

Original Article

RELATIONSHIP OF EXECUTIVE FUNCTION, EDUCATIONAL STATUS AND QUALITY OF LIFE WITH THE FUNCTIONAL BALANCE IN OLDER ADULTS

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ABSTRACT

Background: Balance is a complex construct which is affected by cognition. It is necessary to know the cognitive correlates of functional balance to design necessary interventions for the individuals with balance problems.

Objectives: To determine the relationship of executive function, educational status and quality of life with the functional balance in older adults.

Methodology: 120 healthy elderly subjects were taken for the study based on the inclusion criteria. Following the initial screening, the executive function, educational status and quality of life of the subjects were measured. Executive function performance test was used for measuring executive function. The quality of life was measured using SF36 questionnaire. The functional balance was measured using the berg balance scale and timed up and go test. The relationship among the outcome measure was found out using the Pearson correlation coefficient.

Results: The results of the present study showed that EFPT and BBS are negatively correlated to each other with r-value -0.271. The educational status score showed a low positive correlation with functional balance with r-value 0.358. The quality of life did not show any significant correlation with functional balance.

Interpretation & Conclusion: Executive function and functional balance showed a low correlation. This means that higher the executive function, better will be the functional balance of the individual. Moreover, educational status also affects the functional balance of the individual.

KEY WORDS: Elderly population, executive function performance test, short form health survey, Berg Balance Scale, Timed Up and Go Test.

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INTRODUCTION

Aging is a complex process involving many variables such as genetics, lifestyle factors, chronic diseases, that interact with one another, greater influencing the manner in which we age [1]. With Aging there is deterioration of various physiological capacities such as muscle strength, aerobic capacity, neuro-muscular coordination and flexibility which can lead to impaired physical performance [2]. These age

related declines result in a host of negative outcomes including functional limitations and therefore loss of independence [3]. Moreover, falls in geriatric population is one of the commonest problems. A national review across 10 states in India was undertaken which mentions that among a total population of 10,200 elderly with equal rural and urban distribution, the incidence of falls (History of a single fall in the last 6 months) was found to be 14%.

Balance is a complex construct in older adults with signs and symptoms of balance disorders. Decreased balance in performing functional activities is associated with actual balance performance, general health-related quality of life, and the presence of co-morbid psychological impairments [4]. Also, various factors contribute to the balance of a person [5]. These factors ultimately determine the functional balance, which is needed to carry out daily activities. Alterations in these factors results into falls. As we know that falls are one of the commonest problems in geriatric population. They impair the health status of the elderly persons. Falls are the leading cause of both fatal and other injuries for adults aged e"65 years [6].

Identifying and comparing cognitive components, including the executive function correlates of functional balance, is particularly important in order to design interventions to promote independence and prevent functional disability. By knowing this relationship with functional balance, we can predict the functional balance of an elderly person. Thus, we can tailor necessary interventions for them being a health professional.

Therefore the aim of this study is to determine the relationship of executive function, education status and quality of life with the functional balance in older adults. Understanding these relationships can potentially improve management of older adults who present with balance disorders.

MATERIALS AND METHODS

120 subjects were taken in the study ageing from 60-80yrs. Among these included both male and female gender older adults from old age homes. The study was a cross-sectional study design. Convenient sampling was done and the subjects were informed about the goal of the study. Also, informed consents were taken from the subjects. They underwent general screening and then followed by the tests for inclusion criteria. Inclusion criteria included MMSE (mini mental scale examination) and TUG (timed up and go) test. The subjects who scored >24 in MMSE and those who were able to perform TUG test were included in the study [7] [8]. Exclusion criteria of the study was to exclude the individuals with

cognitive impairment (MMSE score<24). Individuals with balance problems and had history of falls were excluded from the study.

Executive function of the subject was assessed using executive function performance test [9]. The test included four tasks to be performed by the subject. It included cooking, telephoning, medication and billing tasks (Figure 1). For each of these tasks, the EF (executive function) components of the task were measured. The EF components included initiation, organization, sequencing, judgment & safety, completion. The test results into 3 scores: the EF component score for all 4tasks (range 0-20), the total task score (range 0-25), and a total overall score (range 0-100). The EF component score can range from 0 to 5.

Fig. 1: Executive function performance test.



Educational status was documented based on the number of years of formal education of the subject. This included the number of years of schooling and higher education.

Quality of life of the subject was assessed using the SF36 questionnaire (Short form health questionnaire) [10]. All the questions are scored on a scale from 0 to 100, with 100 representing the highest level of functioning possible.

Further, Functional balance of the subjects was measured using Berg Balance Scale (Figure 2) and Timed Up and Go Test (TUG) [11] [12].

Fig. 2: Berg Balance Scale.



Then the subjects were asked to perform Timed Up and Go Test. The total time taken to complete the task was noted down in seconds. The subjects who take longer than 14 seconds to complete this task were considered to have a poor functional balance (i.e. high risk of fall) [13].

RESULTS AND TABLES

The mean score of age is 70.22 and SD is 5.262. The mean score of gender is 1.44 and SD is 0.499. The mean score of MMSE is 27.18 and SD is 1.290.

Relationship between the executive function, educational status and quality of life with the functional balance was correlated using the Pearson's correlation.

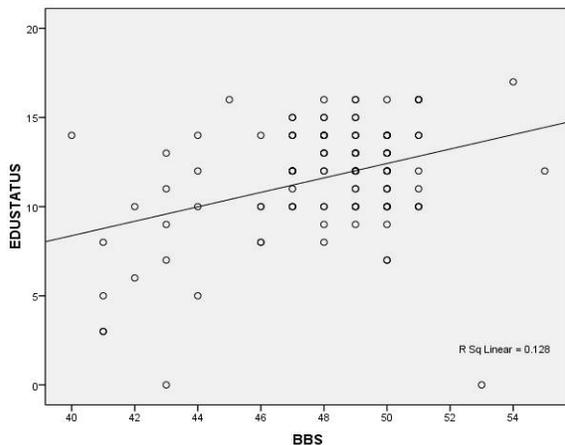
Table 1: The table below shows the r-values for correlations found in the study.

Sr. No	Correlation between	No. of subjects (N)	r- value
1	EFPT and BBS	120	-0.271**
2	QOL1 and BBS	120	-0.236**
3	QOL2 and BBS	120	-0.193*
4	QOL3 and BBS	120	-0.239**
5	QOL4 and BBS	120	0.003
6	QOL5 and BBS	120	-0.217**
7	QOL6 and BBS	120	-0.069
8	QOL7 and BBS	120	-0.037
9	QOL8 and BBS	120	0.06
10	EDUSTATUS and BBS	120	0.358**

** Correlation is significant at 0.01 Level (2-tailed)

EFPT- Executive Function Performance Test, BBS- Berg Balance Scale, QOL (1,2...8)- Quality of life components.

Graph 3: Shows correlation of educational status and BBS scores of the subjects.



Results clearly show that only educational status showed a moderate positive correlation between the berg balance scores of the subjects. (Graph 3.1)

The other correlations done between the executive function and quality of life did not show any significant correlations.

DISCUSSION

In this study, we used executive function performance test (EFPT) for the measurement of executive function of the subject. SF36 health survey questionnaire was used to assess the quality of life of the subjects. To assess the functional balance of the subjects, we used the berg balance scale (BBS) and timed up and go test (TUG).

Executive function performance test included four tasks to be performed by the subject. It included cooking, telephoning, medication and billing tasks. For each of these tasks, the EF (executive function) components of the task were measured. The EF components included initiation, organization, sequencing, judgment & safety, completion. SF36 includes 36 items assessing 8 health concepts by using multi-item scales (35 items): physical functioning (10 items), role limitations caused by physical health problems (4 items), well-being (5 items), energy and fatigue (4 items), pain (2 items), and general health perceptions (5 items). Functional balance of the subjects was measured using Berg Balance Scale and Timed Up and Go Test (TUG). Berg balance scale is a 14 item scale for measuring functional balance. It uses a five point ordinal scale for scoring, ranging from 0-4. The educational status of the subjects was considered as the total number of years of formal education.

The results of the present study showed that EFPT and BBS are negatively correlated to each other with r-value -0.271. This means that lower the score of EFPT, better will be the score of BBS. The quality life domains 4 and 8 showed a positive correlation with the functional balance score (BBS score). While the other quality of life domains namely 1, 2, 3, 5, 6 and 7 showed negative correlations with the functional balance score. Moreover, the educational status score showed a low positive correlation with functional balance with r-value 0.358. This means that higher the educational status of the individual, higher will be the functional balance.

The results of this study were consistent with the study of Teresa J. et al. (2011). They conducted a study to determine association between executive function and risk of falling

and to determine whether it independently determines balance or not. They concluded that the lower scores of executive function indicate higher risks of falls among the study population. This shows that the executive function and functional balance of the individuals are related to each other. Higher the level of executive function, better the functional balance of the individual. Thus, executive function can be considered as a predictor of the functional balance performance of the individual. [14]

The results of this study were consistent with the study of Jennifer Davis et al. (2010). They conducted a study to determine the contribution of executive function to the health related quality of life. From this study they concluded that the executive function has an independent contribution to the quality of life of the individual. Executive function of the individual affects the quality of life of the individual. Better the executive function, better the quality of life and physical performance of the individual. [15] Moreover, the results of our study showed that educational status of the individual is directly related to the functional balance of the individual. These results are consistent with the study of Amer C. et al. (2009). They conducted a study with an aim to determine the influence of educational level and age on TMT performance (a test to measure executive function) in healthy elderly Portuguese speakers. They concluded that the educational level and age significantly affect the TMT performance. The results of this study were also consistent with the previous studies done on the Brazilian population [16].

Similar results were found out in the study of Cahn-Weiner DA et al. (2000). They conducted a study to predict the functional status from the neuropsychological tests performance in community elderly individuals. They concluded that the executive dysfunction can be considered as the best predictor of functional decline in elderly individuals. Also memory, language and spatial skills did not contribute significantly to the prediction of functional status [17]

The practical implication of this study is the early identification of the individuals who are at risk of cognitive decline so that appropriate interventions can be given to retard the cognitive decline and improve the quality of life. Executive

function screening should be implemented for the early detection of executive function status of the geriatric population. So that necessary interventions can be provided to them.

Limitations: The limitations of the study are low sample size and the study design. The prospective study design would have yielded better clinical findings.

CONCLUSION

Executive function is correlated to the functional balance. This implies that higher the executive function better will be the functional balance of the individual. Moreover, Educational status is also moderately correlated to the functional balance. Quality of life has no significant correlation with the functional balance of the individual.

Conflicts of interest: None

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