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THE EFFECT OF LOW LEVEL ACCELERATION ROTATION COMBINED WITH VISUAL ROTATING BACKGROUND ON EARLY COGNITIVE PROCESSING IN VISUAL SELECTIVE ATTENTION

Abstract

Background Astronaut inclined to use visual cues in their space orientation because of less vestibular impulses from inner ear and less proprioception input in weightlessness. In this experiment we used low level acceleration to simulate continuous vestibular efferent and visual rotating background to simulate illusion. The visual attention processing were explored under interaction between visual and vestibular action. **Methods** Twenty university volunteers participated in this study. Rotary chair was used to produce vestibular stimuli and rest or continuous rotated at 1.0 deg/sec2. Visual background was black or a starry sky background simulated by red, yellow or blue dot around a circle with 10 cm diameter in the center of the 14 inches laptop screen. Starry sky background can be set to rotated at 30deg/s, 45deg/s or 60deg/s. A yellow dot flashed in the center of the circle. Red or green dot with equal probability randomly flashed at the right or left side of the yellow dot 5cm away. The flash interval of the red or green dot was in the range of 1500-2300ms. Subjects performed a selective switch choice task with visual fixation on the center flashed yellow dot. Twelve leads of EEGs were recorded and event–related potentials (ERP) were derived. The amplitudes and latencies of N1 and P1 waves in target ERPs were analyzed. **Results** It was found that when the rotary chair was at rest, in contrast to performing tasks under black background, P1 had higher peak amplitudes and quicker P1 latencies under rotating background. And N1 presented highest peaks in black background. P1 latencies was the shorter in 45deg/s rotating background and peak N1 amplitudes was higher than that in 60deg/s rotation background. When the chair was rotated at 1.0 deg/sec2, in contrast to black and 45deg/s rotating background, the N1 latencies were longer in 30 and 60 deg/s rotating background. The P1 latencies were longer in black background than that in 45deg/s rotating background. In contrast to 60deg/s rotating background, the P1 latencies were shorter in 30 and 45 deg/s rotating background. The P1 mean amplitudes were lower in 45 and 60 deg/s rotating background than that in black background. **Conclusion** Rotating background alone facilitated the signal detection and decreased the effort in active filtering or discrimination. And this effect was not obvious under continuous low level acceleration rotation. The optimal early cognitive processing presented in 45deg/s rotating background.