

By jove, we've got it: EEG correlates of insightful problem solving

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The history of our development over the last three millennia chronicles many remarkable and fundamental discoveries, such as Archimedes' law of buoyancy, Newton's law of gravity, Poincaré's conjecture, which are considered as classical cases of cognitive insight (also popularly known as a Eureka moment), a phenomenon where the problem solver working on a complex problem suddenly makes a breakthrough after a period of frustration and finally experiences the much reported Aha!. But despite the widespread evidence and importance of cognitive insight, very little is known about its constituent cognitive components and their underlying neural mechanism.

In a study published in PLoS ONE, researchers at Goldsmiths College, London, investigated brain rhythms and their dynamics while human volunteers solved verbal problems. Often, the participants reached a state of mental block and could not progress further: excessive amount of gamma brain rhythm (the same rhythm gets enhanced with selective attention) might cause this mental road block. It clearly indicates that focusing or attending too much on a topic might have a detrimental effect.

Afterwards, clues were provided yet they were not always successfully utilized, and the researchers found that it was possible to predict the success or failure based on the brain state prior to the clue presentation.

They also found that when the volunteers were consciously aware that they were having a strong breakthrough in their mental strategies, they

were less likely to feel the suddenness of Aha!. Bhattacharya and colleagues show that a strong Aha! sensation involves minimal metacognitive (monitoring of one's own thoughts) processes and unconscious restructuring or, better, an automatic, subconscious recombination of information which stands in contrast to conscious mental restructuring which is an attention-demanding process involving executive control. The study shows that it is possible to identify these processes before they reach the level of verbal awareness.

Arguably, insight lies at the core of human intelligence, so its proper understanding in terms of a set of underlying neural mechanisms will not only influence the immediate fields of psychology and cognitive neuroscience but also exert solid impact on a range of scientific and educational disciplines. The pedagogical importance is also noteworthy.

For example, a better understanding of complex problem solving behaviour of human subjects will facilitate a better strategy of teaching and enhancing the performance of pupils, formulation of efficient solution strategies which, in turn, enhances the creativity.

Citation: Sandkühler S, Bhattacharya J (2008) Deconstructing Insight: EEG Correlates of Insightful Problem Solving. PLoS ONE 3(1): e1459. doi:10.1371/journal.pone.0001459 (www.plosone.org/doi/pone.0001459)

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