Japan Society of Exercise and Sports Physiology

2D04 Soleus H-reflex response to vestibular stimulation by horizontal linear acceleration

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Purpose: Inputs from the otolith organ, sensor of gravity and linear acceleration, elicit the tonic labyrinthine reflex to maintain a body position correctly against external perturbation. The purpose of this study was to clarify the effects of otolith inputs on excitability of the soleus motoneuron pool, using a linear accelerator.

Methods: Subjects were 7 healthy male volunteer aged 21-27. None of them had a past history of auditory or vestibular disorders. Subjects were seated within the capsule of a linear accelerator (sled). The sled under magnetic levitation was driven by cables connected to a servo-controlled motor. It moved along the interaural axis (Y axis) with the rectangular and sinusoidal acceleration of ±0.1G loading at a distance of 14 m. The soleus H-reflex was evoked from both the legs simultaneously, and by stimulating the tibial nerve in the popliteal fossa with constant voltages and duration of 1 msec. The stimulus intensity adjusted 45% of M-response was used in each subject.

Results and discussion: Nobody experienced dizziness during the otolith stimulation. No tonic EMG activities were observed in the soleus and tibialis anterior muscles during G-loading. In the rectangular acceleration, the amplitude of H-reflex increased significantly compared with the control. In the sinusoidal acceleration, the amplitude of H-reflex decreased significantly in every phase of the sled translation. These findings suggested that the excitability in spinal motoneurones during the otolith stimulation was not only modulated by vestibulo-spinal reflex, but also by other reflex which involve inhibitory processes. There were no differences between the amplitude of H-reflex in right and left legs in almost conditions of G-loading. It is suggested that require further examinations about the tonic labyrinthine reflex in human.

Key words: tonic labyrinthine reflex, linear acceleration, H-reflex

2D05 Changes in reaction time of various saccadic tasks during neck flexion

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Purpose: We compared the saccadic reaction time in visually-guided, memory-guided and intentional tasks while maintaining the neck flexion.

Methods: The subjects were 13 men and 15 women, ranging in age from 19 to 40 years. Subjects sat on a chair with their trunk stabilized by a restraining device. Saccadic reaction time for each task was measured at the neck rest position and at a neck flexion angle of 20 degree. In the visually-guided task, the subject fixed upon the position of a central point which disappeared for random durations of 2-4 s before the appearance of a right target, at which time the subject had to gaze on it as quickly as possible. In the memory-guided task, the subject fixed upon a central point and memorized the position of a right target that was presented by using a flash of 500 ms duration. The subject then gazed on the memorized position as quickly as possible when the light for the central point was turned out for random durations of 2-4 s after the flash. In the intentional task, the subject fixed upon a central point for random durations of 2-4 s. When the central point disappeared, the subject gazed on a lighted right target as quickly as possible. Saccadic reaction time was defined as the latency to the beginning of the eye movement following the lighting of the target in the visually-guided task. Reaction time for the memory-guided and intentional tasks was the time between the lights-out of the central point and the beginning of saccadic eye movement.

Results and Discussion: The saccadic reaction time in all tasks decreased during the neck flexion, and the shortenings times of memory-guided and intentional tasks were significantly larger than that seen in the visually-guided task. A very low degree of correlation was found between the shortening times of the memory-guided and intentional tasks. These results suggest that the neural pathway associated with higher information processing in the saccadic system is greatly activated during neck flexion and that there are great variations in the activation degree and parts activated in the brain.

Key words: saccadic reaction time, visually-guided task, memory-guided task, intentional task, neck flexion

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