

HOW BRAIN RESEARCH CAN CONTRIBUTE TO THE EVALUATION OF MATHEMATICAL GIFTEDNESS

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In this paper, we suggest that instruments of neuro-cognitive research enable the evaluation of mathematical giftedness. We start with a literature review that allows us later to discuss our findings, which are based on neurocognitive data collected in a large-scale multidimensional examination of mathematical giftedness. The sampling procedure was performed based on two orthogonal characteristics: general giftedness (G) and excellence in mathematics (EM). Correspondingly, mathematical processing associated with solving different types of geometrical and algebraic problems was examined among 200 16- to 18-year-old students who differ in their G and EM levels. We present study results that lead to a definition of the mathematically gifted population and demonstrate three major findings:

A. Effects of G and EM factors are task-dependent both in behavioral and neurophysiological measures: the EM factor has significant main effects on tasks that require implementation of knowledge familiar to students from school mathematics. By contrast, the G factor has a significant effect on insightbased problems that are not part of the school curriculum and, thus, require original mathematical reasoning.

B. Mathematical performance in gifted students who excel in mathematics (G-EM students) on insight-based tasks has specific characteristics in both behavioral and electrophysiological results.

C. G-EM participants exhibited superior performance in all the tests, showing a constant neuroefficiency effect. Based on these observations we suggest that our research demonstrates that G and EM factors are interrelated individual traits which are different in nature.