

# Verification of the impact of storage by the rhythm phrase to be repeated

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## [Introduction]

Alzheimer's Disease accounts for a high percentage of dementia at over 60%. As dementia incidence doubles every 5 years from 65 years old onwards, developing a countermeasure is an urgent issue<sup>1)</sup>. As a countermeasure, the effectiveness of cognitive function training tasks such as dual-task (performing two tasks simultaneously) and n-back task (a delayed recall task for items shown n steps earlier) have been verified. Furthermore, it has been verified lyrics accompanied with sound or rhythm are stored easily by the memory, but difficult to remember when without sound or rhythm. It was hypothesized that combining rhythmic music with repeated memory tasks would improve memory performance. Please refer to Figure 1.

It was also predicted that stress associated with memory tasks would be alleviated by the relaxing effect of music. The purpose of this study is to verify a new training method combining rhythmic music and repeated memory tasks. An intervention study was conducted over 3 months, and compared results from the intervention group and the control group.

## [Method]

**Screening test** for mild cognitive impairment: Montreal Cognitive Assessment (MoCA test) and; **Stress check**: Measured  $\alpha$ -amylase levels of saliva taken from the sublingual gland. Please refer to Figure 2 and Table 1.

**Target group**: Participants from the elderly population of City Kashihara.

**Period**: April – September 2016

**Intervention**: Once a month, over 3 months Intervention method developed.

**Analysis** was conducted by a corresponding t-test, comparing the control group and intervention group results.

## [Results]

Among the 108 participants, data of the 79 that participated until the end were analyzed. The average age of the subjects is  $75 \pm 8.2$ , with 12 being male and 67 being female. For the cognitive function, the average value of score for each category on the MoCA test and the t-test results are indicated in Figure 3.

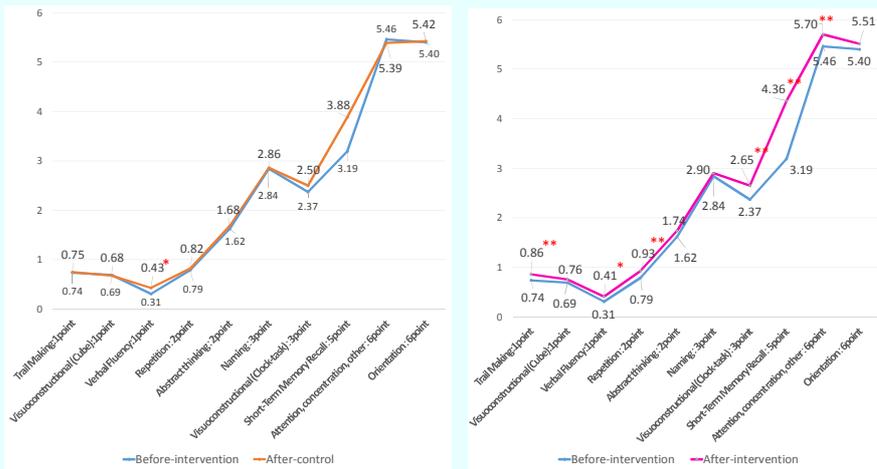


Figure 3: Comparison before and after the intervention and control of the mean value of MoCA test  
Corresponding paired t-test, n = 79. \*\*Significant at 1% level, \*Significant at 5% level

**The average score in the MoCA test:** Please refer to Figure 3 and 4.

For each cognitive item, a significant function improvement was acknowledged in trail making and clock drawing (visual-spatial cognitive ability), verbal fluency (exploration of semantic memory), repetition immediate memory, short-term memory, recall delayed memory, recall repeat, reciprocal number, target detection, subtraction task concentration, attention, memory ( $p < 0.05$ ).

For total score, before the intervention was 23.4 points ( $< 26$  points), and it did not meet the cut-off value.

After the non-intervention control period of 3 month, when measured again, it was 24.7 points ( $< 26$  points), though with a slight increase in the total score, there was not much changed in each cognitive category.

After the intervention, the average total score was 25.8 points ( $< 26$  points), it increased to a score significantly closer to the cut-off value.

**Next, for  $\alpha$ -amylase of the stress measurement results**, in the correlation between psychological stress and cognitive abilities, correlation has been observed; the higher saliva amylase that reflects mental stress was, the lower the cognitive ability was (Pearson's product-moment correlation coefficient,  $r = -0.25$ ). Subsequently as for the results of measuring stress ( $\alpha$ -amylase), the control group did not show any significant change, while the intervention group showed a significant decrease in negative stress from 47.88 (before the intervention) to 40.51 (after the intervention) on average ( $p < 0.01$ ). Please refer to Figure 5.

## [Discussion]

The method developed in this study combines brain training with music therapy.

It is a technique called "Ostinato" that repeats a short phrase and choreography multiple times.

There is a characteristic that phrases can be easily reproduced. As it has a trait which makes it easy retain and recall, it is easy to recall during memory and recall tasks when incorporated into these activities. Music can also help recollecting memories and through this, recalling memory and emotional activity can both be anticipated<sup>2,3)</sup>. A synergistic effect can be expected when the hippocampus is stimulated through recollection through music as well.

## [Conclusion]

Repeated memory tasks combined with rhythmic music were effective both in improving memory capacity and reducing stress.

References : 1. Qiu C. (2009) Epidemiology of Alzheimer's disease: occurrence, determinants, and strategies toward intervention. Dialogues Clin Neurosci.  
2. Dolcos F (2005) Remembering one year later: role of the amygdala and the medial temporal lobe memory system in retrieving emotional memories. Proc Natl Acad Sci.  
3. Umemoto M (2015) The effect of reminiscence with stimulation of sound in elderly living in the community. The Journal of Japan Society for Early Stage of Dementia.



Figure 1: Intervention techniques  
Implement n-back task before, during and after music is played. n-back task is a delayed recall task which increases the difficulty as items are recalled n steps back. For example: 1-back task: answering what the previous task was. 2-back task: answering what the task 2 tasks ago was. 3-back task: answering what the task 3 tasks ago was.

Table 1. The reference values of salivary  $\alpha$ -amylase

Salivary $\alpha$ -amylase (KU/L)	Stress Level
0-30	There is no negative stress.
31-45	There is slight negative stress.
46-60	There is negative stress.
61 KU/L or more	There is a high amount of negative stress.

Upon stress, amylase activity levels in the body for self-defense reaction is increased.

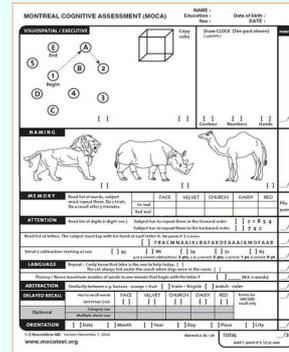


Figure 2: The screening scale; Uses the Montreal Cognitive Assessment (MoCA-test). This is a total of 30 points perfect score, and the higher the score is, the cognitive function is higher, and the cut-off value is 26 points. During the usage of the test, permission has been obtained from the original developer Dr. Ziad Nasreddine.

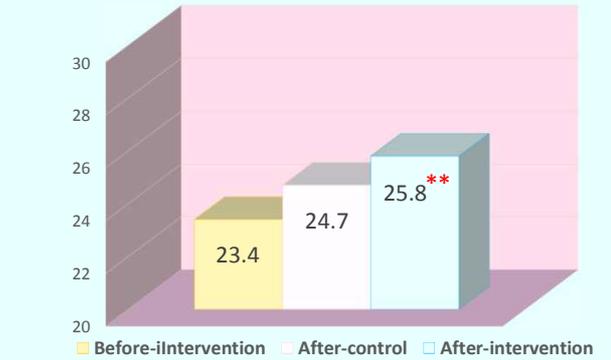


Figure 4: Comparison before and after the intervention and control of the mean value of total score of MoCA  
Corresponding paired t-test, n = 79. \*\*Significant at 1% level, \*Significant at 5% level

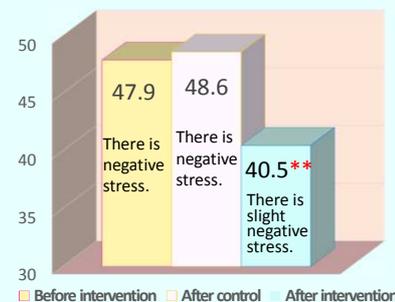


Figure 5: Before and after comparison of salivary  $\alpha$ -amylase: Paired T-test  
Corresponding paired t-test, n = 79.

\*\*Significant at 1% level, \*Significant at 5% level

As you can see from this research, elderly people will increasingly demonstrate their abilities!

