

Mental calculation but not retrieval of arithmetic facts induces spatial attention shifts

Rocco Chiou

National Central University

Ovid Tzeng

Academia Sinica, Taiwan

Denise Wu

National Central University

Abstract: Recent evidence suggests that perceiving small and large numbers causes leftward and rightward shifts of spatial attention along a mental number line, respectively (Fischer et al., 2003). However, the relationship between higher-level numerical processing (e.g., arithmetic) and spatial attention remains unexplored. In the present study, we report novel findings showing that mental calculation influences the attentional orienting in a simple target detection task. Specifically, when participants performed subtraction and addition on numerical symbols, attention was shifted to the left and right side of space, respectively, which facilitated the detection of a lateral target. Importantly, such calculation-induced attentional shifts were not observed when the arithmetic problems could be solved by retrieving well-learned arithmetic facts. Such results reveal the close connection among arithmetic operation, attentional orienting, and the mental number line. The findings further support the hypothesized dissociation between the arithmetic processing of memorized verbal facts and visuospatially-coded numerical magnitude.