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EDITORIAL VIEW PERIOPERATIVE MEDICINE

Scientific decoding of unseen intensive care brain model: Protective insights into good rewires and validating neural networks

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ABSTRACT

The human brain can restructure itself during and this plasticity allows the neural activity to be affected by thoughts and experiences. The healthy patterns of attention and memory as well as the balanced emotional reactions are brought possible through the concentration on the positive stimuli. Such attention also promotes the patterns of thinking which are the same and thus the impacts of stress are minimized. Positive engagement is repeated in constructive cognitive styles which leads to a better mental state with more time. These ideas highlight the effects of the conscious emphasis on positive experiences on daily activities. The revelations of this interrelationship between the brain activity and mindset also come along with valuable guidance on medical advertising of mental health practices, personal resilience, and brain care activities.

Keywords: Emotional Regulation; Memory Consolidation; Neuroplasticity; Positive Psychology; Prefrontal Cortex; Reward System

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The human brain is continuously evolving according to the inner thought and outside experiences and this neuroplasticity during the lifetime allows positively oriented attention to determine healthier cognitional patterns. As individuals continue to focus on meaningful/good stimuli, the prefrontal cortex (PFC) will become more useful in analyzing the situation, inhibiting impulses, and organizing cognitions.[1] This positive mental communication promotes the process of synaptic enhancement as recent studies highlight that this type of communication alleviates the effects of the disturbances caused by the effects of stress and enhances the neurotrophic responses. Through these alterations, there is a gradual shift in the neural pathways to more adaptive and resilient information-processing styles by positive repetitive focus.[2]

The communication bridge between Hippocampus and PFC is also quite sensitive to the type of thought on a daily basis. The functions of the memory circuits involve the adoption of the dopamine-mediated signal in order to integrate the information and pass it onto the frontal components to be under executive control. Experimentally, through the use of dopamine, the hippocampal-prefrontal contacts enhance long term potentiation to boost memory incorporation and cognitive flexibility.[3] Repeated stress or negative rumination switches on the identical pathway that is inefficient and interferes with the adaptive encoding. It is in line with the results that positive affect improves the functional connection between the emotion-processing and executive regions and consequently the cognitive resilience. These findings demonstrate the need to

underline the goodness as not only a philosophical argument but also as a biological fact grounded in the stabilization of the memory circuits.[4]

The functions of dopamine have been expanded beyond memory pathways to include more reward and motivation systems. The PFC is directed by monoaminergic neuromodulation, such as dopamine, serotonin, and norepinephrine, in the expression of emotions, the regulation of attention, and the choice of goal-oriented behaviors. Studies show that the interactions between dopamine and serotonin close-to the executive control and emotional stability, which supports the importance of positive attention to enhance the formation of more healthy responses to everyday difficulties.[5] Further research in the primate indicates that the strength of the signal of reward expectancy in PFC neurons is regulated by the stimulation of dopamine receptors to stimulate motivation and support positive patterns of behavior.[6]

The cognitive remodeling of prefrontal areas is also associated with structural remodeling. Medial PFC dopamine-dependent long-term potentiation stabilizes synaptic architecture and facilitates long term memory formation, executive planning and long term attention.[7] Experimental models prove that PFC networks are stronger in their dendrites and more efficient in the flow of information, which leads to a higher level of emotional control and clear thinking, when dopamine transmission is healthy.[8] These modifications depict how normal positive mental routines can establish neurobiological structures in the long run, which enable more robust mental psychological strength and healthier cognitive framing.

Hippocampus, which is central to the consolidation of memory and contextual learning, also depends on the balanced level of dopamine to work optimally. The loss of dopamine disturbs multiple pathways related to plasticity-like ERK, Akt, GSK3b and CREB, which reduce the stability of memories and exposure to stress-related cognitive impairment.[9] On the other hand, repeated positive reinforcement has been shown to stabilize hippocampal circuits and reinforce the memory of beneficial events and suppress the effects of negative memory bias. Such changes align with the results that mindfulness and positive psychological interventions improve the hippocampal-prefrontal interplay and mitigate the severity of stress-provoking neural reactions.[10] This evidence supports the concept of frequent and minor cognitive changes that bring observable improvements to memory and emotional control.

The implications of these neurobiological findings are practical in general. Positive intentional focus, e.g., gratitude reflection, daily-improvement, or focusing on positive environments can be used to activate adaptive neural networks and lessen stress. Research conducted in behavioral science suggests that implemented positive practices that are structured induce better engagement of the PFC, less limbic responsiveness and increased motivation through strengthening of reward-related circuits.[11] To caregivers, these insights can provide some strategies to enhance emotional stability and cognitive clarity, particularly when working with people who are adversely affected by chronic stress. The positive attention habits can enhance the concentration, performance of memory and coping ability of students and working adults.[12]

Long-term positive attention exercises the dopaminergic, prefrontal, and hippocampal systems in a way that strengthens psychological resilience in the long-term. A repetition of constructive focus is a neural rehearsal that reinforces paths associated with the reward, memory and cognitive permanence. As pointed out in this editorial, the neurobiological magic of positive attention is not figurative--it lies in the objective ability of the brain to change, reconfigure, and reorganize itself with respect to the quality of our thinking.

Conflict of interest

All authors declare that there was no conflict of interest.

Authors' contribution

All authors took part in the concept, literature search, and final drafting.

REFERENCES

1. Ott T, Stein AM, Nieder A. Dopamine receptor activation regulates reward expectancy signals during cognitive control in primate prefrontal neurons. Nat Commun. 2023 Nov 20;14(1):7537. PMCID: PMC10661983 DOI: 10.1038/s41467-023-43271-6

2. Calderone A, Latella D, Impellizzeri F, de Pasquale P, Famà F, Quartarone A, et al. Neurobiological Changes Induced by Mindfulness and Meditation: A Systematic Review. Biomedicines. 2024 Nov 15;12(11):2613. PMCID: PMC11591838 DOI: 10.3390/biomedicines12112613 .

3. Di Domenico D, Mapelli L. Dopaminergic Modulation of Prefrontal Cortex Inhibition. Biomedicines. 2023 Apr 25;11(5):1276. PMCID: PMC10215621 DOI: 10.3390/biomedicines11051276 .

4. Rieck J, Wrobel J, Porras AR, McRae K, Gowin JL. Neural signatures of emotion regulation. Sci Rep.

2024 Jan 20;14(1):1775. PMCID: PMC10799868 DOI: 10.1038/s41598-024-52203-3

5. Boyle N, Betts S, Lu H. Monoaminergic Modulation of Learning and Cognitive Function in the Prefrontal Cortex. Brain Sci. 2024 Sep 6;14(9):902. PMCID: PMC11429557 DOI: 10.3390/brainsci14090902 .
6. Sheynikhovich D, Otani S, Bai J, Arleo A. Long-term memory, synaptic plasticity and dopamine in rodent medial prefrontal cortex: Role in executive functions. Front Behav Neurosci. 2023 Jan 11;16:1068271. PMCID: PMC9875091 DOI: 10.3389/fnbeh.2022.1068271 .
7. Kim B, Kim JS, Youn B, Moon C. Dopamine depletion alters neuroplasticity-related signaling in the rat hippocampus. Anim Cells Syst (Seoul). 2023 Dec 14;27(1):436-446. PMCID: PMC10732217 DOI: 10.1080/19768354.2023.2294308 .
8. Latagliata EC, Orsini C, Cabib S, Biagioni F, Fornai F, Puglisi-Allegra S. Prefrontal Dopamine in Flexible Adaptation to Environmental Changes: A Game for Two Players. Biomedicines. 2023 Nov 30;11(12):3189. PMCID: PMC10740496 DOI: 10.3390/biomedicines11123189 .
9. Hu W, Zhao X, Liu Y, Ren Y, Wei Z, Tang Z, et al. Reward sensitivity modulates the brain reward pathway in stress resilience via the inherent neuroendocrine system. Neurobiol Stress. 2022 Sep 7;20:100485. PMCID: PMC9483565 DOI: 10.1016/j.ynstr.2022.100485
10. Willmore L, Cameron C, Yang J, Witten IB, Falkner AL. Behavioural and dopaminergic signatures of resilience. Nature. 2022 Nov;611(7934):124-132. PMCID: PMC10026178 DOI: 10.1038/s41586-022-05328-2
11. Overman MJ, Sarrazin V, Browning M, O'Shea J. Stimulating human prefrontal cortex increases reward learning. Neuroimage. 2023 May 1;271:120029. PMCID: PMC10525914 DOI: 10.3390/biomedicines11092469
12. Dresp-Langley B. From Reward to Anhedonia-Dopamine Function in the Global Mental Health Context. Biomedicines. 2023 Sep 6;11(9):2469. PMCID: PMC10525914 DOI: 10.3390/biomedicines11092469 .

