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Title: Transcranial Direct Current Stimulation over Posterior Parietal Cortex alters Perceived Position

Conference: Vision Sciences Society Annual Meeting 2013

Date: July 24, 2013

Abstract:

Regions in posterior parietal cortex (PPC) have been implicated in visuospatial processing and attention. The hemispheric rivalry theory (HRT) (Kinsbourne 1977, 1993) proposes that the allocation of attention is governed by mutually suppressive interactions between parietofrontal circuits in the two hemispheres. Consistent with this, previous research has shown that right PPC damage results in various visuospatial deficits such as hemispatial neglect and that transcranial direct current stimulation (tDCS) over PPC reduces line bisection errors in spatial neglect subjects. In the current study, we combined psychophysical methods with tDCS to determine how PPC affects a centroid estimation task in healthy human subjects. We applied tDCS bilaterally, e.g. cathodal stimulation over right PPC concurrent with anodal stimulation over left PPC (right-cathodal) or vice versa (left-cathodal). After 15 minutes of tDCS, subjects located the centroids of briefly presented one-dimensional dot arrays. Based on the assumption that cathodal stimulation suppresses neural activity; the HRT leads to the hypothesis that right-cathodal tDCS should shift the perceived centroid rightward. Preliminary results show that (1) tDCS alters centroid estimation in healthy human subjects; (2) Consistent with the HRT, the right-cathodal configuration shifts the perceived centroid more to the right relative to the right-anodal configuration, this effect lasts up to 15 minutes and (3) Both tDCS conditions shifted the perceived centroid to the left of a sham stimulation baseline. This effect was still measurable 20 minutes after stimulation offset. These findings provide support for the causal role of PPC in position perception, and the asymmetric effect of stimulation supports the HRT hypothesis. The surprising finding that both tDCS conditions altered perceived position similarly relative to a baseline condition suggests that tDCS does not simply increase or decrease PPC activity in a polarity dependent manner.