

A person requiring meal care using NIRS-apparatus

H. ISHIHARA, H. INOUE, S. SHIMIZU. **Basic study on detecting the intention of the person requiring meal care using NIRS-apparatus.** *Gerontechnology* 2014;13(2):216; doi:10.4017/gt.2014.13.02.356.00 **Purpose** Now that Japan has become an aged society with a chronic shortage of caretakers and facilities for the elderly, refined nursing care devices (i.e. robots) are desired. Meal assistance, for example, often requires nursing attendance for long periods of time and can involve heavy workloads. Moreover, people requiring care often feel dissatisfaction and impatience when they cannot eat in the way they desire. Therefore, it is important to develop a highly-functional meal assistance apparatus that does not involve complicated operation. We have advanced a study on applications of NIRS (Near Infra-Red Spectroscopy) that could monitor brain activity non-invasively in real time by measuring the hemoglobin concentration changes in brain blood flow¹. We performed basic experiments in order to figure out the exact requirements of those who need extra care. **Method** The subjects sat on a chair in front of a PC display with the NIRS (Shimazu Corporation FOIRE-3000, 10ch) probes attached to their head and watched the display closely. A photograph of an object (either steak, a screw, or paper) was shown for ten seconds, followed by a photograph of a tool (a screwdriver, a knife, or a fork) for ten seconds, and finally the photograph of the object again for fifteen seconds. The photographs were shown in nine combinations of order as indicated in *Table 1*. **Results & Discussion** Drawing upon the results of these NIRS signals, we examined the differences in brain activity patterns between the cases for which the purpose of the tools was consistent with the object and those that were not. In *Figure 1*, we show an analysis of the t-test results of the difference between condition #1 and #2 for a certain subject (male, age 22). Specifically, *Figure 1* shows the t-test results for the change in brain blood flow between viewing the screwdriver after the steak, and the knife and fork after the steak. The right central frontal lobe and the left lower central lobe reactions were the strongest. Also, a marked reaction could be seen in the right brain channel 5 and left brain channel 10. Similarly, the t-test result between condition #2 (knife and fork after steak) and #3 (scissors after steak) also shows a marked reaction in the right brain channel 5 and left brain channel 10. However, no characteristic difference could be seen between condition #1 (screwdriver after steak) and #3 (scissors after steak). This shows that a unique reaction is seen in the frontal lobes when the subject sees the object-corresponding tool. Similar results were obtained for the objects of screw and paper.

Reference

1. Shimizu S, Hirai N, Miwakeichi F, Kikuchi S, Yoshizawa Y, Sato M, Murata H, Watanabe E, Kato S, Lecture Notes in Computer Science 2009;5639,434-440; doi: 10.1007/978-3-642-02728-4_46

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Table 1. Combinations and order of displayed photographs

Condition	First	Second	Third
1	Steak	Screwdriver	Steak
2	Steak	Knife & fork	Steak
3	Steak	Scissors	Steak
4	Screw	Screwdriver	Screw
5	Screw	Knife & fork	Screw
6	Screw	Scissors	Screw
7	Paper	Screwdriver	Paper
8	Paper	Knife & fork	Paper
9	Paper	Scissors	Paper



Figure 1. Analysis result example of NIRS-data