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Perceptual calibration to delayed auditory feedback of self-body movement

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Abstract

Temporal contingency between self-body movement and its auditory feedback is crucial to perceive external auditory events. The present study examined whether delay detection of self-generated sound is modulated by short-term exposure of delayed auditory feedback. A total of 36 healthy students participated in Experiment 1 ($n = 24$, age 21.4 $\pm$ 1.3 years, mean $\pm$ SD) and 2 ($n = 12$, age 20.8 $\pm$ 1.4 years). In both experiments, the subject pressed a button with their right index finger and judged whether the auditory feedback (full-range pulsed sound) delivered through a headphone was delayed or not, compared to the sensation of the finger movement. Auditory feedback delay was inserted by using a sound effector device (SPX2000, YAMAHA, Japan). The durations of auditory feedback delay were ranged from 118 to 352 ms at 33.3 ms intervals in Experiment 1, and from 19 to 253 ms in Experiment 2. To calculate the point of subjective equality (PSE), where the delay detection rate was 50%, we have fitted a logistic function to the delay detection probability curve for each subject. The results showed that PSEs were 209.0 and 137.5 ms in Experiment 1 and 2, respectively, which were significantly different ($t = 6.13$, $P < 0.01$). This indicates that PSE was modulated by the range of the delay used in the experiment; PSE became longer as the delay lengthened. We suppose that the perceptual delay in auditory feedback of self-body movement is automatically calibrated to the frequently exposed duration between self-body movement and the auditory feedback.

Keywords

Delayed auditory feedback, perceptual calibration, asynchrony judgment

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