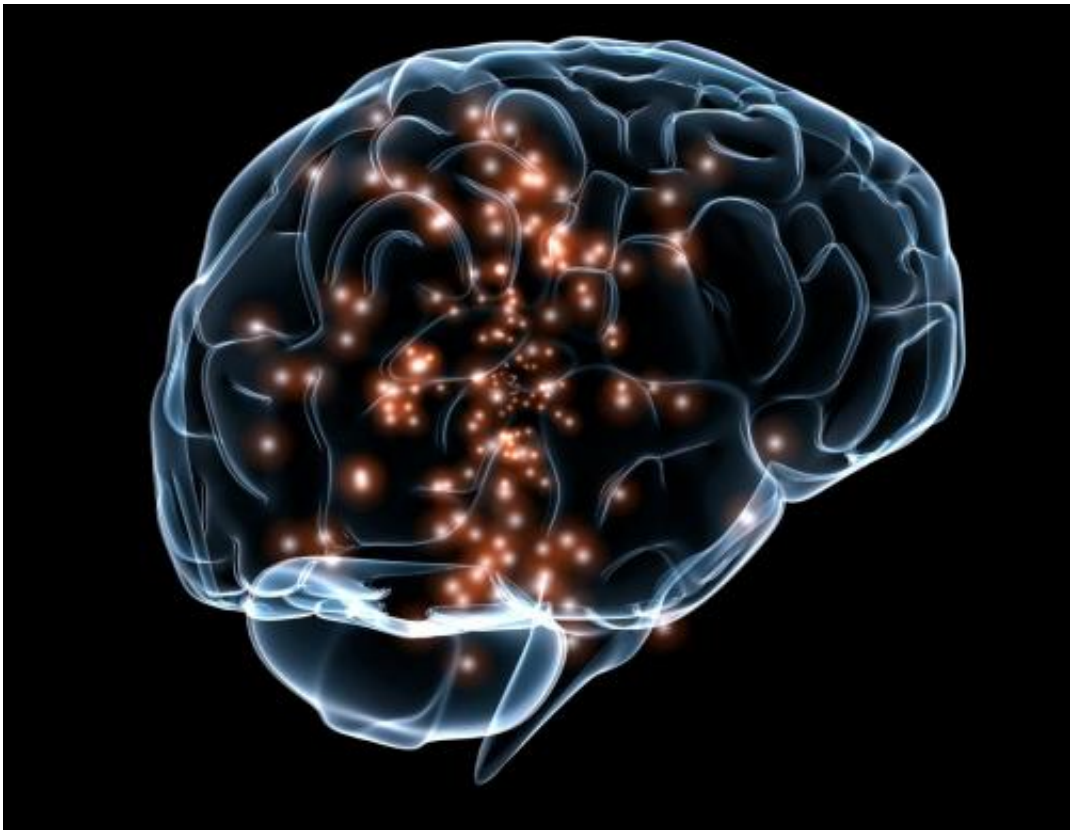
Brain development linked to stimulation of genetic variations

July 31 2017



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Scientists in the UK and India have discovered more evidence that positive stimuli in early childhood can benefit the infant brain.

A comparative study of genetic variations between two parts of the brain

found evidence for progressive variations in the brain's genome benefitting physiological development.

And they believe such variations may be linked to the level of brain activity determined by so-called 'nurture' factors, which are environmental rather than hereditary.

"The implication is that early life positive experiences can stimulate cognitive activities and will favour such 'beneficial' variations, whereas, negative experiences or lack of cognitive stimulation can reduce the genomic diversity resulting in limiting brain capacity," said Dr Arijit Mukhopadhyay, a researcher in human genetics and genomics at the University of Salford.

It is one of the first studies to show the effect of brain activity on genomic changes, and is published in F1000 Research, Dr Mukhopadhyay and colleagues from CSIR-Institute of *Genomics & Integrative Biology*, Delhi.

Dr Mukhopadhyay explains: "It is generally assumed that as we inherit our genetic blueprint (DNA) from our parents, we also inherit the genetic variations alongside. While this is largely true, this research along with other reports in the recent literature shows that some variations – termed de novo somatic variations - occur as a normal process and are added to diversify our genetic repertoire.

The team collected two different parts of the human brain, frontal cortex and corpus callosum from multiple individuals, post-mortem, from the Brain Bank, (the individuals died due to road accidents without any known disease.)

The researchers extracted DNA from the tissue and performed state-of-the-art genomic sequencing to identify genetic variations between the

two. The study found a higher number of possibly 'beneficial' variations in the cortex compared to the corpus callosum of the same individuals.

Dr Mukhopadhyay said: "This finding is an important step in our understanding of early brain development and of how local genetic variations can occur and shape our physiology.

"It is likely that genetic variations beyond those we inherit are important for our ability to adapt and evolve locally for specific organs and tissues.

"We believe our results indicate that such physiology driven genetic changes have a positive influence on the development of the neuronal connectivity early in life."

More information: Anchal Sharma et al. Human brain harbors single nucleotide somatic variations in functionally relevant genes possibly mediated by oxidative stress, *F1000Research* (2016). DOI: 10.12688/f1000research.9495.1

Provided by University of Salford