The Mathematical Brain and Numeracy

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The human brain has remarkable capabilities for encoding and manipulating information about quantities. There is an extensive network of brain areas that support human arithmetic. Like all networks it is distributed, and it is clear that numerical cognition engages perceptual, motor, spatial and mnemonic functions, but the hub areas are the parietal lobes that are activated in almost all numerical tasks. A homologous brain system has been identified in monkey parietal lobes, and many other species have a capacity to process quantities, including bees, fish, reptiles, birds, rodents, elephants, monkeys and apes. This suggests that our basic capacities are inherited. Like all heritable systems, things can go wrong, and they do in 3-5% of the population in a condition called 'developmental dyscalculia', where the capacity for encoding and manipulating numerosities - the basis for building arithmetical skills - is defective. Dyscalculic learners are now known to have abnormal parietal lobe structure and patterns of activations. Here I discuss the basic science behind the typical and atypical development of the parietal lobe and basic numerical capacities, and how this can inform interventions for dyscalculic learners and other learners with low numeracy.

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