Exploration of Design-style Identification of Chairs Based on Event-related Potential Technology

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Event-related potential (ERP) is a brain research technology which is applied to psychology and ergonomics. In the majority of design-style studies, case analysis and subjective measurement are the most popular methods. Although fruitful results have been achieved, it’s still difficult to find out how people identify one design-style regarding reliability and accuracy. Recently, ERPs technology measures objective psychological responses in researches on art and design. In ERP components, P300 are closely related to classification. This P300 waveform represents the cognitive relationship between the target stimulus and the preceding context. This paper investigates relationship between P300 and identification of design-style of chairs.

Twenty-five undergraduate students (eleven males and fourteen females) between 18 and 24 years of age (mean age 20.84 years) from Nanjing Forest University take part in two experiments. All participants are fitted in an elastic cap with 32 scalp sites using Ag/AgCl electrodes (Brain Products ERP workstation) during the experiments.

The experiments are in the way of empirical oddball paradigm which has target stimuli and standard stimuli. It needs participants to identify the design-style of the target stimulus and respond to it, which is representative classification experiment. We organize 40 chairs with the same design-style as two equal groups which are taken as the target stimuli in the two experiments respectively. Similarly, we organize 160 chairs with other two different design-styles as two equal groups (within each group the chairs with the same design-style), which are taken as the standard stimuli in the two experiments respectively. ERPs and behavioural data are recorded while participants taking the design-style identifications. Consequently, we get identification accuracy and reaction time of behavioural data, also latency, amplitude and scalp distributions of P300 of ERPs data.

Compared between the target stimuli in the two experiments, the behavioural results show no significant differences in terms of identification accuracy and reaction time. Meanwhile, there aren’t significant differences between the target stimuli in the two experiments in terms of the latency and the scalp distributions of P300, except the amplitudes of P300.

The behavioural results reveal that the cognition process of one design-style of chairs under different conditions is implemented in the same functional system and keeps unchangeable. Further more, the electrophysiological evidences (latency and scalp distributions of P300) support this idea. At the same time, the amplitude of P300 is closely related to identifications of different design-styles of chairs. Therefore, design-style encoding success is dependent on indirect processing and the size of design-style differences.
Keywords:
Event-related Potential, P300, Design-style Identification

References: