Prevention of Mild Cognitive Impairment

-A project for all citizens of Kashihara, Japan-

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Background

The patient number of dementia and Mild Cognitive Impairment (MCI), which is a reserve of dementia, is increasing every year and a preventing action is needed. [1-3] Accordingly, Nara Medical University of Department of gerontological nursing and Kashihara City Council of Social Welfare of Community Support Service Center began together a project to prevent dementia against all citizens of Kashihara city. A public relation was distributed to all houses of Kashihara city and citizens were collected.

The cognitive function of the citizens were evaluated and methods to prevent dementia (improvement in diet, exercise therapy, studying methods) were trained. For interpositioning, we especially put dual-task as a warm-up. Compared to single-task which is only exercise, many reports of improvement in memory performance is seen with dual-task including thought process.[4-5]

For people of subject, textbooks were distributed for continuous practice of preventive actions and movies were distributed to those who requested.

Objective

- Evaluate the cognitive function of participants.
- Train people of subject improvement of diet, exercise therapy, and studying method, also to continue.
- Measure the effectiveness of the project.

Methods

- Subjects were gathered in 11 different public halls of Kashihara city and trainings were performed on diet improvement and aerobic exercise. Following this, studying therapy (sentence memory, number repetition and reverse ayat, calculation, tongue twisters) were performed after warm-up exercises stated below : 90 minutes.
- **Warming – up exercises ;** (1) Clap on multiples of 3 while taking steps left and right (figure 1). → Speed up when members get used to it. → Change the multiples when members get used to it (Resources : Japanese National Center for Geriatrics and Gerontology, 2014).

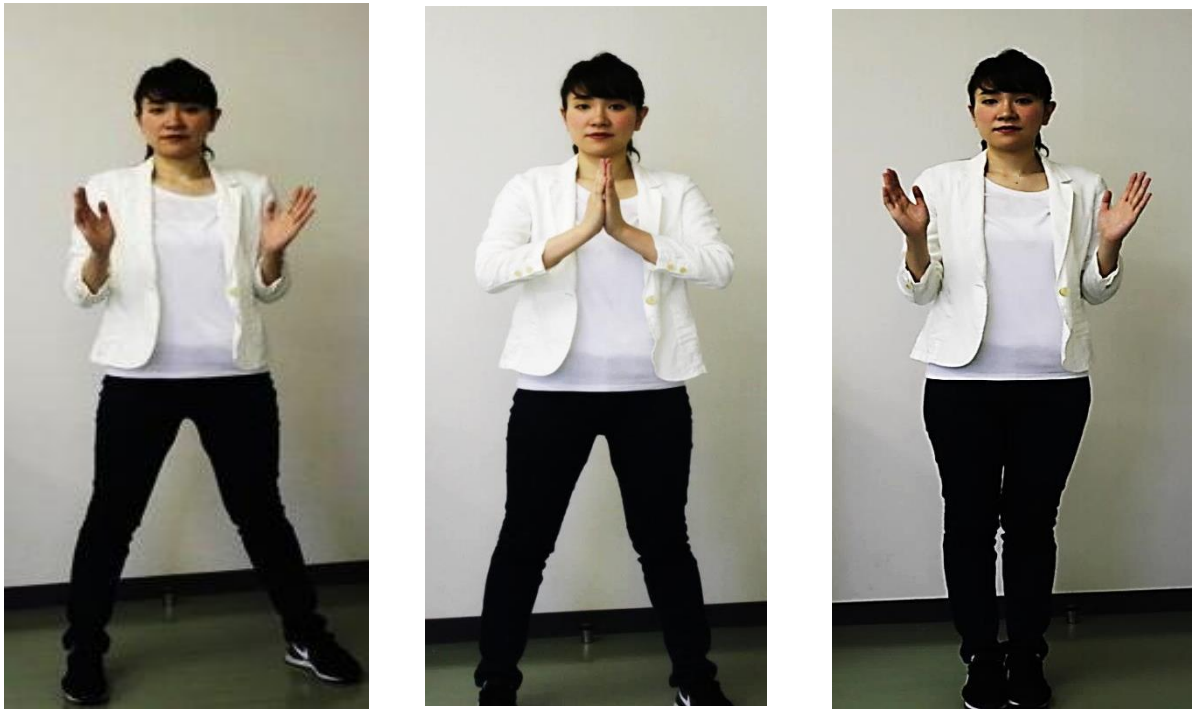

Figure 1. Clapping on multiples while taking steps left and right

- (2) Rock-Paper exercise ; Make a rock with the hand at your breast and make paper with the extended hand. Exchange every second. → Accelerate. Next, make paper with the hand at your breast and make a rock with the extended hand. Exchange every second. → Accelerate. (Resources : Kikunori Shinohara. Brain exercises of 60 seconds. 2006).

Figure 2. Rock-Paper exercise

- (3) Knock your thigh with your right fist and rub your thigh with your left palm. Switch left and right hand every 4 times. → Accelerate.

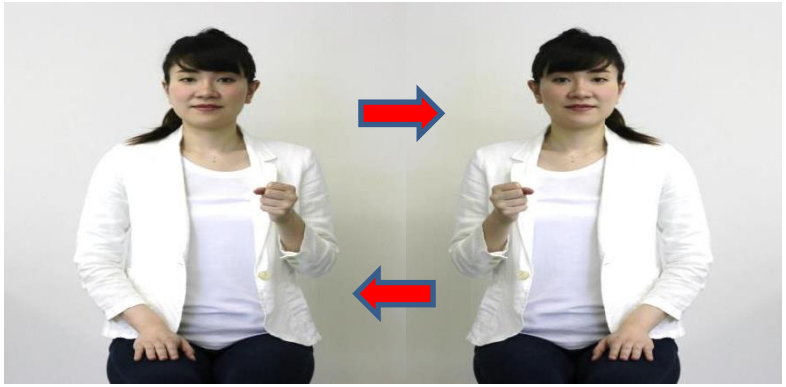

Figure3. Knock with right, rub with left. Switch after 4 times.

- (4) Nose and ear touch; hold your nose with your left hand and hold your ear with your right hand. Switch hands every second. → Accelerate.

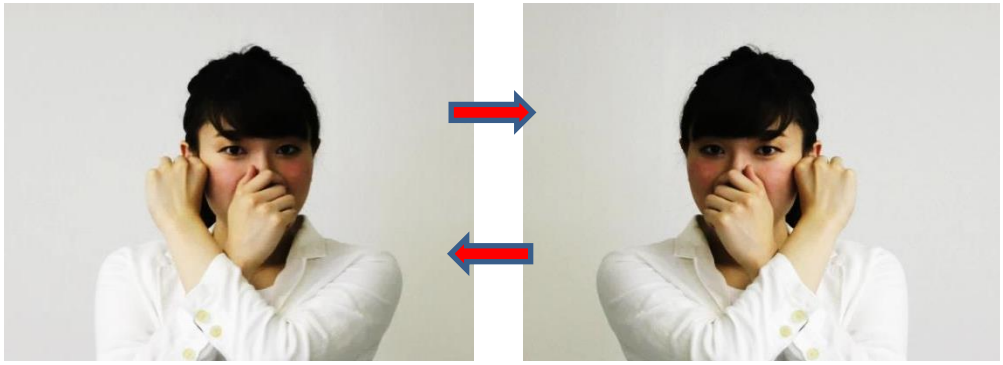

Figure4. Nose and ear touch

- (5) Finger folding; 1. Fold your fingers from the thumb. 2. Fold your fingers from the little finger. 3. Fold your fingers with left hand from little finger, right hand from thumb. 4. Fold your fingers with left hand from thumb, right hand from little finger. 5. Start folding your finger with the thumb of left hand already folded. 6. Start folding your finger with right thumb already folded. (Resources: Yoshihiko Koga. How to make active brains. 2010)

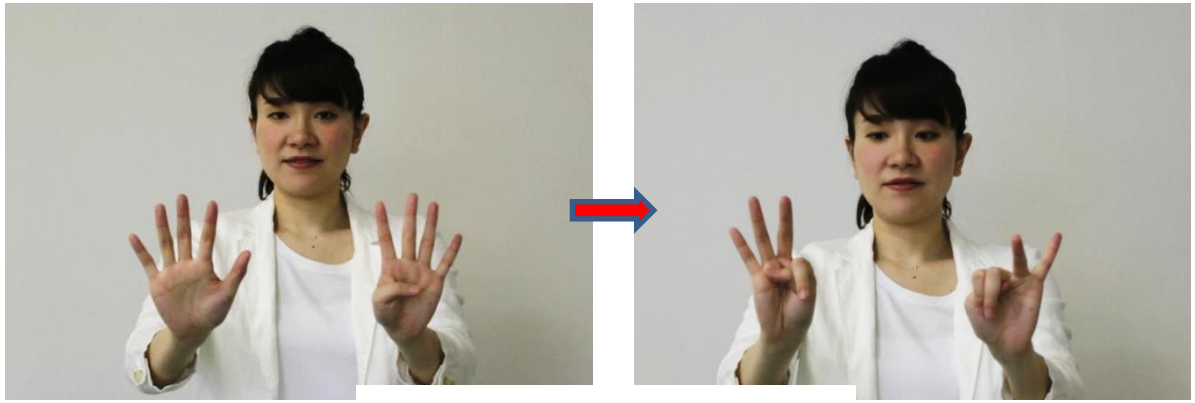

Figure4. Finger folding

- **Studying method :** Sentence memory, number repetition and reverse ayat, calculation, and tongue twisters.
- **Measurement of cognitive function :** Instruction manual of Japanese version of Montreal Cognitive Assessment (MoCA-J) ;

  This is a cognitive screening instrument developed to detect mild cognitive impairment (MCI).

  It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

Source : Translation of the MoCA-Japanese version ; Hiroyuki Suzuki, Supervision ; Yoshinori Fujiwara. Tokyo Metropolitan Institute of Gerontology.

- **Time Frame :** June-July / 2015
- **Analysis :** The relationship of age and sex with the score on the MoCA test : Spearman's rank correlation coefficient.
  Comparison of variables before and after the intervention : Paired t-test.
- **Ethical considerations :** The outline of the research, voluntary nature of participation, anonymity, and agreement regarding the publication of the document were explained to prospective participants both in writing and verbally, and their consent was subsequently obtained.

  The study protocol was approved by the ethical review board of Nara Medical University.

Results

- Participants were 66 male and 238 female. MoCA test was performed before and after interposition and the average score of each item per age is given in the figure (Fig. 6-11).
- The score on the Alternating Trail Making decreased with age (Spearman's rank correlation coefficient: r=-0.34), but improved significant after intervention (Paired t-test: p=0.006).
- Visuoconstructional Skills even up age, almost no change.
- Verbal fluency decreased with age (r=-0.33), and there was no change after intervention.

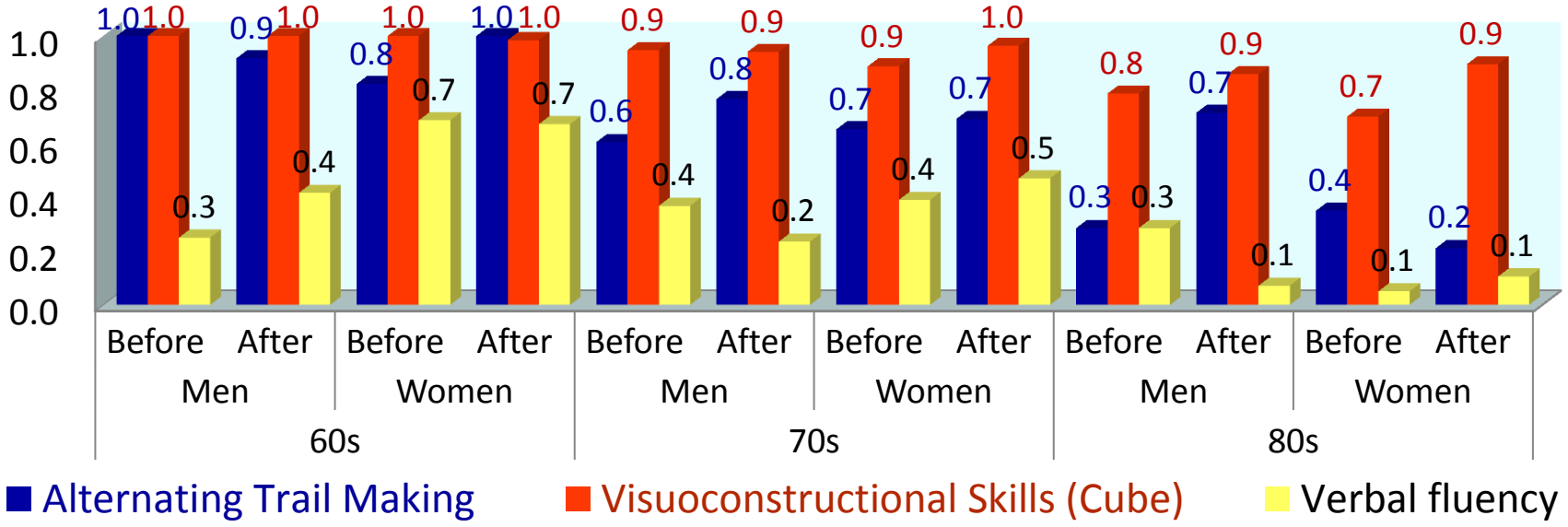

Figure 6. The average score on the MoCA test: 1-point scale

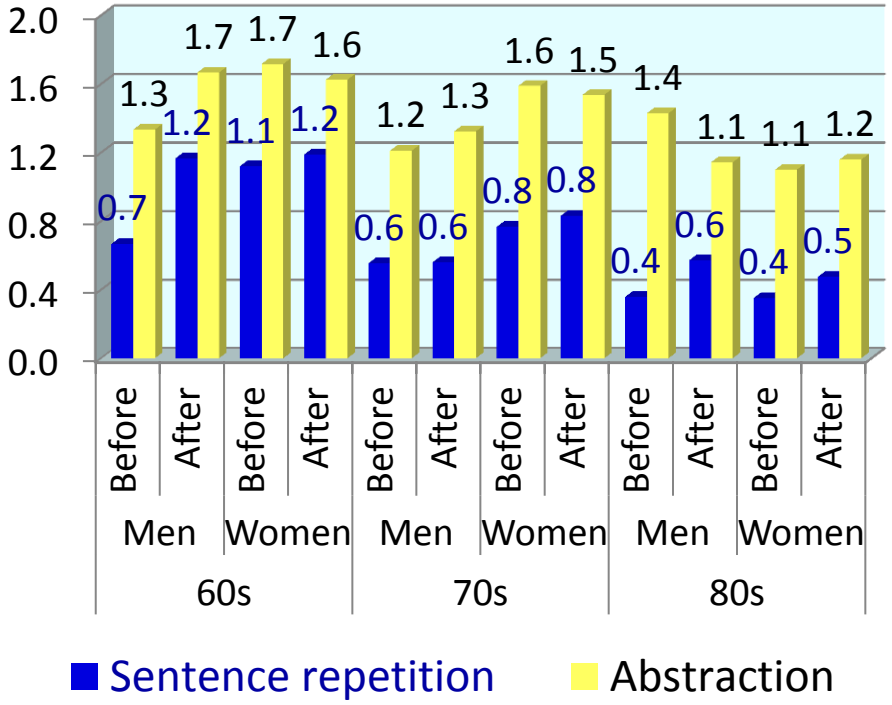

Figure 7. The average score on the MoCA test: 2-point scale

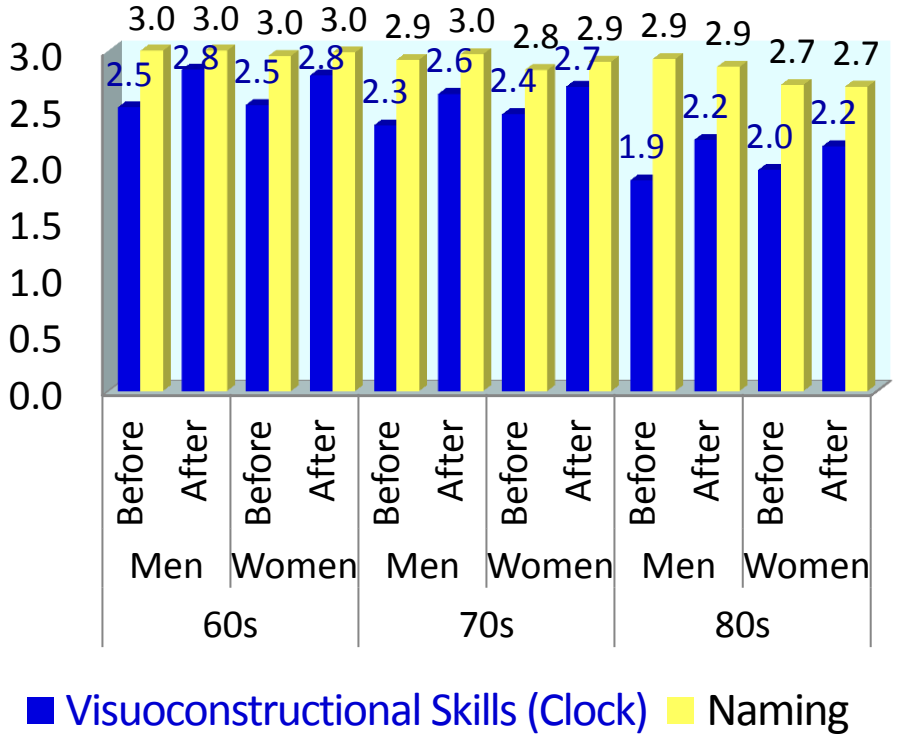

Figure 8. The average score on the MoCA test: 3-point scale

- The score on sentence repetition decreased with age (r=-0.27), but improved significant after intervention (p=0.016).
- Abstraction decreased slowly with age, but was maintained without increasing downward.
- Visuoconstructional Skills (Clock task) decreased with age (r=-0.26), but improved significant after intervention (p=0.000).
- Naming even up age, there was almost no change.

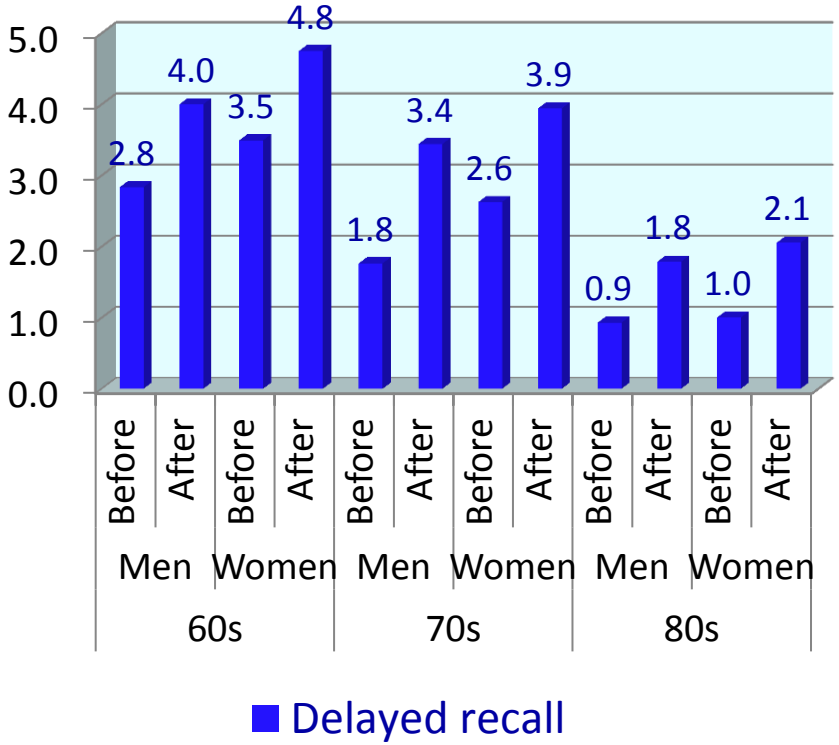

Figure 9. The average score on the MoCA test: 5-point scale

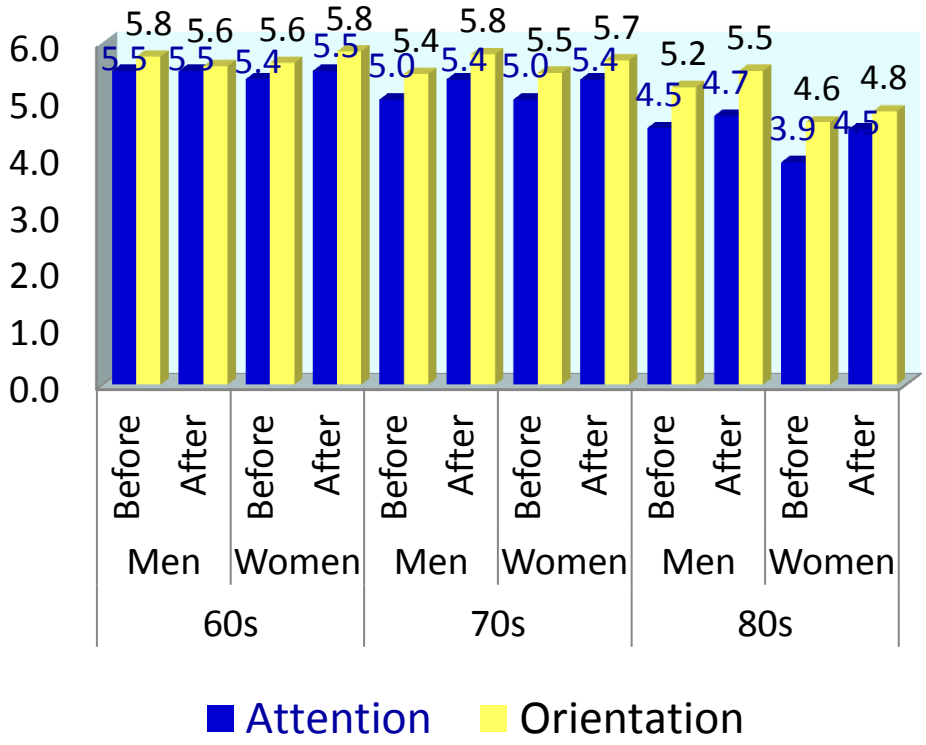

Figure 10. The average score on the MoCA test: 6-point scale

- Delayed recall decreased with age (r=-0.40), but improved significant after intervention (p=0.000).
- Attention decreased with age (r=-0.36), but improved significant after intervention (p=0.000).
- Orientation decreased with age, but was maintained without increasing downward.

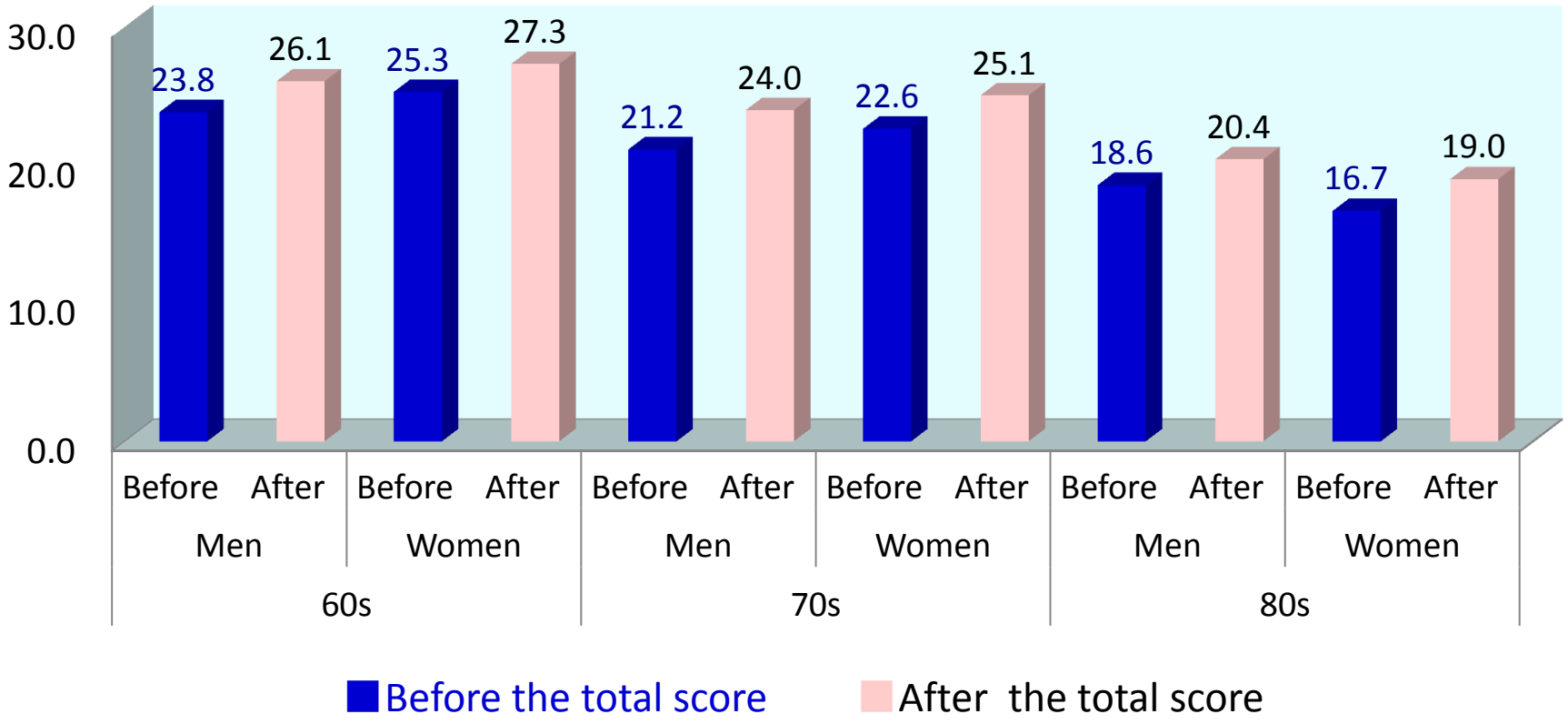

Figure 11. The average score on the MoCA test: Total score

- Although the total score decreased with age (r=0.51), it improved by about 2 points across all ages after intervention (p=0.000).

Discussion

As a result, it was seen cognitive function was divided into a function which lowers rapidly with age and a function which stays constant after a slight decrease. The function which lowered rapidly was alternating trail making, verbal fluency, sentence repetition, visuoconstructional skills (clock), delayed recall, and attention. They are suspected to lower more with no care. No difference between genders were seen here.

However, almost all of the cognitive functions that decline with age saw significant improvements after intervention, so through continuous use of these methods, the length of time for which these functions are maintained can be sufficiently expected to be prolonged. Of these, only verbal fluency failed to improve. The method by which this function is practiced needs to be revised, and a practice method needs to be developed where verbal abilities are used more heavily.

With increase in age, the brain function for dual-task decreases.[6-8] There is still a discussion whether training will improve[8-9] or have a reverse effect. [10] But in our daily lives, during a walk, during shopping, or during interaction with friends, we are always performing multi-tasks. So we concluded training corresponding to these actions will make daily lives smooth and incorporate dual-task trainings. As a results, we saw significant increase in cognitive function.

But we have not performed comparison with single-task training, so we do not understand which has higher effect. So the next objective is the comparison between the two. Also it is expected that the data will return to before interpositioning without continuous training, so follow-ups for everyday individual training is also an action.

Conclusion

A significant increase in the total score of MoCA test, alternating trail making, sentence repetition, attention, visuoconstructional skills (clock), delayed recall, and attention was seen thorough dual-task training and studying method.

We can expect to extend the duration of full cognitive function by continuing to employ this method.

Acknowledgements

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Miss Otani, a student at Nara Medical University, assisted in the creation of the video of warm-up exercises. We are immensely satisfied with her contribution.

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