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**Original Research Article****Effect of mindfulness meditation on attention and executive functions in elderly people****Naren Kurmi, Bhagyalakshmi K\*, Rekha D K and Sheila R Pai***Department of Physiology, Kasturba Medical College, Mangalore, Manipal University, Karnataka, India.***\*Correspondence Info:**

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E-mail : [bhagyaavabratha@yahoo.com](mailto:bhagyaavabratha@yahoo.com)**Abstract****Objectives:** Elderly people are more prone to decline in cognitive functions, This study was aimed to observe the effect of mindfulness meditation on the attention and executive functions in elderly people.**Methods:** In this case control study 100 elderly people (>60 year old) were randomly divided into study (meditating) group (n=50) and control (non-meditating) group (n=50). Meditation group did mindfulness meditation for 45day (half an hour/day, for 6 days in a week). Before and after the study period attention and executive function of both groups were assessed by Trail making test(TMT) type 'A' and type 'B'. Statistical analysis was done by using independent and paired student's t test. P value  $\leq 0.05$  was taken as significant.**Results:** Between both the groups, there were no significant different in the baseline scores for TMT type A (p value =0.06) and type B (p value = 0.91).After study period, significant improvement were noticed in the scores of TMT type 'A' scores (p =0 .036) and type 'B' scores (p =0.002) for the study group. On the other hand there were no significant variations in the TMT type A (P = 0.663) and type B (p= .239) scores of control group.**Conclusions:** This study showed that, mindfulness meditation practice has positive effect on the attention and executive functions in elderly people. Regular mindfulness meditation may improve the quality of life.**Keywords:** mindfulness meditation, cognitive functions, Trail making test, Ageing**1.Introduction**

Ageing brings many physical, social and psychological changes in one's life. Elderly age is associated with decline cognitive functions[1]. This decline may lead to compromise with the quality of life. Mindfulness meditation is a kind of Buddhist meditation[2]. Regular practice of this meditation has shown a significant impact on physical and psychological wellbeing of meditators and many studies have been done to see the effect of mindfulness meditation on the cognitive function in the wide age group population[3]-[6]. Its positive impacts on anger, stress and depression have been proved by many studies[7][8].

As elderly people are more prone to decline in cognitive functions, there is a dire need to study the effect of mindfulness meditation on the cognitive function in elderly people. Here we focused on

selected domain of cognitive functions- attention and executive function.

**1.1 Aim & objective**

Study the effect of mindfulness meditation on the attention and executive function of elderly people.

**2. Material and Methods**

Approval for conducting this study was obtained from institutional scientific and ethical committee.

**2.1 Study design**

The present study was a randomized control trial.

**2.2 Study population**

The study population included 100 elderly people (>60 year old).They were recruited from

general population in Mangalore. Subjects were randomly divided into study group (n=50; 34 male and 16 females) and control group (n=50; 37 male and 13 female). Mean± SD age for study and control groups were 63.86± 3.01years and 64.46± 2.96 years respectively. Study group was meditator group and control group was non-meditator group.

### 2.3 Inclusion criteria

- (1) Elderly people, above 60 years age
- (2) Meditation naïve
- (3) Subjects with a minimum education qualification, i.e., completed primary school education.

### 2.4 Exclusion criteria

- (1) Subjects who were already practicing meditation or yoga.
- (2) Elderly people who were on Alcohol or any other substance abuse.
- (3) Any ongoing or recent mental health problem or neurological disorder
- (4) Receiving any psychopharmacological treatment

### 2.5 Study procedure

During orientation session, each subject was explained the purpose & procedure of the study and then an informed consent was obtained from them. Before the starting of the study subjects completed personal and family history questionnaire, personal health questionnaire and dementia questionnaire[9][10]. Attention and executive function of Subjects of both groups were assessed by Trail making test (TMT) type 'A' and type 'B'[7]. Then, study group started doing mindfulness meditation. The duration of meditation was 30 minutes in a day, 6 days in a week. A meditation instructor was appointed. The same schedule was continued for 45 days study period. Control group subjects did not undergo any meditation practice. After 45 days all the subjects (both study and control group) were again evaluated on TMT type 'A' and type 'B'. A stopwatch was used to note the time in seconds.

### 2.6 Mindfulness meditation

Nyanaponika Thera defined mindfulness as "the clear and single-minded awareness of what actually happens to us and in us at the successive moments of perception". So in other words, mindfulness might be considered as increased level of attention and awareness of moment to moment experience[6]. Mindfulness meditation is a kind of Buddhism meditation. It is also known as *Vipassana Meditation*.

### 2.7 Meditation Instructions

Participants in the meditation group were introduced to a simple mindfulness meditation by a meditation instructor. Participants were instructed to sit in relaxed upright position with closed eyes. In this meditation the meditator was instructed to focus his attention to the sensations linked with the breathing, like the experience at the nostrils, or the movement of the abdomen, without trying to regulate or alter the pattern of respiration. Whenever the attention deviates, the task would be to become aware of it and redirect the attention to the perception of breathing[5]. They were taught to observe all thoughts, sensations and feelings in non-judgmental attitude[11].

### 2.8 Cognitive Tests[7]:

1. Trail making test type 'A'- this test checks the visuo-motor speed and attention. In this test, examination paper has 25 circles with one number, any one from 1 to 25. These circles are distributed in arbitrary manner. Subject need to connect these circles by drawing lines starting from 1 to 25, in the proper order. The time taken (in seconds) by the subject to complete this task is taken as the score.
2. Trail making test type 'B'- this test estimates visuo-motor speed, attention and executive functions. Examination paper contains 25 circles having one number (from 1 to 13) or an alphabet (from A to L). Subject need to connect circles in alternate fashion, one number then one alphabet and so on (1-A-2-B-3-C.....). The time taken in completing this task is taken as the score.

During any of these above mentioned tests, if subject makes any kind of mistake then instructor should point out the mistake and let subject correct it. Stop watch should not be stopped during this period because the apparent increase in time will be the manifestation of decreased cognitive functions.

### 2.9 Statistical Analysis

SPSS (statistical package for social sciences) version 16 was used for statistical analysis. Pre-study intergroup mean score comparisons for trail making test 'A' and 'B' were done by unpaired student's t test. Pre- and post-study intra group comparison of scores was done by paired student's t test. Chi-square test was used to compare the sex distribution. P value ≤ 0.05 was considered significant.

### 3. Results

**Table 1: Unpaired student's t test between study and control group before the starting of study (Mean± SEM)**

Parameter	Study group	Control group	P value	t value
Trail making test type 'A' score (sec.)	56.98± 1.19	60.60± 1.47	0.06	- 1.903
Trail making test type 'B' score (sec.)	109.04± 2.84	108.56± 3.15	0.91	0.113

There were no statistically significant differences in the age and sex distribution between the case and control groups. In pre study stage there were no significant different between the TMT type

A (p value =0.06) and type B (p value = 0.91) scores of study and control groups. It represents that there were no statistically significant differences between the baseline cognitive functions of both groups.

**Table 2: Showing changes in trail making test scores from pre-test to post-test in case group and control group subjects. (Mean± SEM)**

Parameters	Case group (n= 50)	Control group (n=50)
Trail making test 'A' (sec.)		
Pre-	56.98 ± 1.19*	60.60± 1.47
Post-	54.86 ± 1.01	60.26± 1.62
trail making test 'B' (sec.)		
Pre-	109.04± 2.85*	108.56± 3.15
Post-	105.84 ± 2.54	109.50± 2.96

Interpretation of P value- \*P ≤0.05 – significant

Table 2 shows that in study group, after meditation, there was significant improvement in the TMT type 'A' scores (p =0 .036, t= 2.151) and type 'B' scores (p =0.002, t= 3.252). On the other hand there were no significant variations in the TMT type A (P = 0.663, t= .438) and type B (p= .239, t= -1.193) scores of control group.

### 4. Discussion

The purpose of this study was to observe the impact of mindfulness meditation on the attention and executive functions in elderly people. On the basis of previous studies we hypothesized that mindfulness meditation would improve the cognitive functions in elderly people[7][12]. There were non-significant differences in the baseline TMT scores of study and control groups. This indicates towards the fact that in the starting of the study there were no significant differences in the selected domain of cognitive functions. Post-study results of study group show statistically significant improvement in the TMT type 'A' (P=.036) and 'B' (p= 0.002). This improvement points toward meditation induced improvement in visuo-motor speed, attention and executive functions. Similarly other studies have reported positive effect of mindfulness meditation on attention[2][13][14]. However no significant difference in the attention level between the meditator and non-meditator group was found in the studies[15][16] might be because excessive short period of meditation practice. Sharma *et al*[7] showed salutary effect of mindfulness meditation on visuo-motor speed.

This study results showed beneficial effect of mindfulness meditation on executive functions are in line with the results of previous studies[7][17].

Many studies[16]-[20] have been done to understand and explain the beneficial effects of meditation on cognitive functions. Studies show better cerebral perfusion in meditators as compare to non-meditators. Meditation also has a protective effect on the grey matter thickness and has beneficial effect on neural circuits involved in cognitive functions, which leads to increase in cognitive capacity. Meditation can improve myelination of nerve fibers associated with the anterior cingulate cortex. From the psychological point of view, the central theme of mindfulness meditation is "awareness without attachment or analysis". Practice of this kind of attitude towards thoughts, sensations and feeling lead to weakening of affective power of these observations in consciousness. This might leads to improvement in attention.

As a conclusion we can say mindfulness meditation has positive effect on the attention and executive functions in elderly people. Regular mindfulness meditation may improve the quality of life.

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