



Origins of Creative Solutions and its Unconscious Underpinnings: A Brief Overview of the Preparation and Incubation Phase of Wallas' Model

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Abstract:

Creativity has been important in human history as it has enhanced innovation significantly from the earliest cave drawing to the discovery of the wheel to space exploration. Unfortunately, there are no specific pathways that would describe the process from beginning to end. Most research adheres to Graham Wallas model of creativity as a basis. It is comprised of a preparation phase, the incubation phase, illumination phase, and verification phase resulting in a solution to a given problem. The first two phases are responsible for actual solutions [1] often setting the stage for later modification to a more convergent solution. The process generally involves various aspects of the brain systems involving the Prefrontal cortex, DMN network along with cerebellum and varies in activation noted in Music, Verbal and Visuospatial dimensions [2]. The role of the unconscious significant as not does it create visual representations of the problem [3] at the onset but is also responsible for motivation, compare with other comparable memories that were responsible for creating a dopamine high. Likewise, the unconscious also in sleep states is responsible for processing enhancing creativity in NREM [4] and REM [5]. It is likely that the incubation phase is less likely to be affected external stimulation. The creative process seems to more complex utilizing various aspects both conscious and unconscious brain function to achieve solutions.

Keywords: Creativity; preparation; incubation; unconscious

Creativity is fundamental to human progress and innovation, driving achievements from early cave drawings to present-day space exploration. Although everyone has creative potential, there is significant variation in how creativity is expressed. While researchers have widely studied human creativity, the specific pathways and sequences leading to creative expression are still not well understood. Generally, creativity can be described as a multidimensional process that conscious information and unconscious mechanisms to synthesize novel ideas in productive ways to solve problems. Several factors have been identified and influence creativity including genetics, environment, novelty, and relaxation, among others [6]. The creative process is more complex than attributing it simply to left or right-brain exclusivity. Some researchers suggest brain structures share information depending on the source and type of creative task. Research highlights the importance of the Prefrontal Cortex and the Default Mode Network (DMN), which collaborate with other brain systems to compile and consolidate information. In order to understand the basic dynamic of how creativity functions most researchers have relied Wallas model to explain its general structure. Wallas four-phase model involved a preparation phase, incubation phase, illumination phase, and verification phase [1]. Preparation and incubation are crucial for gathering and synthesizing information leading to divergent solutions and the last two are related to finding a notable singular solution that is both realistic and unique. Even though some researchers believe that this framework is too simple and linear it has been used to understand the dynamics of the creative process.

The preparation phase can be defined in terms of novel idea stimulation, information gathering, and defining the parameters of the problem [1]. The novelty of the problem usually acts as a spark for further investigation leading to exploration and a greater understanding of the topic. Motivational factors that influence this search for information are based upon mental representations of [3] of similar experiences often with previously known stimuli with similar content, which in turn tends to increase dopamine in the reward centers of the brain and are likely to promote a sense of relevance by creating a dopamine high [7,8]. Involvement of free association is necessary to established, knowledgeable, and flexible guidepost and for narrowing of focus within the given parameters. As this process progresses, there is an increased focus on the internal rather than the external environment leading to

disengagement. Disengagement from the environment allows for focused concentration on a particular set of ideas. [6] noted that disengagement and novelty were of particular importance in creating a homeostatic environment for the repining of creative ideas. Most of the supporting evidence of this phase comes from various studies dealing with fMRI, EEG, and ALE studies. fMRI results, even though similar to ALE studies, have often suggested creativity is prone to individual differences, and are related to a direct correlation with gray matter volume in prefrontal and parietal areas of the brain [7]. Individual differences as noted by [1] are related to a marked difference in the rate at which the ECN and DMN switches in connectivity predicting performance in creative thought patterns and function. In earlier stages, there are lower executive demands followed by lower demands between the frontal and the parietal regions, it is more akin to a resting stage but exhibits an increase in alpha wave activity [8]. There is also a greater degree of coupling between the ECN and the DMN during the creative idea generation that exist in both divergent and convergent thinking [1,2] noted that during this process there was greater activation in specific areas of the brain. Using ALE (Activation Likelihood Estimation) activation levels were noted in three categories namely the Musical, Verbal, and Visuospatial creativity dimensions. The Musical creativity was an activation of the bilateral network and was found to be hemisphere dominant. Conversely, in Verbal creativity was dominant in the left hemisphere due to a higher level of activation. The Visuospatial activation was noted to right hemisphere dominance. However, this activity is likely to persist well into the process as it moves from externally focused process to a more internally focused incubation phase. The incubation phase is highlighted by the fermentation of relevant ideas and dismissing nonessential or noncoherent ideas resulting in more divergent thinking patterns [1]. It is predominately an unconscious process often utilizing existing information related to similar experiences, links in weak memories, and present information gathered by conscious activity. The DMN network seems more active when there is an internal focus and is linked to greater unconscious information processing than previously suspected [4]. In this phase it is believed by most researchers that mind wandering tasks and distraction are responsible for enhancing creative process. Most researchers consider mind wandering itself as incubation periods of very short duration as opposed to incubation as a whole [5]. However, it has been noted that mind wandering tasks during incubation show greater results if they are gradual,



Undirected processes using unconscious representation of the initial problem rather than direct conscious presentation of problem attempting to solve it on a continuous basis during a pause or break [5].

During this phase, EEG studies indicate a decrease in alpha wave activity [10] as executive functions become more active. Furthermore, this phenomenon is not limited to waking states as sleep studies have indicated that non-REM (NREM) sleep, characterized by no eye movement and no dream states, seems to activate associative memory functions [4]. This shift in cognitive processing, results in bizarre dream patterns and is likely to link, reinforce, and consolidate given information between existing memories. REM sleep, as noted by [10], has been found to be related to flexibility, remote associations and fluid reasoning and is known to enhance creativity in about 40% in RAT (Remote Associate Tests). In comparison, distraction studies seem to suggest that external distractions such as poetry reading for instance during a break period may increase associative process but did not necessarily encourage or facilitate divergent thinking [11]. The incubation is likely to utilize unconscious processes and seems to be minimally affected by external stimuli or tasks.

The process of creativity seems to be more complex involving various aspects of brain function, environmental influence and previous experience to say the least. The first two phases seem essential in creation of divergent solutions. Research by [12] noted that the conscious and unconscious structures exhibit an overlap suggesting sharing of information between the two structures. If recent assumption holds to accurate that the unconscious mind might be fooling us into believing that the end result or solution has been a product of the conscious mind [13]. As the unconscious seems to function in multiple level and dimensions as suggested by [14], it seems feasible that as one process occurs at one level there might be similar processes occurring at the same time at a different level in an attempt to find a solution or solutions to the same problem. If that is the case than the unconscious might be responsible for most if not all of the activity that brings about both divergent and convergent solutions. Secondly, it would be simplistic to believe that this complex process is unidirectional and occurs within sequential parameters from beginning to end. Mind wandering might in itself be incubation period [5] suggesting that there might be more than one process involved often not following this sequential pattern. Unfortunately, there are many unknowns and without a specific proven pathways we can only speculate on the process idea formation in the first two stages of this model.

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