

Visuomotor Neuron Activity in Subjects When Observing Other Individuals Performing Various Actions

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Introduction

Mirror neurons are a particular class of visuomotor neurons, originally discovered in F5 area of the monkey premotor cortex, and they discharge both when the monkey does a particular action and when it observes another individual doing a similar action. Patients sometimes lose the ability to perform certain movements which are needed to successfully perform their activities of daily living due to various diseases, however, all patients desire to recover such movement abilities whenever possible. Human used to observe other individuals performing actions at first. We studied the cerebral hemodynamics of healthy volunteers using near-infrared spectroscopy (NIRS: ETG-4000, HITACHI) which measures the changes in the attenuation of near-infrared light passing through tissue when an individual observes a particular action.

Subjects and methods

Ten right handed healthy volunteers ranging from 21-38 years age participated in this study after providing their informed consent. We placed the central lower part of a fiberfolder of 22ch at F7 of the international ten-twenty system. The subjects oxygenation hemoglobin (OXY-Hb) and total hemoglobin (Total-Hb) concentrations were measured while observing the following actions on videos; (1) a person was juggling three balls, (2) a person was pretending to juggle, (3) a person was gripping a ball, (4) a person pretending to grip a ball. A statistical analysis was carried out using ANOVA.

Results

When the subjects observed an individual gripping a ball, an increase at both Ch1 and Ch5 was demonstrated. In addition, when the subjects watched an individual juggling three balls, increases at Ch21 in both the OXY-Hb and Total-Hb concentrations were seen in comparison to when the subjects watch an individual who only pretended to juggle.

Conclusion

The Ch1 and Ch5 areas corresponded to the primary motor area around the Brodmann 44 area. The observation of familiar movements that are often performed everyday might activate the primary motor area. The Ch21 area also corresponded to the premotor area and the supplementary motor area. The observation of more concrete movements might activate the premotor and supplementary motor areas.

Contribution to the practice/evidence base of occupational therapy

These results are considered to help us understand the mechanism of the brain in regard to recovering the activities of daily living.