

# Frontal Assessment Battery in Persian population with Parkinson's disease

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## ABSTRACT

**Background:** Several studies have indicated that executive dysfunction is the main neuropsychological feature of Parkinson's disease (PD). The Frontal Assessment Battery (FAB) is a short tool for the assessment of executive functions.

**Purpose:** The aim of this study was to determine the relationship between Persian version of FAB scores and age, education, Mini-Mental State Examination (MMSE), and severity of the disease in Iranian patients with PD.

**Methods:** The study involved 60 healthy participants and 60 patients with idiopathic PD. Age, sex, disease duration, and Unified Parkinson's Disease Rating Scale (UPDRS) scores were noted. FAB and MMSE were administered to all participants. Both groups were compared according to FAB scores, MMSE, age, and education.

**Results:** FAB scores were significantly lower in patients with PD than in healthy controls ( $P < 0.05$ ). In patients with PD, FAB scores were correlated with MMSE ( $P < 0.05$ ) but not with UPDRS ( $P = 0.93$ ).

**Conclusion:** FAB scores were significantly lower in Iranian patients with PD in comparison to controls and it can indicate that this battery has good discriminate validity and can be a useful tool to identify executive dysfunction in Iranian patients with Parkinson's disease. Also it seems that FAB is not useful test to show disease severity in Iranian patients.

**Keywords:** Executive Functions; Parkinson disease; Frontal Assessment Battery; Unified Parkinson's Disease Rating Scale

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## INTRODUCTION

Parkinson's disease (PD) is a progressive neurological disorder characterized by motor disturbances and ranks the second most common neurodegenerative disease. It affects 1 to 2% of individuals older than 60 years old and 4 to 5% of individuals older than 85 years old and corresponds to about 75% of all forms of parkinsonism<sup>1-6</sup>. PD is associated with a wide range of cognitive problems that significantly impair the quality of life of affected

individuals, while also having an impact on the life of the caregivers<sup>3,7,8</sup>.

The cognitive impairment in patients with PD mainly consists of problems with Executive Functions (EFs). EFs consist of higher order processes such as planning, inhibition of responses and actions, strategy development and goal definition, flexible performance of goal-directed actions, resistance to interference, abstract thinking, problem solving, self-monitoring, and self-regulation<sup>9,10</sup>.

The identification of executive dysfunction is useful for the analysis of the severity of brain injuries and for the diagnosis and prognosis of brain diseases like frontotemporal dementias<sup>9</sup>.

Dubois B et al, presented Frontal Assessment Battery (FAB) for the bedside assessment of EFs<sup>10</sup>. The FAB has been validated for PD<sup>10,11</sup>, showing high correlation with classic frontal neuropsychological tests<sup>12</sup> and significant differences between patients and controls<sup>13,14</sup>. Functional brain imaging studies have shown significant correlation between FAB performance and perfusion in the medial and dorsolateral frontal cortex<sup>15</sup>.

We aimed to investigate the relationship between FAB scores and age, education, Mini-Mental State Examination (MMSE), and severity of the disease in a group of Iranian patients with PD.

## METHODS AND MATERIALS

Among the 76 patients diagnosed as idiopathic PD being followed up in the Shohada-e-Tajrish hospital's Movement Disorders' outpatient clinic from Feb 2011 to Feb 2012, 60 patients (38 men and 22 women) were included in this study. PD diagnosis was made on the basis of the UK Brain Bank Criteria<sup>16</sup>. PD severity was scored using the Unified Parkinson's Disease Rating Scale (UPDRS)<sup>17</sup>. This study was approved by the Shahid Beheshti University of Medical Sciences ethics committee and patients included in this study gave their informed consent to participate.

Sixty (35 men and 25 women) healthy subjects were selected from the caregivers of patients and people who attended to the hospital for routine check-up. All patients and controls were from various regions of Iran. None of the participants had current or past history of alcohol or drug abuse, current depression or psychiatric diseases, history of traumatic brain injury, neurological illness or other reported conditions that could affect mental state, as assessed by an individual clinical interview.

Those who had less than 5 years education, those with MMSE<sup>18</sup> less than 24, and other differential diagnosis of parkinsonism were excluded through neurology examinations and radiological evaluations.

After a brief clinical interview and collection of demographic features, MMSE, Persian version of FAB and UPDRS applied to all patients and healthy participants. Patients were tested in the "on" state, when the medication minimizes or eliminates motor symptoms.

FAB takes about 10 minutes to be administered and can be applied by any practitioner. It consists of six subtests: conceptualization (Similarity), mental flexibility

(Fluency), motor programming (Luria motor Series), sensitivity to interference (Conflicting Instructions), inhibitory control (Go-No-Go Task), and environmental autonomy (Prehension Behavior). Each subtest is scored between 0 and 3; a composite score ranging between 0 and 18 indicates whether executive dysfunction is present or not, and if yes, it is severe.

We use the Persian version of FAB which has not been validated in Iran. The battery was first translated independently by five people with advanced understanding of English. Different translations were combined by two independent experts, minor inconsistencies solved, and a preliminary version was produced. After that, the consensus version was then back-translated into English by another person fluently in both of the languages and then compared conceptually with the original text.

According to our pilot study, a linguistic adaptation was made in one of the subtests: the letter used in the original Lexical Fluency subtest, "S", was replaced by "B", which is as frequent in Persian as "S" is in English. This is because in Persian there is different kind words with "S" sound, that might be confusing especially for people with lower levels of education. After reaching consistency for all verbal instructions and performing some pilot administrations, the final version of the Persian FAB was produced.

The SPSS version 20 statistical package was used for statistical analysis. The unpaired t test and Chi square test were used for the comparison of FAB scores of PD patients with those of healthy participants. Pearson and Spearman correlation tests were used for the correlation of FAB scores with age, education, MMSE, and UPDRS as appropriate. P values <0.05 were considered statistically significant.

## RESULTS

The demographic features of patients with PD and the healthy participants are shown in table 1. The mean age of the patients with PD and the healthy participants was 55.29±2.61 and 57.32±8.01, respectively ( $P=0.81$ ). The education level of healthy participants was mildly and insignificantly higher than patients with PD ( $P=0.8$ ). MMSE scores did not differ between patients with PD and the controls (26.2±0.1 and 28.19±1.47, respectively,  $P=0.2$ ) and FAB scores were significantly lower in patients with PD than in controls ( $P<0.05$ ).

In patients with PD, there was significant correlation between mean FAB scores and age, education level and MMSE but no with UPDRS. ( $r=-0.386$  and  $P<0.05$ ,  $r=0.489$  and  $P<0.05$ ,  $r=0.708$  and  $P<0.05$ ,  $r=-0.242$  and

**Table 1.** Demographic Features of PD Patients and Controls.

	PD(n=60) Mean±SD (Min-Max)	Healthy Participants (n=60) Mean±SD (Min-Max)	P
Age	55.29±2.61 (39-80)	57.32±8.01 (48-81)	0.81
Education	9.65±3.36 (7-14)	10.14±2.234 (7-14)	0.80
Sex(F/M)	38/22	35/25	-
Age onset of disease	62.3±9.34 (51-85)	-	-
Disease duration	7.1±3.1 (1-15)	-	-
UPDRS 1-3	47.29±18.62 (10-96)	-	-

Values are mean+SD (Min-Max). \*P<0.05 significant.  
UPDRS: Unified Parkinson's Disease Rating Scale.

**Table 2.** MMSE and FAB Scores of PD Patients and the Healthy Participants.

	PD (n=60) Mean±SD (Min-Max)	Healthy Participants (n=60) Mean±SD (Min-Max)	P
FAB	13.44±0.1 (7-18)	15.68±1.701 (13-18)	<0.05*
MMSE	26.2±0.1 (25-29)	28.19±1.47 (25-30)	0.20

Values are mean+SD (Min-Max)\*P<0.05 significant  
MMSE: Mini-Mental State Examination, FAB: Frontal Assessment Battery, PD: Parkinson' Disease.

P=0.093, respectively). In healthy participants FAB scores were significantly correlated with age, education level and MMSE. ( $r = -0.588$  and  $P < 0.05$ ,  $r = -0.509$  and  $P < 0.05$ ,  $r = 0.628$  and  $P < 0.05$  respectively) (Table 2).

In the evaluation of the whole group (n=120), FAB scores were correlated with age, education level and MMSE ( $r = -0.363$  and  $P < 0.05$ ,  $r = 0.425$  and  $P < 0.05$ ,  $r = -0.703$  and  $P < 0.05$ , respectively).

## DISCUSSION

Results of this study showed that FAB score in PD patients was lower than those of the healthy participants. Also it was correlated with age, education level and MMSE but was not correlated with disease severity.

In Dubois et al study, FAB scores were not correlated with age or MMSE but they didn't evaluate the effect of education level on FAB scores<sup>10</sup>. Also, their patients mean MMSE scores were higher and lower patient's age than ours. Kenangil et al, didn't find any correlation between FAB and education<sup>19</sup>. Lima et al, reported that in healthy participants FAB scores were positively influenced by education and negatively influenced by age<sup>20</sup>, similar to the results of Apollonio et al<sup>21</sup>, and

Iavarone et al<sup>22</sup>, studies and also our results. A positive correlation between FAB and MMSE scores reported in other studies with the elderly subjects<sup>19,23</sup>. In our point of view, high MMSE scores<sup>10</sup> and low educational level<sup>19</sup> can influence on FAB scores.

We also obtained a positive correlation between FAB and MMSE scores in healthy and PD participants. Although there was lower FAB scores in PD patients, but we did not find a correlation between FAB scores and UPDRS in patients with PD. We found that there was a statistically significant correlation between FAB scores and UPDRS when we evaluated the whole study group. Dennis JA reported that low FAB scores in PD were attributable to frontostriatal circuit impairment<sup>24</sup>. Matsui et al, proposed that FAB scores were closely related to that in the parietal and temporal lobes in patients with PD without dementia. In Matsui et al report, disease duration in patients was longer than our case and they did not find significant difference in two groups of patients with high or low levels of FAB scores in UPDRS<sup>25</sup>. Similarly, in our study, we did not find a correlation between FAB scores and UPDRS in patients but there was a correlation between FAB scores and UPDRS in healthy controls and in evaluation of whole groups. It is our view that the small number of patients with PD might have led to such a result.

## CONCLUSION

FAB scores were significantly lower in Iranian patients with PD in compares with controls and it can indicate that this battery has a good discriminate validity and can be a useful tool to identify executive dysfunction in Iranian patients with PD. Furthermore, normative data from a Persian healthy sample are useful to improve the confidence and accuracy in the application of the FAB to Persian-speaking patients.

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