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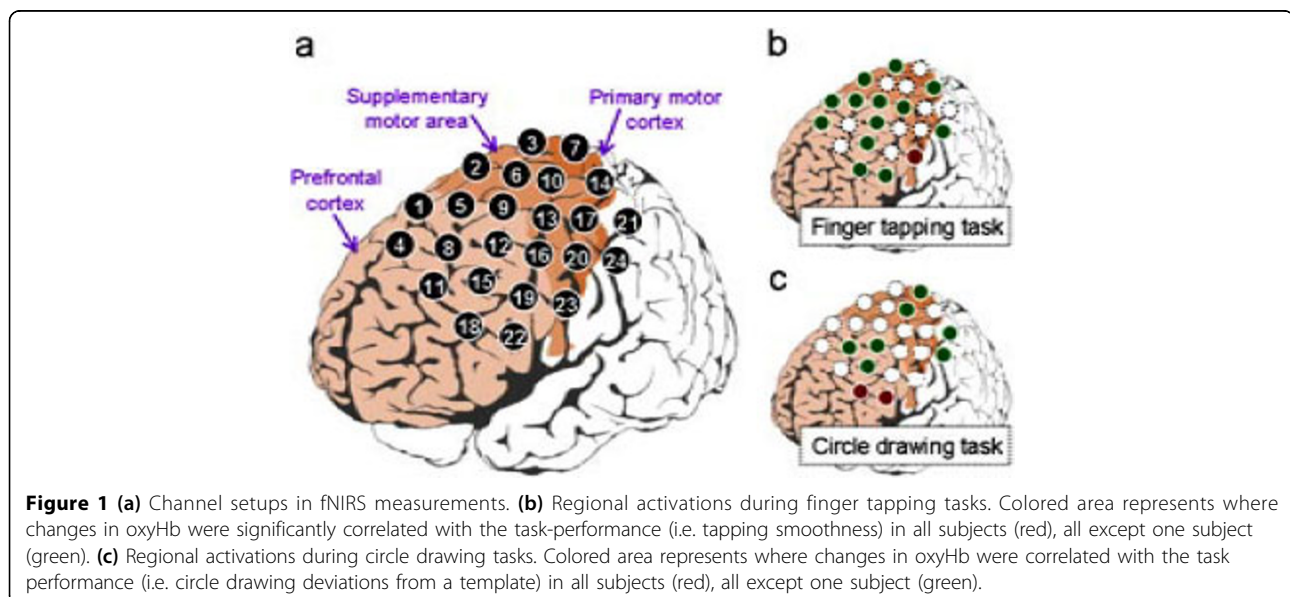
# Task-related brain activation during finger tapping and circle drawing monitored by fNIRS

Shuichi Matsuzaki\*, Masamichi Morihiro, Tadashi Tsubone, Yasuhiro Wada

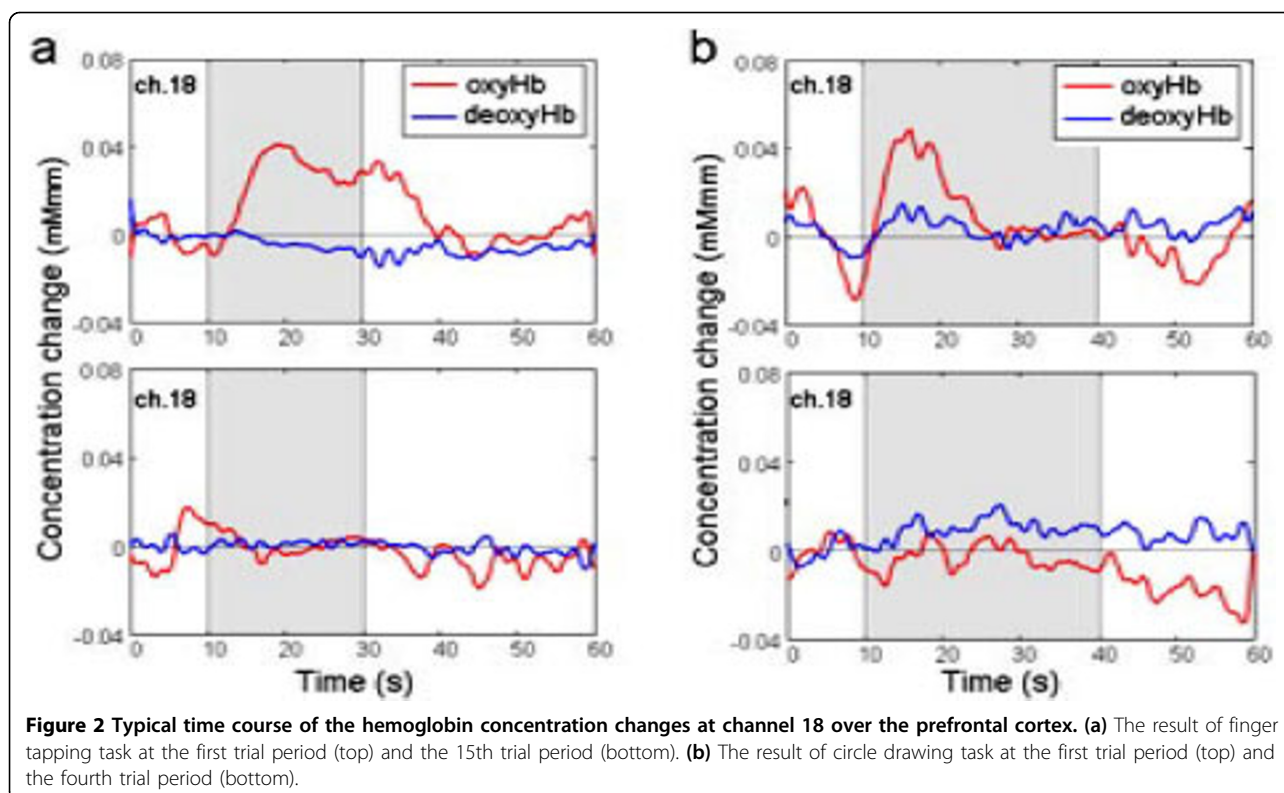
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The present study assessed brain activation measured by functional near-infrared spectroscopy (fNIRS) in which subjects perform two types of hand motor tasks: a finger tapping task and circle drawing task. For both experiments we employed 24-channel NIRS system covering the left hemisphere (Fig. 1(a)). The typical time course in oxygenated hemoglobin concentration (oxyHb) and deoxygenated hemoglobin concentration (deoxyHb) are shown in Fig. 2. In finger-tapping tasks, four right-handed subjects performed right hand finger tapping at a rate of approx. 3 Hz paced by a metronome. Subjects performed 12 or 15 trials in which a trial consists of 10-s rest, 20-s finger tapping movement, 30-s rest and

about 180-s of inter-task intervals. Changes in oxyHb and deoxyHb were measured at a sampling period of 130-ms. Also changes in the angular velocity of finger tapping, as a measure of the movement smoothness, were measured. Significant decrease in oxyHb and the angular velocity over time were observed, while those transitions further exhibited significant correlation at the channels covering SMA, the pre-motor area (PMA) and PFC (Fig. 1(b)). In circle drawing tasks, six right-handed subjects (males from 22 to 24 years old) performed circle drawing with right hand. Subjects were instructed to trace around a template circle at the frequency of 0.667 Hz. All subjects performed four trials



\* Correspondence: [shmatsu@nagaokaut.ac.jp](mailto:shmatsu@nagaokaut.ac.jp)  
Department of Electrical Engineering, Nagaoka University of Technology,  
Nagaoka, Japan



where each consists of 10-s rest, 30-s circle drawing, 30-s rest and about 180-s intervals. We calculated a spatial error as a measure of task performance which is derived from the trajectory deviated from the template circle. We found that oxyHb as well as error rate were decreased over time, with those transitions further be significantly correlated at the channels covering PFC and M1 (Figure 1(c)).

In summary, this paper reports our empirical results using the two types of hand motor tasks. The experimental results indicated the task-related activity observed in NIRS signals. A previous fNIRS study using hand motor tasks showed similar results including decreased pattern of hemodynamics in SMA [1], whereas further investigation will be desired that may allows to estimate precise cortical functions reflecting motor behaviors.

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#### Reference

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