Association Between Brain Gym And Cognitive Function In Postmenopausal Women

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Abstract—Aging results in cognitive decline in memory and intelligence of the elderly, but this may be delayed or maintained by brain exercises. Studies on increasing cognitive functioning, e.g. by brain gym and physical exercise did not clearly demonstrate an association of brain gym and physical activity with cognitive functioning. Therefore the present study aimed to find any relationship between brain gym and cognitive functioning in postmenopausal women. This analytical study was conducted for three months on healthy postmenopausal women aged 60 years and older at the Mampang Public Health Center in South Jakarta. Excluded were patients with psychosisis, neurological abnormalities, patients on antidepressant or antipsychotic medications, patients with malignancies or diabetes mellitus, or subjects not completing the study. The selected subjects underwent the MoCA-INA and walking tests. Subjects passing both tests were assigned to the brain gym intervention group and the others to the control group without brain gym. The intervention group performed brain gym three times weekly for 3 months, after which both groups underwent a repeat MoCA-INA test. Mean age of control (n=12) and intervention groups (n=14) was 64.58 ±3.42 years and 64.86 ± 4.94 years, respectively. Baseline mean MoCA-INA scores in control and intervention groups were 22.33 ± 2.05 and 20.42 ± 1.69, respectively (p=0.016). After brain gym for 3 months, mean MoCA-INA scores in control and intervention groups were 19.07 ± 2.12 and 20.50 ±1.56, respectively (p=0.067). Cognitive functioning of postmenopausal women increased after performing brain gym. Postmenopausal women are recommended to perform brain gym to prevent or retard reduction in cognitive functioning.

Index Terms—Brain gym, Cognitive Function, MoCA-INA, Memory, Postmenopausal women, Physical activity, Walking test

1 INTRODUCTION

Increased longevity has increased the population of elderly (aged 60 years and above). In Indonesia in 2010, there were 18,037,009 elderly or around 7.59% of the Indonesian population. In the Jakarta Special Capital Region there are 495,024 persons over 60 years of age, or around 5.15% of the population.[1] The Indonesian population of elderly inhabitants for 1990-2025 is projected to increase to 414%, the highest in the world. Increased longevity may cause an epidemiological transition in healthcare due to increased morbidity from degenerative disease.[1] Aging causes various changes in the elderly, such as a decline in brain function [2]. Increasing age decreases cognitive functioning, thus causing financial losses, and personal and social burdens. Decreased cognitive functioning may develop into dementia, morbidity, and mortality [3].

Brain gymnastics (brain gym) may increase cognitive function and the balance between right and left brains by aligning the capacity for simultaneous activity and thinking in the elderly [4]. Brain gym may also stimulate the brain, thereby increasing learning concentration, memory, and cognitive abilities such as alertness and creativity [5]. Carvalho et al. found that physical activity is of benefit for increasing and maintaining optimal cognitive functioning in the elderly, e.g. by preventing progressive delayed cognitive functioning as in Alzheimer disease [6]. This study aimed to determine the influence of brain gym performed in one-hourly sessions twice weekly for three months in post-menopausal women.

2 METHODS

2.1 Design of the study

This was an analytical-experimental study conducted at Mampang District Public Health Centers in South Jakarta from September 2018 up to March 2019. Physical examination and MoCA-INA testing was performed at Mampang District and laboratory examinations were performed by Prodia Laboratories.

2.2 Subjects

The study subjects were randomly selected postmenopausal women aged 60 years and above from five villages (kelurahan) of Mampang Prapat District, South Jakarta, who had satisfactorily filled in a questionnaire. The inclusion criteria were: women aged 60 years and above, capable of good verbal communication, of walking unaided, and agreeing to participate in the study (by signing informed consent) after receiving information about this study. Exclusion criteria: patients with psychosis, neurological abnormalities, on antidepressant or antipsychotic medications, with malignancies or diabetes mellitus, or subjects not completing the study. After physical examination (weight, height, and blood pressure) and determination of fasting blood glucose, cognitive function testing was carried out using the MoCA INA test, while the MMSE test was used for screening purposes only. Sample size determination in this study was based on r=0.80. The sample size for each group was minimally 10. In this study each group had 15 subjects, in order to account for dropouts. In the final test, control and intervention groups contained 12 and 14 persons, respectively.

2.3 Six minutes walking test

This was to determine the subjects’ capacity of performing gymnastics in the intervention group. Subjects not meeting...
walking test requirements were assigned to the control group. Before performing the walking test, the subjects were examined for body weight, height, blood pressure, pulse rate per minute, oxygen saturation and the Borg scale. Then the subjects performed static and dynamic balance tests. The subjects were instructed to walk along a path at the highest speed that they were capable of for six minutes, after which they were asked to sit down and immediately afterward their blood pressure, pulse rate per minute, oxygen saturation and the Borg scale were again measured. Subsequently the predicted VO2 max was calculated. The study subjects were divided into two groups on the basis of the walking test results: Group I, 12 subjects as controls and group II, 14 subjects as intervention group. The control group did not perform brain gym whereas the intervention group did perform brain gym twice weekly in one-hourly sessions for three months, after which the subjects were again tested for cognitive functioning. The brain gym was performed for 60 minutes with 40 minutes of core exercises, 10 minutes of warming up and 10 minutes cooling down(7).

2.4 Cognitive function tests
MoCA-INA (Montreal Cognitive Assessment (MoCA) for Indonesian subjects) is to evaluate various areas of cognitive functioning as follows: (1) short-term memory, (2) visuospatial memory, (3) executive functions, (4) attention, (5) language, and (6) spatial and temporal orientation. Because of its good reliability, internal consistency and validation, MoCA-INA is an excellent screening method for mild cognitive impairment (MCI).

2.5 Data analysis
Various analyses were performed on background characteristics, while the normality of the data distribution was evaluated with the Kolmogorov-Smirnov test. A normal data distribution was expressed as mean, standard deviation, and percentage. To determine any effect of brain gym on cognitive functioning, the t-test was performed on MoCA-INA scores between the control group and the group performing brain gym for three months. The statistical analysis was carried out using SPSS software (Windows version 17 SPSS, Chicago), and a p value of <0.05 was considered statistically significant.

2.6 Ethical Approval
Ethical clearance for this study was issued by the Ethical Commission, Faculty of Medicine, Universitas Trisakti. Nomer : 119/KER/FK/XII/2017

3 RESULTS
Before the intervention (at baseline): Mean age of control group (n=12) was 64.58 ±3.42 years, mean age of intervention group (n=14) was 64.86 ± 4.94 years. Mean MoCA-INA score of control group was 20.50 ±1.56, and that of the intervention group 19.07 ± 2.12 (p=0.067). After performing brain gym for three months, twice weekly with a duration of 60 minutes, mean MoCA-INA score of control group was 22.33 ± 2.05 and mean MoCA-INA score of intervention group was 20.42 ± 1.69 (p= 0.016) (Table 1).

4 DISCUSSION
The MoCA-INA test results between the control group and the intervention group were significantly different (p=0.016) and agree with the study of Azizah et al. stating that brain gym has a significant effect in increasing cognitive functioning in the elderly, and allowing balance between the right and left brains by aligning the ability for simultaneous activity and thinking [4]. Brain gym may stimulate the brain, thereby increasing learning concentration, memory, and cognitive abilities such as alertness and creativity [5]. Aging results in a decline in cognitive functioning, such as dementia, since decreased intensity and duration of activity will cause decreased cognitive functioning and influence brain age, thus decreasing brain function. According to Hauser at al., the positive effect of exercise on cognitive functioning may increase neurogenesis, cell proliferation and hippocampal volume [9]. Regular brain gym may stimulate integration of different parts of the brain, particularly the corpus callosum that leads to a faster and integrated communication between the two hemispheres for increased logical thinking [10]. Yaguez et al. state that brain gym may increase cognitive performance, particularly attention and memory in the elderly with dementia [11]. Okura et al. also state that physical activity and physical fitness at a higher level may delay cognitive decline or decrease its influence [12]. Ohman et al. found that moderate intensity exercise for 50 minutes, three times weekly, may increase global cognitive functioning [13]. According to Lautenschlager et al., the aim of brain gym is to maintain brain health by body building [14], and furthermore brain gym may also affect neuronal degeneration [15]. The study of Yusuf et al. found a significant difference between the control and intervention groups (p=0.001)[16]. The study of Parellangi et al. found that light-intensity brain gym for 10 minutes three times weekly for three months was more effective than moderate-intensity brain gym for 15 minutes twice weekly [8].The study by Fotuhi et al. found that brain gym increases cognitive functioning to 84% in patients with MCI by means of a brain fitness program for 12 weeks [17].Buchman et al. state that cognitive decline in the elderly is associated with disturbed regulation and plasticity of the brain,
and that physical exercise may increase positive neuroplasticity, cognitive reserve and density of nerve interconnections [18]. According to Rhyu et al. aerobic exercises retard neuronal degeneration that causes cognitive decline and dementia. In their animal experiments, physical exercise stimulated angiogenesis of the smaller vessels in the cerebrum, motor cortex, and hippocampus [19]. Ericson et al. showed that physical exercise may increase hippocampal volume, thus increasing serum brain derived neurotrophic factor (BDNF), which acts as a mediator of neurogenesis in the dentate gyrus. Neurotropin is an endogenous protein for increasing neuroplasticity [20]. In contrast, Ayan et al. found no significant association of brain gym and fitness exercises performed for 18 weeks, twice weekly, for 30 minutes, with cognitive function [21]. Other investigators, Kuster et al. [22] and Canela et al. also found no association between brain gym and cognitive function [23]. These differing results may possibly have been due to differences in physical activity assessment, validity of cognitive measures, and the elderly that were followed up.

5 CONCLUSION

In this study a significant association was found between brain gym performed twice weekly for 60 minutes, during a time period of three months, and increased cognitive functioning in postmenopausal women.

6 ACKNOWLEDGMENT

The authors express their gratefulness to the Head and Staff of Mampang Public Health Center for the use of facilities and to the study subjects for their cooperation during the study.

REFERENCES