

Study of visual function evaluation for people with severe motor and intellectual disabilities utilizing Near-Infrared Spectroscopy

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[Introduction] In Japan, people with severe motor and intellectual disabilities, termed people with SMID hereafter, live in institutions and get long-term living support and rehabilitation. It is often the case that people with SMID have difficulties in rolling over or walking by themselves and they cannot talk with others. These disabilities make it very hard for them to take action or respond to their ambient environment. The Occupational Therapists realize that setting up suitable living environment and making personal rehabilitation program according to their disabilities are indispensable for them. However, the severity of their disabilities makes it difficult for the Occupational Therapists even to assess their visual function whether gaze a visual stimuli. The purpose of this study was (1) assess the effectiveness of near-infrared spectroscopy (NIRS) for evaluating visual function of people with SMID, and (2) investigate the inference of characteristics of visual stimuli to response from people with SMID and to dynamics of their cerebral blood flow.

[Methods] Twenty-one people with SMID were presented Visual Task 1 (using photograph), and classified into gaze, habituation, non-gaze and non-judgment group based on subjects' eye movement. Oxy-Hb change at the time it be most increased was measured by NIRS evaluation at the same time. A same experiment was performed using Visual task 2 (using moving image) for people with SMID who were selected based on the result of Visual Task 1.

[Results and Discussion] The averages of oxy-Hb change for "gaze group" and "habituation group" were 0.45 and 0.83 mM*mm. Two subjects classified into "non-gaze group" were 0.019 and 0.005 mM*mm, while three subjects classified into "non-judgment group" were 0.263, 0.251 and 0.207 mM*mm. All subjects in "non-gaze group" and two of three subjects in "non-judgment group" were classified into "gaze-group" as a result of Visual Task 2 and oxy-Hb had increased. This study indicated that the increase or decrease of oxy-Hb change depended on gazing or non-gazing to stimuli and that difference in the characteristics of visual stimuli could affect the responses and the dynamics of cerebral blood flow of people with SMID.