

Neurophysiological mechanisms of movement-associated intention and anticipation

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While detailed understandings of postural changes and musculoskeletal loadings with falling movements have developed, less is known about the neurophysiological response characteristics to falling movements and movements of daily life and differences between them. Defining these response characteristics is important for developing a technology to infer falling accidents.

This study focused on movement-associated intention and anticipation to clarify the differences between nervous activities during movements of daily life and nervous activities during unintentional falling. In this paper, blood pressure, electroencephalographic (EEG) signals, electromyographic (EMG) signals and magnetoencephalographic (MEG) signals were measured during 1)active 2)passive, 3)anticipated, and 4)unanticipated movements and also were used to evaluate the effects of the existence of intention and anticipation on nervous activities.

The second chapter describes measurements of blood pressure, ECG, and EMG signals during active and passive movements in order to evaluate autonomic nervous and motor nervous activities. The shortened peak time during active movement shows the possibility that sympathetic nervous activities became dominant before the movement.

The third chapter describes a measurement of MEG signals during active, passive, anticipated and unanticipated movements in order to evaluate cortical nervous activities. The MEG activation and the reduction in the amplitude of the peak component on the somatosensory motor area during active and predictable passive movements shows the possibility that the existence of intention and anticipation causes intercortical interference with cortical nervous activities after the movements.

These experimental results indicated the possibility that when we perform a movement with intention and anticipation, our nervous systems have mechanisms for activation of nervous activities prior to the movements and for facilitation and inhibition of nervous activities after the movements. I believe that the results of this study can contribute to the development of technology for inferring falling accidents using nervous activities.