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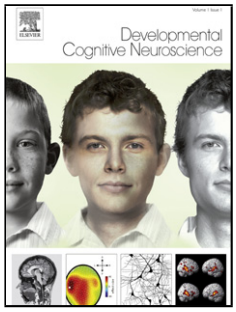

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On the role of visual experience in mathematical development: Evidence from blind mathematicians

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Abstract

Advanced mathematical reasoning, regardless of domain or difficulty, activates a reproducible set of bilateral brain areas including intraparietal, inferior temporal and dorsal prefrontal cortex. The respective roles of genetics, experience and education in the development of this math-responsive network, however, remain unresolved. Here, we investigate the role of visual experience by studying the exceptional case of three professional mathematicians who were blind from birth (n=1) or became blind during childhood (n=2). Subjects were scanned with fMRI while they judged the truth value of spoken mathematical and nonmathematical statements. Blind mathematicians activated the classical network of math-related areas during mathematical reflection, similar to that found in a group of sighted professional mathematicians. Thus, brain networks for advanced mathematical reasoning can develop in the absence of visual experience. Additional activations were found in occipital cortex, even in