The human visual system spontaneously computes approximate number

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Abstract

Is numerosity an abstraction that arises downstream of basic perceptual processing, or does the brain process numerosity like a primary perceptual feature such as color or motion? Here, we tested whether visual cortex computes number automatically, even when number is task-irrelevant and is being processed unconsciously. We recorded electroencephalography while subjects watched dotcloud stimuli that alternated in numerical content at 15 Hz, under one of three conditions: judging numerosity, judging convex hull, or making no judgments. Under all three conditions, we observed oscillatory activity at 15 Hz in early visual cortex. The strength of this signal depended on the numerical content of the stimuli in all three conditions and did not differ significantly across the conditions. Results show that number can be computed spontaneously by visual cortex, even when participants are attending to non-numerical information, consistent with the proposal that number is a primary perceptual attribute of visual stimuli.