

More wide-spread approach needed to explore visual creativity

Dear Sir,

We read with interest the article: *Neural circuitry of visual artistic production and appreciation: A proposition* by Dr. Amber Chakarvarty (2012).^[1] The concepts have been well framed and presented. The circuitry described by the author covers some of the important brain areas described till date in various studies of creativity and artistry. We do appreciate the fact that given the complexity of the topic of creativity and the availability of only few researches in this field, the author has done a commendable job forming the hypothetical neuro-circuitry of creativity in relation to visual art. But at the same time, author has made some over-generalizations regarding the role of some brain areas in the review of his article and has missed some important concepts in the topic of creativity. It seems that the article has been inclined toward more of neuro-circuitry of visual art perception and appreciation rather than visual art production as visual art requires a highly sophisticated combination of various neural and cognitive processes, which is missing from the article. Here we intend to highlight only the most important and established ones of these laggings and provide backup from the results of latest studies and discussions.

DLPFC as the most important area related to creativity

The author mentions in his review that '*Ventro-medial prefrontal lobe (VMPLF) is the site of origin of creative cognition*'.^[2] Further, the author also goes on to state that '*it has been suggested that creative cognition starts at the VMPFC and is then transferred to DLPFC*'. Strangely, the author does not cite any reference for the second statement which forms an important step in his hypothetical neural circuit of visual artistry. These statements are overgeneralizations at the best and do not seem to be based on latest evidences. Although at this point of time, it is impossible to pin-point any specific area of brain as the 'seat of creativity,' but if any one area has to be attributed this position, this would be Dorsolateral Prefrontal Cortex (DLPFC) rather than VMPLF. Several studies have provided evidences that DLPFC is the most important site related to creative thinking. This area has been implicated in creative thinking both theoretically and experimentally.^[2,6] This role of DLPFC in creative thinking is the combined result of several of its functions, which include the ability focus or defocus attention, the ability to shift the focus of attention (set shifting), and most importantly, the memory buffer.^[2,6,7] Our immediate conscious experience, of the here and now, is made possible by the sustained buffering of information in working memory. It has been suggested that a working memory buffer is not only critical, but also is actually a prerequisite, for creative thinking.^[6,7] In this regard an interesting study result has been recently published.^[3] They found using functional magnetic resonance imaging (fMRI) related measures that bilaterally, although medial prefrontal

cortex was more active during visual creative processing when compared with control tasks, but only DLPFC (along with other brain areas) was predominantly active during the creative processing when compared with both control tasks and rest. Thus, it seems premature to conclude that VMPFC is the seat of creativity. These results also contradict the suggestion by the author that creative cognition first begins at VMPLF and is then transferred to DLPFC. At the best, both these areas can be considered as among the most vital areas involved in creativity.

Role of wide-spread connectivity for creative processing

The second important point which the author has grossly underestimated in his review is the role of wide-spread connectivity for production of creative ideas. Author focuses on discrete brain areas rather than connectivity patterns of the neuro-circuitry. Recent approach has been toward finding connectivity patterns rather than individual brain areas. This connectivity is need for creative processing both intra-hemispherically by long cortico-cortical association fibers^[8] and inter-hemispherically especially of the frontal lobes.^[3] Infact, the cortical connectivity has been implicated not only anatomically but also functionally, especially in context to visual creative imaging as revealed by the study by Bhattacharya and Petsche.^[8] This study revealed that higher phase synchrony was found among the electroencephalography (EEG) of visual artists both in their high frequency (γ Gamma bands) and low frequency bands (δ delta bands) corresponding to visual perception and visual imagery experiences, respectively, which were interpreted as separate parts of visual creativity.

The insight (Aha) experience

Another important aspect of creativity which has been untouched by the author is the neuroscience of the insight experience. Although several cognitive and thought processes like divergent thinking, inductive thinking, etc. are used to define the creative thinking, but recently, much focus has been placed on the cognitive process of insight experience. Every creative novel idea whether artistic or otherwise is followed by a feeling known as 'Aha experience,' which relates to the sudden appearance of insight while solving a problem. This insight or 'Aha experience' is quite different from the 'Ah experience' described in the *Future thoughts* section of the article. The author himself mentions that this experience is the emotional response of artistic appreciation. This experience should not be interpreted as the insight experience of creative idea, which is a distinct subjective experience of suddenly realizing the solution to a problem without any previous experience of gradually reaching to the insight, which subjectively correlates with a sudden sense of increased warmth.^[9] It has been suggested

that insight involves a conceptual reorganization that results in new, nonobvious interpretation, and has been identified as an important form of creativity.^[10] The subject of insight experience is important not only because of its relation to creativity but also because it is a vital link between unconscious and conscious events of brain. The sudden occurrence of insight experience is actually preceded by an unconscious phase thereby making the traceability of the origin of this experience extremely difficult.^[9,11] Thus, this experience involves both conscious and unconscious elements, which makes this experience unique.

To conclude, there is a high complexity to be dealt with while interpreting various highly interrelated themes of creativity and the article falls short on various fronts of the same. Our additions are only few of the several others and a much more wide-scale approach is needed to put forth a theory of neural correlates of creativity.

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