# Basic Research of Reminiscence Therapy in Nursing Measured by Near Infrared Spectroscopy (NIRS)

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## Ⅰ. Objective

Reminiscence therapy is one of therapies which nurses can perform as an approach to the elderly with dementia. Many reports have indicated its effects, however, few reports in nursing have demonstrated the effects by using physiological indicators. The aim of this study is to clarify whether reminiscence therapy can be used to stimulate the brain as a nursing care by using a set of optical encephalography.

## Ⅱ. Methods

### 1. Subjects

Participants: 20 healthy adults （ average age 21.9±2.7 ); 8 males and 12 females.

### 2. Measurements

(1) **Basic data**: age, underlying diseases
(2) **NIRS data (hemoglobin in the frontal lobe):** Changes in blood flow was measured by the NIRS.
   The set of optical encephalography (Spectratech, Inc., OEG-16) was used to measure it.
   This device is noninvasive and can measure the activity of the frontal lobe.
(3) **Arousal level data**:
   I asked to the participants when they were most arousal (stimulus images, control images, or a conversation).



Figure2-1. Example of reminiscence images

Figure2-2. Example of control images
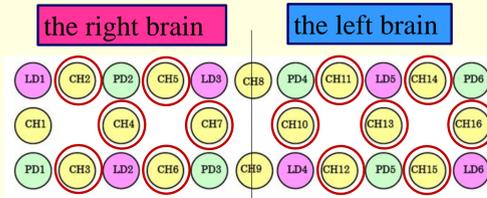
Figure3. Experiment environment

the right brain    the left brain

Figure4. Analytical 12 channel

### 3. Measurement items and a measurement tool

#### 1) Blood-flow volume change in the frontal lobe （ NIRS data ）

I used a light imaging cerebral function measuring device OEG-16 (made in Spectratech, Figure1). This measuring device can measure the blood-flow volume change in the frontal lobe using Near-infrared spectroscopy (NIRS) at the same time in multi-channel.
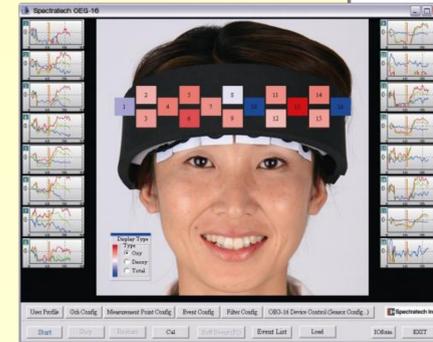
#### 2)Subjective awareness

I asked to the participants when they were most arousal (stimulus images, control images, or a conversation).



Figure1. The cerebral function measuring device

http://www.spectratech.co.jp/index.html

### 4. Measurement methods    Figure2, 3

I prepared reminiscence images (which described trends when the participants were childhood and were considered to recall the participants' memories) and control images (abstracts images such as a landscape), and show these images to the participants.
I prepared 40 reminiscence images and 40 control images (required time: total 10 minutes), and showed each images to the participants for 15 seconds per image. Subsequently, each participant had a conversation with a researcher for 10 minutes with the reminiscence images.

### 5. Analytical methods

NIRS data can be measured by this device through 16 channels, but 4 channels were excluded (the rightmost and leftmost channels which caused remarkable noises, and the central 2 channels which could not be divided into the right and left brain). Therefore, I analyzed data for 12 channels (right 6 channels and left 6 channels, Figure4 ). I compared the data between the right brain and the left brain for oxyhemoglobin (ΔOxy-Hb) for the reminiscence images and control images. Furthermore, simple tabulation was performed the subjective survey.

### 6. Ethical Consideration

This study was approved by the Research Ethics Committee of the university which the researcher belongs to. I recruited participants from the public, and I explained the study to candidates in verbal and written forms. After that, I obtained their written consent individually.

## Ⅲ. Results

### 1. Changes of brain blood-flow volume ( NIRS data)

I have to apologize that there are some parts where abstract description and analysis results have been modified.

In reminiscence images, number of sites where Oxy-Hb values of the left brain was significantly high was same as that of those where value of the right brain was significantly high on six pairs of channels. In addition, Oxy-Hb values of the left brain were significantly higher in 5 out of 6 paired channels for the control images.
In the conversation, all channels except one channel whose data showed significantly higher value of the left brain revealed no significant difference between the right and left brain.

Table1. Comparison of ΔOxy-Hb values

| reminiscence images | | | control images | | |
|---|---|---|---|---|---|
| CH | Values | Wilcoxon | CH | Values | Wilcoxon |
| 2 | 0.10±0.04 | 0.000 | 2 | 0.19±0.07 | 0.000 |
| 14 | 0.29±0.03 | | 14 | 0.32±0.07 | |
| 3 | -0.05±0.05 | 0.000 | 3 | -0.04±0.07 | 0.000 |
| 15 | -0.08±0.04 | | 15 | 0.06±0.05 | |
| 4 | -0.04±0.06 | 0.000 | 4 | 0.06±0.07 | 0.000 |
| 13 | 0.08±0.04 | | 13 | 0.11±0.06 | |
| 5 | 0.28±0.07 | 0.113 | 5 | 0.22±0.07 | 0.000 |
| 11 | 0.27±0.05 | | 11 | 0.28±0.09 | |
| 6 | -0.10±0.20 | 0.000 | 6 | 0.02±0.07 | 0.000 |
| 12 | 0.05±0.06 | | 12 | 0.10±0.86 | |
| 7 | 0.09±0.05 | 0.000 | 7 | 0.15±0.05 | 0.006 |
| 10 | 0.07±0.05 | | 10 | 0.14±0.07 | |



watching at reminiscence images

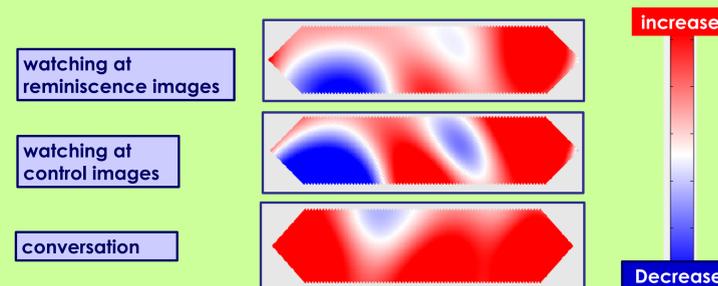watching at control images

conversation

increase

Decrease

Figure5. Examples of Changes of Oxy-Hb values

### 2. Study on subjective awakening degree

In the subjective survey, 15 out of 20 participants answered that they were more arousal when they saw the reminiscence images than control images. In addition, all participants answered that they were most arousal during the conversation. Furthermore, most participants answered that the conversation was fun.

## Ⅳ. Discussion

A comparison of ΔOxy-Hb levels revealed that there were differences in the activity of the right and left brain when the participants saw the reminiscence images and the control images. Some reports have indicated that the right brain is dominant to process visual information, however, the values in the left brain was higher than the right brain in this study. In stimulus images, it was believed that both the left and right brain might have been stimulated by generated emotional effect in addition to an action to watch. I intend to perform more detailed data analysis in future.
   I presume that the participants use both of the right and left brain during the conversation based on the fact that there were not much differences between the right and left brain in the conversation. Furthermore, subjective arousal level was highest during the conversation.
   I presume that the reason was that the frontal lobe was activated by the conversation. For ΔOxy-Hb levels, the right and left brain also showed their activity, indicating that the entire frontal lobe was used for reminiscence.
   From these results, I conclude that reminiscence therapy through a conversation with a subject can be used as a nursing care to activate the brain. Further investigation in the elderly participants will be required.

Thank you for your interest in my presentation.

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