

**P30.05****Lateral orbitofrontal cortex is associated with human cognitive dynamics in the congruency sequence effect**

Nan Li, Kang Cheng, R. Allen Waggoner, Keiji Tanaka\*

RIKEN, Wako, Japan

Responses are slower when the relevant and irrelevant cues indicate different responses (incongruent) than when they indicate the same response (congruent). This difference is referred to as conflict cost. The conflict cost is smaller when the previous trial is incongruent than congruent (congruency sequence effect, CSE). The conflict monitoring hypothesis (CMH) proposes that the anterior cingulate cortex detects the conflict in an incongruent trial, and the dorsolateral prefrontal cortex upregulates the cognitive control accordingly so as to decrease the conflict cost in the following trial. However, recent experimental results argued against the CMH by including a neutral condition in which the irrelevant cue indicates no response (thus no conflict). It was found that the conflict cost was larger after a congruent than neutral trial, while the CMH predicts no difference. In the present study, we proposed contribution of task set inertia to the CSE: the irrelevant task set is more carried-over after a congruent than neutral trial. We conducted an fMRI experiment in which the participants responded according to the color of a bar and ignored the direction of an arrow overlapping on the bar. With a multi-voxel pattern analysis, we found that, for the neural response pattern in the lateral orbitofrontal cortex (IOFC), (1) the discrimination accuracy of the current trial condition (congruent vs. incongruent) was significantly higher after a congruent than neutral trial, and (2) this difference in neural discrimination accuracy after congruent and neutral trials was positively correlated, across participants, with the difference in conflict cost after congruent and neutral trials. These results suggest that the IOFC plays a crucial role in the process through which the task sets evoked in a trial influences the task execution in the following trial.

<https://doi.org/10.1016/j.ibror.2019.07.1382>

**P30.06****The effect of audio-visual stimulation on sleep quality**

Hyeyeoun Joo<sup>1</sup>, Hyunwoo Nam<sup>3</sup>, Dae Lim Koo<sup>3</sup>, Jeh-Kwang Ryu<sup>4</sup>, Sunkyue Kim<sup>5</sup>, Kyoung-Min Lee<sup>2,\*</sup>

<sup>1</sup> Interdisciplinary Program in Cognitive Science, Seoul National University, Seoul, Republic of Korea

<sup>2</sup> Department of Neurology, Seoul National University Hospital, Seoul National University College of Medicine, Seoul, Republic of Korea

<sup>3</sup> Department of Neurology, Boramae Medical Center, Seoul National University College of Medicine, Seoul, Republic of Korea

<sup>4</sup> Institution for Cognitive Science, Seoul National University, Seoul, Republic of Korea

<sup>5</sup> Neuroscience Research Institute, Gachon University, Incheon, Republic of Korea

This study aimed to investigate the effect of audio-visual stimulation on sleep quality. To measure the physiological signals, we designed a three-night sleep study using polysomnography (PSG). Thirty-seven healthy subjects participated. All subjects spent the first day outfitted with all experimental setting to adapt to the

PSG environment considering the first night effect. The order of the experimental condition (audio-visual stimulation) and the control condition was counterbalanced. For auditory stimulation, we used amplitude-modulated sound with 444 Hz sine-like carrier wave with 2–10 Hz modulation. The modulation frequency starts from 10 Hz and gradually decreases to 2–5 Hz in 10 min and sustained for 4 h. Visual stimulation was given simultaneously with the same frequency and phase of the auditory modulation stimulus. There was a significant difference in the sleep onset latency for audio-visual stimulation ( $M = 6.5$ ,  $SD = 6.84$ ) and control ( $M = 10.375$ ,  $SD = 12.81$ ) conditions;  $t(23) = 2.33$ ,  $p < 0.029$ . In addition, there was a significant difference in the percentage of REM sleep for the experimental condition ( $M = 20.3$ ,  $SD = 0.62$ ) and the control ( $M = 17.7$ ,  $SD = 0.55$ ) conditions;  $t(23) = 2.36$ ,  $p = 0.022$ . Any other parameters, including total sleep time, the number of awakenings, REM episodes, etc. was found that there were no significant differences. The shortened time to sleep onset leads to improved sleep quality in that it results in higher sleep efficiency. To specify the underlying processing of the shortened latency with the audio-visual stimulation, further analysis using neural and cardiac signals other than classical hypnogram derived statistics should be followed, and it is necessary to scrutinize the meaning of reduced proportion of REM sleep among human sleep behavior.

<https://doi.org/10.1016/j.ibror.2019.07.1383>

**P30.07****Dissociable PFC activity and attentional modulation in response to two kinds of affective arousal**

Haneul Song, Sang Ah Lee\*

Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea

It is known that the prefrontal cortex (PFC) plays an important role in top-down cognitive processing, executive function, and attention. Previous studies have shown that these cognitive functions can easily be influenced by negatively arousing stimuli. It is not yet clear, however, whether this effect is due to arousal or negative affect. In this study, therefore, we aimed to test the effects of two types of arousing visual stimuli (sexual and negative) on attention level and PFC activity. We presented sexually and negatively arousing pictures (International Affective Picture System) to subjects, both explicitly and implicitly, immediately before they performed the Attentional Network Task (ANT). We measured hemodynamic response of PFC using a high-density functional Near-infrared Spectroscopy (fNIRS) system. For each subject, we measured anxiety and depression levels using the Beck Anxiety and Depression Inventory.

First, we found that attentional performance was significantly impaired only in the sexual-implicit condition ( $t(18) = 3.20$ ,  $p < 0.01$ ), with a negative correlation between left dorsolateral PFC (dlPFC) activity and attention ( $r = -0.74$ ,  $p = 0.01$ ). In the negative-implicit condition, in contrast, there was a positive correlation between dorsomedial PFC (dmPFC) activity and attention ( $r = 0.64$ ,  $p < 0.05$ ). Depression level was negatively correlated with dmPFC activity only in this condition ( $r = -0.66$ ,  $p = 0.04$ ).

In this study we revealed differences between sexually-arousing stimuli and negatively-arousing stimuli on PFC response and influence on attention. Considering the vulnerability of attention in the sexual-implicit condition, we could infer that the dlPFC activation may indicate distraction from the task. On the other hand, in the negative-implicit condition, activation of dmPFC may indicate emotional regulation, perhaps through dmPFC-amygdala suppres-