2P-P-14 Duration of effects by aerobic exercise on cerebral nerve function

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Purpose: The present study investigated how long the effects of moderate exercise on cerebral nerve function continue, using a P3 component of event-related potential and reaction time (RT).

Methods: Sixteen healthy females (21.4±0.5 years) performed moderate (mean heat rate: 113±12.8 bpm) bicycle exercise for 30 minutes. They also performed auditory oddball tasks (OT) to measure the latencies and amplitudes of P3, and RTs before exercise, immediately after, and at 1 hr, 2 hrs, 48 hrs and 96 hrs intervals (Experimental trial). Eight subjects in 16 performed oddball tasks without exercising during the same timeframe to determine the influence by the number of OTs on P3s and RTs (control trial).

Results: In the control trial, there were no significant effects by the number of OTs on the latencies, amplitudes of P3, or RTs. However, in the experimental trial, P3 latencies and RTs were shortened immediately after exercise, and those latencies returned pre-exercise level until 96 hrs after. P3 amplitudes were significantly larger immediately after exercise, but peaked at 1 hr after exercise, and returned pre-exercise until 96 hrs after.

Discussion: It is believed that aerobic exercise may transiently accelerate the brain information processing process. From these findings, it is suggested that the enhancement of nervous system activity is caused by exercising, in the endogenous factor, and leads to concentration of attention and enhancement of arousal level. It is therefore theorized that the endogenous factor has a duration of at least 2 days after aerobic exercise.

Key words: exercise, auditory P300, reaction time, duration

2P-P-15 Dimensionality of visual size cues in the size-weight illusion

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Purpose: The size-weight illusion method was used in an attempt to identify the dimensionality of the visual size cues acquired from a target object in the process of lifting it and perceiving its heaviness. Effects of dimension and stereopsis of a target object on the size-weight illusion were investigated. **Methods:** A solid cube, a frame cube,a square, and a simple straight line were presented as graphical objects on a 2D flat monitor. A Phantom device provided a 2D graphical object with a specified mass and natural gravity. Subjects thereby could haptically perceive weight (0.5 N or 0.75 N) of a graphical object through a stylus controlled by the Phantom when they lifted a graphical object using the stylus. Sixteen subjects were required to compare the difference in perceived heaviness between the first object and the second object after lifting them by the stylus one by one. Size or length of graphical objects was either changed or identical between them, while object shape, dimension, and weight were constant within each visual condition. The frequency of occurrenceof the size-weight illusion was focused on to assess the effects of dimension of visual size cues.

Results: All subjects experienced the size-weight illusion for all four visual stimuli, suggesting that the illusion brings about in any dimension of a target object and that stereopsis is not necessary to induce the size-weight illusion. This observation suggests that visual information that integrates with weight information in the process of lifting and perceiving heaviness may be two-dimensional, and not necessarily three-dimensional such as highly processed in the recognition of an object, though volumetric cues have been thought to be critical.