

# Unconscious Number Discrimination in the Human Visual System

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## Abstract

How do humans compute approximate number? According to one influential theory, approximate number representations arise in the intraparietal sulcus and are amodal (independent of any sensory modality). Alternatively, approximate number may be computed initially within sensory systems. We tested for approximate number representations in the visual system using steady state visual evoked potentials (SSVEPs). We recorded EEG from human subjects while they viewed dotclouds presented at 30 Hz. Alternating the dotcloud numerosity at 15 Hz evoked a 15 Hz SSVEP detectable over the occipital lobe (Oz). The SSVEP amplitude increased as the numerical difference between dotclouds increased, indicating that subjects visual systems were differentiating dotclouds on the basis of their numerical ratios. Critically, subjects were unable to consciously discriminate dotcloud numerosity, indicating the rapid presentation disrupted reentrant feedback to visual cortex. Approximate number appears to be computed within the visual system, independently of higher-order areas such as the intraparietal sulcus.