Effects of Hidden Visual Stimuli on Visual Cortex Activity and Behavior

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Everyday behavior is shaped by both conscious and unconscious processes. While neuroscience research has traditionally focused on brain activity associated with conscious perception, far less is known about how unconscious information influences brain function and behavior. In this project, I analyzed data obtained from an experiment in which neural activity was recorded from the primary visual cortex (V1) of macaque monkeys during repeated exposure to natural images presented below the threshold of conscious perception, and later during a perceptual decision-making task. When these same images were later presented above threshold, perceptual accuracy and neural response efficiency were enhanced compared to novel images. In my study, I extended these findings by examining how prior subliminal exposure influences the relationship between neural activity and behavioral decisions. Specifically, I measured neuronal choice probability during the behavioral task to determine how well individual neurons predicted the animal's choices, and I analyzed neuronal response latencies along with behavioral reaction times. I found that neurons showed significantly higher choice probabilities and faster response latencies for stimuli that had previously been presented subliminally compared to new stimuli. Behavioral responses were also faster for previously exposed images. These results demonstrate that subthreshold and behaviorally irrelevant visual experience improves sensory processing and strengthens the role of V1 neurons in perceptual decisions. Even without conscious awareness, prior exposure can bias neural decision signals and accelerate behavioral responses, highlighting the lasting impact of unconscious visual processing on brain function and behavior.

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