Intellectual capabilities, cortical circuits and evolutionary aspects of brain.

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Abstract

Over millions of years, the nervous system has evolved to produce a vast range of species-specific brains and behavioural abilities. The ability to create and appreciate art, for example, appears to be a uniquely human trait, a newly acquired cognitive capability in the genus Homo. Almost everything a human being makes contains an element of art, even though we do not require beauty or an aesthetic sensibility to thrive; rather, it just provides intellectual pleasure. Other mental pursuits, such as reading a book or listening to music, have the same effect. Only anatomically modern humans (i.e., Homo sapiens) can be behaviorally modern, capable of making symbolic items, it seems evident.

Keywords: Cortical circuits, Neurosurgery, Head injury.

Introduction

Brain size and the origin of human culture because the brain does not fossilise, anthropological research on our predecessors' intellectual capabilities is limited to looking at the tools they made. Thus, Homo erectus was able to produce the first bifacial tools 1.8 million years ago, implying that they had a higher cognitive ability than Australopithecus. 650,000 years ago, Homo heidelbergensis had a bigger brain (cranial capacity of 1,350 cm^3) than H. erectus (brain volume of 800 to 1,200 cm^3). This species was capable of making exceptionally symmetrical biases (with numerous functions such as cutting skin, flesh, or woodworking), as well as certain flint tools such as arrow or spearheads and scrapers for wood, bone, and horn, and was a pioneer in this method. It's also possible that fire was employed for the first time at this period, and that its use spread through time. The use of fire signified an advance in quality of life and adaptability to the environment, allowing for a more diverse food through cooking and improved cold tolerance, as well as contributing to increased social contact and communication development. As a result, current cognitive capacities began to evolve some 500,000 years ago [1].

The number of cells inside short strips of distinct functional neocortical regions (motor, somatic sensory, area 17, frontal, parietal, and temporal) in numerous species was determined in a widely significant work on the development and organisation of the neocortex. (Mouse, rat, cat, monkey, and man). Despite changes in brain size, the number of neurons per depth stays constant, with the exception of area 17 in primates, which has 2.5 times more neurons. This research backs up the theory that variations in cytoarchitecture and function are due to changes in connections [2].

As a result, the higher separation of neurons in humans compared to other animals might be interpreted as a sign of better refinement of neuron connections. As a result, estimating the average number of synaptic inputs per neuron is one technique to assess putative variations in the architecture of the cerebral cortex between various cortical layers, regions, or species.

These distinctions are crucial for the cortical information's functional processing. Variances in the number of spines, for example, imply differences in the quantity of excitatory inputs they receive, whereas the volume of the spine head is linked to the size of the postsynaptic density. The number of presynaptic vesicles, postsynaptic receptors [3], and the ready-releasable pool of transmitter are all connected to the size of the postsynaptic density. The level of biochemical and electrical separation of the spine from its parent dendrite is proportional to the length of the spine neck. The electrical [4], biochemical, and biophysical features of the pyramidal neuron's synaptic inputs are affected by differences in overall length, number of branches, and dendritic width.

The human cerebral cortex is distinctive in many ways, and further extensive investigations of human cortical circuits are anticipated to reveal many additional distinctions between humans and other species at the genetic, molecular, structural, and physiological levels. As a result, it appears that not only the expansion of our brains, and hence their complexity, is responsible for our higher or more abstract mental capacities, but also the specialisation of our cortical circuits [5].

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