Pilot Study on Brain Gym® and Mild Cognitive Impairment among Seniors in Hong Kong

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Introduction

Mild cognitive impairment (MCI) represents the transitional state from normal cognitive aging to dementia. It is found in up to one-fifth of elderly persons aged over 65.[1, 2] MCI is a heterogeneous clinical entity with multiple etiologies.[3] Most often, MCI is described in the context of prodromal Alzheimer's disease (AD) because of its potential progressive nature. Patients with MCI, in particular the amnestic MCI subtype, have been shown to exhibit a more rapid cognitive decline than their normal counterparts. Overseas studies have shown that MCI patients exhibit an annual progression rates of 4-40% and have a 7-fold risk of progression to dementia compared to cognitively-normal persons.[4, 5] Despite the large variability across different studies and the lack of local data, these alarming figures show that MCI represent a detrimental and malignant state of cognition that should be detected and treated early.

Delaying progression from MCI to dementia entails substantial personal, social and economic benefits.[6] To date, there is no promising pharmacological intervention for MCI.[7] Yet, studies of cognitive training for elderly groups have demonstrated encouraging results for future research in MCI treatment. For example, a small uncontrolled study of computer-assisted training of multiple cognitive domains yield long-term benefit in fluid intelligence in old age home residents.[8]

Brain Gym®

Brain Gym® is originated from Educational Kinesiology It is a series of simple and interesting movement. Brain Gym® draws out the learning potentiality of participants through movement, it brings happiness and success to various age groups and to participants with different abilities. Even for young children or elderly participants, with proper guidance they can learn Brain Gym® easily. If they persist in practicing Brain Gym® for 4 to 6 weeks, generally, there is a distinct observable difference in their learning ability.

Brain Gym® was found by Dr. Paul E. Dennison and Gail E. Dennison while Paul had learning disability in his childhood. In 1970s, they conducted study on how to improve children and adults' learning disability. They carried out extensive research in areas that include brain function, applied kinesiology, traditional Chinese Meridian, yoga, psychology and Neuro Linguistic Programming. Derived from the extensive clinical results, they devised Brain gym® as 26 movements which categorized into 4 groups and a series of whole brain integration "Balances" to enhance participants' performance.

The Brain Gym® activities are organized into four categories-the Energy Exercises, Deepening Attitudes, the Lengthening Activities, and the Midline Movements-that correspond with the three primary types of movement that humans learn: stabilization, locomotion, and manipulation. These three types of movement, contributors to the physical skills of learning, work together to provide the spatial orientation that allows for flexibility of attention in three directional fields: up-and-down, forward-and-back, and left-and-right.[13] They also support the physical mechanics involved in the three main areas of function:

- Organization/up-and-down ~ (Energy Exercises) to center and align; for planning, creating order, and lining things up. (Deepening Attitudes) to relax, calm, and physically or emotionally stabilize; for sharing, playing, cooperating, and sensory memory

- Focus/forward-and-back ~ (The Lengthening Activities) to release held tension and enable action; for focusing, understanding, expressing oneself, and taking initiative

- Communication/left-and-right ~ (The Midline Movements) to encourage sensorimotor coordination; information processing necessary for reading, writing, listening, and speaking

Organization/up-and-down	**Focus/forward-and-back**	**Communication/left-and-right**
The Energy Exercises	The Lengthening Activities	Midline Movements
✧ Sipping Water	✧ The Owl	✧ The Elephant
✧ The Energy Yawn	✧ Arm Activation	✧ Think of an X
✧ The Thinking Cap	✧ The Footflex	✧ Neck Rolls
✧ Space Buttons	✧ The Gravity Glider	✧ The Double Doodle
✧ Earth Buttons	✧ The Calf Pump	✧ Alphabet 8s
✧ Brain Buttons	✧ The Grounder	✧ Belly Breathing
✧ Balance Buttons		✧ The Cross Crawl
		✧ Cross Crawl Sit-ups
Deepening Attitudes		✧ Lazy 8s
✧ The Positive Points		✧ The Rocker
✧ Hook-ups (Part I & Part II)		✧ The Energizer

<u>Objective, Subjects and Methods</u>

With the objective of studying the relationship between Brain Gym® and MCI, the Hong Kong Sheng Kung Hui Welfare Council conducted a pilot study from May to September, 2009. The council recruited members in 7 elderly service units in Hong Kong. Subjects aged ≥60 years were invited by social worker, occupational therapist or trained programme worker for study screening, during which information on cognitive functions and depressive mood were collected. Subjects were also administered the Hong Kong version of the Montreal Cognitive Assessment (HK-MoCA).[14] The HK-MoCA assesses 7 cognitive domains and has shown good validity and reliability in detecting patients with mild cognitive symptoms. Objective cognitive impairment was defined as score of <22 on the HK-MoCA.[14] Subjects were recruited into the study if they met the criterion for objective cognitive impairment, showed evidence of preserved daily functions and were judged to be non-demented based on all available information. In the setting of local elderly service units, this subject selection process provides the closest possible approximation to the revised MCI diagnostic criteria.[15] In addition, the Chinese version of the Geriatric Depression Scale (GDS) was administered to assess the severity of depressive symptoms[16] with higher scores denoting more depressive symptoms.

Subjects were further assigned to the Brain Gym® group or the control group. Those in the Brain Gym® Group received the Brain Gym® training in at least 8 out of 12 available sessions spanning 6-12 weeks each. Control subjects did not receive any cognitive intervention during the study period. The HK-MoCA and GDS were repeated at the end of study period to assess the effect of the Brain Gym training on cognition and mood. Informed consent was obtained from all subjects for study participation.

Statistical analysis

We calculated the change in the performance on the total and domain subscores of the HK-MoCA and on the GDS total score by subtracting the pre-study score from the post-study score. For HK-MoCA, changes were further classified as *declined or no change* for change score of ≤0, and as *improved* for change score of >0. For GDS, changes were classified as *declined or no change* for change score of ≥0, and as *improved* for change score of <0. To assess efficacy of the Brain Gym® programme upon cognition, we used the χ^2 test to compare the proportion of change in total and domain subscores of the HK-MoCA and in the GDS across the two subject groups.

Results

Fifty four subjects were recruited. Thirty five and 19 subjects were assigned to the Brain Gym® group and control group, respectively. Subjects' demographic factors are summarized in Table 1.

Table 1. Demographic features of subjects

	Control	Brain Gym®	
N	19	35	*p*
Median age	81±12	80±12	0.358
Female	68%	86%	0.166

Figure 1 shows that, when compared to the control group, fewer subjects in the Brain Gym® group had decline or no change on the HK-MoCA over the study period, χ^2 (1, N = 54) = 4.91, p = .027. As shown in figure 2, domain subscore analysis revealed that more Brain Gym® subjects exhibited improvement in the executive/visuospatial measure on the HK-MoCA, χ^2 (1, N = 54) = 4.84, p = .028. In contrast, the effect of Brain Gym® training upon change in GDS was not significant.

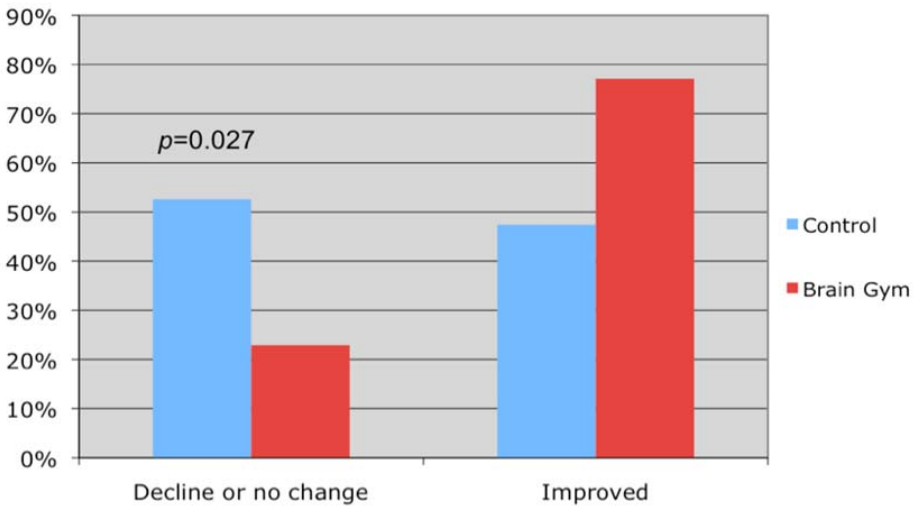

Figure 1. Change in HK-MoCA total score

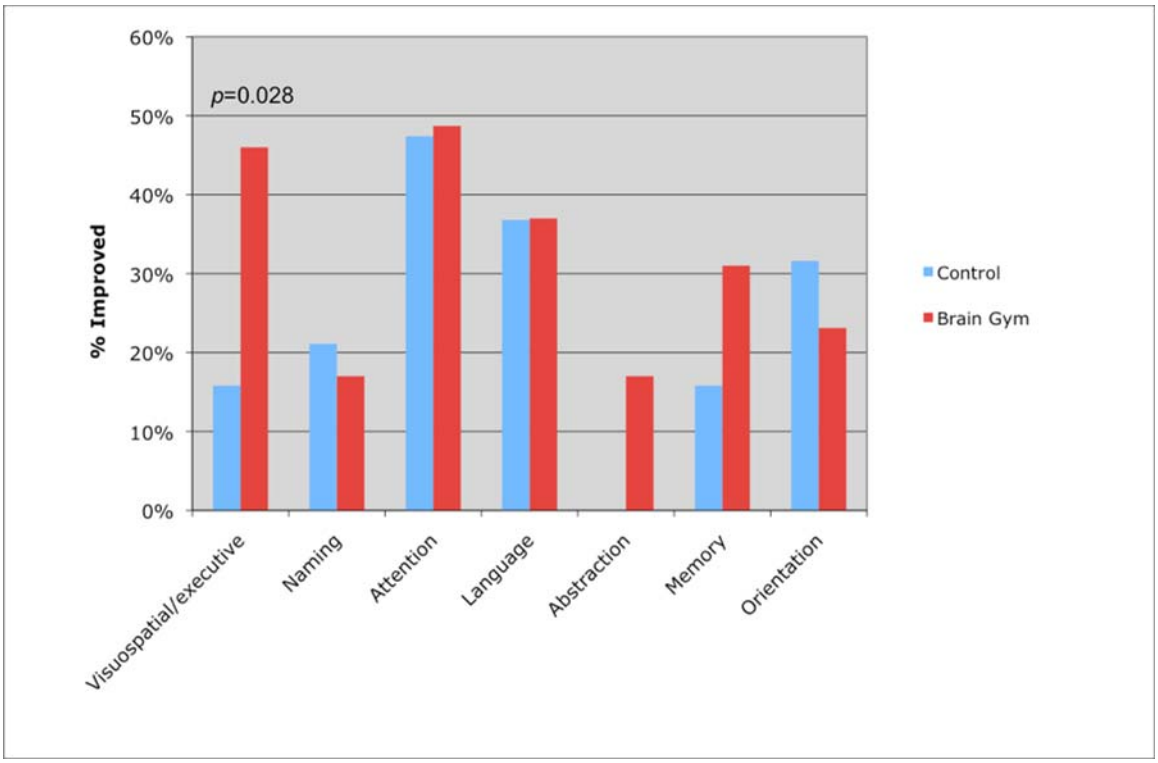

Figure 2. Change in HK-MoCA domain scores

Discussion

In this pilot study we show that the Brain Gym® programme exerts significant cognitive benefit for MCI. Moreover, the beneficial effects seem to be specific to executive and visuospatial functions. Executive functions are higher-order, complex cognitive processes that are involved in planning, organization, flexible thinking and cognitive control.[17] Executive functions are sensitive to age effects, and impairment of which is the most potent independent predictor for nursing home placement in older persons.[18] The present results show that Brain Gym® exercise may help to slow cognitive aging by preserving or even improving these functions.

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