Effects of non-pharmacological therapies for mind and brain health evaluated by NIRS

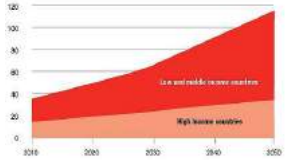
NEWCAT Research Institute

Background of OS3

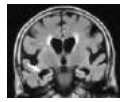
Application of NIRS to Mind and Brain Health

Growth in Number of People with Dementia in High and Low Income Countries

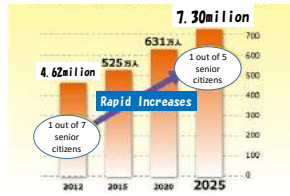
● WHO reported that number of dementia cases in the world may increase to 65 million in 2030.



MRI of Alzheimer's disease

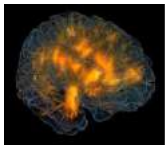


Changes of Population of Senior Citizens with Dementia in Japan



Brain Health Care Based on Neuroscience

Brain Healthcare can prevent various physical and mental illness



Cognitive dysfunction ⇨ Alzheimer's disease

Mental stress ⇨ Affective disorders

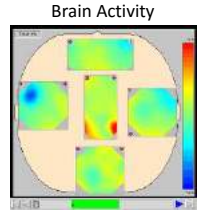
Hypertension, DM (Life style Diseases)

Imaging of the Brain by Optical Topography

Optical Topography

(ETG-4000/7100、Hitachi)

Brain Activity



Wearable Optical Topography

HOT-1000 (Hitachi)

OS3: Application of NIRS to Mind and Brain Health

① Effects of non-pharmacological therapies for mind and brain health evaluated by NIRS (K. Sakatani)
② Effects of physical exercise on working memory and prefrontal cortex function in post-stroke patients (M. Moriya)
③ Prediction of cognitive function based on hemoglobin concentrations at rest in the prefrontal cortex: A time-resolved near infrared spectroscopy study (Y. Murayama)
④ A small NIRS device and its application (T. Katsura)

Non-pharmacologic therapies on cognitive function

In order to improve QOL of older people, we have been studying various non-pharmacologic therapies on cognitive function.

Cosmetic therapy

Cosmetic therapy program; which begins with deep breathing using fragrances and relaxing light exercise, followed by skin care and make-up. Beauty therapists encouraged subjects to perform by themselves as much as possible. The therapy lasted approximately 50 minutes.

Aims

In the present study, employing TRS, we evaluated:

1) The PFC activity at rest.
2) Effects of CT on the PFC activity at rest.
3) Effects of CT on salivary cortisol levels.

These were compared between the mild and moderate cognitive impairment groups.

Subjects

We studied 61 elderly women (82.2±6.3 years) living in a nursing home in Tokyo.

According to MMSE scores, the subjects could be classified into:
① Mild cognitive impairment group (n=29)
(mean MMSE score = 24.1±3.8)
② Moderate cognitive impairment group (n=32)
(mean MMSE score = 10.3±5.8)
(p<0.0001)

Methods: Functional Study by TRS

・TRS-20 system (Hamamatsu Photonics K.K.).

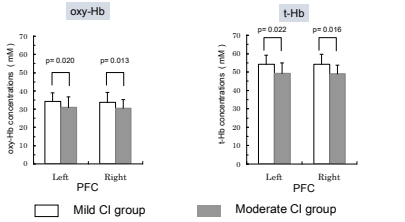
・The advantages of TRS; unlike CW-NIRS,

1) ***measurements of hemoglobin concentrations at rest without tasks.***
2) ***the probe of TRS can be removed during the cosmetic therapy.***

(50 min)

Results

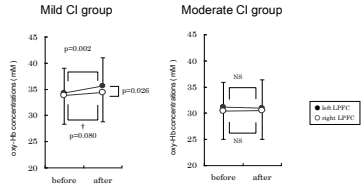
Differences in oxy-Hb and t-Hb concentrations in the PFC at rest between mild and moderate cognitive impairment groups



Moderate cognitive impairment group exhibited smaller baseline concentrations of oxy- and in both PFC than mild cognitive impairment group.

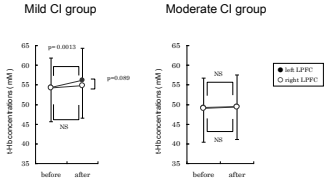
Adv Exp Med Biol. 2016;876:289-295

Effects of cosmetic therapy on oxy-Hb concentrations at rest in mild and moderate cognitive impairment groups



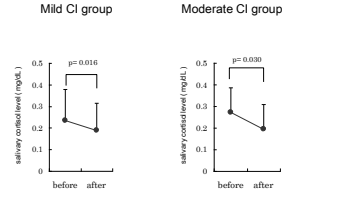
CT increased the baseline concentration of oxy-Hb in the PFC, particularly on the left side in mild CI group. However, no significant effect was observed in moderate CI group.

Effects of cosmetic therapy on t-Hb concentrations at rest in mild and moderate cognitive impairment groups



CT increased the baseline concentration of total-Hb in the left PFC, but not on the right side. However, no significant effect was observed in moderate CI group.

Effects of cosmetic therapy on salivary cortisol levels in mild and moderate cognitive impairment groups



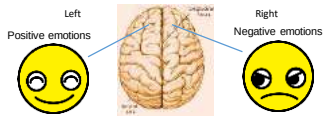
CT decreased salivary cortisol levels in both mild and moderate CI groups.

Discussion

Discussion (1)

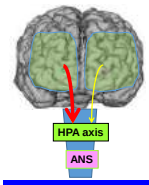
The CT-induced changes of PFC activity were observed mainly on the left side, resulting in left dominant PFC activity.

Left/right asymmetry in PFC activity at rest is correlated with emotional state (ISOTT2013): right dominant activity was correlated to negative emotions, whereas left dominant activity was correlated to positive emotions.



Discussion (2)

Salivary cortisol levels ⬇ in mild & moderate CI.



This may be related to the left dominant PFC activity since left dominant PFC activity was associated with reduced stress responses (ISOTT2010).

Summary

- We evaluated the neurophysiological mechanism of cosmetic therapy employing TRS.
- CT increased PFC activity, particularly on the left PFC, resulting in left dominant PFC activity.
- CT had no effect on PFC activity in the moderate cognitive impairment group. These findings suggest the limitation of CT on aged women.
- In this preliminary study, we evaluated only acute effects of CT on the PFC activity in aged women.
- 2 channel NIRS including TRS are useful tools to evaluate cognitive function in aged people.