Is Consciousness Necessary for Semantic Integration to Occur? An EEG Study

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Purpose of the Experiment: What can our brain process without us being conscious about? The current study focuses on one aspect of this question - what are the relations between integration and consciousness. Specifically, whether semantic integration can occur without consciousness. The literature is quite divided around this question with theories claiming for both ends of the spectrum. Procedures Used: The experiment included three parts – calibration, main experimental session, and a visibility post-test. The main session consisted of the target image containing a scene and an object that is either congruent/incongruent and scrambled/intact, masked by both forward and backward masks. During the main experimental session subjects' brain activity was recorded via EEG. Results: The behavioral results showed that subjects were unaware of most of the stimuli, as reflected both in their visibility ratings (subjective measure), their post-test performance (objective performance) and accuracy during the main experimental session. The EEG waveforms were affected by the intactness of the object both in the 200-300ms time window and 300-500ms time window. But they were not affected at all by the congruency of the image. Conclusions: In the study we found that subjects were able to distinguish between images with intact and scrambled objects but did not perform semantic integration (that we were able to detect). These findings imply that consciousness might be necessary for semantic integration to occur. The results support the two prominent theories in the field – "Integrated Information Theory" and "Global Neuronal Workspace" and challenge others like "Yes It Can" theory.

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