学位論文の要旨

Abstract of Thesis

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学位論文題目 Title of Thesis（学位論文題目が英語の場合は和訳を付記）

Study on the effect of subliminal stimulus in human choice processing
選択過程に及ぼす閾下刺激の影響に関する研究

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The ability to make such voluntary, or free, choices is fundamental to being a human. In order to achieve our goals or aspirations, we constantly interact with the external environment through our voluntary actions. In recent years, many related studies have shown that even subliminal information can be processed by human brain, the brain can encode invisible features, and subliminal information can also have an impact on human free choice. A famous example is subliminal priming effect. The priming effect is to increase sensitivity to specific subsequent target stimulus by exposure to prior stimuli. The priming effect is to increase sensitivity to specific subsequent target stimulus by exposure to prior stimuli. When a person is exposed to a stimulus below the threshold of perception, a priming effect is called a subliminal priming effect. Unlike information obtained directly from memory, this process occurs below the level of consciousness. The impact of priming of unconscious information (below the level of consciousness) on humans is an important and significant phenomenon, as it can influence people's choices and actions. Choosing is a complex process. People face an uncountable number of choices. The ability to make such voluntary or free choices is fundamental to being human. Recent research has demonstrated that subliminal primes can influence the motor system, and thus freedom of choice. The idea of manipulating unconscious information to change behavior has long been a very interesting point of view in psychology. However, the brain mechanism of subliminal information processing and subliminal priming processing in human free choice is not completely clear.The main purpose of this paper was to study the influence of subliminal visual information on the process of free choice. The dissertation contains descriptions of the four experiments and a general discussion briefly introduced below.

Chapter 1 describes the concept of subliminal priming effect and brain activity in free choice. Finally, the purpose and contents of this paper are briefly introduced. This chapter also summarizes past behavioral and neuroimaging studies of free choice subliminal priming effect.

Chapter 2 introduces the first experiment, which compare the difference between questionnaire choice and normal choice subliminal priming effect. This part aim to determine whether subliminal priming can only affect a single action task. Present experiment add a questionnaire after the normal choice response. By this way, it is possible to compare the subliminal priming effect in a single action and multiple action. Based on results, it is found that humans respond differently

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between free choice and forced choice. In general, free choice takes more time than forced choice; this means that people spend more time preparing for free choice than they do for forced choice under external stimuli. Notably, there was no significant difference in the reaction bias in the trials of the experimental conditions of questionnaire choices. Therefore, we suspect that this priming effect is interrupted by another action in a trial, affecting the perception and processing of subliminal information.

Chapter 3 introduces the second experiment. This experiment applied repeated practice in the masked priming paradigm. This experiment set up an experiment group and a control group. In experiment group, the radio of free choice trials and forced choice trials in a training block is equal. During the training phase in the control group, although 50% of the free choice and forced choice trials in each block were the same as in experiment group, there were no directional primes in each block. Compared with the experimental group, although the participants in the control group received 4 training sessions, with this method, it was difficult for the directional information of the masked prime to affect participants response during the training session. The results found that after training, the participants in experiment group were more likely to be influenced by masked primes during free choice, but the control group have not been found the significant enhancement in free choice priming effect.

Chapter 4 describes the third experiment. This experiment applied repeated practice in the masked priming paradigm like experiment 2. However, to determine whether the ratio of free choice to forced choice trials during the training phase had an impact on the learning effect, the free choice and forced choice trial proportions in each training block during the training stage were changed. Group 1 consisted of 50% free choice trials and 50% forced choice trials. Group 2 consisted of 10% free choice trials and 90% forced choice trials. Group 3 consisted of 90% free choice trials and 10% forced choice trials. By calculating the intensity of the priming effect of the free choice trials before and after training and comparing it with the control group, we can determine whether the influence of the ratio of free choice to forced choice trials affected the learning effect. The free choice congruent response rate was analyzed using a 2 (pre-test vs. post-test) × 3 (Groups: Group 1 vs. 2 vs. 3) mixed analysis of variance. The results found that the subliminal learning effect in Group 1 (50% free choice trials) was significantly higher than that in Group 2 (10% free choice trials) and Group 3 (90% free choice trials). According to congruent response rate results in the training phase, only in the Group 1 training phase, as the number of training sessions increased, did the masked priming effect become stronger.

Chapter 5 describes the fourth experiment. In this experiment, using methods from signal detection theory, we measure sensitivity index for Kanji detection or discrimination, and evaluate the semantic information processing at the subliminal level. Results suggested that the sensitivity index of Kanji have the significant difference between the different target presentation time both of detection and discrimination task. And at the same presentation time, the sensitivity index of the discrimination task is lower than the sensitivity index of the detection task.

Chapter 6 presents the conclusions and future challenges of this thesis. In particular, the role and prospects of subliminal information in human-computer interaction are discussed. In addition, hypothetical mechanisms of brain activity related to subliminal information processing and future research directions are discussed.

As things stand, future research will focus on patterns of brain activity using fMRI technique to process subliminal information. It is hoped that the neural mechanism of free choice subliminal priming will be found and provide important basis for the development of cognitive neuroscience.