Brain activity measurement at performing motivative exercise
vs passive exercise by Functional Near-Infrared Spectroscopy
(Out patient of Geriatric Health Services Facility)

Yoshiko Morita\(^1\), Tomoji Ishimaru\(^2\), Masahiro Hirayama\(^2\), Takizawa Shigeo\(^3\) Toshiyuki Tanaka\(^4\), Yoshiyasu Taketufi\(^5\), Hajime Takada\(^5\)

\(^1\)Okayama Rehabilitation Hospital, \(^2\)Medical corporation Kigankai, Geriatric Health Services Facility Izuminosato, 
\(^3\)Biophilia Institute, \(^4\)Keio University, \(^5\)Yokohama National University

**Key words:** out patient, post-stroke elderly, Takizawa Method Rehabilitation, motivative exercise, brain function, fNIRS

**Abstract**

[**Introduction**]

We reported the clinical study of the developed device, the consumption living with slight dementia elderly and the effect of the Takizawa Method here for many years. The studies were found the good outcome Therefore the investigation of the mechanism is required for the Motivative exercise that is a core exercise program, we planned to brain function evaluation performed using functional near-infrared spectroscopy (fNIRS).

[**Method**]

It is the intention of clarifying the specificity by comparing the Motivative exercise by unaffected side priority to the passive exercise by passive. We set 13 subjects by consent among out patients of the Geriatric Health Services Facility. They were 2 females and 11 males and age 54-91 (mean age 71 years), and had aftereffect of cerebrovascular disease, (8 Cerebral infarction, 7 Cerebral hemorrhage, 3 Cerebral infarction and hemorrhage crossover, and 6 left hemiplegia and 7 right hemiplegia). The evaluation criteria is using the ADL evaluation that are used in the outpatient service. In addition, two subjects were excluded because of the insufficiency of a measurement.

We examined the activation region of the brain at the time of performing bilateral simultaneous ankle and knee training named the motivative exercise by using devices and the passive exercise. We used FOIRE-3000 manufactured by Shimadzu Corp as the NIRS device. We measured 45 channel 14 set as the sending and receiving optical fiber. We placed the parietal region (CZ) to the location of the light-sending fiber 7 (middle of the channel 10-23) upon measurement.

The Test was carried out for 4 days of 16 to 19 March, 2010. The Patients tasks were the bilateral simultaneous and autonomous ankle and knee training by using the motivative exercise devices and the passive exercise. Take a rest of 20 seconds from the start, task 30 seconds, the rest 20 seconds as one cycle, and was carried out for 3 cycles.

We made a task cycle for each patient, which is 20 seconds rest from a start - 30 seconds task - 20 seconds rest and performed three cycles. The evaluation was determined by the load average of the three cycles exercise.

This analysis was performed using the Functional Optical Imager for Research (FOIRE) software equipped with FOIRE-3000 and performed multiple examination of the oxy hemoglobin change at the time of rest and task.

[**Result**]

The motivative exercise made brain broadly active significantly (P <0.01) for comparing the autonomous motivative exercise to the passive exercise by the physical therapist.

[**Discussion**]

The elderly who require nursing care are increasing rapidly with the progress of aging. A development of an effective rehabilitation method is an important theme subject in the aging society. We reported that aggravation was not realized for both the degree of independence in daily living and the nursing care level and the enforcement of the method on twice or fourth in a week showed significantly effective.

The introductory trial of the autonomous rehabilitation method (the motivate exercise and Takizawa method patented in USA) that we had reported and this study could show effectiveness to establish the independence life of the elderly who require nursing care.