This might be because a fronto-parietal network , spanning the frontal and parietal lobes, on the lateral surface of the brain, appears to mediate performance in visual-search and detection tasks and with increasing age the decline in volume of grey matter is greater in frontal lobe than other brain regions leading to a decrease in Visual Selective Attention [21]. Despite having moderate to excellent visual field sensitivity many older adults have difficulty locating objects of interest in the environment as they have difficulty in both inhibiting irrelevant information as well as selecting relevant information[20].

The accumulation of deficits in elderly, such as muscular weakness, decreased balance , result in mobility impairments that may cause falls and difficulty in performing ADL's. Falls are the major source of injuries in the elderly, and are the 6th leading cause of death in individuals over 65[11]. Also studies have shown that balance decreases with increasing age and so the risk of fall increases with increasing age[10] . Maintaining balance requires input from visual, vestibular and somato-sensory (proprioceptive) systems. Age related decline in the ability of these systems to accept and integrate the information leads to decline in balance ability in older adults[11] . Timed Up and Go test is useful in detecting balance and mobility impairments in elderly persons.

In a study conducted by Vanesa et.al, showed that there was a significant relationship between attention and balance in children aged 4-5 years. They have reached to conclusions that when there is greater balance challenge, attention performance decreases [22]. In a study conducted by Kim et.al (2017) , the relationship between Visual Selective Attention and Balance has been considered as a part of postural control. Age related changes in visual selective attentional demands of postural control to maintain balance depends on many factors including complexity of task as well as difficulty of postural task [23].

Also, increase in the Trail A scores of Trail Making Test which presumes to be a test of visual search and motor speed skills indicates that the chances of risk of fall are higher in those individuals as there is a positive correlation of Trail A scores with TUG score in geriatric population. Similarly, Trail B scores of Trail Making Test is sensitive to deficits in cognitive flexibility as well and so increase in Trail B scores of Trail Making Test indicates that there are deficits in cognitive flexibility and the chances of risk of fall are higher as there is positive correlation of Trail B scores with TUG score in geriatric population.

In other study conducted by Vali Shiri et.al, they have shown that there is a significant relationship between selective attention and balance in patients with relapsing remitting multiple sclerosis. One of the possible reasons for this relationship can be found in the brain system that attention circuits are interacting with equilibrium systems abd any defect in selective attention leads to a loss of balance [24]. In one of the studies conducted by Susan J.Leat and Jan.E.Lovie-Kitchin showed that in elderly when walking ,they have to maintain concentration centrally while scanning the environment to detect and resolve the object of interest, avoid obstacles, amid the visual clutter[25]. The positive correlation might be attributed to the fact that older adults require to visually scan the environment and grab the selected objects to avoid falls[20] .The visual scanning part requires visual selective attention and to avoid a fall it is necessary to maintain balance and so if one of the components is affected it has an effect on the other component as well and so they are positively correlated. Therefore an increase in the score of trail making test indicates increase risk of fall in geriatric population.

Hence, our study concludes that Visual Selective Attention and Balance are positively correlated in geriatric population.

CONCLUSION

This study concludes that there is positive correlation between Visual Selective Attention and Balance in geriatric population.

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