**Technical subject:**

Visualization of Cerebral Capillaries' Function from bridging functional near-infrared spectroscopy & fMRI

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Figure 1

Figure 2
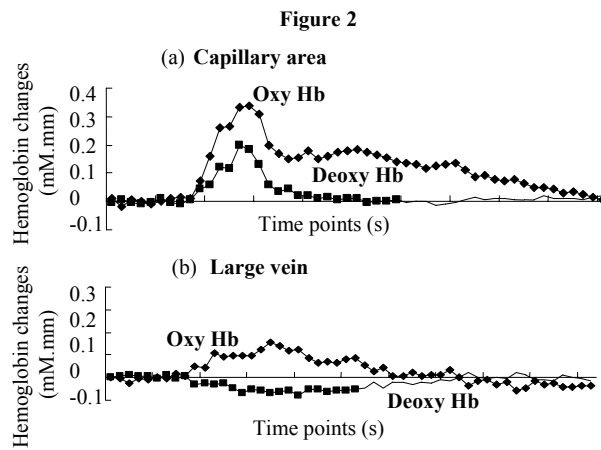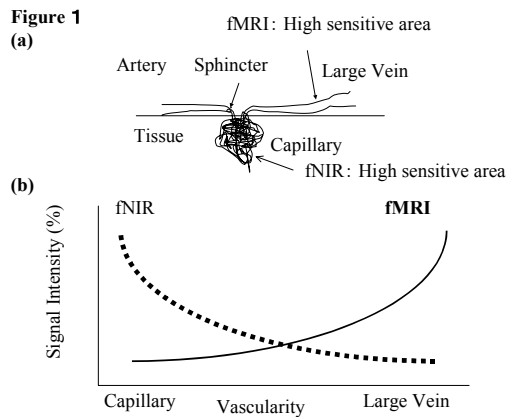
Goal & Contribution to human life: What is task to the human brain? How we consume our oxygen in the brain during education and sports training? To measure and visualize the capillaries function, we use functional near-infrared spectroscopy at bedside (fNIR) and functional magnetic resonance imaging (fMRI). If we can measure the dynamical changes of the oxygen consumption ratio in the capillaries not in the large vein, it is very useful as the functional index for language learning and sports training effect.

Method & Approach: Machine for fNIR system: multi-channel recording for multi-points from the skull surface. We will develop a new system to increase the sensitivity for the capillaries instead of large veins. Machine for fMRI system: Siemens Allegra 3Tesla. Our recent work (the bridging theory between fNIR and fMRI; Yamamoto T and Kato T, Phys Med Biol 47:1121 – 1141,2002) showed fNIR was more sensitive to capillaries' function than to the large vein, although fMRI was less sensitive to capillaries (see **Figure 1**). fMRI does not reflect Deoxy-Hb changes in activation focus. Our theory answers the question of why MR-insensitive boxy correlates better with the MR signal than does paramagnetic deoxy-Hb. This study throws light on the physiologically different function between the capillaries and the veins (see **Figure 2 &3**). **Introduction & Position in the session: Figure 3**

We plans to build several machine for sports training and education using our invention for dynamic measurement of oxygen consumption ratio. It is very important to exclude the artifact and contamination from large vein for the precise detection using fNIR and fMRI.

Call for collaboration:

We would like to collaborate with the company of education to develop the device for language learning.