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Article / Book Information

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Title(English)	Voluntary Movement Affects Simultaneous Perception of Auditory–tactile Stimuli in TOJ Task
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論文審査の要旨及び審査員

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論文審査の要旨（2000 字程度）

This dissertation demonstrates how voluntary movement affects simultaneous perception of multimodal sensory information. Specifically, the author focuses on two questions. First one is whether voluntary movement affects simultaneous perception of auditory and tactile stimuli. Second one is whether voluntary movement affects simultaneous perception, when tactile stimulus is presented to a non-moving body part, as an extension of the effect. The title of this dissertation is “Voluntary movement affects simultaneous perception of auditory–tactile stimuli in TOJ (Temporal Order Judgement) task”, which includes six chapters.

In Chapter 1, the author summarized the general background of the temporal integration of auditory and tactile stimuli, in which attention is reported to affect simultaneous perception. After the summary, the author pointed out that most of these studies have focused on no movement condition, in which participants simply receive information from external environment. Furthermore, the author indicated that there are few studies on the relationship between voluntary movement and simultaneous perception. Thereafter, the author put forward the necessity of investigating whether voluntary movement affects simultaneous perception and the extension of the effect.

Chapter 2 introduces the contradictory effects of voluntary movement on simultaneous perception in previous studies. That is, voluntary movement was reported to affect simultaneous perception of auditory and visual or tactile stimuli, while voluntary movement was not found to affect simultaneous perception of auditory and tactile stimuli. The author proposed that the divergent results should be attributed to the different methods in previous studies and it is necessary to use improved method.

In Chapter 3, the author chose the same experimental method and conditions including the movements (voluntary and involuntary movements on right index finger) and no movement, as in previous studies. In the experiment, the author asked participants to judge the temporal order of auditory and tactile stimuli presented on right index finger, in which the point of subjective simultaneity (PSS) and the just noticeable difference (JND) were measured. The PSS is a time point at which the two stimuli is perceived at the same time subjectively, while the JND is the smallest interval that participants can clearly judge the order of two stimuli. As the results, the author reported that voluntary movement, compared with passive and no movements, affected the PSS, while voluntary

movement did not affect the JND.

In Chapter 4, the author demonstrated the experiment related to the extension of the effect of voluntary movement on the simultaneous perception. The only difference from the chapter 3's experiment was that tactile stimulus was presented with the non-moving left index finger. As the results, the author reported that voluntary movement, compared with passive and no movements, also affected the PSS of auditory and tactile stimuli. Furthermore, the author reported that voluntary movement and passive movement, compared with no movement, significantly increased the JNDs and voluntary movement, compared with passive movement, increased the JND.

Chapter 5, as the general discussion section, shows the comparison of the results of PSSs and JNDs in the experiments and the discussion of the possible mechanisms. The author reported that there are consistent results in PSS and inconsistent results in JND, which might demonstrate the different attentional resources on the judgement tasks in the three conditions, based on the same location of movements and tactile stimuli in chapter 3's experiment, while the different locations of movements and tactile stimulus in chapter 4's experiment. The author also indicated that if attention affects the PSS, the PSS should shift in no movement condition only, based on the highest attentional resource on judgement task than that of other two conditions. According to the result showing that PSS shifted only in voluntary movement condition, the author suggested that both attention and motor information in voluntary movement might affect the PSS in the two experiments.

In Chapter 6, the author summarized that voluntary movement affects simultaneous perception of auditory and tactile stimuli, when tactile stimuli were presented to the moving body part and also to the non-moving body part.

In summary, this dissertation addresses the questions of simultaneous perception by voluntary movement and provides a possible mechanism of the temporal perception of multimodal sensory information. Therefore, we conclude that this dissertation meets the criteria for the Doctor (Science).